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Best Practice Handbook for Establishing and Enhancing Energy Efficiency Obligation (EEO) Schemes

APEC Energy Working Group

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Preface

Purpose of this handbook

This handbook is intended to help you (the policy maker) make decisions across the entire process of considering, designing, implementing, and reviewing an **Energy Efficiency Obligation** (EEO) scheme.

EEO schemes are a type of policy tool to help Governments deliver **energy efficiency**, energy productivity and/or carbon emission reduction goals. They are also commonly known as Energy Efficiency Resource Standards (EERS), Energy Efficiency Incentive schemes or White Certificate Schemes (if they involve trading). There are many scheme design options, but each have common features which involve legislated energy efficiency **targets** and the creation of a competitive market for the supply of **energy saving activities** and projects.

This handbook will help you understand when an EEO scheme might be useful, how to design a scheme that will achieve your strategic policy goals, develop your business case, and review and reform an existing scheme. This handbook has been prepared alongside experts in energy efficiency and EEO schemes. It has been validated using examples of existing schemes from around the world. This handbook regularly references these case studies which are also detailed in Appendix A.

EEO schemes are not a "one size fits all" policy tool; there are numerous elements that need to be adapted to suit your local context. "Best practice" therefore changes depending on the economy the scheme is designed for. This handbook aims to detail a general "best practice" where possible, noting that some elements will not be suitable for all policy objectives and operating context.

How to use this handbook

This handbook is split into two parts, with two supporting appendices:

- Part A - Establishing an EEO scheme
- Part B - Reviewing and enhancing established EEO schemes
- Appendix A – International EEO scheme case studies
- Appendix B – Additional resources for policy makers

Part A is structured according to the order in which a policy maker may typically make decisions about designing an EEO scheme. For each stage of the decision-making process, the handbook steps policy makers through the different design options, important considerations, and best practice principles to help analyse which choices are right for your economy.

Part B of the handbook covers the key considerations, activities, inputs, and best practice tips for reviewing and enhancing established EEO schemes. It written primarily for policy makers of existing schemes but is also likely to be of interest for policy makers who are developing new schemes. This is because, as detailed in this part, best practice evaluation, review, and enhancement commences at the scheme design stage.

The handbook is structured to suit various policy maker needs. Each chapter can be read as a standalone guide, or the entire handbook can be read from beginning to end. When a key concept is explained elsewhere, the relevant section is cross referenced. For example, a cross reference to Chapter 3, Section 3.4 will be shown as "(see Section 3.4)". Key terms are **bolded** the first time they appear in a chapter and are also defined in the glossary.

Structure of this handbook

Part A Establishing an EEO

Each one of the six chapters in Part A is dedicated to one key component of scheme design. This starts with understanding if an EEO scheme is appropriate, through to developing the business case to obtain approval for the final scheme design. Within each chapter, each section is structured according to the key steps required to design the relevant scheme component. The chapters and key design choices of policy makers in Part A are as follows:

Chapter 1 – Deciding if an EEO scheme is the right tool for your needs

Chapter 2 – Choosing your policy objectives

Chapter 3 – Creating a mechanism to increase the demand for energy efficiency

Chapter 4 – Creating a mechanism to increase the supply of energy efficiency

Chapter 5 – Designing your scheme market governance structure

Chapter 6 – Developing the business case for your EEO scheme

Figure 1 below is a high-level representation of the key components of EEO schemes in operation and the corresponding chapters in Part A where detail design considerations are covered.

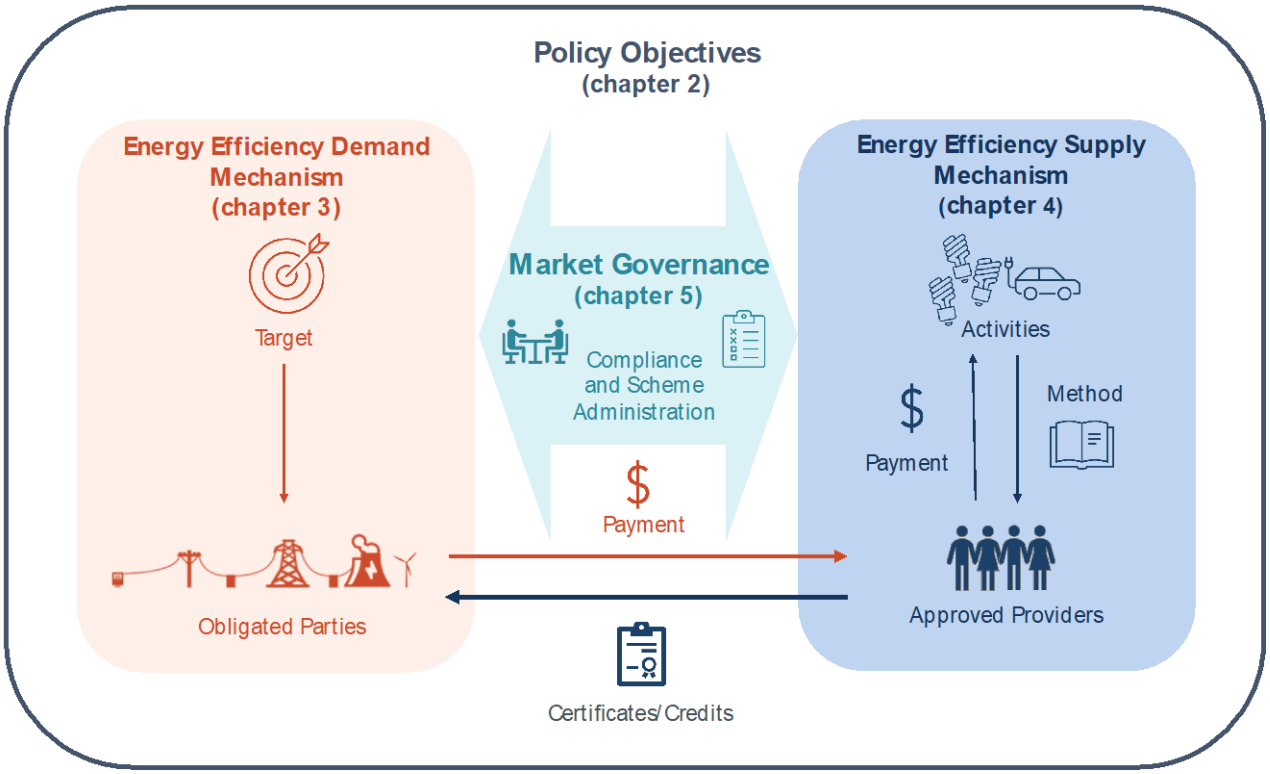

Figure 1: Interaction of the major components of an EEO scheme and relevant chapters in this handbook

Part B - Reviewing and enhancing established schemes

Part B is designed to help policy makers think through the important considerations and best practice principles to incorporate during the review and evaluation of an EEO scheme. Part B provides cross references to sections in Part A, where appropriate, and to avoid repetition. For policy makers mid-way through the implementation of an existing scheme, Part B may prove a more practical way of navigating this handbook.

The issues and key steps in the review and enhancement of existing EEO schemes are explained in the following four chapters, with cross references to Part A:

- **Chapter 7** – Overview of the main EEO scheme review types
- **Chapter 8** – First principles reviews and reform of existing EEO schemes
- **Chapter 9** – Ongoing monitoring, maintenance, and enhancement of existing EEO schemes
- **Chapter 10** - Major policy trends for next generation EEO scheme reforms

Why has APEC developed this handbook?

In 2011, the APEC Economic Leaders' Meeting set a goal to reduce the collective energy intensity of all APEC economies by 45% by 2035 (against the 2005 level). The Asia Pacific Energy Research Centre (APERC) completed a progress analysis in 2019 to understand how APEC was tracking against its energy intensity target. Between 2005 and 2017 energy intensity across APEC economies, on average, declined by 22.1%. If economies continue reducing energy intensity at the current rate, APERC predicts that economies will be able to exceed the 45% reduction goal by 2035.[3] The APEC Secretariat, alongside the Expert Group on Energy Efficiency and Conservation (EGEEC), has identified EEO schemes as an important tool to help member economies continue to reduce the energy intensity in the region and meet the 45% reduction goal by 2035. To date, more than fifty EEO schemes have been implemented throughout the world, including in five APEC economies.[4] As there are currently sixteen APEC economies without EEO schemes, establishing schemes in these economies could contribute to achieving the energy intensity reduction target.

[3] (Asia Pacific Energy Research Centre (APERC), 2019)

[4] *National schemes exist in Canada, People's Republic of China, and the Republic of Korea. Sub-national level schemes exist in Australia and the United States.*

Key terms

There are several key concepts that are fundamental to understanding EEO schemes. Different economies will use different terminology. The key terms used in this handbook are explained below. These and other key terms can also be found in the glossary at the end of this handbook.

Activity – An energy efficiency or demand management measure which is approved under EEO scheme rules to deliver eligible energy savings. Activities typically involve the installation of new, or the modification of existing equipment or buildings to improve the way households or businesses use energy.

Approved provider – An organisation authorised to create energy efficiency certificates / credits. Certificates / credits are created by implementing eligible energy saving activities in accordance with energy savings calculation methods. Approved providers may include either obligated parties and/or approved third party energy efficiency solution providers.

Eligible energy savings – Energy savings that contribute to meeting the overall energy savings target of an EEO scheme. Eligible energy savings are measured and expressed in the chosen scheme metric (e.g., megawatts (MW) of peak demand reduction or tonnes of CO_2 avoided). In this handbook the term "energy savings / demand management" is used generically to describe the outcomes of energy savings and demand management activities.

Energy efficiency certificates / credits – The legal instruments that represent eligible energy savings. These instruments are surrendered by obligated parties to comply with their energy savings obligations. Certificates / credits are approved by the scheme administrator as being created in accordance with correct calculation methods. The term "certificate" is used to describe tradable eligible energy savings, while "credits" are typically non-tradable eligible energy savings.

Obligated party – An entity that is legally required to deliver a defined share of an EEO scheme's overall energy savings target. Obligated parties create and/or purchase energy efficiency certificates / credits and later surrender a sufficient number of these to meet their individual shares of the scheme's energy savings target. Obligated parties can be energy providers, energy end-users, or dedicated organisations specifically set up to achieve the scheme target(s).

Scheme metric – Describes the common base unit that is used to quantify eligible energy savings, obligated parties' individual obligations, and energy efficiency certificates / credits. Scheme metrics vary depending on the policy goals for a specific EEO scheme. For example, a metric could be either:

- petajoules (PJ) of energy saved
- tonnes of carbon dioxide equivalent (tCO_2e) of greenhouse gas emissions avoided
- megawatts (MW) of peak demand reduction or negative demand increased.

Scheme target – Describes the legislated target for the total amount of eligible energy savings an EEO scheme must deliver each year. Scheme targets are divided and allocated as individual obligations to each of the obligated parties.

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Part A - Establishing an EEO scheme

Chapter 1 – Deciding if an EEO scheme is the right tool for your needs

This short chapter aims to help policy makers to consider whether an EEO scheme may support their economy's broader **energy efficiency**, energy productivity or carbon policy framework. This chapter provides a high-level outline of what an EEO scheme is, how EEO schemes relate to other policy instruments and what their key advantages and disadvantages are. This chapter also covers the considerations and options to manage risks of **additionality** when planning or implementing an EEO scheme that overlaps with the coverage of an emissions trading scheme (ETS).

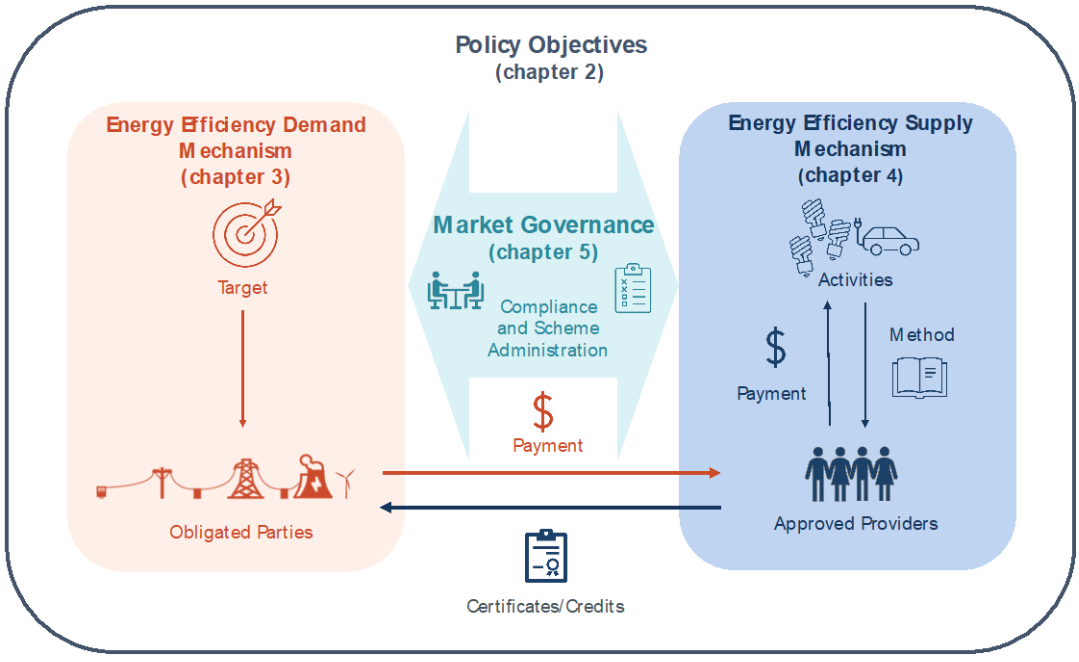
1.1 What is an EEO scheme and how does it work?

An effective EEO scheme drives large scale energy savings and/or demand management by creating a competitive market that funds the implementation of **energy saving** upgrades for households and/or businesses.[5] These schemes can be used to achieve a number of different policy goals, including improving energy efficiency, increasing energy productivity, and reducing carbon emissions.

EEO schemes have three main mechanisms that interact to deliver the policy goals:

1. Create demand for energy efficiency or demand management.
2. Regulate the supply of additional energy savings and/or demand management activities.
3. Provide a market governance framework to facilitate an efficient and competitive market.

The figure below illustrates the key elements and interactions of these three mechanisms, and the relevant chapters within this handbook where they are explained.



As illustrated above, EEO schemes work by requiring **obligated parties** to meet specific energy savings or emissions reduction **targets**. Obligated parties meet these targets by directly creating or purchasing **eligible energy savings** (**certificates / credits**). Certificates /credits can be purchased from **approved providers** who pay for the **activities** that deliver these energy savings. Approved providers use the funding from obligated parties to reduce the cost of, improve the quality of, or

[5] *An EEO scheme can establish an open competitive market for trading of energy savings. However, most EEO schemes worldwide do not establish open competitive markets: only the Italian scheme and the three Australian schemes have established open markets. Some other schemes have established markets that enable trading of energy savings only among obligated parties.*

increase access to their products, services, or processes. For example, an industrial facility might receive a discounted high-efficiency motor system upgrade or a household that buys a high efficiency fridge might get a discount from the retailer. Approved providers quantify the energy savings and certify the energy saving activities using a predetermined **method**.

1.2 Where does an EEO scheme fit into the demand-side energy policy mix?

There are a broad range of policy tools available to economies to help improve energy efficiency and energy demand-side outcomes. These tools include a mix of financial incentives, regulations, and information provisions to help remove or overcome barriers to energy efficiency and to drive increased uptake of activities which meet policy goals. Within this mix of policy tools, EEO schemes are a type of financial incentive.[6] Figure 2 below illustrates the mix of commonly used policy tools. These tools are comprised of financial incentives (e.g., EEO schemes, grants, rebates etc.) and non-financial incentives (e.g., minimum efficiency standards, energy saving audits, awareness campaigns etc.) tools. Note that Figure 2 does not consider the relative impact or spread of these tools.

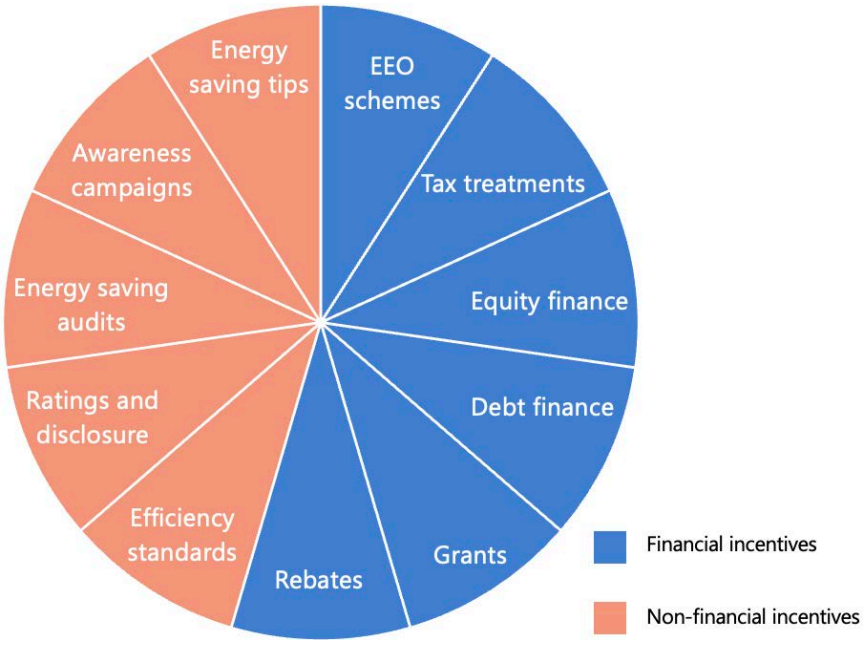


Figure 2: The energy efficiency policy mix (adapted from: Common Capital[7])

Internationally, financial incentives are key to supporting government policy that promotes energy efficiency[8]. Grants and market-based incentives are the most commonly used financial incentives. They have increased their share of global government expenditure from less than 40% in 2018 to over 60% in 2019.[9]

EEO schemes are most effective when operating within a broader policy mix, which has been designed in response to local market conditions. These schemes should be designed to complement the broader overall policy mix to maximise the benefits of the scheme. This policy mix should be designed to support the emergence of a sustainable energy efficiency industry that can deliver upgrades at scale.[10]

Different policy tools are suited to different circumstances. One way to understand the mix of

[6] *More specifically, EEO schemes are a market-based incentive.*
[7] (Common Capital, 2020)
[8] (International Energy Agency (IEA), 2015)
[9] (International Energy Agency (IEA), 2015)
[10] (Gooding & Gul, 2016)

energy efficiency policy tools is to understand the current level of market adoption of opportunities that improve energy efficiency in an economy. In practice, energy efficiency is a highly fragmented market comprised of thousands of different technology choices across various types of equipment and buildings. Some of these technologies might be mature with high levels of market adoption (e.g., LED downlights). Others may be immature with very low levels of market adoption, for example high efficiency heat pumps for industrial heating. Technology adoption rates are also likely to vary greatly from economy to economy based on past regulatory and consumer trends. Figure 3 shows a framework[11] for targeting energy efficiency policy tools, depending on where the target activity sits on the diffusions of innovations curve. It is based on the findings of a 2020 Common Capital study into the effectiveness of financial incentive-based policy tools in driving energy efficiency upgrades.[12]

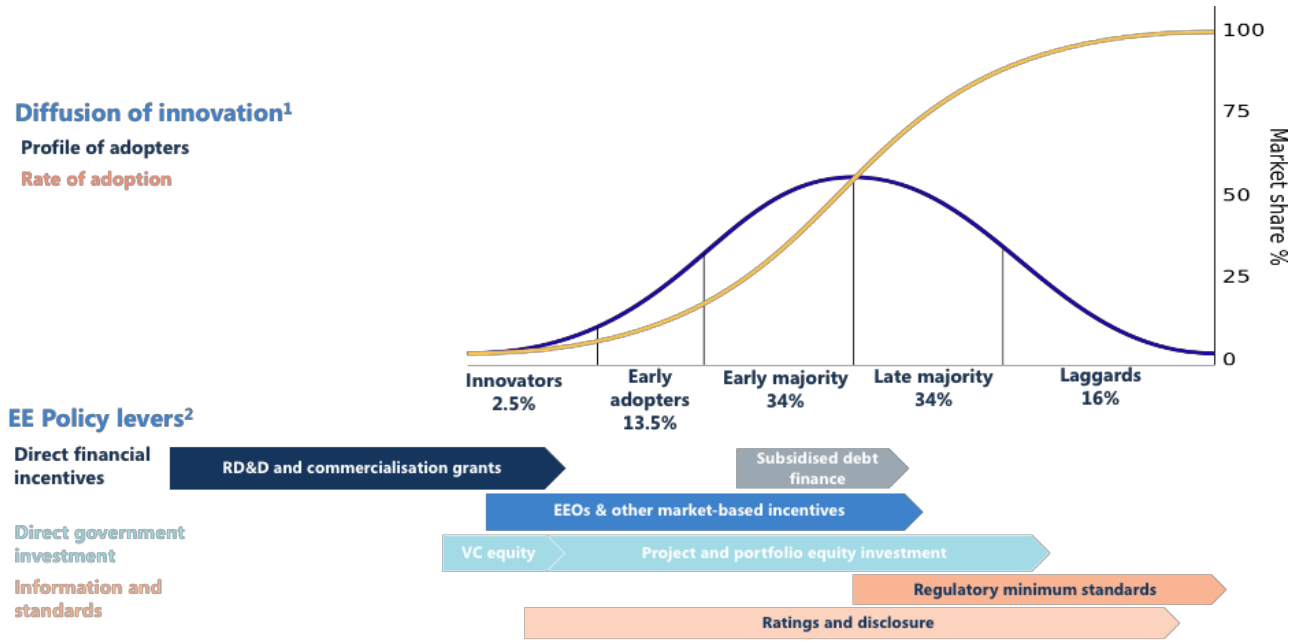


Figure 3: Adoption curve showing how policy tools interact to incentivise the uptake of energy efficiency practices in commercial buildings (source: [1]Rogers[13] and [2]Common Capital[14])

In Figure 3 above, the yellow s-curve is a simplified depiction of the rate of market adoption over time for the successful diffusion of new innovations, over time. The blue bell curve shows the percentage of market share that different customer categories represent. Under Rogers' diffusion of innovations theory, for a new a technology to progress from a promising innovation, to mass adoption, it typically needs to be adopted by more than a minority of innovators and early adopters. After which, the rate of adoption rapidly accelerates as the early majority take up innovations. Once this occurs, innovations are much more likely to become mainstream. The policy levers in this figure show that EEO schemes are most effective when targeted at technologies and practices in the innovator and early adopter stages to drive costs down and result in mass market adoption. For energy saving technologies that are starting to be adopted by the "late majority", minimum product and building standards may be more cost effective at driving adoption. Policy levers such as subsidised debt finance, direct government investment and ratings and disclosure can be complementary across technology adoption stages.

Therefore, EEO schemes are useful for scaling the adoption of energy saving activities with demonstrated commercial feasibility, but low levels of adoption. As technology adoption rates are

[11] (Common Capital, 2020)
[12] (Rogers, 2003)
[13] (Rogers, 2003)
[14] (Common Capital, 2020)

also likely to vary greatly from economy to economy based on past regulatory and consumer trends, their appropriateness, in part, depends on the maturity of the energy savings opportunities in your economy.

1.3 Advantages of EEOs as policy tools

Compared with other incentive-based policy tools for improving energy efficiency and energy demand-side outcomes, EEO schemes have three key advantages when implemented effectively. EEO schemes typically offer more dynamic and efficient subsidy levels, the ability to self-fund and a greater capacity for market transformation.

Dynamic and efficient subsidy levels

First and foremost, when compared with other types of financial incentives, EEO schemes are more dynamic and efficient. Policy tools like rebates, grants, subsidised finance, and tax incentives typically lock in the amount of subsidy paid for a given project or equipment purchase. In contrast, EEO schemes do not have a fixed price. EEOs drive competition that lowers the cost of energy savings/demand management through product and business model innovation, and deployment scale. The technologies subsidised and the amount of subsidy paid adjusts to efficient levels based on the price paid for certificates / credits (which is driven by the forces of supply and demand).

Long-term, self-funding

Securing a sufficient and long-term program budget is a key challenge for policy makers who are designing energy efficiency incentives. A key advantage of EEO schemes is their ability to be self-funding in the long-term. This is because EEO schemes are funded by obligated parties, rather than government budgets. Moreover, EEO schemes are generally designed in a way that seeks to ensure that any costs that are passed on to customers are less than the benefits which they ultimately receive from the scheme (as detailed in Chapter 6). Ensuring these benefits materialise is a key goal of effective scheme monitoring, review, and enhancement (see Part B).

For example, if the obligated parties are energy providers, they will slightly increase energy prices (rates) to cover the cost of purchasing certificates / credits. As energy efficiency improves, demand for energy will decrease below what it would have been. This reduces future energy generation and network costs and the associated price increases. If the scheme is implemented correctly, the reduction in future wholesale energy prices and network costs will be greater than the initial increase in energy prices. In addition, administrative and compliance costs can be recovered through administrative charges. For example, the registration fees to become an approved provider of energy saving certificates / credits can be set to cover the costs of scheme administration. These, and other indirect compliance costs (e.g., audits), are included in the costs recovered through energy prices. This allows policy makers to design EEO schemes at scale and for a duration far greater than would be possible if they had to compete with the myriad of other demands on government budgets.

Market transformation

Compared with other financial incentive-based energy efficiency policy tools (such as rebates or grants) EEO schemes have a greater ability to deliver lasting transformations that remove energy efficiency barriers (rather than just reducing barriers).

Transformative versus transitory policy impacts

When incentive-based policies have an impact on the target market, this impact can either be transitory or transformational. A transitory impact is one where the uptake of a subsidised activity increases with an incentive but reduces again once the incentive is taken away. For example,

demand for efficient water heaters might increase when a government provide a rebate but reduces to previous levels once the rebate funding is exhausted. In some cases, the long-term demand for energy efficient products can end up at lower levels than it was before the rebate, once the rebate is removed.[15] In contrast, market transformation involves creating sustained change even after an incentive is removed. This is because the policy intervention has resulted in the lasting removal of barriers that were preventing uptake in the first place.[16]

From a policy point of view, transformative impacts are highly preferable to transitory ones. This is because it overcomes the root problem and rediverts funds to new problems. From a net public cost-benefit analysis perspective, transformative impacts deliver benefits that result from unsubsidised uptake, rather than benefits that result from directly funded incentives. Figure 4 below illustrates the difference between transitory and transformative market impacts. The area under the orange curve shows the greater "spill over" benefits from market transformation.

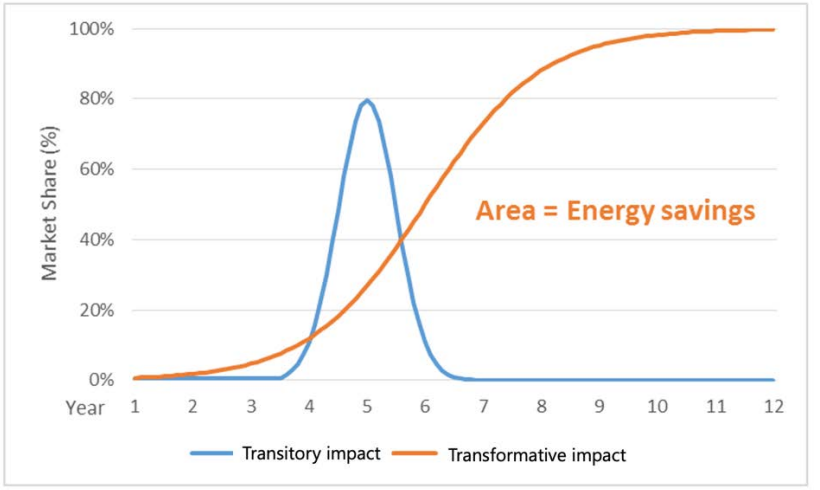


Figure 4: Example of energy savings from a transformed market vs a short-term transitory impact (source: Common Capital[17])

There are many examples of EEO schemes delivering transitory benefits, with schemes frequently driving large uptake of an eligible energy savings activity until the market is saturated and incentives are removed. However, the ability to achieve market saturation through sheer scale is an advantage over grant and rebate programs.

Therefore, one of the distinct advantages of EEO schemes, relative to other financial incentive options, is their capability to deliver market transformation. Their scale, long-term and competitive basis promote both investor confidence and incentives to invest in product and business model innovation. These market changes can in turn drive down costs, and barriers to access, for customers who do not receive direct subsidies. The transformation of the lighting market under several Australian EEO schemes is one example (see Appendix A, Case Study 6 and 7).

1.4 What are the challenges of implementing an EEO scheme?

While EEO schemes have the ability to deliver large-scale energy savings, along with other significant benefits, there can be challenges in their implementation. The main challenges are:

- EEO markets tend to solve one problem at a time, resulting in trade-offs between policy goals.

[15] (Common Capital, 2017)
[16] (Eto, et al., 1996)
[17] (Common Capital, 2017)

- In efficient markets, winners-take-all and can crowd out other promising opportunities.
- Success breeds challenges as innovative technologies and practices become routine, and stakeholders resist change.
- Political and administrative patience and restraint are needed to allow time for supply and demand to work.

These challenges are closely related to the scale, time frames and market competition forces that drive the strengths of EEO schemes. Policy makers can mitigate these challenges in two ways. When designing an EEO scheme, it is important to understand and focus on the barriers and opportunities for energy efficiency. This ensures the scheme can have the greatest impact when combined with other policy tools that complement the weak aspects of the scheme. Further, there are key choices for the design, implementation, and review of EEO schemes that can mitigate the risks of these challenges, as detailed throughout this handbook.

Solving one problem at a time

Policy makers may have multiple policy goals for their EEO scheme, such as reducing energy emissions and increasing productivity and affordability. EEO markets are highly effective at seeking out the lowest cost and most readily scalable energy saving activities. Many eligible energy saving activities will support more than one policy goal. However, it is likely that the optimal activity will vary for different policy goals. For example, commercial lighting projects may be the lowest cost way to reduce market-wide wholesale energy demand, but not the optimal solution to reducing **peak demand**, and will only have negligible benefits for households in energy hardship. The activities which the market pursues are highly sensitive to both the metrics chosen for the scheme (Section 2.3) and the cost of the activity, relative to the eligible savings as determined by calculation methods (Chapter 4). Consideration must be given to which problems you want your EEO scheme to solve, and the trade-offs involved with designing these components.

Winner-takes-all markets

Closely related to the challenge above, is the short-to-medium term tendency for winner-takes-all EEO markets. This does not refer to the market power of individual approved providers, but rather the tendency for one type of energy saving activity to dominate the market at a time. This occurs when the market finds a particularly cost-effective and scalable activity to meet the demand for certificates / credits. The market tends to drive the cost of this activity even lower through a combination of learning-by-doing, increased customer acceptance, economies of scale, and product and business model innovation. As costs decrease, the price of certificates / credits for this activity become significantly lower than the other activities, reducing their cost effectiveness and level of uptake. Without an increase in uptake, other potentially cost effective and scalable activities do not receive the same benefits of scale and are crowded out of the EEO market. Ultimately, as markets are saturated, policy makers tend to revise the calculation methods for the dominant activity, making it less cost effective, and certificate / credit prices rise again, making other activities more attractive until the cycle repeats (see Appendix A, Case Study 6 – New South Wales Energy Savings Scheme).

The tendency for EEO markets to maximise the energy savings delivered, while driving costs down, is an advantage of these schemes. However, the cyclical winner-takes-all nature is viewed with scepticism and frustration by many policy makers. Moreover, schemes could be more effective with a more diverse range of eligible activities that are competing at scale pricing. Design solutions to help achieve this diversity include complementary grant programs, sub-targets, and incentives (see Chapter 3).

Success breeding challenges

The third challenge is closely related to the issues discussed above. As a result of the market's success in scaling activities, EEO schemes can deliver market transformation for dominant

activities. This transformation can take the effect of near saturation, for example every eligible house in an economy receiving an upgrade. Or this can take the effect of spilling over into the non-EEO market for an activity. For example, the scheme drives the price down and the demand for energy saving products up, to the degree where subsidies are no longer required for consumers to adopt new practices. Under either of these circumstances, the baseline assumptions in the calculation methods need to be revised to reflect the new "business as usual". In well maintained schemes, the adjustment of baselines should happen regularly, and market expectations should be clearly managed (discussed in Part B of this handbook). Eligible savings will also need to be reduced (see Chapter 4). Although, reducing the eligible energy savings for a dominant activity will have the short-term effect of increasing certificate / credit prices in an efficient market. This is also likely to be met with resistance from stakeholders involved in the supply of the activity who have grown accustomed to higher levels of subsidies. These effects tend to resolve over time. The implications and solutions to this are discussed further in the next section, under the need for political and administrative patience and restraint.

Political and administrative patience and restraint

As discussed, a key advantage of EEO schemes is that their long timeframes and funding certainty can provide investors the confidence to develop innovative new products and business models that transform markets. This, however, takes time. It can take two to three years to develop new products or solutions. Even established businesses can take at least eighteen months to refine their supply chain and distribution model to deploy new solutions at scale.

This lead-time can result in periods of lower supply and higher prices for certificates / credits, while the market is refining scalable solutions. EEO policy makers and administrators are often uncomfortable with the prospect of higher certificate / credit prices. This can result in feeling pressured to develop more generous (and less accurate) calculation methods that will increase the number of certificates / credits issued and lower prices in the short-term. This can also compound the reluctance policy makers may feel to revise calculation method baselines when activities become more business-as-usual (as discussed above).

These concerns and actions completely counter the forces that drive the success of EEO schemes and undermine policy outcomes. For EEOs to work, calculation methods must be based on average actual savings at an activity level. If they are too generous, then the savings delivered by the scheme will be lower than the targets represent, and cost-benefit outcomes of the scheme will be eroded. Thus, short-term efforts to reduce prices actually result in increasing the net public cost of the scheme. Similarly, EEO schemes require the forces of supply and demand to succeed. As discussed above, higher numbers of certificates / credits provide an incentive for the market to innovate and find new ways to drive the cost of genuine energy saving activities down. Efforts to keep short-term prices low by over-subsidising certain activities hinders the market's ability to deliver sustainable, lower prices for genuine savings in the medium-to-long-term.

Addressing these challenges are primarily issues for scheme administration, review, and enhancement (covered in Part B of this handbook).

1.5 Managing EEO additionality with an emissions trading scheme (ETS)

Many economies with EEO schemes or considering EEO schemes also have emissions trading schemes (ETSs) to reduce greenhouse gas emissions. ETSs can be grouped into two general categories: "cap-and-trade" and "baseline and credit".

Cap-and-trade schemes

Cap-and-trade schemes involve setting hard legislative ceilings on the total emissions permitted

each year from the sectors and facilities the scheme covers. Emitters who are covered by the scheme either reduce their emissions or trade with other emitters for more rights to emit. The EU ETS is the prominent example of such a scheme.[18]

Baseline and credit schemes

A baseline and credit scheme provides financial incentives to those who reduce their emissions but does not penalise those who continue to emit. Baseline and credit schemes involve methods for estimating and rewarding emission reductions that result from new activities that are implemented in the different sectors and facilities the scheme covers. Methods involve estimating what baseline emissions would have been for a site or activity and calculating the difference between estimates of emissions after the activity is implemented. Some baseline and credit schemes cover many sectors, facilities, and activity types. Some only cover a few. The calculation methods in EEO schemes typically operate in a very similar way to baseline and credit schemes. In fact, EEO schemes with explicit greenhouse gas reduction policy goals, and scheme metrics denominated in tonnes of CO_2e, are a type of baseline and credit ETS focused exclusively on energy efficiency. The United Nations' Clean Development Mechanism (CDM) is the prominent example of a baseline and credit scheme.[19]

Additionality in ETSs and EEO schemes

Additionality is crucial for the policy integrity of both ETSs and EEO schemes. Additionality means ensuring that the emissions reductions, energy savings or **energy demand shifts** that are credited towards its targets would not have occurred otherwise. There are numerous risks around additionality that policy makers need to consider and manage in both ETS and EEO design.

For the purposes of interactions between EEO schemes and ETSs, the potential for double counting savings between the two schemes is the key additionality risk to consider. This is a risk when an economy has (or is planning) both an EEO scheme and an ETS that overlap in the sectors and facilities covered.

If the ETS is a cap-and-trade scheme, the emissions units under the ETS should take priority over an EEO scheme. If cap-and-trade ETS certificates have been allocated appropriately, they will be based on actual measured point-source emissions. Whereas baseline and credit certificates are estimated reductions of predicted future baselines. EEO schemes are incentive-based, rather than regulatory policy instruments, and as such, complement cap-and-trade ETSs by helping to reduce the cost of energy sector emission reductions. If EEO schemes have tradable certificates, the legislation for both the ETS and EEO scheme must ensure these certificates are not able to be exchanged ("fungible") with credits under the cap-and-trade ETS. A prominent example of this is the European Union's Energy Efficiency Directive[20] that has led to the establishment of EEO schemes in EU member states, to complement the EU ETS.

If the ETS is a baseline and credit scheme, policy makers have two options to manage the risk of double counting. They can either facilitate fungible certificates between the two schemes, which would involve the legislation of one or both schemes to allow certificates from certain activities from the other scheme to be counted against targets. It also involves aligning calculation methods or developing conversion factors to ensure the equivalence of certificates. Alternatively, policy makers can prevent double counting by ensuring the calculation methods for both schemes prohibit claiming certificates for the same eligible savings under the other scheme. Calculation methods typically include prohibitions such as this to manage other additionality risks, such as claiming savings from activities that are required by law (see Chapter 4). Under either of these scheme harmonisation options, there is a need for close ongoing collaboration and information exchange between the scheme administrators from both schemes. This includes sharing certificate registry

[18] (European Commission, n.d.)
[19] (United Nations Framework Convention on Climate Change, n.d.)
[20] (European Commission, n.d.)

data and level of the site address where savings are attributed to cross check savings are not deliberately or accidently claimed for the same activity.

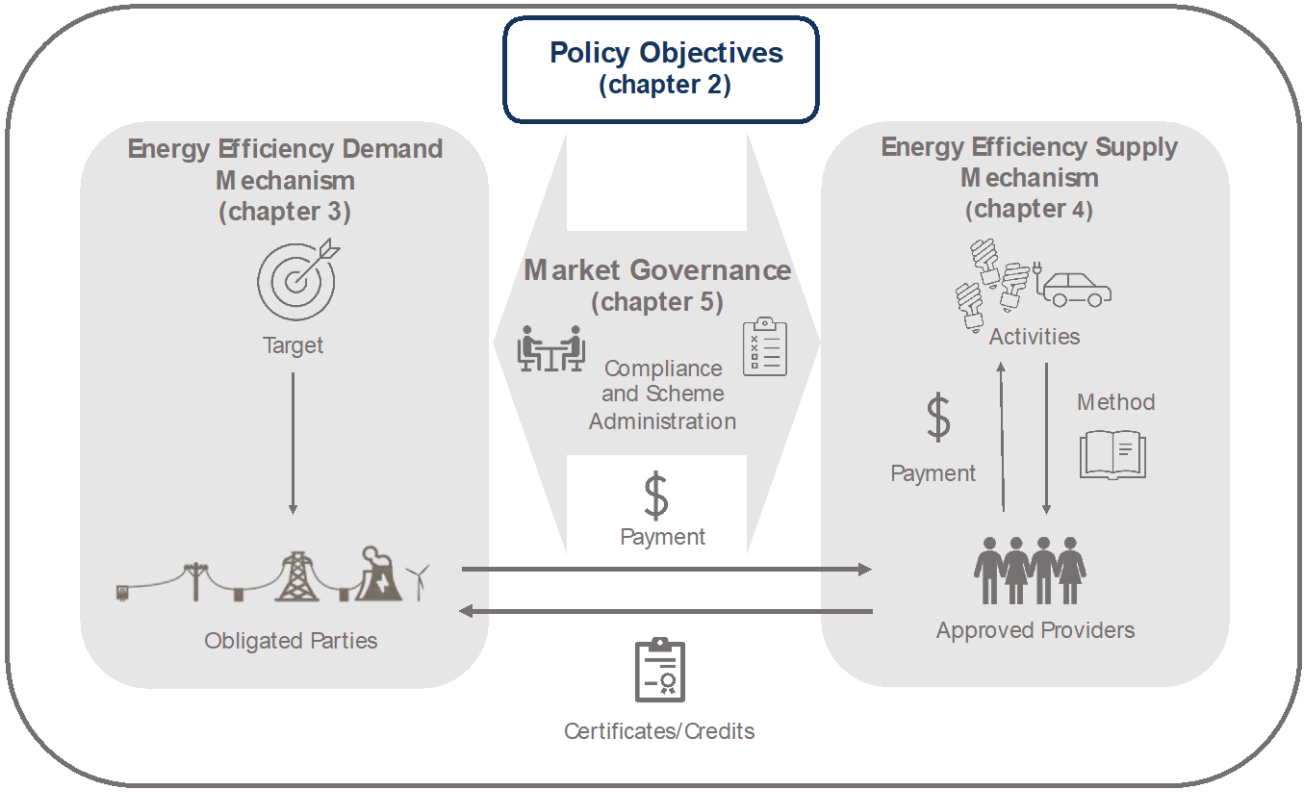
Issues of additionality and policy interaction are also relevant to EEO scheme design in relation to other market-based based policy (e.g., demand-side energy market participation schemes and subsidy programs) and regulatory standards. Policy makers need to consider these trade-offs between complementarity and duplication between other policy tools, when deciding to: use an EEO scheme; setting scheme coverage (Section 2.1); activity and method development (Chapter 4); and evaluation attribution of impacts (Chapter 7).

Best practice tip: develop a program logic and theory of change to map out policy goals

A program logic and theory of change are useful tools for mapping which scheme goals are primary and supporting, and the mechanisms your EEO scheme will use to achieve these goals. Program logics and theories of change create essential hypotheses about the expected outcomes and causal mechanisms that policy interventions will deliver. As we will see in Part B of this handbook, these are also important tools for the program review and evaluation. Developing a program logic and theory of change before you implement your EEO scheme is important as it helps shape your evaluation and data gathering to ensure you have the information you will need in later years during the policy review stage.

See Appendix B for links to resources on program logics and theory of change.

Chapter 2 – Choosing your policy objectives



Internationally, EEO schemes are used to deliver a broad range of policy objectives related to driving changes in the amount, timing and/or type of energy demand. The term "**energy efficiency obligation**" is derived from the fact that EEO schemes historically have been focused on **energy efficiency**. However, within this context different governments pursue energy efficiency as a means of achieving a range of different policy objectives. The way energy efficiency is measured and types of energy efficiency that are pursued can vary depending on the desired policy outcomes.

The objectives of an EEO scheme set the framework for deciding many of the of key EEO design components. These include demand mechanisms (Chapter 3), supply mechanisms (Chapter 4), and assessing costs and benefits (Chapter 6). Therefore, the first and most important design decision is to decide and clearly articulate the primary and supporting objectives of your EEO scheme.

The key steps are:

1. Map your strategic policy goals to potential EEO scheme objectives (Section 2.1).
2. Decide the primary policy goals which will determine scheme design components (Section 2.2).
3. Set the base metric and conversion factors (Section 2.3).

This chapter steps through the options and key considerations for these steps and provides examples from case studies of different approaches.

2.1 Map your strategic policy goals to potential EEO objectives

As discussed in Chapter 1, energy efficiency and EEOs can be used to help solve a range of policy problems, while delivering a range of co-benefits along the way. You will likely have a clear understanding of your particular policy context before even considering an EEO scheme. The various policy goals which EEOs are used for can be grouped into four high-level categories as shown in Figure 5 below. In addition to these energy-system related primary goals, energy efficiency and EEOs generally deliver a broader range of co-benefits beyond these[21], including health, environment, jobs, and industry development. Refer to Chapter 6 and Appendix B for guidance on how to calculate and assess different EEO costs and benefits.

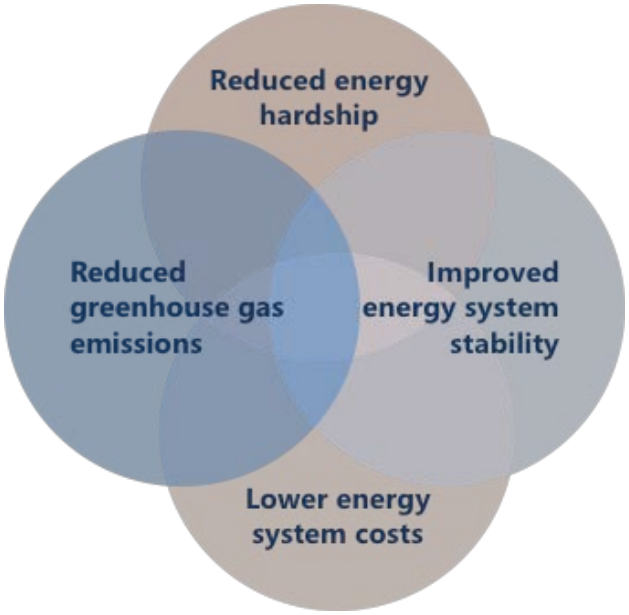


Figure 5: High-level complementary, but not equivalent, categories of potential EEO policy goals

These types of policy goals are related, but not perfectly equivalent. EEOs can help deliver some or several of these goals, but detailed design decisions will result in trade-offs between each. It is important to understand which of these goals are your primary objectives and which are supporting objectives or important co-benefits. In practice, EEO schemes cover a broad range of policy goals. Table 1 shows the policy objectives of the EEO schemes that were in place in 2016 in 11 European Union member states.

[21] (Rosenow & Bayer, 2017)

Table 1: Policy objectives for EEO Schemes in 11 EU Member States[22]

Policy Objective	EU Member State										
	Austria	Belgium	Denmark	Spain	France	Ireland	Italy	Lithuania	Portugal	Slovenia	United Kingdom
Deliver cost-effective energy savings / reduce energy bills	X	X	X	X	X	X	X		X	X	
Environmental / CO_2 reduction								X			X
Improve energy security by reducing imports							X				
Assist low-income households to install efficiency measures						X					X
Tackle fuel poverty*					X	X**					X
Stimulate energy services market	X						X	X			
*** Fuel poverty refers to that subset of low-income households that struggles the most to heat their homes affordably.**											
**** Only 5 percent of the target is to be met by actions in fuel-poor households.**											

2.2 Decide the primary policy goals which determine scheme design components

It is important to clearly articulate what the primary goals are for your EEO scheme as these will later inform detailed design decisions that shape the outcomes the scheme will deliver. This will likely involve trade-offs between the complementary real-world outcomes achievable using EEO schemes.

Best practice tip: develop a program logic and theory of change to map out policy goals

A program logic and theory of change are useful tools for mapping which scheme goals are primary and supporting, and the mechanisms your EEO scheme will use to achieve these goals. Program logics and theories of change create essential hypotheses about the expected outcomes and causal mechanisms that policy interventions will deliver. As we will see in Part B of

[22] (Bayer & Lees, 2016)

this handbook, these are also important tools for the program review and evaluation. Developing a program logic and theory of change before you implement your EEO scheme is important as it helps shape your evaluation and data gathering to ensure you have the information you will need in later years during the policy review stage.

See Appendix B for links to resources on program logics and theory of change.

Table 2 below shows examples of the types of policy goals and the corresponding intermediate outcomes for EEO schemes. It also provides examples of site-specific activities that EEO schemes can drive to achieve these goals. As you can see, these complementary but different goals drive a mix of real-world **energy efficiency/demand management upgrade activities**.

Table 2: Expected outcomes of example policy goals (continued across three pages)

Primary goal	Ultimate outcomes	Intermediate outcomes	Example activities the EEO market may deliver
Reduced energy hardship	Direct energy bill savings, improved health, well-being, and climate resilience for participants.	Lower energy consumption / avoided under consumption due to subsidised appliance and home upgrades provided to households in, or vulnerable to, energy hardship.	• Activities that deliver the deepest reductions in energy consumption for individual participants. For example: o Replace gas/oil/resistance space/water heating to a high-efficiency heat pump in the home of an energy hardship customer. o Install insulation and draught proofing to weatherise homes in the home of an energy hardship customer.
	Indirect bill savings for all households.	Lower energy system costs through reduced total demand for energy.	
Reduced greenhouse gas emissions	Decarbonise industrial, commercial, and residential end-uses of primary gas and liquid fuels.	Electrification of space, water, and process heating; and transport with most cost-effective, high efficiency alternatives.	• Activities that deliver the greatest combined emissions reductions for the lowest net cost: o Convert gas/fuel boiler space/water heater to a high a high-efficiency heat-pump. o Convert low-grade industrial heat to a high-efficiency heat-pump. o Decommission internal combustion engine (ICE) vehicle and replace with electric vehicle (EV).

Primary goal	Ultimate outcomes	Intermediate outcomes	Example activities the EEO market may deliver
Improved energy system stability	Reduce system costs and/or provide grid firming to support the transition to a zero-carbon electricity system.	Reducing peak demand and/or reversing **negative demand** through targeting energy savings, demand shifting and/or **demand response** to address energy supply-demand imbalances.	• Activities that deliver the greatest combined peak demand reductions/negative demand increases/demand flexibility for the lowest net cost: o Connect commercial or household battery to approved **Virtual Power Plant (VPP).** o Connect commercial or household building or appliance (e.g., HVAC, water heater, pool pump, EV charger) to approved Demand Response Aggregator (DRA). o Industrial Demand Response. o Replace inefficient, high peak demand appliance (e.g., HVAC) with high efficiency alternative. o Install timed load controls on peak or negative demand equipment (e.g., shift water heating to off-peak or negative demand periods).
Lower energy system costs	Lower future energy system costs and retail price/rate increases.	Reduce the need for new expenditure on network and generation infrastructure and fuel by reducing total energy demand.	• Activities that deliver the greatest combined reductions in demand and generation needs for the lowest net cost: o Upgrade commercial and industrial lighting with high efficiency alternatives. o Upgrade commercial and residential HVAC with high efficiency alternatives. o Upgrade industrial compressed air, pumping and motor systems with high efficiency alternatives.

2.3 Set the base metric and conversion factors

The first step to developing the demand mechanism of an EEO scheme is deciding how the scheme will be measured. The base metric acts to convert the scheme goals into measurable objectives. The metric is the base unit of measurement through which both scheme targets and **energy savings certificates / credits** will be denominated. The base metric links the demand and supply for energy savings or demand management and is fundamental in influencing the outcomes of an EEO scheme.

Metric conversion factors are the ratios used in the calculation required to convert different types of energy use (or savings) into a common unit. These are used to convert energy savings (demand changes) from different fuel and activity types into the base metric of the certificates / credits. They may also be used to calculate what portion of a scheme target individual obligated parties are liable for in a given year. For example, converting obligated parties' liable energy sales into the number of certificates / credits they must surrender (see Section 3.3).

Examples of common metrics for different policy goals are shown in Table 3 below. The table also gives example conversion factors and considerations that may influence the need to update the conversion factors over time.

Table 3: Common metrics for different policy goals and example conversion factors

Primary policy goal	Potential metric(s)	Example conversion factors	Reasons to update conversion factors
Reduced greenhouse gas emissions	Tonnes of carbon dioxide equivalent avoided (t CO2e) from a specific geographical area or within a specific timeframe	t CO2e / MWh electricity consumed (adjusted for losses) t CO2e / MJ natural gas	Changes in the local carbon intensity of electricity (historical and/or forecast)
Improved energy system stability	Megawatts of reduced peak demand (MW)	Average MW reduction over target peak demand window	Shifts in the timing of problematic peak demand periods
Demand smoothing	Megawatts (MW) of demand smoothing (reduced peak and/or negative demand)	Normalisation factor based on the relative value between reduced peak and increased negative demand	Shifts in the timing of problematic peak and negative demand periods
Lower energy system costs	Petajoules (PJ) of primary energy saved	PJ primary energy / MWh electricity consumed (adjusted for losses)	Changes in the local primary energy mix of electricity (historical and/or forecast) or other energy types covered
	Petajoules (PJ) or megawatt hours (MWh) of final energy saved	PJ final / MWh electricity consumed (adjusted for losses)	N/A
Reduced energy hardship	Normalised energy cost	Hybrid factor based on relative retail price / PJ Final energy	Changes in the local retail price/rate of different fuels (historical and/or forecast)

Best practice principle: choose a metric that aligns with your primary policy goal and consider supporting policy goals when choosing conversion factors

Base metrics may be set in terms of primary energy (i.e., energy in its original form, such as coal, before any transformation into other energy forms, such as electricity) or final energy (i.e., the quantities of energy delivered to, and used by, consumers). EEO schemes solely concerned with energy efficiency may prefer final energy as a base metric because it relates most closely to the energy quantities familiar to end-users and energy providers. Targets that use primary energy as a base metric may be preferable for schemes that cover a range of fuels with different conversion factors from primary to final energy (e.g., in converting coal or natural gas to electricity). Primary

energy is also useful if emissions reduction is a secondary goal of the scheme, as primary energy is a rough substitute for the relative emissions intensity of a fuel source. The NSW Energy Savings Scheme (Appendix A, Case Study 6) is an example of a scheme using primary energy as a base metric.

EEO schemes with a primary goal of greenhouse emission reduction through energy efficiency are likely to have metrics based on avoided greenhouse emissions, typically set in terms of tonnes of carbon dioxide equivalent (t CO_2e). While the targets are stated in terms of t CO_2e, they are firstly measured in units of energy saved (e.g., MWh of electricity or MJ of gas). The corresponding emission reductions are then calculated using conversion factors from energy units to t CO_2e.

EEO schemes that aim to deliver peak demand reduction or grid firming are likely to require a base metric measured in units of demand reduced (or shifted) in the target window. For example, an EEO scheme that aims to reduce peak demand between 6-9 PM in summer might set a base unit measured in megawatts (MW) of peak demand reduced during this period. Alternatively, a scheme that seeks to both reduce demand at peak times and increase demand at times of negative demand might have hybrid metrics. For example, New South Wales is planning a peak demand reduction scheme legislated to commence in 2022 in parallel with its existing EEO scheme.

Finally, schemes that seek energy affordability or hardship reduction as their primary goal may seek a metric that is linked to the retail energy prices (rates) customers pay. This prioritises energy savings activities towards fuels that are more expensive. The French EEO Scheme is one such example (Appendix A, Case Study 4). This EEO scheme has a hybrid metric that converts primary energy savings from different fuels (electricity, natural gas, heating oil, and liquid transport fuels) to a common artificial metric.

Best practice tip: plan to update your metric conversion factors in the future

Plan for the likely future requirement to update metric conversion factors from time to time. When establishing the legal authority for the scheme (see Section 3.4 below) ensure this will be a relatively straightforward process.

See Part B of this handbook for guidance on when and how to update metric conversion factors.

It is important to identify the implications for design components for your EEO scheme to deliver the different policy goals and intermediate outcomes. While most EEO schemes may have a similar mix of eligible energy efficiency/demand management upgrade activities, some key design choices will strongly influence which activities the market will and will not likely adopt. These key components and relevant sections of this handbook are listed below.

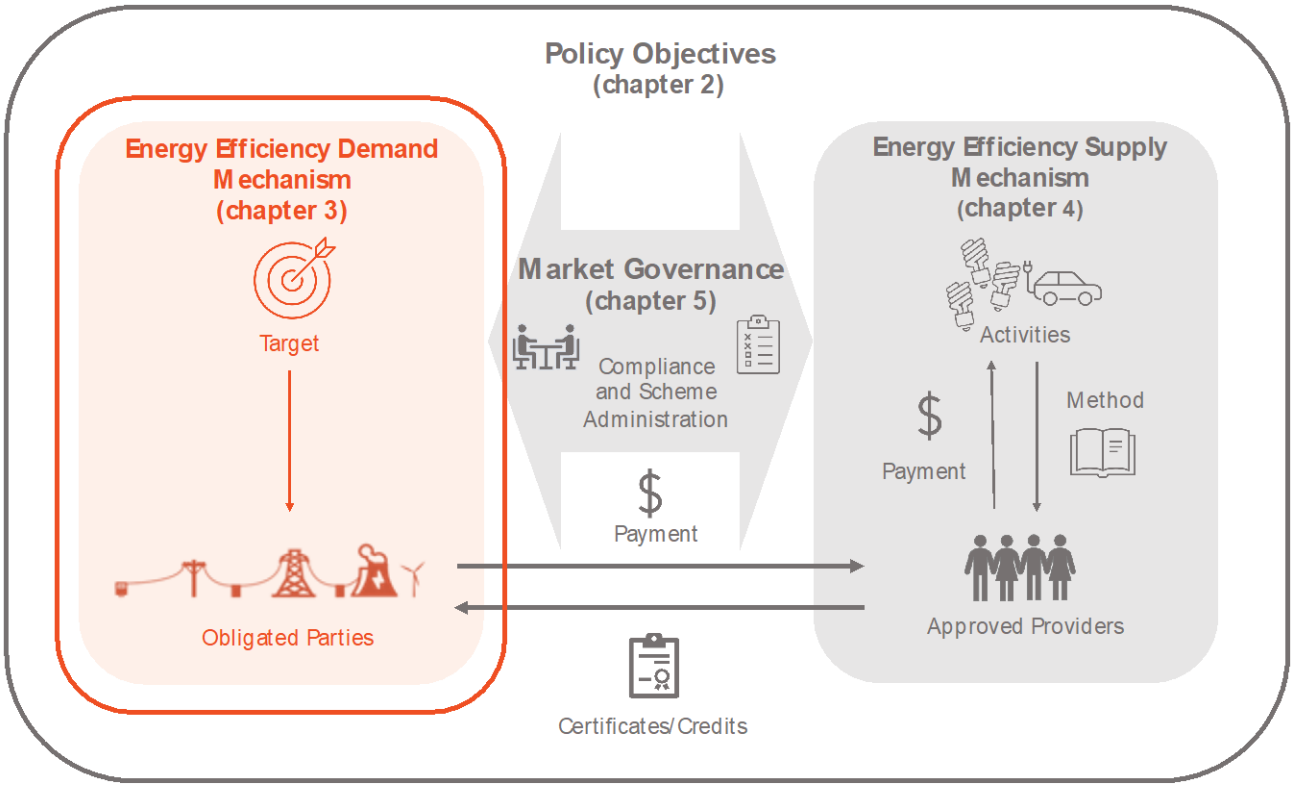
- Decide the fuel, sector, and customer inclusions, exclusions, and priorities – Section 3.1
- Set scheme targets, trajectories, and target adjustment mechanisms – Section 3.2
- Determine the energy saving activities that will be eligible for incentives – Section 4.1

Key resources:

1. *Best Policy Practices for Promoting Energy Efficiency*[23]
2. *How to Identify Policy Options*[24]

[23] (United Nations Economic Commission for Europe, 2015)
[24] (European Commission, 2017)

Chapter 3 – Creating a mechanism to increase the demand for energy efficiency



One of the three main mechanisms of an EEO scheme are the components that create a demand for approved **energy efficiency** and/or the demand management **activities**. Collectively, these demand-side components form the mechanism that raises the funds to provide financial incentives and creates the demand for approved activities which deliver policy goals.

Often the demand mechanism will not literally involve the centralised and direct collection and spending of funds on incentives for approved activities. Instead, the demand mechanism drives the decentralised collection of funds and **obligated parties** directly or indirectly invest in approved activities (see Section 3.3). The combined result is that the total expenditure on approved activities is equal to the amount each obligated party spends on approved activities.

There are four key steps required to design an EEO demand mechanism:

1. Decide the fuel, sector, customer inclusions and exclusions, and priorities (Section 3.1).
2. Set targets, trajectories, penalties, prices, and other automatic stabilisers (Section 3.2).
3. Select obligated parties and allocate obligations (Section 3.3).
4. Establish a legal authority for your EEO scheme (Section 3.4).

As with most scheme design elements, policy makers have multiple options to choose from. Best practice is to understand which choices align best with your policy goals, energy market structure and stakeholder acceptance. This chapter sets out some of the key design choices, considerations, and steps to best practice in designing each of these components.

3.1 Decide the coverage of fuels, sectors, and customers

The next step is to decide which fuels, economic sectors, and customer types you will seek to improve with your EEO scheme (based on the metric you selected in Section 2.3). Within this scope you may also wish to identify priority groups of customers to ensure they receive direct benefits. For equity considerations, you may also wish to exclude or limit the pass through of scheme costs to certain customer groups. These decisions vary from scheme to scheme depending on policy goals and the local market and stakeholder contexts.

All EEO schemes reviewed in this study cover electricity end use, and all but one (Vermont) cover natural gas use (see Table 9 in Appendix A). Some schemes, such as the Perform, Achieve Trade Scheme in India also cover liquid fuels for onsite heating, for example diesel or fuel oil (see Case Study 5). Only half of the schemes reviewed in this study include liquid fuels for transport. In California, for example, the EEO scheme covers electricity and natural gas only (see Appendix A, Case Study 2). California also has a completely separate EEO-style scheme called the Low Carbon Fuel Standard. This scheme aims to reduce the emissions of liquid fuels through obligations on fuel importers and refineries with tradable certificates.[25]

Best practice principle: align fuel, sector, and customer coverage with opportunities to solve policy problems while considering administrative feasibility

Ideally when selecting fuels, sectors, and customers, you should make sure that coverage includes all the known opportunities to achieve the policy objectives of the scheme. For example, if the scheme seeks to deliver energy efficiency, scheme coverage should include those fuels, sectors, and customers with the greatest levels of energy inefficiency. If you seek to deliver direct bill savings through upgrades for a targeted set of customers, you need to understand if the size of that group is large enough for a complex program like an EEO scheme to be the best choice.

Best practice tip: start constructing your business case modelling and analysis early to help with high level design decisions

As discussed in Section 6.5, a key input to the business case is **opportunity identification** and **cost curve modelling**. This includes understanding the range of potential demand-side activities your EEO scheme can target, their costs (operating and capital) and benefits (energy bill and maintenance savings) to customers who choose to adopt them, and their current levels of market penetration and uptake growth under current policy settings.

This analysis is also useful to inform early design decisions, such as coverage of fuels, sectors, and customers. If this information is not already known, you may want to commence business case development at this stage. It will also assist with target option analysis during Section 3.2 below.

Administrative feasibility is also a key consideration. For example, in many economies, similar or the same organisations will be involved in the electricity and gas retail markets. This makes it straightforward to cover both fuels with the same legislative framework, compliance processes and administrative costs (if you select energy providers as your obligated parties) (see Section 3.3 below). There is also often a strong overlap between energy saving activities for stationary energy fuels and the potential for saving energy in one fuel by switching to another (e.g., electrification of gas heating with high efficiency heat pumps).

In contrast, liquid fuels for transport generally have very different supply chains, leaving little room for administrative synergy between an electricity/gas EEO and a liquid transport fuel EEO. For example, it is not currently common for petrol retailers or refineries to be involved in the retail or

[25] (California Air Resources Board, n.d.)

distribution of electricity or natural gas. It could prove administratively challenging to combine the diverse customers, liable parties, and savings activities for energy, gas, and transport under one EEO scheme[26]. For simplicity, policy makers may choose to start with one fuel, then expand once the administrative framework and market are mature enough to manage greater complexity. For example, the New South Wales scheme, which commenced in 2009, covered electricity only and then expanded to cover gas in 2015 (see Appendix A, Case Study 6). Alternatively, separate parallel EEO schemes with complementary but discrete goals and sectors, may be desirable.

Policy makers typically align the coverage of customers in EEO schemes to policy goals. Some EEO schemes also set sub-targets for priority groups to ensure a guaranteed minimum level of energy efficiency upgrades are delivered to customers in these groups. For example, the first iteration of the South Australian EEO scheme had energy affordability as its primary goal. It limited energy efficiency upgrades to households and small businesses. This ensured households and small businesses received additional direct benefits of upgrades. It also excluded lower cost commercial and industrial energy savings activities, which could have delivered scheme targets for a greater net public benefit. The South Australian Scheme also set sub-targets for low-income households to ensure direct savings would flow to this priority customer group. The potential higher cost sub-targets can be justified in the cost-benefit analysis (Chapter 6.5) if they deliver increased co-benefits in other policy areas, such as social policy and health.

Best practice principle: seek customer inclusions and exemptions to maximise efficiency while avoiding perverse impacts

A key feature of an EEO scheme is that costs are recovered through small increases in retail prices (rates) for the fuels covered by the scheme. To maximise the net public benefits of a scheme, the pass through of these costs should be spread broadly across customers who are expected to benefit from the scheme outcomes (see Section 6.5 for the cost-benefit analysis and the Ratepayer Impact (RIM) Test). For the same reason, costs should also be passed through proportionally to customers' energy use, thus aligning to the expected benefit from indirect energy price reductions.

However, there may be circumstances where the proportional passing through of costs has perverse policy impacts. In these cases, it may make policy sense to exclude or significantly reduce the pass through of costs for certain customer types. There is a strong equity case for exempting households who are in, or are vulnerable to, energy hardship. EEO schemes have a risk of being regressive forms of indirect taxation on lower income earners. This is because they recover costs through energy prices (rates) and low-income households typically spend a greater share of their income on energy than other households and business.

In economies where there are energy-intensive, trade-exposed industries, governments and/or energy regulators may decide to exclude such industries from the sectoral and facility coverage on the grounds that their competitiveness in international markets may be adversely affected. For example, the New South Wales Energy Savings Scheme excludes up to 90% of the cost pass through of "trade exposed energy intensive customers" (Appendix A, Case Study 6). In contrast, the Grid Company EEO scheme in China prioritises energy intensive customers on the grounds that they will benefit commercially from increased energy efficiency (Appendix A, Case Study 3).

Best practice principle: consider performance incentives for certain activities or behaviours

Some EEO schemes include performance incentives for obligated parties. The purpose of these incentives is to have greater influence over the ways obligated parties meet their targets. For example, performance incentives encourage obligated parties to exceed their targets, with the aim of achieving scheme policy goals earlier than planned. Alternatively, schemes may encourage a greater diversity of savings activities through creating premiums on higher cost activities that are considered to have other policy benefits. For example, incentives may deliver a broader distribution

[26] *Note that as discussed in Chapter 10, trends towards the electrification of transport may see future convergence between sectors these sectors and have different implications for future EEO reforms.*

of upgrades across different customer types (households versus businesses). Or incentives may seek to support ongoing innovation to drive down the costs of a broader range of activities and counteract the “winner takes all” challenge discussed in Section 1.4.

Typically, performance incentives may be provided for obligated parties that:

- exceed their energy savings or carbon emissions reduction targets
- implement particular, specified energy savings measures
- carry out whole-of-facility retrofits, rather than installing only one energy savings measure
- reach more than their target number of hard-to-reach end-use customers.

Possible performance incentives for obligated parties include:

- financial payments
- increases in the deemed values of energy savings measures
- other incentives that may be claimed for particular activities in relation to meeting a scheme target.

In some EEO schemes, out-performing obligated parties stand to gain significant revenue from performance incentive payments. In such schemes, it is important to have robust measurement, verification, and reporting procedures in place to ensure that incentive payments are justified. For example, in the Californian EEO scheme, obligated parties can gain significant revenue from performance incentive payments (see Appendix A, Case Study 2).

Performance payments however also involve trade-offs that must be considered. Performance payments increase the cost of savings and distort market choices. Policy makers should consider whether the benefits sought (distributional equity, innovation, etc.) outweigh the additional costs.

3.2 Set targets, trajectories, penalty prices and other automatic stabilisers

Scheme targets set the total amount of energy efficiency (or demand management) that will be delivered in a given year, as measured in the scheme’s base metric (Section 2.3). Targets are allocated across obligated parties’ individual obligations (Section 3.3) and therefore set the demand for certificates / credits in the market. If the certificate / credit calculation methods are mostly accurate (Chapter 4), targets will determine the total amount of energy savings, demand reduction, or other chosen outcome of the EEO scheme.

If an EEO scheme involves priority customer groups, then the scheme will typically also involve sub-targets that can only be met by certificates / credits created from activities delivered to this group. For example, the EEO scheme in India splits its targets between sectors in proportion to their corresponding energy consumptions (see Appendix A, Case Study 5). These sub-targets effectively create a separate market within the scheme with its own levels of supply, demand, and pricing, leveraging aspects of scheme administration and energy efficiency service delivery. The considerations and principles for setting sub-targets are the same as those for primary targets and are described below.

Targets may be set at the same level every year, or they may vary. In the early years of a new scheme, it is common for targets to gradually increase year-on-year until they reach their ultimate level. This gradual increase in targets from year-to-year is referred to as the target trajectory.

EEO schemes also generally have a number of policy levers that act as automatic stabilisers that smooth out the impacts of mismatches between the demand for energy efficiency (targets) and the supply of energy efficiency (certificates / credits). These include penalty prices, banking and borrowing provisions, and target adjustment mechanisms.

The initial policy settings on targets, trajectories and stabilising penalty prices are generally

designed continuously as part of the quantitative modelling which is also used to support the scheme business case (Section 6.5). As noted, this modelling should be started early to help identify optimal targets, target trajectories and penalty prices. This can be done by drawing on savings opportunity models to understand the level of energy savings that can be expected from the incentives provided by different target and price levels. As explained in Section 6.5, uptake modelling is used to predict the volume, mix and timing of different energy savings activities that will be undertaken in response to different values of subsidies. The different values of subsidies represent the different average certificate / credit prices that result from different scenarios between supply (opportunities) and demand (targets) for certificates / credits. Section 6.5 sets out a range of analytical tools that can be used to assess the relative costs and benefits of different target and price combinations. This section sets out some key tips and principles for policy makers to both consider when undertaking this analysis. These principles also cover important design options to manage the likelihood that modelling, however like all forecasting, the models won't perfectly predict the outcomes the market will ultimately deliver.

Best practice tip: when setting targets, also remember to understand the effect that certificate creation methods may have on savings outcomes and activity uptake

Targets will be greatly influenced by calculation method design decisions that you will need to make (see Chapter 4) regarding the number of years of savings each certificate / credit represents. These decisions will influence both the mix of activities that are completed and the timing of when real-world energy savings are delivered. As you'll see in Chapter 4, it is common for EEO schemes to develop calculation methods that award "deemed" future energy savings upfront when certificates / credits are created for certain activities. In contrast, activities may require certificates / credits to be created in arrears each year, following more intensive measurement and verification. Awarding deemed savings upfront allows much higher incentives to be paid at the point at which upgrade costs are incurred, rather than years later. This has two implications for target modelling:

- activities that receive "deemed" future energy savings are likely to see a much greater uptake than those which do not, as upfront incentives are usually more attractive
- When modelling targets (that will later support cost: benefit modelling in Section 6.5), ensure incentive payments (costs) are accrued at the point of creation. Deemed energy demand reductions (benefits), should be spread over the corresponding timeframe for the different activities.

Therefore, it is important at this target modelling stage, to understand which activities, and for what time periods, you will allow the use of deemed savings when you later develop detailed methods.

Best practice principle: stretch targets with an achievable trajectory and a good cost-benefit ratio generally maximise net public benefit and transform the market

The long-term success of an EEO scheme is dependent on achieving the optimal balance between demand for energy savings (target) and supply (the amount of savings the market can cost effectively deliver). When modelling target options to understand the optimal level, policy makers should understand the risks of setting targets too low and too high. However, as discussed in the next section, there are also EEO scheme design features that can help correct these decisions if energy savings markets respond differently than expected at this early target modelling stage.

If targets are set at levels that demand more energy savings than the market is able to deliver, obligated parties will then be forced to pay penalties rather than acquire certificates / credits from energy savings activities. If the money collected from penalties is not invested in activities that deliver equivalent public benefits, as the certificates / credits, then there is a risk of undermining the scheme benefits by increasing retail energy prices (rates) without greater reductions in wholesale

costs. This is a problem if it persists for the medium to long term because there simply are not enough cost-effective energy savings activities for the EEO scheme to access. However, in the short-term, an under supply of savings increases the value of certificates / credits. This increases supply by making more activities cost-effective and encouraging new providers to enter the market. When considering this risk, policy makers should consider that even if targets are set at achievable levels, it is possible for obligated parties to construct an undersupply by refusing to enter into contracts with energy efficiency service providers. As discussed in the next section, penalty prices are crucial to encouraging compliance, and revenue from penalty payments can be used to fund other energy savings programs to ensure benefits are realised.

The bigger risk is arguably setting targets too low. If the EEO market you create is able to deliver more energy savings (certificates / credits) than the target for a sustained period, then demand and thereby prices are likely to reduce. In the short to medium-term an oversupply is likely to result in reductions in certificate / credit prices. This will drive competition and efficiency in the delivery of activities and improves EEO scheme outcomes. Depending on banking rules (see the next section), obligated parties may be able to take advantage of being able to purchase surplus and lower cost certificates / credits to help meet future year's targets. However, if targets are set too low, obligated parties will be able to acquire enough certificates / credits to meet their total future obligations years before the EEO scheme is due to end. Unless there are clear signals to the market that targets will be increased (see automatic adjustments in the next section), obligated parties will have no cause to purchase any more certificates / credits, and demand will collapse. Policy makers may view this as the scheme achieving its objectives early. However, this is also a missed opportunity to deliver higher levels of the desired energy savings policy benefits, at a lower cost than anticipated. If demand collapses due to a premature scheme end, then providers are likely to be forced to leave the market. Once this occurs, setting new higher targets can be challenging because of the lost capacity and the new reluctance to re-enter the market because of the risk of demand collapses.

Since a key goal of an EEO scheme is generally to help transform the market for energy efficiency / demand management to a significant size, undersupply of savings is a material risk in the early years of a scheme. However, if targets are set to the level that small and immature energy efficiency markets are capable of servicing, the scheme will never provide incentives large enough to transform these markets. Therefore, the solution for many schemes is to increase target trajectories over time. Long-term scheme targets may be set to levels based on the modelled cost-effective potential for energy savings, with short-term targets set at levels the market is capable of delivering and then increased over time. For example, an EEO scheme might have a target to deliver annual energy savings of 10% of annual energy sales in 2030. The EEO trajectory might start at 1% of annual sales for 2020, gradually increasing to 5% in 2025, and so on).

Best practice principle: use penalty prices / price caps, banking and borrowing, and a target adjustment mechanism as automatic stabilisers to mitigate implementation risk

Policy makers have a range of EEO design components they can use to stabilise the price impacts of short to medium-term fluctuations in the supply and demand for energy savings.

Penalty prices are the most important of these components and serve two critical purposes to ensure compliance and provide a safety valve for scheme costs. In most economies, some form of penalty for non-compliance is generally required to compel obligated parties to deliver their share of targets. Penalties can take many forms but, typically, obligated parties that fail to meet a target are required to pay a financial penalty. Obligated parties will have no financial incentive to comply with their targets, and EEO schemes risk failing if penalty prices are lower than certificate / credit prices need to be to encourage cost-effective savings activities. This is because once certificate / credit prices exceed the penalty beyond a certain level (accounting for differential tax treatment of government penalties and certificate / credit purchases and reputational concerns) it becomes cheaper for obligated parties to pay the penalty, rather than purchase certificates / credits.

Therefore, the price (after tax effects) at which this penalty is set provides an effective price ceiling

on the market price for certificates / credits. In this way penalty prices provide a safety valve for scheme costs. Policy makers should set penalty prices at a rate (e.g., $ per MWh) which is high enough to provide a compliance incentive, but below the level in which they no longer consider the EEO scheme to be the most effective policy tool for delivering savings. Policy makers may choose to set penalty prices at rates where higher prices would still deliver good public benefits (see Section 6.5 on benefit: cost modelling). This is because they may choose the "optimal" certificate / credit price cap, rather than set prices at the upper limit of cost effectiveness. Such a buffer may be desirable because there is a risk that sometimes certificate / credit calculations will deliver lower savings than anticipated (see Section 8.2 on activity and method reviews). Alternatively, policy makers may decide that at above a certain price, it is more cost effective to use penalty revenues to fund curated energy efficiency programs (see Appendix A, Case Study 1 – the Brazilian ANEEL EEO Scheme). If the obligated party is a government organisation (see Section 3.3) price caps above which certificates /credits will not be purchased can serve the same safety valve function on scheme costs (See Appendix A, Case Study 3 – the Chinese Grid Company EEO Scheme).

In addition to financial penalties, EEO schemes may also require obligated parties to "make-good" if they fall short on their targets by having to purchase certificates / credits and pay a penalty. This provides a much stronger compliance incentive but removes the ability of the penalty to act as a price safety valve. The choice to use "make-good" requirements depends on the policy goal. For example, absolute emissions reductions may be the most important goal in an EEO scheme. In this case, "make-good" requirements may be more important than a price safety valve. Conversely, take the example of an EEO scheme that aims to reduce energy system costs by driving investment in energy efficiency or demand management when it is cheaper than the cost of new energy supply. In this instance, price safety valves are likely to be a crucial design feature and "make-good" requirements inappropriate.

"Banking" and "borrowing" are terms used to describe other common design components of an EEO scheme. These components govern the treatment of obligated parties when they acquire greater or fewer certificates / credits than they need for their obligation in a given year. Policy makers could choose to deem that surplus certificates are forfeited, and any shortfall is penalised. However, it is more common to allow a degree of flexibility from year-to-year to smooth imbalances between supply and demand.

- "Banking" rules allow obligated parties to count surplus certificates from previous compliance periods to meet future compliance obligations. If no banking is allowed, there is a risk of creating annual price volatility as demand for energy savings collapses each year once targets have been met. This would result in annual, arbitrary shutdowns and restarts of energy efficiency / demand management sales campaigns. This makes it difficult for solution providers to retain staff, build customer trust and growth momentum. On the other hand, unlimited banking means that long-term scheme targets can potentially be exceeded early if the market is able to deliver far more low-cost savings than anticipated. There is therefore a strong case for unlimited banking as a stabiliser mechanism.
- "Borrowing" rules allow obligated parties to carry forward a share of their obligations in one year if they are short of their target. Limited borrowing helps avoid supply and demand mismatches and price volatility in instances where obligated parties underestimate their savings requirements. Unlimited borrowing, however, can materially weaken demand for certificates / credits as obligations could be perpetually deferred, thus undermining the functioning of a scheme. In addition, borrowing can drive more efficient certificate / credit prices, for a longer period. This is because borrowing allows more certificates / credits to be created in a year when it is more cost-effective. Most EEO schemes therefore permit a degree of limited borrowing. For example, the New South Wales Energy Savings Scheme (Appendix A, Case Study 6) allows obligated parties to rollover 10% of their obligation in any given year to the next compliance period.

Target adjustment mechanisms are a final potential stabiliser for EEO schemes. Ultimately, targets can always be adjusted through the method if targets are found to be set much lower or much higher than the market is able to deliver. However, there are two key considerations at the design stage in thinking about the possible future need to adjust targets. Firstly, a key advantage of EEO schemes over other policy tools is the long-term signal they send to the market through medium to long-term legislated targets (Chapter 1). If governments alter targets earlier, or in ways other than they have committed to, they risk undermining investor confidence, which is pivotal to the scheme's success. Adjusting targets may also be a time consuming and legislatively uncertain process, depending on the legislative tools used to create the legal authority for the scheme (see Section 3.4). Policy makers may wish to build processes into the scheme that trigger manual, semi-automatic or automatic adjustment of targets, if certain preconditions are met.

Some EEO schemes only set targets for medium-term periods (e.g., 5 years). This has the advantage of allowing scheduled formal reviews of the supply and demand balance before setting targets for the next period. The disadvantage of this strategy is that it effectively sets an expiry date on the scheme unless targets are reinstated. This hinders the ability to provide long-term investor confidence and exposes the scheme to the risk of changes in short-term political priorities. Some EEO schemes set long-term targets but also set conditions that trigger intermediate reviews, while maintaining a degree of flexibility. For example, the New South Wales EEO scheme legislation has triggers for Ministerial target reviews in the event of a sustained oversupply or undersupply of certificates beyond a certain threshold, for more than two years (See Appendix A, Case Study 6). A final theoretical option is the use of automatic target adjustment mechanisms. We were unable to identify any EEO schemes with this mechanism, but a parallel example can be found in the former German renewable energy feed-in-tariff scheme. After the scheme proved a greater success than anticipated, legislation was amended to automatically step-down feed-tariffs when different levels of uptake were reached. Similarly, EEO targets could be legislated in a way that automatically modifies targets up or down in future years by pre-prescribed amounts, depending on long-term trends for the supply and/or price of certificates / credits. Care must be taken to prevent market manipulation by obligated parties or energy efficiency solution providers.

3.3 Select obligated parties and allocate obligations

The term "obligated parties" is used here to refer to the entities that are legislatively required to create or acquire the certificates / credits necessary to deliver the scheme targets each year. It is crucial that the obligation falls on one or more entities in order to create demand for, and fund, energy saving activities. Without obligated parties, there would be no demand. However, policy makers have flexibility in choosing which parties to assign the obligations. In theory, the obligation could be placed on any entity ranging from individual energy customers to government or large corporations capable of acquiring certificates / credits and recovering costs. However, in practice obligated parties tend to be either directly involved in the energy market or associated with government. In the case studies included in this handbook (see Appendix A), obligated parties can be grouped into three different types:

- Energy Providers – the providers of the fuels or energy forms covered by the scheme.
- Energy End-Users - energy end-users in the sectors and facilities covered by the scheme.
- Dedicated Organisations – either government entities or private non-profit or for-profit organisations specifically set up to achieve the scheme targets. They are selected through a competitive tender process.

Best practice principle: when selecting obligated parties, optimise for administrative efficiency, alignment of capabilities and incentives, and political feasibility

When choosing the obligated parties for a scheme, policy makers need to manage trade-offs between different design choices. On the one hand, administrative efficiency is desirable, and this

generally promotes assigning obligations to a manageable number of organisations. This minimises compliance costs and avoids placing a compliance burden on entities without the sufficient skills and resources. For this reason, a smaller number of larger organisations are generally chosen (e.g., energy providers or large energy users rather than every individual energy customer). Even within this context, some schemes set thresholds for compliance and exempt smaller energy providers with customers below a set number.

Consideration is also given to the alignment of organisational capabilities and incentives when selecting obligated parties. For example, energy retailers have consistent direct relationships with customers and can potentially provide energy efficiency solutions at a lower cost. However, customer energy savings may come at the direct expense of energy retailer revenue under some regulatory frameworks which creates a disincentive for retailers to help the scheme succeed. Energy networks may have commercial incentives aligned with peak demand reduction, but less direct access to customers. Integrated retailers and networks may have both alignment of incentives and access to customers or may also suffer lost revenue depending on how energy rates are collected and distributed.

Political feasibility is also a crucial consideration in selecting obligated parties. It may prove more practical to assign obligations to entities which are either directly controlled by government or already fall under existing regulatory frameworks.

When reviewing options for obligated parties, consider the following:

- If **energy providers** are to be obligated parties, choose providers that have the infrastructure and capability to manage the procurement and delivery of eligible energy savings. Consider restricting the obligation to larger energy providers.
- If **energy end-users** are to be obligated parties, make sure that end-users have pathways to acquire eligible energy savings, including a mechanism for obligated parties to transfer the obligation to other entities.
- If a **dedicated organisation** is to be the obligated party, choose the organisation carefully and make sure that it has the ability to acquire eligible energy savings and has no conflicts of interest.

A variety of obligated parties can be included under one EEO scheme to maximise scheme efficiency. For example, the French EEO Scheme includes a broad range of energy providers as their designated obligated parties (see Appendix A, Case Study 4). Ultimately the choice of obligated party depends on local circumstances.

Considerations for the three different types of entities are outlined below.

Energy providers

Obligated energy providers may include different entities depending on the nature of the market.

- In traditional, regulated electricity and gas markets, they may include vertically integrated energy providers.
- In unbundled electricity and gas markets, they may include energy retailers, and/or transmission and distribution system operators, and/or electricity generators, where the generator has direct relationships with large end-use customers.
- In other energy markets, they may include suppliers of heating fuel and/or road transport fuel.

Depending on the local energy market structure, policy makers may need to decide which type of energy provider will be obligated. This decision should be based on whether a particular type of provider has relationships with end-users and also has the infrastructure and systems necessary to manage the delivery and/or procurement of eligible energy savings. Larger energy providers are usually able to themselves implement energy savings projects in customers' facilities, or to contract

third parties to do so. If some small energy providers in an economy lack the requisite systems, infrastructure, and capability, or only have a small number of end-use customers in the economy, it may be necessary to restrict the application of an EEO to the larger energy providers.

Energy end-users

In deciding whether energy end-users should be the obligated parties, you may consider whether end-users have pathways to acquire eligible energy savings, including the ability to transfer the obligation to parties with greater capabilities.

Some end-users, particularly larger commercial companies, may be comfortable in managing their energy savings obligation themselves. For these companies, saving energy makes commercial sense and they may have established energy savings programs with the staff to implement these programs.

Some end-users, particularly smaller commercial companies and individual households may be more comfortable transferring their energy savings obligation to an organisation that has the infrastructure and expertise to acquire eligible energy savings. Organisations such as energy service companies (ESCOs) and similar entities, may be able to establish successful businesses based on acquiring eligible energy savings on behalf of obligated parties. EEO schemes that place obligations on end-users should include a mechanism for obligated parties to transfer the obligation to other entities.

An example of a scheme that has selected end-users as the obligated parties is India's Perform, Achieve Trade Scheme. The obligated parties under this scheme are large industrial and commercial end-users (see Appendix A, Case Study 5).

Dedicated organisations

Dedicated organisations are the obligated parties in a handful of EEO schemes around the world. This choice is often made because a dedicated organisation is seen to be more efficient and cost-effective in acquiring eligible energy savings than individual energy providers or end-users. For example, in the USA, the state of Vermont has created an energy efficiency utility that can effectively take over an electricity distribution utility's obligation to provide energy efficiency services (see Appendix A, Case Study 8).

Choosing a dedicated organisation which is to be the obligated party of an EEO scheme is an important decision. Questions to take into account include the following.

- Is the mission of the organisation consistent with acting as an obligated party?
- Does the organisation have any conflict of interest with acting as an obligated party?
- Does the organisation have the infrastructure and expertise to acquire eligible energy savings?
- Does the organisation have the ability to respond quickly to market feedback and opportunities?
- In EEO schemes with multi-fuel coverage, does the organisation have the ability to bring a multi-fuel perspective?

It is unlikely that a single type of organisation in the market will be able to address all of these considerations equally well, so there will be important trade-offs to consider. This includes the possibility of appointing more than one organisation as the obligated party. Obligated parties can also include a mix of public and private entities within one scheme. An example of this is the Vermont Energy Efficiency Utility Scheme (see Appendix A, Case Study 8). In Vermont, both a private sector company (Efficiency Vermont) and a government entity (the City of Burlington Electric Department) are jointly the chosen obligated parties. While both organisations co-operate closely, the local government entity operates solely within the City of Burlington while Efficiency Vermont operates across the rest of the State.

Another important question to be resolved is how the dedicated organisation (that is the obligated party) will be renumerated. Typically, government or an energy regulator pays the obligated party for the energy savings it acquires. It is also possible for the organisation to establish a revenue stream by charging end-users for acquiring eligible energy savings. If this is allowed and depending on how the energy services market is structured in the relevant economy, the obligated party may be in direct competition with other commercial organisations (such as ESCOs) which will inevitably create conflicts of interest to resolve.

Best practice principle: allocate individual targets proportionally

Once the obligated parties have been identified, you need to develop a methodology for allocating each party's individual share of the total annual scheme target. This is typically done by splitting the overall scheme target according to each obligated party's market share of energy sales or energy consumption. If there are exemptions for energy-intensive, trade-exposed industries, low-income households and/or other specified groups of end-users, sales to these end-users are typically excluded from the calculation of market shares.

3.4 Establish the legal authority for your EEO scheme

The final step in setting up the energy savings demand mechanism for your EEO scheme is establishing the legal authority for the design decisions you have made. As discussed in Chapter 1, a key advantage of an EEO scheme is the ability to drive market transformation by sending clear signals to investors and innovators that there will be a long-term demand for energy efficiency services. The legal authority of an EEO scheme is a core component required to send this signal. Unlike many other energy efficiency incentives such as grants and rebates, a defining feature of EEO schemes are that they are typically set in legislation or similar authority with long timeframes. Thus, once you have designed your scheme, based on the key decisions outlined in this Chapter, the next key step is to obtain approval for a legislative or similar framework that supports them.

Best practice tip: establish the legal authority before your scheme commences

The precise timing and sequence of decisions for establishing legal authority will vary for different economies. Many economies will require formal consultation on, and approval of, a business case (see Chapter 6) before new legislation or regulations can be authorised. Alternatively, political opportunities may drive the establishment of legislation before all the design decisions have been made.

It is important to ensure the legal authority is established prior to scheme commencement, and that the enabling legislation makes provisions for minor adjustments to be made to each of the key scheme components covered in Chapters 2 to 5.

The legal authority for an EEO scheme generally involves a combination of legislation, regulation, rules, guidelines, administrative and Ministerial declarations (or equivalent) processes to establish and operate the EEO scheme. These tools are required to cover the key scheme components outlined in this chapter, as well as each of the components described in chapters 4 and 5.

Establishing legal authority may involve amendments to existing legislative frameworks or establishing new EEO-specific legislation. For example, if you decide the obligated party should be an energy provider, then the simplest approach to legislation may be to amend the existing legislation which regulates these organisations (this was the case for the Californian EEO scheme and the South Australian Retailer Energy Productivity Scheme (see Appendix A, Case Study 2 and 7). Alternatively, if there is no suitable existing legislative framework, new stand-alone legislation may be required. For example, the Brazilian EEO scheme was established through a number of new laws and decrees (see Appendix A, Case Study 1).

Best practice principle: seek to balance the need for investor confidence and administrative agility

The precise mix of legislative and regulatory tools varies and will align with the governance and legislative frameworks for each government. Within local constraints, policy makers need to balance two competing needs – investor certainty and administrator agility.

- **Investor certainty** – EEO schemes need to send a clear signal to prospective investors in energy services, energy efficiency, and demand management of the government's long-term commitment to drive investment and transformation of the energy services industry. This requires long-term (and difficult to amend) legislative and regulatory tools.
- **Administrator agility** – EEO schemes also need to allow policy makers and scheme administrators to make short and medium-term adjustments to policy settings. These might be required in response to scheme successes. For example, targets (Section 3.2) may need to be increased if the EEO scheme proves capable of delivering far more low-cost energy savings than anticipated. Or calculation methods may need to be adjusted (Section 4.3) in response to successful widespread adoption of new energy savings activities. Alternatively, changes may be required to maintain EEO scheme additionality if new policies are introduced that cross-cut scheme objectives – such as new minimum energy standards for buildings or appliances.

In striking the balance between investor confidence and administrative agility, policy makers should consider the timing and flexibility possible with different legislative and regulatory tools in their economy. Consideration should be given to who in government will be authorised to make decisions and with what level of urgency or deliberation. For example:

- Once legislation is passed, it is relatively inflexible and cumbersome to change as it requires consent of the legislature.
- Guidelines published by scheme administrators are easy to change, but this flexibility is a confidence limitation when investors need medium to long-term confidence on policy settings.
- Regulations and administrative orders that require Ministerial or executive approval are generally more flexible than legislation, but less likely to be changed on a short-term basis.

Rules can be established to govern the timing and process through which scheme administrators are able to alter scheme components.

Best practice tip: exercise caution when adjusting scheme components

A reluctance to change settings when required can undermine scheme performance, however the ability to readily adjust scheme components must be used with caution to avoid undermining investor confidence. Part B of this handbook discusses the best practice principles and considerations for the triggers, timing, and communication the use of administrator agility to change settings.

Table 4 provides examples of the legislative tools available when allocating scheme components. The table illustrates how often changes can be made under each legislative tool.

Table 4: Example allocations of EEO components across different legislative tools

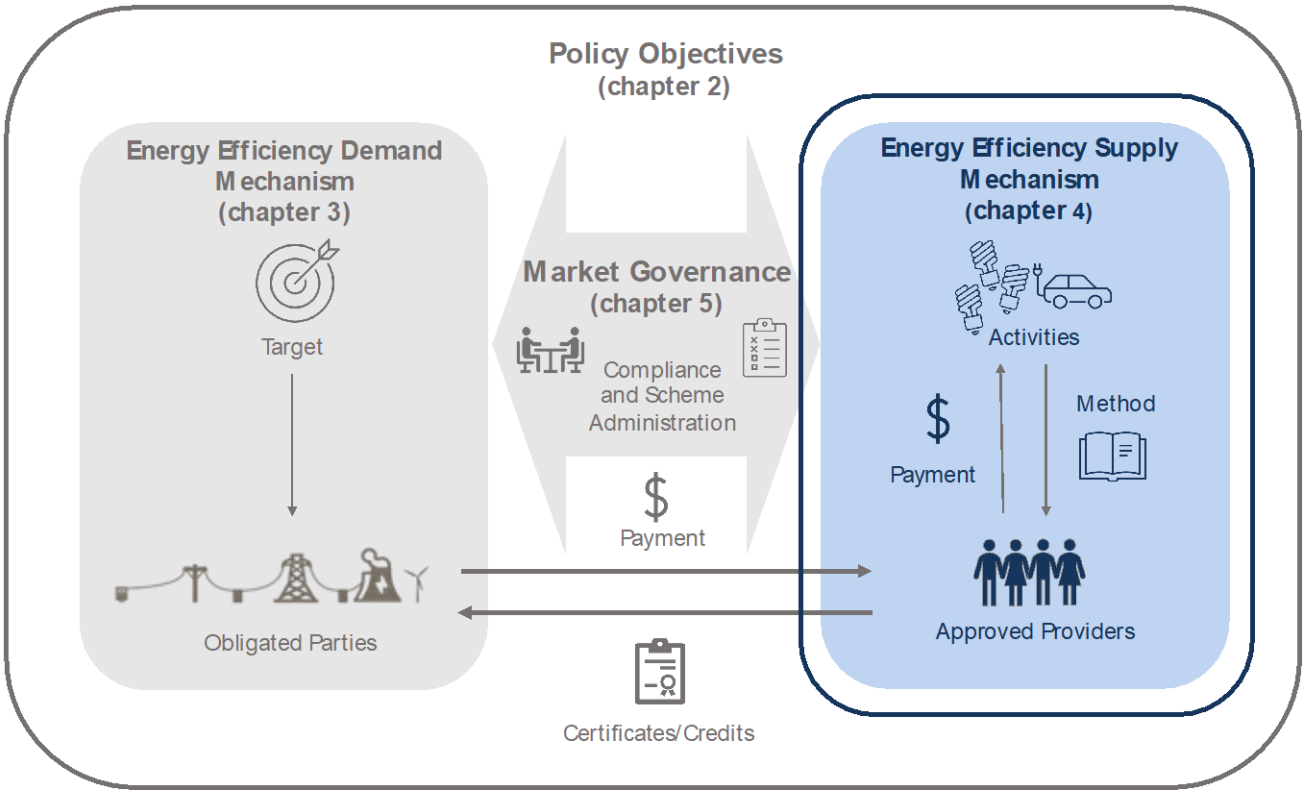
Legislative tool	Timing of changes	Example EEO Components
Legislation	Long-term	• Scheme policy objectives and timeframes • Obligated parties and mechanism to allocate and enforce obligations • Ministerial/executive power to create regulations for targets, obligations, penalties, certificates, scheme administration • Mechanisms to create, adjust and enforce: o Precise annual target o Precise penalty rate o Roles and responsibilities of the scheme administrator
Regulations and Schedules	Medium-term	• Precise annual target • Precise penalty rate • Appointment, roles, and responsibilities of the scheme administrator
Administrative / executive orders	Short-to-medium-term	• Rules governing methods to calculate energy savings for eligible activities • Audit framework for compliance with obligation requirements • Audit framework for compliance with certificate creation rules
Processes, guidelines, and application forms created by the scheme administrator	Short-term	• User guidance and evidentiary requirements to prove compliance with methods (Section 4.4) • User guidance and accreditation processes for certificate creators • Panels of approved auditors, measurement, and verification professionals, etc.

Key resource:

1. *Energy Saving Policies and Energy Efficiency Obligation Scheme – Report on existing and planned EEOs in the EU*[27]

[27] (VITO, Flemish Institute of Technological Research, n.d.)

Chapter 4 – Creating a mechanism to increase the supply of energy efficiency



4.1 How to design the supply components of your EEO scheme

Every EEO scheme fundamentally depends upon participants taking action to save energy. To take action, participants need clear guidance on the supply components of the scheme – that is, the **activities** that are included in the scheme, and how savings from these activities will be measured and verified. The supply components are a critical element of EEO scheme design.

The activities made eligible under an EEO scheme are critical to ensuring the scheme meets its objectives. For example, if the scheme objective is to reduce energy costs for low-income households, providing incentives for activities that can be accessed by the entire population will dilute the benefit for low-income households.

The **methodology** used to measure and verify energy savings can result in high compliance costs, depending on the level of assurance required. High compliance costs can impact the market's ability to find the most cost-effective solution. Conversely, if the methodology assumes energy savings without measured verification, there is a risk that individuals will exploit the scheme and not deliver the **energy savings** accounted for. The design of the supply components can therefore influence scheme participation, actual energy savings delivered and ultimately the success of the scheme.

The key steps to design the supply components of an EEO scheme include:

1. Determine the energy saving activities that will be eligible for incentives (Section 4.1.1).
2. Choose the type of method that will be used to estimate and verify energy savings for each activity (Section 4.1.2).

3. Develop the method for each activity (Section 4.1.3).

4.1.1 Determine Eligible Energy Saving Activities

Energy saving activities are the types of products, projects or processes that will be eligible to receive incentives under your scheme. Activities should only be considered eligible if they increase **energy efficiency** without affecting the performance of the equipment. For example, an incandescent lightbulb and an LED lightbulb provide the same amount of light, however the LED uses less electricity. Taking the time to consider which activities to include in your scheme will improve its effectiveness.

The four key principles outlined below will help you decide which activities to include in your scheme.

Best practice principle: prioritise activities that contribute to achieving the objectives of your scheme

Now that you have your scheme objectives finalised (Chapter 2), prioritise potential activities by the outcomes they produce. For example, if your scheme objective is to reduce energy demand to relieve stress on your energy grid system, conduct an analysis of your economy's major end-users of energy. Determine where there are major opportunities for those end-users to reduce their energy use. You may find that most businesses and households have already installed low-flow shower heads so the impact of including shower head replacements in your scheme would be minimal and should therefore not be prioritised. Alternatively, upgrading residential air conditioners may provide the greatest opportunity to reduce energy demand due to the number of old air conditioning units in circulation in your economy.

Best practice principle: aim to incorporate as many activities as possible

Include as many eligible activities as possible to foster competition and innovation. This will help the market to achieve the scheme's objectives in the most efficient way. As discussed in Section 1.4, be wary of the "crowding out" effect, where activities with the lowest marginal cost are chosen. Ensure your activities have similar marginal costs or be prepared for incentives to be dominated by certain activities.

Best practice principle: ensure additionality by managing the interaction between your scheme's activities and existing policies and programs, as well as activities that already are business-as-usual

As discussed in Section 1.4, ensuring **additionality** is key to the overall success of your scheme. You only want your scheme to provide incentives for activities that would not have occurred in the absence of your scheme. Avoid including activities that are already covered by existing programs and legislation, or that are already business-as-usual in your economy. There are three types of additionality to consider: market additionality, regulatory additionality, and program additionality. Collectively, these different types of additionality represent the net outcome of "freeriding" (activities that would have happened without EEO scheme incentives) and spill-over (activities that happened because of EEO scheme-related market changes but did not receive direct EEO incentives). These are complex, interacting and changing forces that are difficult to perfectly account for. Chapter 8 in Part B covers the review processes and tools to monitor and refine methods over time.

When considering **market additionality**, avoid including activities that are already widely adopted or considered "business-as-usual". First you will need to define what your "business-as-usual" context looks like. "Business-as-usual" is different at the level of an individual customer undertaking an upgrade activity, and a market-average level. It also changes over time, especially if EEO schemes help make niche energy savings activities common practice. For each individual activity, market additionality can be quite subjective as EEO scheme incentives may have been one of a combination of factors that together drove a decision to upgrade. Schemes that seek to manage market additionality too prescriptively, risk adding so much compliance cost that they prohibit uptake. Market additionality is best managed by considering market average trends when setting

baseline calculations that discount savings for average levels of freeriding. However, there will be some activities that are so common that freeriding cannot be effectively accounted for, and these should be excluded. For other activities, it may be possible to identify customer groups or attributes which correlate with "business-as-usual" behaviours and develop correspondingly different baselines, eligibility criteria and evidentiary requirements.

In regard to **regulatory additionality**, your scheme should not provide incentives for an activity that is required by any other policy, regulatory, or legal requirement to reduce energy consumption. For example, exclude activities that achieve the minimum energy efficiency standard for new buildings.

In regard to **program additionality**, your scheme should complement, rather than duplicate, other programs (as discussed in Section 1.4). You should manage this balance in the design of your scheme. Leveraging other programs can increase the positive impact of your entire policy mix. For example, the Australian Government's Commercial Building Disclosure program requires Australian office building owners to disclose their energy efficiency rating to potential purchasers and lessees. Each of the Australian EEO schemes includes an activity for these buildings to participate in the EEO scheme using improvements in their disclosed ratings. By leveraging each other, scheme compliance costs are reduced and both schemes benefit from increased upgrades.

Best practice principle: when defining each activity (Section 4.1), ensure the incentives are made available to the most influential actors in the supply chain.

From manufacturer to final customer, a lengthy supply chain influences energy efficiency upgrade decisions. For example, retailers and distributors play an important role in guiding customer decisions for appliance purchases and installers and technicians may direct customers to familiar products rather than more efficient alternatives. Depending on the maturity and market penetration of the activity, incentives may be more effective when targeted at different points in the supply chain, rather than directly to the customer.[28] For example, defining activities that allow product suppliers to participate in the EEO scheme based on sales volumes. It could also involve aligning activities with existing standards or business practices adopted by electricians when installing equipment.

costs.

Key resource:

1. *South Australian Retailer Energy Productivity Scheme Activity Specifications*[29]

4.1.2 Choose the method for each activity

Methods are the rules and processes that define how to measure, calculate and demonstrate energy savings for each eligible activity. EEO scheme methods fall into two broad categories: default savings factor/formulae (DSF) and measurement and verification (M&V).

- DSF methods are typically used for relatively standard activities where energy savings do not vary greatly between completion of the same activity. Energy savings calculations under this method are based on estimated average energy savings over the lifetime of an activity. DSF methods generally only count the number of times the activity is conducted, and (in some cases) very basic information about factors that affect energy use (such as site location or use). For example, if a building is installing LED lighting, it would be costly and inefficient to require photos of every light installed with the installation time, date, and geographical stamp. A DSF method would assume that every light in the building is replaced and calculate savings based on the number of light fittings in the building and the expected lifetime of the LED light. The factor or formula are provided to approved providers so they can efficiently calculate energy savings. This

[28] (de la Rue du Can, et al., 2014)

[29] (Department for Energy and Mining, Government of South Australia)

method may require minor adjustments to the factor or formula depending on relevant variables (e.g., location, product class, operating hours etc.)

- M&V methods have detailed principles, processes, measurements, and evidentiary requirements to follow when calculating energy savings. They involve measuring site-specific energy consumption before and after the activity is completed. Energy savings are then calculated based on the difference between these measurements, using calculations set by policy makers.

Your EEO scheme may include a mix of DSF and M&V methods. Apply the four best practice principles below to help you select the right method for each eligible activity in your scheme.

Best practice principle: seek assurance not certainty

Each activity must be measured, proven, and verified. This can be a costly process depending on the level of assurance you seek from each of these steps. When designing your method, you should strike a balance between how much of the savings are estimated and how much you need to prove. You want to optimise for administrative efficiency (i.e., keep compliance costs low) while maintaining confidence in the energy savings.

Note that Chapter 5 goes into more detail on the administration costs of designing a scheme.

Best practice principle: ensure the aggregate market savings align with the awarded number of certificates / credits

Following this principle will ensure the scheme does not pay for more savings than it delivers. For any method, there will be multiple factors that determine the energy saved at a particular site. For example, the energy savings from low-flow showerheads depend upon the frequency and duration of showers, which will vary between homes. Applying a market average to savings calculations will mean that the combined incentives will match the overall market energy savings (even though savings at a particular site may be over- or underestimated). However, if site variations are very significant or cumulative savings cannot be reliably determined, savings may need to be measured at a site-level using the M&V approach.

Best practice principle: your method should leverage existing standards and frameworks (from your economy or internationally) wherever possible

Aligning your method with existing standards and accreditation frameworks will reduce the transactional costs of your scheme for both scheme administrators and participants. This is because you can leverage existing material meaning you do not have to start from scratch. It can also allow economies or non-energy schemes to coordinate to further reduce costs, broaden participation, and improve scheme efficiency. For example, if your economy has energy efficiency minimum standards or performance ratings systems for appliances, equipment and/or buildings – these may make effective regulatory frameworks for EEO scheme requirements.

However, EEO schemes can be effective for scaling the deployment of emerging high efficiency technologies, for which standards have not yet been developed. In these instances, policy makers and/or scheme administrators may need to develop new product and installation eligibility requirements.

Best practice principle: your method should include safety and quality standards for both products and installations

Quality standards ensure that activities are properly installed and that any installed products operate as they are intended to. For example, when installing insulation, ensuring there are no gaps may be a quality standard that ensures the benefits of the insulation are maximised. Safety standards are intended to protect people from accidents either during installation or when using the upgraded product. You can either leverage an existing safety standard, for example the *Australian*

Standard AS 3999 Bulk Thermal Insulation Installation standard[30]; or set your own safety standards for the purposes of the scheme, for example, only permitting electricians to complete lighting upgrades.

Key resources:

1. *Determining Energy Savings for Energy Efficiency Obligation Schemes*[31]
2. *New South Wales Energy Savings Scheme Calculation Methods*[32]

4.1.2.1 Default Savings Factor/Formulae (DSF)

DSF methods are activity or technology-specific and typically involve easy-to-use savings formulas or factors that estimate the baseline and operating energy use to calculate energy savings. These methods tend to be very simple to use, with few input parameters (if any). The South Australian Retailer Energy Productivity Scheme uses DSF methods extensively (see Appendix A, Case Study 7).

When to use this method

Use a DSF method for relatively simple, well-defined activities where the average energy use is known (or where there is little uncertainty around the average energy savings per unit). This method is best suited to situations where the energy demand and overall performance of the equipment is well understood. This usually means the equipment is simple, like air conditioners, or that the equipment performance has been tested against an established standard, like household appliances. This method is not suitable for energy saving opportunities where there is too much variation between installations. This is because it is not feasible to create a default factor to apply to every possible case.

DSF methods commonly assume the lifetime of energy savings and allow an upfront creation of energy savings certificates / credits, without ongoing monitoring of energy performance. Consequently, these methods can be a low cost and highly efficient way to calculate and reward energy savings from a broad range of residential, commercial, and industrial activities.

4.1.2.2 Measurement and Verification (M&V)

M&V methods are typically activity and technology neutral as they stipulate, in detail, the principles, processes, measurements, and evidence to follow when calculating energy savings. Instead of using factors or formulae to estimate savings, M&V methods require site-specific data for each activity. These measurements are then verified and used as inputs into auditable calculations. Almost all of the case studies included in this handbook include M&V methods.

When to use this method

Use the M&V method for opportunities where a DSF method is not suitable (i.e., where there are large variations between installations). Note that an EEO scheme can include a range of M&V calculation methods. M&V methods represent a far more rigorous approach to ensure **certificates / credits** are only awarded for actual energy savings. However, DSF methods have traditionally been preferred by policymakers and scheme participants as they are often simpler and cheaper to administer. Due to the level of assurance required, M&V methods require more skilled input which can be more expensive. These methods ensure that not only was the activity completed, but that the measurements were appropriately done, and the calculation correctly completed. This requires different capabilities of all scheme participants, including the scheme administrator and approved suppliers of energy savings compared to DSF methods. See Chapter 5 for more information on the

[30] *This standard can be bought from Standards Australia.*
[31] (Staniaszek & Lees, 2012)
[32] (Independent Pricing and Regulatory Tribunal (IPART) New South Wales)

scheme administrator.

4.1.3 Develop the method for each activity.

The method for each energy savings activity includes three elements.

1. The specific eligibility requirements that apply to the particular activity.
2. The approved calculation approach to determine savings for the activity.
3. The evidentiary requirements that confirm the activity was conducted in line with safety and quality standards, and that savings were properly calculated.

The design of each these elements will vary between methods, based on the principles set out in Section 4.2 and 4.3. This remainder of this chapter sets out key issues to consider during the detailed design of your methods.

4.2 Eligibility requirements

Each method will describe specific eligibilities for the activity. This will include, for example, the economic sector(s) covered by the EEO scheme (such as residential or commercial), customer types (e.g., low income or business users), and equipment details.

For DSF methods, eligibility criteria are typically strictly defined to match the predetermined energy savings for the activity. For example, these criteria might include the types of sites, as well as the type of existing, and new equipment, that can use the method.

Eligibility rules for M&V methods will match appropriate calculations with the energy savings activities. For example, different M&V methods may apply to different customer or site types, or different end uses. Eligibility requirements may also include measurement systems to ensure savings are accurately determined.

You may also require additional eligibility requirements for both methods to ensure the safety and quality of upgrades. This is to guarantee the new efficient equipment remains in place and that energy savings continue for its assumed lifetime. This could include, for example, compliance with voluntary best practice installation standards, or requiring that the installer holds certain qualifications to prove their competence and ensure installation quality.

Eligibility criteria may also help safeguard and ensure additionality to ensure that activities align with broader policies, such as specific requirements for the disposal of replaced equipment.

4.3 Calculation approach

Calculating energy savings involves the same five basic steps for all methods (illustrated in Figure 6 below).

Step 1: Estimate or measure the baseline energy use. This is what the energy use would be if the activity is not implemented.

Step 2: Estimate or measure the operational energy use. This is what the energy use would be if the energy saving activity is implemented.

Step 3: Calculate the energy savings by subtracting operational energy from the baseline energy figure.

Step 4: Calculate the persistence of savings based on how long you expect the savings to continue. This may include, for example, the expected lifetime of the installed equipment, equipment degeneration, and how much earlier the upgrade was completed.

Step 5: Convert nominal savings to the base scheme metric (t CO_2e, MWh etc). See Section 2.3 for more information on establishing scheme metrics and conversion factors.

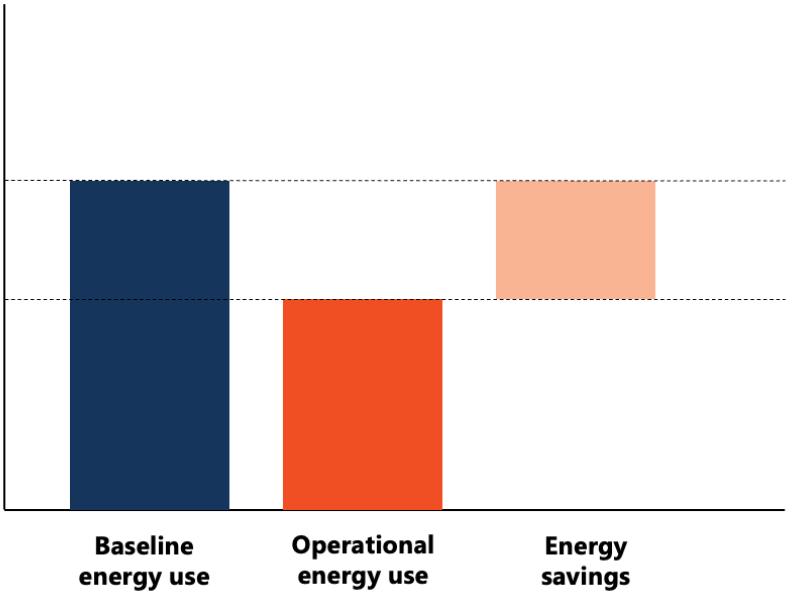


Figure 6: Energy savings calculation

Each method in your EEO scheme will need to outline how to complete each of these steps for the related energy savings activity. Use the four principles below to guide you in defining the calculations for each method.

Best practice principle: calculations should be evidence-based

The inputs and assumptions for calculations should come from verifiable data, to ensure reliable savings estimates. For example, under a DSF method to estimate savings from replacing an inefficient water heater with a more efficient one, real savings will be influenced by the daily hot water use for each customer. Hot water is not typically metered separately, and water isn't typically metered daily, so this not a feasible way to collect and verify data. Instead, the method may assume the average hot water use data and adjust for things with available evidence – such as the size and type of existing water heaters. Best practice principle: calculations should use appropriate assumptions

The incentive for each activity depends on the defined calculations of energy savings. Very generous assumptions (for example, assuming unrealistically high product use baselines in a DSF method) will lead to inflated savings and higher incentives that do not reflect the actual savings delivered by the activity.

Best practice principle: calculations should recognise products that deliver higher energy savings

Some energy savings activities might involve choosing between products with different energy efficiencies. For example, purchasing an efficient air conditioner may be an eligible activity. The calculated savings for this activity should differentiate between more and less efficient air conditioning systems to proportionately incentivise larger savings for a more efficient air conditioner.

4.3.1 Designing Default Savings Factor/Formulae (DSF) calculations

Calculate energy savings by either looking up a table, using common equipment or site measurements, or inputting equipment or site measurement values into a simple formula. The simplest savings formula is *savings per unit multiplied by the number of units*.

DSF method calculations should be underpinned by credible research and a valid methodology. This may include, for example:

- stock research to establish baseline adoption assumptions
- trials to measure activity savings and variables that may affect energy use
- savings measurements by manufacturers or installers
- surveys to determine typical use patterns.

4.3.2 Designing M&V calculations

All M&V methods should strive for a balance between accuracy and commercial feasibility. There are many different M&V calculation methods that could be used depending on the specifics of the energy saving project. Examples of these methods and when to use them include:

- **Site-specific or multi-site calculations** – depends on whether the activity occurs at a single site or is conducted across many sites.
- **Whole-site or sub-site calculations** – depends on the scale of energy savings as a proportion of energy use by the whole site. Also depends on the availability of robust sub-site energy consumption data (e.g., sub-metering).
- **Simple average or more advanced statistical or modelled calculations** – depends on whether energy consumption is constant or varies over time subject to external conditions (such as operating hours, weather, site production etc).

Your EEO scheme may include a range of methods to allow participants to choose the approach that is most appropriate to their activity.

Key resources:

1. *A Best Practice Guide to Measurement and Verification of Energy Savings*[33]
2. *Measurement and Verification Method Activity Guide: Project-based Activities*[34]

4.4 Evidentiary requirements

Each method will specify the information that participants need to gather to show compliance. This will include verifying that the activity is eligible and that savings calculations are correct. The level of evidence required will vary based on the flexibility of the method. Generally, evidentiary requirements for DSF methods will focus on proving that equipment matching the specified calculations, was installed. Evidence for M&V methods will include more extensive requirements. Including verification that the calculations themselves are appropriate to the activity, along with evidence that the activity itself was conducted in accordance with eligibility requirements in the method.

Evidence requirements could include, for example:

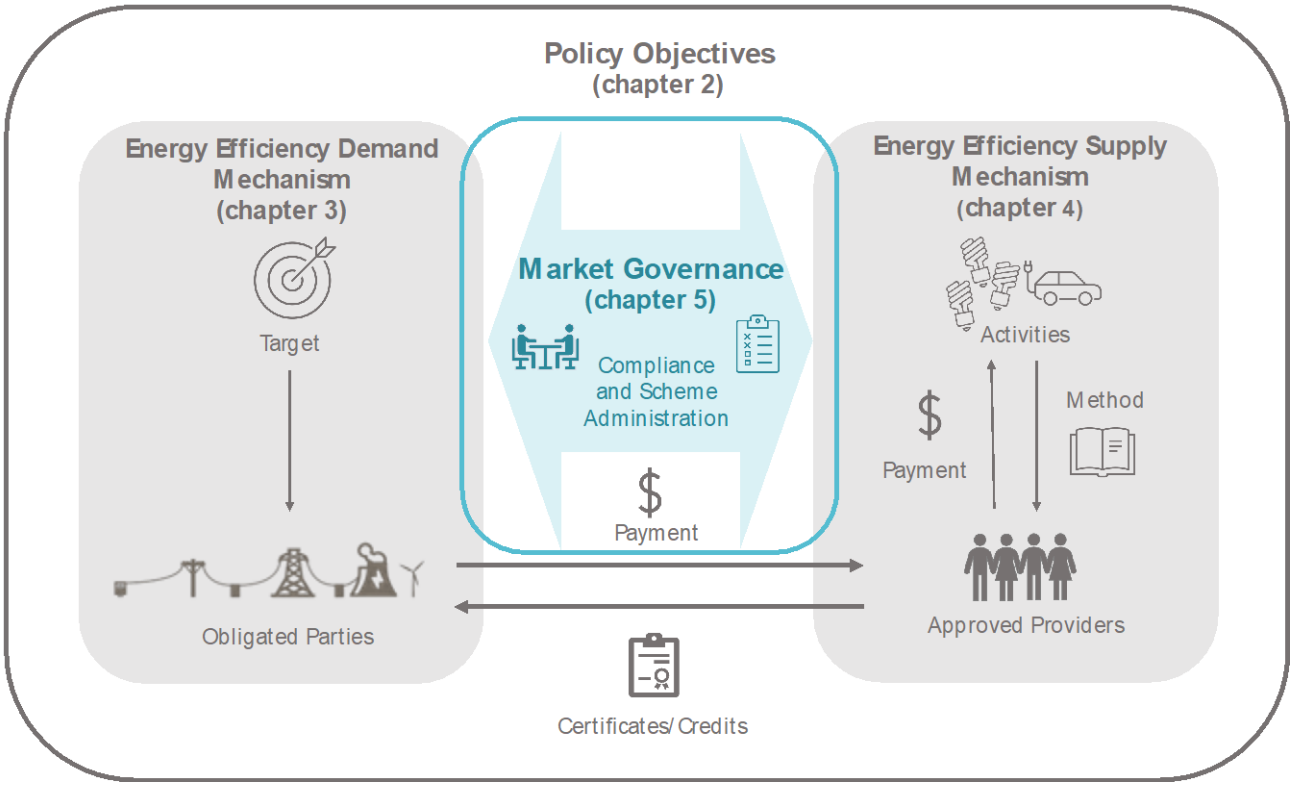
- site details such as location, customer type and occupancy details
- energy consumption and other operational data
- compliance certificates or other evidence that products and/or installations meet eligibility criteria
- photographs of installation
- detailed documentation of calculations.

Gathering evidence to prove compliance with the method is vital to controlling the quality of an EEO scheme and ensure that scheme participants are actually delivering energy savings. Note however,

[33] (Australian Government, 2004)
[34] (Essential Services Commission Victoria)

that each additional evidence requirement adds cost and complexity to scheme compliance. As such, care should be taken to ensure that the level of evidence required is appropriate for the activity. Unnecessary requirements will reduce the effectiveness of your scheme and stifle participation. Where possible, evidence requirements should align with standard business practices for the associated product suppliers and installers to minimise documentation costs.

Chapter 5 – Designing your EEO scheme market governance structure



Once you have designed the demand and supply mechanisms that govern **energy savings** / demand management, the remaining design decisions relate to the market framework that connects these mechanisms. The linking of supply and demand for **energy efficiency** / demand management is the way EEO schemes harness the market to drive scale, efficiency, and innovation that ultimately help achieve policy goals.

Day-to-day commercial transactions are typically regulated outside of an EEO scheme by the normal commercial laws that govern business and trade in any given economy. These include commercial transactions between obligated parties and providers of energy efficiency / demand management goods and services, such as sub-contracting activity implementation, certificate trading and forward contracts. This also includes transactions between the providers of energy efficiency / demand management goods and services, and household and / or business customers, such as energy saving lighting, heating, and cooling upgrades.

However, in designing the governance structure of an EEO scheme, there are three key considerations for policy makers to ensure the efficient and effective functioning of the market that drives the scheme:

1. There must be effective and efficient monitoring and enforcement of the individual obligations of **obligated parties** to ensure there is a demand for **credits / certificates**.
2. There must be effective and efficient monitoring and enforcement of compliance with savings calculation methods that govern the creation of certificates / credits.
3. There must be efficiency, integrity, and competitiveness in the trading of certificates in the market that the EEO scheme facilitates.

If these conditions are not met, schemes risk not delivering the **net public benefits** they are expected to (see discussion on the business case in Chapter 6). Therefore, it is crucial to design the EEO market structure and governance in a way that will function effectively.

The two key steps to establishing this framework are:

1. Decide whether your EEO scheme will allow energy savings to be traded (i.e., will your scheme produce certificates or credits) (Section 5.1).
2. Identify your **scheme administrator**, and their roles, responsibilities, and funding (Section 5.2).

Best practice principle: ongoing monitoring and continuous improvement of policy and administrative settings is crucial to ensure policy outcomes are delivered

As with any policy undertaking, reality is likely to deviate from initial plans as details are finalised and external circumstances change. Therefore, ongoing monitoring and continuous improvement is crucial to implementation success. This is particularly true with EEO schemes as they are designed to change the dynamics of the energy and energy efficiency / demand management markets in which they intervene. For example, if an EEO scheme succeeds, the assumptions about the availability, uptake and use of different energy end-use equipment and processes will change. In response, **scheme activities**, **methods** and compliance processes will then need to be updated. If the EEO scheme fails, assumptions about design settings, the efficiency of compliance frameworks and **trading** arrangements will also need to be improved. These issues are discussed in Part B of this handbook on scheme review, enhancement, and reform.

Compliance with certificate / credit calculation methods alone is not enough to ensure the savings they represent are real. Policy makers must also continuously review and adjust methods to ensure they result in energy savings that, on average, equate to the total number of certificates / credits that are created.

In addition to the steps in this chapter, it is crucial for policy makers to understand that the establishment of a scheme administrator and trading arrangements alone are not sufficient to ensure scheme success.

5.1 Decide on the level of energy efficiency trading for your EEO market

EEOs generally involve some level of trading of eligible energy savings certificates that result in funding new activities which deliver the desired level of energy savings / demand management. Obligated parties typically contract third parties to undertake the sales and installation of savings activities and calculation of eligible savings. It is also common for schemes to involve a level of trading between obligated parties to smooth supply and demand for savings. These transactions are how EEO schemes create a market and fund investment in energy savings upgrades. The purpose of trading is to broaden the pool of opportunities that produce eligible energy savings and to enable market forces to identify the most cost-effective opportunities.

In simple terms, the spectrum of trading arrangements can be grouped into the following three main categories:

(A) Non-tradable obligations – Obligated parties are not able to trade between each other but will typically still engage sub-contractors to deliver approved activities, while retaining all compliance accountability. For example, EEO schemes in Brazil, California, and Vermont do not allow trading (see Table 9 in Appendix A).

(B) Tradable obligations – Obligated parties are able to trade their annual obligation surpluses and deficits amongst themselves but cannot trade with other third parties. Obligated parties retain all compliance accountability. For example, the EEO scheme in South Australia allows excess credits to be traded, but not excess energy savings (see Case Study 7 in Appendix A).

(C) Tradable energy savings – Energy savings are converted into formal tradable “certificates” that are created by approved providers and openly traded as property rights on a formal registry (see Section 5.2). Obligated parties retain compliance accountability, which they do through either

the creation of certificates, or purchase and surrender of certificates. Approved providers take on compliance accountability to ensure certificates are created in accordance with approved calculation methods. For example, EEO schemes in China, France, India, and New South Wales allow the trading of energy saving certificates (see Table 9 in Appendix A for a full summary of the case studies that allow and don't allow trading).

Best practice principle: select a trading arrangement that aligns with the capabilities and incentive structure of your local energy and energy efficiency markets

There are advantages and disadvantages to different trading options. Policy makers must assess which trade-offs are most appropriate for their local context.

An advantage that (B) Tradable obligations and (C) Tradable energy savings have over (A) Non-tradable obligations, is that they offer an additional stabilising mechanism to manage short-term misalignments in supply and demand (which can complement the stabilisers discussed in Section 3.2).

Obligated parties are encouraged to have a greater degree of direct involvement in the delivery of energy efficiency or demand management services with (A) Non-tradable obligations and (B) Tradable obligations. If obligated parties are energy providers and have direct relationships with energy customers, they can leverage these relationships to achieve lower costs of sales for new energy savings and demand management activities. By requiring closer involvement in activity delivery by obligated parties, energy providers are encouraged to transform their "energy only" business model (i.e., electricity and gas sales) to an "energy services" business model (e.g., also providing bundled energy and heating/storage). However, any additional incentives offered by an EEO scheme to energy providers or other obligated parties must be considered in the context of broader existing commercial incentives. If the costs and revenue opportunities resulting from eligible EEO scheme activities are small relative to an obligated party's core business, the EEO scheme is likely to have little influence over organisational priorities. In non-tradable EEO schemes, it is common for energy providers to largely outsource the delivery of activities and management of compliance to third party contractors (see the French EEO scheme in Appendix A, Case Study 4).

(C) Tradable energy savings are a way to avoid misaligned incentives in the energy market. They also grant firms the greatest capability and motivation to directly innovate and compete in the delivery of energy savings. Policy makers may also favour trading regimes as they encourage competition through the number of providers and provide the greatest transparency of scheme costs (through openly traded certificate prices). However, the challenge of trading regimes is that they can result in the obligated parties taking an "arm's length" approach to activity delivery, where they miss opportunities to leverage energy providers' direct customer relationships. While increased competition is good for lowering scheme prices, price-based competition and transactional customer relationships may put pressure on the quality of energy saving products and installations. Minimum quality and safety requirements and co-payments in certificate / credit calculation methods are tools that policy makers can use to mitigate these risks (refer to Chapter 4).

Another key advantage and challenge of (C) Tradable energy savings is the tendency for the market to find and scale the lowest cost activities, driving costs down further through economies of scale. These market forces exist to a degree with all regimes but tend to be stronger with trading regimes due to the increased competition they foster. This risk can be mitigated through incentives structures for obligated parties (see Section 3.3), or complementary energy efficiency grant programs designed to assist emerging solutions reach the commercial maturity required to compete in a low cost EEO market.

5.2 Identify your scheme administrator, roles, responsibilities, and funding

A major design component for an EEO scheme is identifying the organisation you will appoint to administer the scheme, and defining their roles, responsibilities, and operational requirements. Scheme administrators generally have two clear legislated functions: ensuring compliance of

obligated parties with their individual savings obligation; and ensuring compliance of certificate / credit creation with calculation methods. However, the success of an EEO scheme is also inextricably linked to how the actions of the scheme administrator impact the effective operation of the market.

The efficiency and effectiveness with which the administrator exercises its role directly influences the volume of certificates / credits created, the cost of their creation and the real world benefits they represent. For example, if the direct or indirect compliance costs placed on obligated parties or approved providers by the scheme administrator are too high, they will divert funding from energy saving activities without delivering public benefit. Conversely, if scheme compliance requirements are ineffectively enforced, there is high risk that insufficient certificates / credits will be created, and/or the certificates / credits that are created do not represent genuine energy savings or demand reductions. Finally, if the commercial arrangements to connect buyers of energy efficiency (obligated parties) with suppliers (approved providers) do not function smoothly, this can result in under supply and higher prices of energy savings. Under any of these scenarios the scheme would fail to sufficiently deliver its ultimate policy goals.

When selecting a scheme administrator, it is therefore crucial to ensure they have the capacity and capabilities required to deliver on all these outcomes. This means ensuring they have clear terms of appointment setting out their objectives, roles and responsibilities, and the capabilities, culture and resources required to succeed. There may be existing organisations that are suitable for the role of scheme administrator, or you may need to develop a new organisation. While the scheme administrator needs to sit in an organisation with sufficient authority to execute its responsibilities, it does not need to be large. The size of the administrator is likely to vary according to the size of the market.

Best practice principle: ensure the scheme administrator has a clear outcome focused mission with well-defined roles and responsibilities

Central to the success of the scheme administrator, as with any well-governed organisation, is to clearly define its mission and objectives in a way that are outcomes-focused (note this is different to the process-focused approach defined previously). This mission should be clearly aligned with a view to deliver the scheme's policy goals (Chapter 2), in line with the business case (Chapter 6), and within the constraints for the rules of energy efficiency demand (Chapter 3) and supply (Chapter 4). In practical terms, the mission should focus on the two outcomes the scheme administrator can influence:

1. Maximise the total number of certificates / credits that are created in accordance with the rules.
2. Minimise the total direct and indirect costs of certificate / credit creation and compliance.

As outlined above and throughout this handbook, there are unavoidable trade-offs in all aspects of a scheme. Poor compliance results in the anticipated benefits of energy efficiency not being realised. However, excessive compliance costs can deter participation and/or drive up the cost of energy savings, undermining the net benefit they are expected to produce.

If the scheme administrator's mission is not explicitly defined or defined in terms of specific tasks, it will lack guidance on how to prioritise decisions over unavoidable trade-offs. For example, administrators that are tasked solely with ensuring compliance may end up with a narrow legalistic focus on absolute compliance over every certificate / credit. While this may improve the integrity of individual certificates / credits, it may do so at the expense of compliance costs that drive up the cost and/or reduce the total supply of energy savings. A focus on maximising the savings delivered by the scheme at the lowest net cost would permit the scheme administrator to take a risk-based approach to compliance, aimed at reasonable compliance assurance at a method or approved provider level. To deliver on this mission, the key functions for an effective administrator are outlined in Table 5 below.

Table 5: The key functions and responsibilities of a scheme administrator

Role	Responsibilities
Ensure the integrity of, and target demand, for, certificates / credits	• Monitor, calculate and enforce obligated parties' individual targets. • Manage acquisition and acquittal of certificates / credits to prevent double counting of the same activities. • Facilitate the effective monitoring, evaluation, and improvement of target levels through collecting and sharing data.
Ensure the integrity, and required supply, of certificates / credits	• Approve and maintain accreditation of approved providers. • Oversee audit and assurance of compliance with certificate / credit calculation methods. • Manage registration and trading of certificates / credits to prevent double counting of the same activities. • Facilitate the effective monitoring, evaluation, and improvement of calculation methods through collecting and sharing data.
Facilitate the efficient and competitive exchange of certificates / credits	• Promote and facilitate the accreditation and retention of sufficient approved providers. • Develop capability of obligated parties and approved providers to comply with their requirements. • Facilitate the open and competitive trading of certificates / credits (within trading regime) through collecting and sharing information. • Facilitate access to accredited parties and credits though collecting and sharing information.

Best practice principle: ensure the scheme administrator has the full suite of powers, capabilities, and resources to succeed at its mission

The mission, roles and responsibilities of a scheme administrator require a diverse range of powers, processes, administrative tools, and skills. It is not necessary, or often desirable, for a scheme administrator to possess all these capabilities and capacity internally. Rather, an administrator needs access to the mix of capabilities it requires and funding for the authority to use them. This access often involves internal administrative staff, information technology and processes, and contractual arrangements with panels of external technical, measurement and verification, audit, communications, training, and legal service providers.

Sufficient delegations and resourcing are crucial for the administrator to make decisions and issue advice to obligated parties and approved providers within the dynamic times frames that markets require. Administrators with governance structures that involve part-time tribunals or committees which make rules on monthly or quarterly basis, can cause delays in decision-making and advice. This in turn can increase risk and undermine scheme credibility by hindering an approved provider's ability to provide advice in timeframes expected by their prospective energy savings / demand management customers.

Capacity building tools and processes include providing clear online information sheets, application forms, and guidelines on requirements; hosting joint technical working groups to identify and solve compliance challenges; running training sessions on common compliance issues; and issuing public notices when new rulings are made.

For compliance-related activities, a broad suite of compliance tools gives administrators the ability to undertake proportional enforcement actions. While administrators have the ability to issue strong penalties in cases of serious and wilful noncompliance, they may rightly be reluctant to use these tools for smaller cases of non-compliance. Examples of EEO-legislated penalties for severe offences include imprisonment, cancellation of energy provider licences, and large fines. Other compliance tools that are useful include the ability to issue small fines, temporarily suspend accreditations / or approvals and require bonds for invalid certificates / credits. The NSW Energy Savings Scheme (Appendix A, Case Study 6) has examples of the penalties available. Access to staff with training and experience in investigation, evidence gathering, and litigation, supports the effective use of these tools.

Administrators require a range of information technology infrastructure to support the efficient and transparent collection and sharing of information with participants, policy makers and the public. Many EEO schemes have some form of online portal through which approved providers can lodge evidentiary requirements for the creation of certificates / credits. Online certificate ownership registries are key information technology capabilities required for schemes with tradable energy savings (Type C in Section 5.1 above). Best practice schemes link these functions and provide publicly searchable access to detailed transparent information that shows certificate creation and ownership. Data on energy savings is broken down by factors like sector, activity, calculation method and location.

The staffing and funding levels of an administrator are typically proportional to the size of the scheme. Smaller schemes may have a one or two full time staff,[35] whereas larger schemes may have 10 to 20. A good rule of thumb is to aim for a scheme administration budget (internal and external resources) of 3 to 5% of the total scheme costs, with an additional 3 to 5% allocated for evaluation. Governments may seek to recover these costs directly from scheme participants through a range of charges. For example, scheme administrators may charge registration fees for the creation of certificates / credits. It is also common to require obligated parties and approved providers to pay directly for audit reports and measurement and verification reports from suppliers.

Best practice principle: appoint an administrator with a constructive service culture

As a market-based policy instrument, the success of an EEO scheme is dependent on the market functioning effectively (for the reasons outlined above). Given the key mission, roles, and responsibilities of the scheme administrator, it is important that the administrator culture is focused on constructively growing and working with the market to deliver scheme outcomes.

In EEO schemes, as in any government program or market, it is highly likely there will be some actors who push the rules to their limits and others who attempt outright fraud. This is why administrators require the compliance and enforcement powers, and resources described above. However, administrator cultures that focus primarily on compliance at the expense of capacity building can undermine participation in the scheme and increase costs. Conversely, administrators with a constructive service culture that see the market as a partner, prioritise building the capability of approved providers to comply through transparent and collaborative approaches to improved compliance. This approach can help maintain the integrity of certificates / credits, while also keeping compliance costs down and supporting price competition through increased participation in the scheme.

[35] (European Bank for Reconstruction and Development and the Energy Community Secretariat, 2019)

Key resource:

1. *Trading green or white certificates…for the sake of the environment or for the sake of traders?*[36]

[36] (Haas, et al., 2011)

Chapter 6 – Developing the business case for your EEO scheme

In this handbook the term “business case” refers to the formal package of research and analysis required to support your Ministry/Agency’s recommendation that government approve the development and implementation of an EEO scheme.

If an EEO scheme is an appropriate policy tool for your economy, and your Ministry/Agency wishes to recommend and obtain government approval to develop and implement an EEO scheme, most economies will have a formal approval process for a legislative program of this size and complexity. This process typically involves approval of the responsible Minister(s) (or equivalent, such as Agency head), approval of the broader cabinet (other Ministers), head of government (for example Premier, Prime Minister, Governor, President), and finally the legislature (in parliamentary systems).

This chapter sets out the relevant key elements, considerations, and analysis for an EEO scheme business case. Each economy typically has its own approval processes and requirements of supporting documentation that are beyond the scope of this handbook. The elements described below can be adapted to suit the procedural and governance needs of the relevant economy

There are six main steps to consider and address in developing your EEO business case:

1. Understand your local approval process and adapt this framework accordingly (Section 6.1).
2. Articulate the policy problem an EEO scheme can help government solve (Section 6.2).
3. Identify alternative policy options to an EEO scheme (Section 6.3).
4. Identify detailed EEO design sub-options you have considered (Section 6.4).
5. Analyse the costs and benefits of different EEO and non-EEO options and identify a preferred option for approval (Section 6.5).
6. Understand the required resourcing, next steps, and timelines for implementation (Section 6.6).

In practice, much of the analysis required to build a business case overlaps with the design choices and analyses set out in Chapters 1 to 5. For example, much of the market and economic modelling required to develop **targets** and penalty prices (Chapter 3) will be the same as the economic cost and benefit analysis required in developing your business case (see Section 6.5 in this chapter). It is important to understand which assumptions and outputs you will need for your business case in the design phase of your EEO scheme. Elements of the business case will require you to document the reasons behind your design choices (whether implicit or decisions made by government before you commenced work on your EEO scheme design). For example, the government may have already implicitly or explicitly made decisions related to fuel, sector, and facility coverage (Chapter 3) when setting out the strategic policy goals for **energy efficiency**. The business case can explain which options were ruled in and out based on their alignment with government strategy.

Best practice tip: identify components to include in the business case prior to commencing scheme design

When you plan and design an EEO scheme, understand the detailed components that may later be required to develop a business case. This will save effort and rework later by documenting the required research and analysis as you go.

This is also important to ensure you obtain the required combination of staffing, budget and time to conduct the research, analysis, consultation, and drafting needed to obtain approval.

6.1 Understand your local approval process and adapt this framework accordingly

Each economy has approval processes and requirements for supporting documentation which is likely to involve some elements of each of the following steps. There are likely both formal and informal processes to which you need to adapt the steps in this chapter. These generally involve understanding the needs and interests of key stakeholders, influencers, and decisions makers, as well as the formal requirements of policy and legislative approval processes.

Key stakeholders, influencers, and decisions makers

For EEO schemes, key stakeholders ordinarily include Ministry/Agency executives, Ministers, Cabinet and heads of government, and legislatures (or the equivalents based on different economy structures). Additional key stakeholders and influencers are included in Table 6 below.

Table 6: Additional stakeholders and their interest in EEO schemes

Stakeholder		Interest in the EEO scheme
Related government portfolios	Energy	Energy market impacts
	Environment	Climate and air quality benefits
	Treasury/finance	Innovative program funding approaches
	Industry	New industry growth and job creation
	Proposed scheme administrator	Implementation feasibility, operational capability, and capacity
Energy supply stakeholders	Energy generation and networks	Lost revenue / revenue growth opportunities, price impacts, potential compliance obligations
	Energy retailers	Lost revenue / revenue growth opportunities, retail price impacts, potential compliance obligations
Energy customer stakeholders	Consumer advocacy organisations, social welfare / low-income household advocacy organisations, large energy users, property industry organisations	Direct access to incentives for upgrades (refer to the participant test in Table 7 of Section 6.5), short-term price increases vs long-term price reductions (refer to the Ratepayer Impact (RIM) test in Table 7 of Section 6.5)
Energy demand-side industry	Energy efficiency service companies, behind the meter solar PV and battery installers, virtual power plants, demand response providers, high-efficiency equipment suppliers	Maximising incentive levels and ease of access
	Inefficient equipment suppliers	Potential disruption of existing markets
Environment advocacy organisations		Maximising level and additionality of carbon reductions, avoiding double counting with related schemes (for example, with an Emissions Trading Scheme)

The interests of some stakeholders are generally aligned with EEO scheme policy objectives and the public benefit. Competing interests of stakeholders may be aligned with broader policy goals across government and key decision makers. Section 6.5 provides a framework for assessing impacts and balancing trade-offs of EEO scheme costs and benefits from multiple perspectives.

Ultimately, as with all policy, design compromises are often necessary to balance the interests required for successful approval and implementation.

Formal requirements for policy and legislative approval processes

EEO schemes are likely to involve a more formal approval pathway than that required for more short-term transitory incentive programs (such as rebates). This is due to the extent of the legislative and regulatory changes required to secure funding for EEO scheme incentives and provide the investor confidence that is their key policy advantage. Many economies have formal templates and processes that must be followed for the introduction of new regulations such as "regulatory impact statements" (see Appendix B for examples). If this is the case for your economy, obtain and review these documents. For economies with less formalised processes, it can be helpful to obtain examples of recent business cases of successful and unsuccessful policy proposals and develop your own template and process, based on the lessons you learn from these examples.

Once you have your general business case template and process, compare it with the steps laid out in the rest of this chapter to understand which analysis is required or useful, and which is not. Secondly, perform the comparison to determine what else you need to address the formal and informal needs of your stakeholders, influencers, and decisions makers. Finally, prepare and follow a project plan to develop your business case.

6.2 Articulate the policy problem an EEO scheme can help government solve

A key step of a policy business case is to identify and define the policy problem that your recommended solution is intended to help solve. In an EEO scheme, the answer to these questions is likely be formed in the considerations set out in Chapter 1 and 2. The key issues to consider in articulating the policy problem are outlined below.

- **What is the problem** – examples of the problems an EEO scheme can solve are carbon emissions, peak demand, **grid-firming**, negative demand, or consumer energy bills (see Chapter 2).
- **Why is it a problem** – this should be clearly defined by the government's existing policy in the relevant area(s). For example, Climate Change impacts, Paris Agreement Commitments, energy system costs and reliability.
- **What are the root causes of the problem** – these will likely relate to some of the general market barriers to the adoption of energy demand-side measures, lack of pricing of environmental externalities in the energy system, and energy demand-side specific issues (e.g., lack of energy efficiency service industry maturity).
- **Who the problem (or the root causes) impacts (e.g. including people in energy poverty)**
- **What real world outcomes would characterise a solution** – this relates to the **energy efficiency** policy goals, objectives, key **metrics**, target fuels, sectors, and facilities (see Chapter 2).
- **Why is government action required to overcome the barriers** - these reasons should be self-evident from your description of the market barriers and failures. Include an explanation of why the private sector or other levels of government are unable to overcome the barriers. The program logic and theory of change will help articulate the case for government action (see Chapter 2).
- **Who is best able to address the problem and its causes** – once government sets up an EEO scheme, who will be responsible for its implementation (overlaps with discussion of obligated parties in Chapter 3)?

6.3 Identify alternative policy options to an EEO scheme

Many decisions regarding alternative policy options may have already been made before you commence planning and designing an EEO scheme. However, for business case development, it is good practice to clearly state both the implicit policy choices you have made, alongside the conscious design decisions you have considered.

Chapter 1 provides an overview of other key energy efficiency policy tools that could be considered as alternatives or complementary to an EEO scheme. It also sets out the circumstances under which an EEO scheme may be preferable. Appendix B provides references to supporting resources on the broader energy efficiency and demand-side policy toolkit.

6.4 Identify detailed EEO design sub-options you have considered

In addition to considering alternative policy options to an EEO scheme, there are many sub-options to consider. These options involve different combinations of design decisions covered in detail through chapters 2 to 5 of this handbook.

This option design step supports the next step - analyse costs and benefits. It is not feasible to analyse and communicate the costs and benefits of every variation of each design option described through chapters 1 to 5. In order to provide policy makers and decision makers with a manageable set of options to consider, it will likely be necessary to qualitatively rule out certain options before documenting a formal analysis of costs and benefits of different options (see section 6.5).

Potential groupings of qualitative design choices can be created to reduce the number and complexity of options in Section 6.5, examples of which are outlined below.

- **Coverage of fuels, sectors, and facilities** – significantly, these design choices will include the range of potential energy and demand savings, costs, and benefits in the economic cost benefit analysis (Section 6.5.2 below). However, it is likely that broader policy goals will already rule in and out certain choices. For example, existing policy is likely to dictate whether a scheme can cover liquid fuels, or the priority given to household versus business energy efficiency (See Chapter 3 for details). If there is strong stakeholder disagreement on the preferred option, then the quantitative analysis of costs and benefits of these different sub-options (see Section 6.5.1 below) is likely to be very informative.
- **Obligated parties** – the factors influencing obligated parties relate to local energy market structure, existing legislative frameworks, and implementation feasibility (See Chapter 3 for details). In many economies, there are not many feasible alternatives, and these can be compared qualitatively, and separately to the quantitative **cost-benefit analysis** of the main policy options. If there is strong stakeholder disagreement on the preferred option, then it may be appropriate to include these in the quantitative cost benefit analysis. This can help compare the administrative costs of different scenarios, while the qualitative analysis can compare issues of effectiveness and efficiency (see Section 6.5).
- **Trading, banking, and borrowing** – the factors influencing the trading regime relate to local policy goals, administrator capacity, energy demand side-market maturity, as well as the structure, culture, and incentive structures of the desired obligated party (see Chapter 3 for details). It is difficult to quantitatively analyse the cost and benefits of these options in any meaningful way. If there is strong stakeholder disagreement on preferred option, then it may be appropriate to include these as sub-options in the quantitative cost-benefit analysis (see Section 6.5.2).
- **Targets, trajectories, and penalty prices** – these are the other set of EEO sub-options that should be considered (Chapter 3). These options are likely to require quantitative cost benefit analysis (Section 6.5.1) to meaningfully compare, unlike the above sub-options which can potentially be qualitatively established in the case of clear policy guidance and strong

stakeholder support.

You may consider a much broader range of target, trajectory, and penalty price scenarios as you test sensitivities as part of your initial analysis, as discussed in Chapter 3. The multi-perspective cost-benefit analysis and four key modelling steps outlined in Section 6.5.1 below are likely crucial to iteratively analysing the optimal target, trajectory, and penalty price combinations.

Once you have identified a sub-set of these options to provide meaningful choice for decision makers (e.g., 3 to 5 combinations), these can be documented in the multi-perspective cost-benefit analysis (see Section 6.5 in below).

6.5 Analyse the costs and benefits of EEO and non-EEO options and identify a preferred option for approval

The central pillar of most policy business cases is a cost-benefit analysis of the different options considered. This is used to illustrate the advantages of why the preferred option is recommended instead of the other options. Some processes may only require a quantitative cost-benefit analysis, whereas others may also require a qualitative analysis. It is good practice to think through the qualitative costs and benefits when analysing options, even if they are not included in the business case.

This section sets out some key considerations for both quantitative and broader qualitative economic cost-benefit analysis of the options you identified in Steps 3 and 4. These considerations will help you identify a preferred option and allow decisions makers to meaningfully compare it with the alternatives.

Quantitative analysis of EEO option costs and benefits

Each economy will have its own requirements for comparing the net costs and benefits of a policy. Best practice for EEO economic analysis is to also consider the costs and benefits from a range of key perspectives, not just the overall net benefit (or cost) of an option.

Unlike programs which are funded through general taxation, EEO schemes are typically funded through small increases in energy prices (see Chapter 1). Because energy is an essential service, customers on lower incomes are vulnerable to energy price increases. This is both because they have little discretion on how much energy they need for a basic standard of living, and less disposable income to purchase more efficient equipment that reduces their energy needs. A key policy goal of an EEO scheme is often to reduce energy prices and assist customers on lower incomes to afford energy saving upgrades (see Chapter 2). However, if not designed carefully, EEO schemes can inadvertently have the opposite and regressive effect of increasing net costs to some energy customer groups. Therefore, an analysis of the costs and benefits of an EEO scheme often considers a broader range of perspectives than the conventional total net public benefit and benefit-cost ratio.

The Californian Public Utility Commission has a robust and long-standing framework for the multi-perspective analysis of energy efficiency and broader energy demand-side programs. First developed in 1983, and continually refined, this is a best practice tool and readily adaptable to a broad range of demand-side program types and business case requirements.

Key resource:

1. *California Standard Practice Manual - Economic Analysis of Demand-side Programs and Projects*[37]

The Californian Standard Practice Manual sets out five economic tests for policy makers to consider in both program design and evaluation. The Manual provides detailed worked examples for a broad

[37] (California Governor's Office of Planning and Research, 2002)

range of types, that can be adapted for other scheme designs. These tests and key metrics are summarised in Table 7 below.

Table 7: The Californian Public Utility Commission metrics for multi-perspective economic analysis of program costs and benefits (continued across four pages)

Economic test	Purpose	Scope	Key metrics
Participant	Understand at a high-level whether a program is likely to be attractive enough for customers to undertake upgrades. If participant benefits are low, take-up and thereby savings could be low.	Costs and benefits for those who undertake a subsidised upgrade under a program, including: • direct costs of the upgrade and potential indirect energy tariff increases • direct energy bill savings from lower consumption and indirect energy bill savings from lower tariffs.	• Net present value (all participants) • Discounted payback (years) • Benefit-cost ratio (BCR) • Net present value (average participant)
Ratepayer Impact Measure (RIM)	Understand the direction and magnitude of expected changes to energy tariffs from all customers. If the scheme goal is to be cost-neutral or negative, avoided energy wholesale and network costs should be lower than the subsidy levels recovered through retail price increases.	Net impact on energy tariffs expected after considering factors like: • energy system cost reductions from transmission, distribution, generation, and capacity costs • energy provider cost increases from incentive payments, lost revenue, and program compliance and administration.	• Lifecycle revenue impact per unit of energy (kWh or therm) or demand customer (kW) • Net present value (NPV) • Lifecycle revenue impact per unit of annual revenue impact (by year, per kWh, kW, therm, or customer) • First-year revenue impact (per kWh, kW, therm, or customer) • Benefit-cost ratio (BCR)

Economic test	Purpose	Scope	Key metrics
Total Resource Cost (TRC)	Understand the total energy system net public and private costs and benefits of the program. The higher the NPV and BCR of a policy option, the better the net public benefit is from an energy market perspective. If the levelised cost of demand or energy savings under a program are lower than the levelised cost of supply, it supports the case for demand-side intervention.	Essentially a combination of the cost and benefit calculations from the Participant and RIM test (with energy provider revenue losses and participant bill savings cancelling each other out). Excludes consideration of externalities (for example health, carbon, and other environmental program benefits). Uses a different discount rate form the Societal test.	• Net present value (NPV) • Benefit-cost ratio (BCR) • Levelised cost (cents or dollars per unit of energy or demand)

Economic test	Purpose	Scope	Key metrics
Societal	Understand the complete net public cost and benefits of a program, beyond the impacts on just the energy system (for example health, climate change, and other environmental benefits). The greater the NPV and BCR of an option, the more attractive it is. BCRs greater than 1 mean every dollar spent on a program delivers more than a dollar in public benefit. NPV shows the total magnitude of all the future benefits that can be expected, discounted for uncertainty, risk and the opportunity cost of money invested through the program.	Generally, the same as TRC, except: • also includes value of externalities (e.g., health, carbon, and other environmental program benefits) • tax credits and interest payments are treated as a transfer payment • uses higher marginal cost of energy if government is facing higher costs from external energy sources or imports • potentially uses a lower societal discount rate rather than a market discount rate, as the latter can undervalue the interests of future generations. • **Note:** other societal costs and benefits such as employment and GDP impacts could also be considered here but are not explicitly set out in the CPUC handbook.	• Societal Net present value (NPV) • Societal Benefit-cost ratio (BCR)

Economic test	Purpose	Scope	Key metrics
Program Administrator Cost (PAC)	Calculate the cost for delivering energy savings (or other demand-side impacts) net of the costs incurred by the participant. Similar role to the TRC test but allows costs of the program to be compared with costs of energy supply-side projects, which do not consider direct customer costs. Also avoids the need for complicated calculations of future energy tariffs.	Benefits from avoided supply costs of energy. The reduction in transmission, distribution, generation, and capacity valued at marginal costs for the periods when there is a load reduction. Costs include total incentives paid to customers and administrator costs (set up and operational), increased costs of supply (if program results in load increases). Revenue shifts are treated as transfer payments.	• Net present value (NPV) • Benefit-cost ratio (BCR) • Levelised cost (cents or dollars per unit of energy or demand)

The California Standard Practice Manual explains that each of these tests have their advantages and disadvantages and are not intended as absolute measures of a program's merit. The Manual provides detailed guidance on how to perform these tests and how to qualitatively weigh up trade-offs in different tests for different policy options. The precise costs, benefits and outcome metrics vary depending on the policy objectives of the program (for example energy savings, demand reduction, carbon abatement) and the types of projects it is expected to encourage.

You will likely need to undertake some preliminary research and analysis to obtain the data you will need to calculate the different types of net benefits and costs of different policy options. The level of detail of this analysis will vary depending on various factors including the size of the scheme you are developing, your policy development time frames and accessible data. However, generally there are four main things you will need to consider to be able to calculate EEO costs and benefits using the full suite of tests described above. These are:

- **Demand-side opportunity costs-curves** – understand the range of potential demand-side activities your EEO scheme can target, their costs (operating and capital) and benefits (energy bill and maintenance savings) to customers who choose to adopt them, and their current levels of market penetration and uptake growth under current policy settings.
- **Incentive uptake modelling** – understand the likely uptake of additional demand-side activities as a result of the new incentives provided under different EEO schemes. In addition, understand the likely uptake of alternative policy options, considering levels of freeriding and spill over, based on current uptake levels, scheme and customer upgrade costs, and the resulting changes energy consumption.
- **Energy market impact modelling** – understand the likely impacts on changes in energy demand from different scenarios of energy market demand, capacity, and pricing (including wholesale, network, and retail prices across relevant fuels), compared with forecasts in the absence of an EEO scheme.
- **Program costs modelling** – understand the costs of developing and operating the different programs, including establishment, administrative, compliance and incentive payment costs.

Best practice tip: use the modelling steps from the business case development stage when designing or reviewing your scheme

The modelling steps required to develop a business case for different EEO scheme sub-options are also useful to work through when deciding target levels, target trajectories and penalty prices (in Chapter 3).

Figure 7 below provides an example of how this data and analysis can be combined to produce the final economic cost-benefit analysis to support your business case.

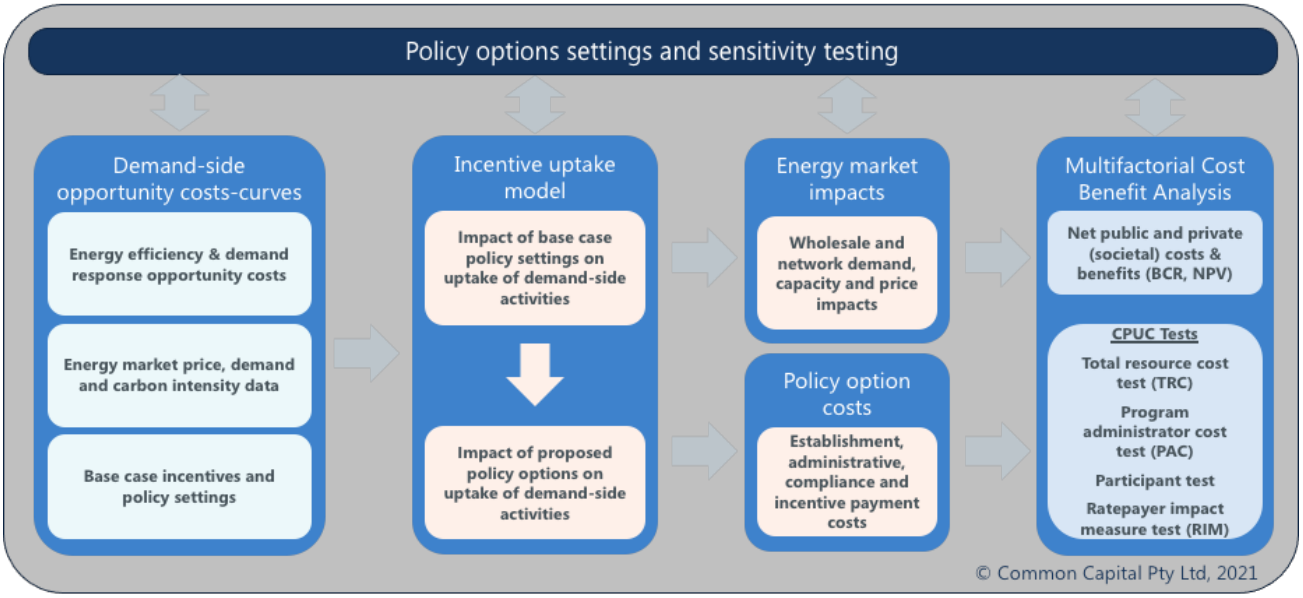


Figure 7: An integrated modelling framework and dataset for energy-demand side policy impacts (source: Common Capital[38])

Note that we will revisit these concepts in Part B of this handbook when historical, rather than predicted data is used to calculate scheme costs and benefits during the EEO scheme review stage.

Qualitative analysis of the advantages and disadvantages of EEO scheme policy options

It is important to consider qualitative factors when comparing different policy options, in addition to tests of economic effectiveness. As with any policy, the modelled benefits are only predictions of the potential benefits when a program is implemented effectively and operates as intended. In reality, some factors that influence implementation success cannot be meaningfully analysed using pure economic models. Best practice analysis of any policy typically involves an assessment of issues such as equity, efficiency, and effectiveness.[39] In EEO schemes, consideration should be given to some of the specific factors that influence the ease and success of implementation, such as:

- the likelihood of key stakeholders requiring support
- the adequacy of required staffing, skills, funding, and authority of program administrators
- the adequacy of the time allowed for policy makers, program administrators and market participants to develop the capacity and capabilities they require
- any complementarity or tensions with other related policy tools
- the likelihood that the design option will be understood and trusted by the market
- the ability of the design option to be finetuned to respond to market conditions once implemented.

Note that these concepts are further explored in Part B of this handbook, when historical rather than predicted, information is used to qualitatively assess issues of scheme equity, efficiency, and effectiveness during reviews of existing EEO schemes.

[38] (Common Capital, 2020)
[39] (Althaus, et al., 2020)

6.6 Understand your required resourcing, next steps, and timelines for implementation

A final key step in developing a business case involves obtaining approval for the budget, staffing, key next steps, and timelines that you will require for the detailed design and establishment of your EEO scheme. Once your business case is approved, much of the high-level EEO scheme policy analysis and design work will have been completed. There will then be significant further work required for detailed scheme design and establishment. The details will vary from economy to economy, depending on existing legislation, institutional capacity, and policy processes. However, the key elements and considerations will likely include:

- **Drafting of legislative amendments and new regulatory instruments** – these generally cover new or amended legislation and regulations to establish the legal authority for the scheme, key energy efficiency demand-side components (Chapter 3), and the appointment and terms of reference for the scheme administrator (Chapter 5).
- **Detailed design, drafting and approval of methods** – these may be issued as regulations or administrative instruments to enable the key supply components of the scheme (Chapter 4). Unless this work has already commenced in anticipation of business case approval, it will likely require considerable research, analysis, consultation, drafting and additional approvals.
- **Establishment of the scheme administrator** – before your scheme can commence, you'll need to establish a scheme administrator (Section 5.2). The administrator will need the required functions, processes, staffing, skills, and training to implement the roles and responsibilities you have allocated. Beyond the formal legislative, regulatory and administrative instruments described above, the administrator is likely to also require user-friendly web-content and online guides to help energy efficiency/demand activity suppliers to become accredited with the EEO scheme and comply with scheme rules.
- **Marketing and communication** – it is likely that the key reason you are establishing an EEO scheme is because there is no existing mature market for the types of energy demand-side projects you wish to encourage. Many of the businesses and people who will comprise this market are unlikely to be engaged with your policy process. This lack of awareness risks extended delays in the supply of demand-side activities (and therefore higher compliance costs and potential target shortfalls). To mitigate this risk, it is good practice to invest in a targeted marketing and communications campaign to promote scheme participation through events, workshops, one-on-one meetings and advertise to potential energy efficiency/demand activity suppliers.
- **Budget, timelines and workplan for policy and administrator transition team staffing, consulting budget** – an EEO scheme establishment budget and project plan should cover the authority, resources, and timeframes you need to complete the above and other related tasks. EEOs are complex, multiyear endeavours that pursue more transformative outcomes and take longer than short-term programs to develop. The policy work described in this handbook will take around 12-18 months to develop. More time is required to set the scheme administrator up. The details of many administrative functions and processes are dependent on detailed design decisions on obligated parties, activities, and methods. If your EEO scheme is starting from nothing (as discussed in Section 1.4), it may take several years for businesses and markets that EEO schemes harness take time (several years) to ramp up. This means that some administrative processes can be developed in parallel to market ramp up – with effort priorities to areas of market activity.

Policy maker handbook for establishing and enhancing energy efficiency obligation (EEO) Schemes

Part B: Reviewing and enhancing established EEO schemes

Chapter 7 – Overview of the main EEO scheme review types

Part B of this handbook covers the key considerations, activities, inputs, and best practice tips for reviewing and enhancing established EEO schemes. It is written primarily for policy makers of existing schemes. Part B is likely to also be of interest to policy makers who are developing new schemes as it is best practice to consider during the design stage how you will **evaluate**, **review**, and **enhance** an EEO scheme in the future. Many of the processes and considerations surrounding scheme reviews involve repeating the key steps outlined in Part A. Part B provides cross references to sections in Part A, where appropriate, and to avoid repetition.

This chapter outlines the three key review types used to assess EEO schemes. Table 8 below summarises these key review types, including their scope and timing. Each review type is described in detail in Chapters 8 and 9 which include a discussion on the key questions, steps, considerations and supporting inputs for scheme reviewers.

Table 8: Overview of the main EEO review types (continued over two pages)

Review type	Key questions	Frequency	Responsibility actor
Ongoing monitoring, maintenance, and enhancement (Chapter 8)			
Target reviews	• What should the targets for the next compliance period be? • What mix of activities helped deliver on the previous targets and why? What lessons does this offer for new uptake forecasts? • What is the remaining stock size, costs, and benefits of eligible upgrade opportunities? • What level of uptake can be expected at certificate / credit prices, that will deliver attractive net public benefits? • What scheme design changes are required to facilitate this (e.g., new activities or methods)?	• Annual high-level monitoring • 5-yearly (or less) / or as required by legislation	• Policy maker

Review type	Key questions	Frequency	Responsibility actor
Activity and method reviews	• For activities with high levels of uptake, what enhancements will ensure calculation methods still provide method-wide measured energy savings that are equal to, or greater than, energy savings represented by certificates/credits? • For all activities, what are the implications of technology, market and regulatory changes and what enhancements will ensure calculation methods provide: o additionality of baseline energy, operating energy, and persistence of savings estimates o consistency across methods and non-distortionary calculations o adequate product and installation quality o effective and efficient audit processes and clear evidence requirements o For activities with high potential but low uptake – what are the enhancements that address any barriers to participation? o What are some new high-potential technologies/activities, and what enhancements could be made to existing methods to include these technologies/activities	• Annual – incremental revisions • 3-5 yearly – major review	• Policy maker / scheme administrator
Major periodic reviews (Chapter 9)			
First principles review	• How has the EEO scheme performed and how is it likely to perform against policy goals? • How are the current policy settings helping and/or hindering the delivery of policy outcomes? • What changes should be made to the scheme as a result of these findings? • Are the current policy goals still relevant, if not, how should they be enhanced? • Is an EEO scheme still an appropriate tool to deliver these goals? • If an EEO scheme is an appropriate tool, how can it be enhanced?	• 5-yearly / or as required by legislation	• Policy maker

Chapter 8 – Ongoing monitoring, maintenance, and enhancement of existing EEO schemes

It is best practice to undertake continuous monitoring and improvement of operational processes and outcomes for all public and private sector programs. This chapter aims to help policy makers understand, plan, and implement the two major types of reviews involved in the ongoing **monitoring**, maintenance, and enhancement of existing EEO schemes: target reviews, and activity and method reviews.

Some policy makers only undertake these types of reviews as part of their major periodic (e.g., 5-yearly) reviews, such as a first principles review. While this is appropriate for some schemes, it is good practice to undertake more frequent monitoring of your scheme's performance. This is to identify and mitigate risks before they evolve into significant issues. Similarly, from a scheme administration perspective, it is good practice to proactively monitor the scheme's performance (as part of your continuous operational improvement processes). As discussed in Chapter 5, the detailed operational choices and actions made by the scheme administrator have significant impacts on the efficiency and effectiveness of EEO scheme implementation.

8.1 Target reviews

8.1.1 What type of review is this?

For the purposes of this handbook, 'target reviews' refers to the periodic monitoring and formal review of EEO scheme targets and the availability of eligible savings opportunities in an economy.

- **Periodic monitoring** often occurs by default as part of the scheme's compliance processes that ensure individual obligations and overall scheme targets are being met (this usually occurs annually).
- **Formal target reviews**[40] involve a more structured consideration of whether targets and trajectories are set at appropriate levels, given the forecasted availability of eligible energy savings activities (and the ability of the EEO scheme to unlock them).

8.1.2 Why is this type of review important?

Periodic monitoring

Under the scheme's legislative framework, scheme administrators are often required to conduct periodic monitoring of scheme performance. This is to ensure, and report on, compliance. It is also good practice for policy makers to monitor the outcomes of these reports to understand the underlying trends of the balance and volatility in the demand and supply of certificates / credits. Often no action is required as scheme performance is satisfactory. However, as discussed in Section 8.1.5, mismatches or volatility in the demand and supply of certificates / credits may be an indicator of scheme design issues that need to be addressed.

Formal target reviews

Formal target reviews are required at the end of compliance periods to both develop and set your targets and obligations, and to periodically consider the appropriateness of current targets. It is good practice to set targets for long periods (e.g., at least 10 years) to provide stable, long-term signals that encourage and allow investors to innovate and scale new products and services (as discussed in Chapter 3). However, some EEO schemes will have policy makers choose to set targets that expire after much shorter periods, such as every two or five years. For these schemes, formal target reviews are required to set new targets and obligations for the next compliance period, or the scheme will cease to deliver savings and investors will leave the market.

[40] *Formal target reviews are also known as "Energy Efficient Potential and Goals Studies" in the United States.*

For schemes with long-term targets, formal target reviews are an important component of first principles reviews (see Chapter 9) to ensure targets remain appropriate after other scheme enhancements and reforms. Formal target reviews will be required earlier than planned if an EEO scheme has automatic stabilisers. These stabilisers trigger a review due to sustained over, or undersupply, of certificates / credits relative to targets (see Chapter 3 for further discussion on automatic stabilisers).

8.1.3 When should these types of reviews be conducted?

Periodic monitoring

Less formal, periodic monitoring should occur annually at the end of each compliance period.

Formal target reviews

Formal target reviews should occur approximately every 5 years, unless required sooner by legislation due to short-term targets, or if automatic stabilisers trigger a review.

8.1.4 Who should conduct these reviews?

As stated in Section 8.1.2, the scheme administrator will often complete periodic monitoring of scheme performance. However, policy makers should critically engage with the results of this monitoring to understand the policy implications for the scheme.

Formal target reviews are most likely to be conducted by the policy team responsible for creating the EEO scheme, rather than the scheme administrator. This is because these reviews should consider how the scheme targets interact with the demand mechanisms, supply mechanisms, market governance, and the scheme administrator.

8.1.5 What are the considerations, key steps, tools, and inputs required?

Periodic monitoring

It is good practice to include automatic stabilisers that manage short-term variations between certificate / credit supply and demand (as discussed in Chapter 3). If automatic stabilisers are in place, the best course of action is often for policy makers to do nothing. However, as mentioned, short-term mismatches between the supply and demand of certificates / credits can result in oversupply, undersupply, and/or volatility and trigger formal reviews. Three of the consequences of a supply-demand mismatch that can be identified during periodic monitoring are explained further below:

- **Oversupply** – when the supply of certificates / credits continually exceeds scheme targets, it could be an indication that targets are too low and future increases may be required. Alternatively, it could mean that a finite supply of low-cost activities has been unlocked, but once exhausted, the medium-term prices should rise to encourage new eligible activities to enter the market, meaning the supply and demand balance is likely to return.
- **Undersupply** – when the supply of certificates / credits continually falls short of targets, it could be an indication that targets are too high, and/or penalty rates are too low, and future target reductions or penalty increases may be required. This could mean that higher prices are required to attract new entrants to the market. This would likely decrease prices in the medium-term as the supply of certificates increases. Alternatively, shortfalls in the supply of certificates / credits may be an indication that scheme administrative processes are too onerous and are creating barriers to the implementation of energy savings activities. For example, overly complex, slow and/or expensive accreditation processes, audit procedures and/or calculation methodologies may be the root cause of certificate undersupply.
- **Volatility** – a mismatch between the needs of certificate / credit buyers and creators can create volatility in the timing of certificate / credit creation and/or processes. This could increase risks, costs and/or reduce the attractiveness of participation in the EEO scheme. Increasing the

frequency of compliance periods (e.g. quarterly rather than annual compliance) may uncover the root causes of any volatility before they cause significant issues. Alternatively, engagement with the finance industry may encourage the development of financial derivatives that can help smooth cashflow requirements for certificate / credit creators. Reviewers may also find that a high supply of certificates / credits is the result of a market dominated by large energy savings projects, and not a problem for either certificate / credit buyers or sellers.

These consequences can be an indicator of issues with market governance and scheme administration and may trigger a formal target review. There will be better outcomes for the scheme in the medium-to-long term if these issues are addressed early. Policy makers should therefore contemplate how and why a scheme is meeting its targets by analysing compliance reports provided by the scheme administrator and underlying certificate / credit registry data. Alternatively, policy makers may undertake an informal stakeholder consultation to understand the significance and implications of any supply-demand mismatches and/or volatility observed. It is good practice for policy makers to use the results from these periodic monitoring evaluations to support formal reviews.

Best practice tip – let market prices manage supply and demand in the medium-term (while ensuring administrative processes are not barriers to the uptake of energy savings activities)

As previously discussed, political and administrative i**nvolvement should be minimised** to provide stable signals for investors. If an EEO scheme is to effectively harness markets to drive energy savings, the mechanism of price must be allowed to function. However, even in carefully designed and implemented schemes, design components or administrative processes can unintentionally result barriers to the uptake of certain activities through increased costs. Periodic monitoring of targets, regular formal process evaluations and continuous operational improvement are important in identifying and addressing unintended market distorting friction.

Formal target reviews

There are two key tasks involved in formal target reviews:

1. Understand the appropriateness of current scheme targets and trajectories.
2. Formally recommend new targets and trajectories for the next period.

Completing a formal target review is very similar to the process followed when setting the original scheme targets (Section 3.2) and leverages the modelling and analytical methods outlined in Section 6.5. The key difference between setting targets, trajectories, and penalty prices for a new EEO scheme compared with during a formal review of an existing scheme, is the ability to draw on real-world data from the existing scheme's performance.

In considering the appropriateness of current targets and what future targets should be, policy makers should consider the additional questions below.

- What mix of activities helped deliver on the previous targets and why? What lessons does this offer for new uptake forecasts?
- What are the remaining costs and benefits, and size of eligible upgrade opportunities?
- What level of uptake can be expected at certificate / credit prices that will deliver attractive net public benefits?
- What scheme design changes are required to facilitate this (e.g., new activities or methods)?

Best practice tip – strive for stretch targets with an achievable trajectory and a good cost-benefit ratio that maximise the net public benefit of the scheme and transform the market

for energy savings.

As previously discussed, the long-term success of an EEO scheme is dependent on achieving the optimal balance between demand for energy savings (target levels) and supply (the amount of savings the market can cost-effectively deliver). Short-term targets and activity opportunity modelling based on short-term potential and current costs, is likely to result in targets that are too low to drive innovation and price competition. Opportunity modelling should include assumptions that consider the decreasing costs of niche activities, driven downwards by mass market adoption.

Targets should focus on maximising the net public benefit, noting that as a voluntary scheme, participants are unlikely to undertake energy savings activities unless they receive the appropriate incentive. Target trajectories can be used to gradually ramp up annual targets, allowing the market to grow to stretch levels without causing a short-term undersupply of certificates / credits.

8.2 Activity and method reviews

8.2.1 What type of review is this?

An activity and method review seeks to understand how eligible energy saving activities and calculation methods are expected to contribute to the EEO scheme outcomes, and why. In simple terms, these reviews seek to understand and maximise the degree to which certificates / credits created under the EEO scheme represent additional, real-world energy savings.

Note that this type of review does not judge methods on a pass/fail basis, but rather aims to maximise your scheme's success by preventing non-additional energy savings from being rewarded under the scheme. These reviews analyse the reasons for any variation between the estimates of the methods and the real-world values (both historical and forecast). They develop and recommend enhancements to energy saving activities and methods that reduce this variation in future. These reviews therefore draw on the findings of program and method-level **impact evaluations** to draft, consult and recommend detailed revisions to the schedules of eligible activities and methods.

8.2.2 Why is this type of review important?

An activity and method review is fundamental to ensuring the integrity of your EEO scheme. While scheme targets determine how much energy is saved, the activities and methods determine the real-world energy savings behind the certificates / credits that are counted towards scheme targets. All savings calculation methods are likely to be imperfect. The energy savings represented by certificates / credits at site, method and target levels will unavoidably vary from the real-world outcomes. There are six main reasons why activities and methods require continuous monitoring, evaluation, and maintenance:

1. **Measurement precision versus administrative and commercial feasibility**. Calculation methods involve trade-offs between measurement precision, auditability, and cost-effectiveness. Activities will not be taken up if they involve perfectly precise energy savings calculation methods that are too complex or expensive to use. Therefore, variations are expected between the precise savings delivered and the certificates / credits awarded. The integrity of your scheme depends on the projected savings represented by the certificates / credits being the same, or less than, the total additional real savings delivered.
2. **Measurement precision versus additionality.** It is highly likely that some of the energy saving activities would have been undertaken without the scheme incentives. The precision of your methods is irrelevant if the energy savings being calculated are non-additional. It is impossible to completely prevent freeriding at an individual upgrade level. Rather methods should be developed in a way that accounts for a level of freeriding across all activities of a given type. For example, an activity type with no historical uptake may receive ten years of persistence savings.

If the activity becomes more common (because the EEO scheme has transformed the market) then the persistence savings from that activity should be reduced to offset freeriders. If researchers find that in the absence of a scheme, a typical building would have implemented the energy savings measure after three years, then the deemed persistence savings should be reduced from ten to three years. Conversely, some sites may see neighbours or competitors undertaking activities because of an EEO scheme and participate in these activities without claiming the certificates / credits. This is known as "spill-over" and is a highly desirable feature of effective market transformation. Accurately predicting the net levels of freeriding and spill-over is near impossible when methods are first developed. Therefore, monitoring and evaluation is required to retrospectively understand the net impacts at a method level and the method updates required.

3. **Savings vs persistence of savings.** Most calculation methods combine the measurement (or estimate) of annual savings with a prediction of future savings, also known as persistence of savings (see Section 4.3 for further detail on calculating persistence of savings). Predicting the future is always challenging, and monitoring and evaluation is required to validate and refine the inputs used in methods measuring future savings, which often represent the majority of certificates / credits. Understanding persistence of savings is particularly important for reviewing and improving calculation methods for activities that are currently eligible under the scheme. However, even if activities are no longer eligible under the scheme, it is important to understand the persistence of savings for previously eligible activities (as energy savings from these activities have already been paid for) to generate data that can be used in impact evaluations.
4. **EEO-driven market transformation**. If an EEO scheme succeeds in its objective of market transformation, activities with no previous uptake, or low uptake levels, may become more likely to be taken up with incentives. Therefore, initially valid assumptions about baseline energy use and/or the number of years of savings in methods may become out-of-date and require updating. For example, the method for an activity that is not implemented in the absence of the scheme (i.e., requires an incentive) may adjust the persistence savings as the market changes and the activity becomes mainstream. That is, a scheme may award ten years' of persistence savings however adjust this to three years once the market has been transformed. The method would therefore require an update due to the market transformation that has occurred.

Failing to update methods can prevent an EEO scheme from driving market transformation. For example, consider a scheme that includes subsidised energy efficient appliances as an eligible activity. The method for this activity might use the historical number of appliances purchased as a baseline to calculate avoided energy use. If this activity results in a significant increase in sales, it could be a signal that the market has been transformed and the levels of freeriding are likely to be low, requiring no method reform. However, if uptake is low, then it could signal high levels of freeriding, and policymakers should consider whether a method reform would improve uptake.

5. **External market and regulatory changes.** EEO schemes are based within existing energy efficiency policy and markets. Policies and market conditions periodically experience changes that have implications for EEO scheme activities and methods. Some examples are provided below:
    - o New building efficiency standards may ban products which an EEO scheme had previously funded requiring the activity to be removed from the scheme.
    - o New products may be developed that meet EEO scheme goals and need to be added as eligible activities with a corresponding method.
    - o New installation or safety standards require an update in the activity criteria.
    - o Previously niche products may become mainstream and methods will need updating to reduce assumptions on additionality.

6. **Alignment with EEO scheme goals.** First principles reviews and **process evaluations** may help identify activities and methods that better align with EEO scheme goals. For example, if the goal of an EEO scheme is to ensure a fair distribution of participant benefits, yet uptake only occurs in major cities, then methods should be updated to increase the value of savings in regional communities. Alternatively, updating activities and/or methods to provide greater incentives for activities resulting in large energy savings, rather than low-cost low energy saving upgrades, could help achieve **fuel poverty** goals.

8.2.3 When should these types of reviews be conducted?

Review frequency

Ideally, high-level incremental revisions to activities and methods should occur annually, with a major activity and methods review every 3 to 5 years. If scheme budgets are limited, costs can be contained by limiting the focus of these reviews to a subset of activities, since EEO schemes will commonly have many eligible activities and savings calculation methods that are never used. The priorities for limited annual reviews are the activities and methods which are seeing moderate to high uptake, and rising levels of uptake, as well as activities and methods with high theoretical potential but low uptake.

Activity and methods reviews can also be triggered outside of these recommended timeframes. Examples of these triggers include:

- changes to regulation (e.g., a significant increase to minimum standards)
- significant changes to technology availability or costs
- high levels of uptake for a certain activity.

Market notification of decisions

It is crucial that sufficient market notice is provided of changes to activities and methods. This is to maintain trust and confidence in the scheme. This is a particular issue for activities and methods with high levels of uptake, or for which providers are investing in new savings products and solutions. If EEO scheme activities and methods are conceived to be unpredictably variable, schemes are perceived to be riskier and less attractive to participants who undertake the multi-year efforts required to develop and scale product and services innovations. Erratic method changes can also generate a bad reputation for the scheme and result in distrust amongst installers and customers of energy saving activities, thereby reducing demand for energy savings. The reduced demand, competition, innovation, and market transformation therefore increases the costs of energy savings under the scheme.

It is best practice to provide notice of activity and method changes proportional to the impact it will have on the business processes occurring under the scheme. For example, changes that will materially change the number of certificates / credits for a given activity (and thereby prices) should give providers enough notice to reduce product inventories commenced in good faith under previous calculation methods. This might require 6-12 months' notice, depending on the product and market, and can be tested through stakeholder consultation. Method changes that remove the commercial viability of current activities should provide sufficient notice for providers to develop and transition to new activities/business models, or to make an orderly exit from the market.

8.2.4 Who should conduct these reviews?

These reviews should be conducted by the team responsible for developing and maintaining EEO scheme activities and methods. For some EEO schemes this may be the policy maker responsible for overall scheme design and legislation. For other schemes, it will be delegated to the scheme administrator. Consultation with stakeholders is particularly important for activity and method reviews. Best practice is to establish standing stakeholder advisory bodies to assist with activity and method monitoring, evaluation, and review.

8.2.5 What are the considerations, key steps, tools, and inputs required?

The key goal for an activity and method review is to understand the appropriateness of policy settings for eligible activities and methods (see Chapter 4). This includes understanding the nature and reasons for:

1. Savings outcomes and historical certificate / credit creation under current activity and method rules.
2. Changes required to current activity and method rules to maintain or improve future savings outcomes.

Consideration of the nature and reasons for these issues mean that the findings of impact evaluations, process evaluations, and market transformation evaluations will be available as key tools for reviewers.

- **Impact evaluations** should consider:
  - which activities were implemented
  - the certificates / credits attributed to activities
  - the gross and net energy savings versus number of certificates / credits created
  - additionality and distribution of impacts by activity, method, and consumer type.
- **Process evaluations** should consider:
  - coverage of eligible activity definitions
  - calculation methods for baseline and operating energy
  - eligibility requirements (for additionality, quality, and safety)
  - evidentiary requirements for compliance.
- **Market transformation evaluations** should consider to what extent impacts were transitory, i.e., dependent on continued policy interventions, or transformative, i.e., likely to persist after the program has ended. These evaluations should assess:
  - market structure, in terms of the mainstream and niche roles, interrelationships, segments, routes to market, and business models
  - market dynamics, in terms of the social practices, technology infrastructure inertia, capabilities, opportunities and motivations
  - performance, in terms of the level of uptake of activities relative to the overall share of specific energy end use.

Reviewers should then integrate these findings to develop, consult and obtain approval for revisions to activity and method rules.

Prioritisation of limited resources

If budgets are constrained, reviews of historical certificate creation can focus on activities that have seen high or rising levels of uptake. However, reviewers should also consider any activities with low certificate creation that show high potential for uptake. Below are the specific considerations for different categories of activities:

- **All activities**
  - For all activities, understand the implications of any recent major technology, market, and regulatory changes. Identify enhancements to ensure calculation methods provide:
    - additionality of baseline and operating energy, and persistence of savings estimates

        - consistency across methods when calculating persistence of savings
        - adequate product and installation quality
        - effective and efficient audit processes and clear evidence requirements.

- **Activities with high or rising uptake**
    - If budgets are limited, funding should be focused on activities that have experienced high volumes of certificate / credit creation or are expected to before the next review. Savings outcomes from activities with low certificate / credit creation are unlikely to have significant impacts on EEO scheme-level policy outcomes.
    - When impact evaluations involve measurement and verification for default savings factor/formulae methods, variations at a site-by-site level are not a concern because they are, by definition, based on averages and not actuals. The objective of impact evaluation M&V should be to ensure the deemed savings are reflective of the average savings for all sites.
- **Activities with high predicted uptake but low observed certificate / credit creation**
    - It is unlikely that activity uptake and target modelling will accurately predict the activities that will be adopted at certain levels. This is because markets are always evolving and include complex interactions beyond the scope of the modelling. However, if there are activities in which policy makers expect to see a high uptake that do not perform as expected, this can be an indication of issues with modelling assumptions in the method design and should be reviewed. Possible reasons for low uptake of high potential methods include:
        - inefficient method administration that creates barriers to uptake
        - distortions in the awarded persistence of savings between different methods (e.g., different certificate / credit forward creation periods), making high potential activities less viable than they should be
        - inaccurate cost-benefit assumptions of activities in target update models, suggesting activities are more viable than they are
        - costs of dominant activities are driven down by market transformation.

Availability of empirical data

When conducting an activity and methods review, it is best practice to use the vast amounts of ex-post empirical data that exists for established EEO schemes, including:

- Calculation method data on exactly how many certificates / credits were provided. Including data on when, where and which activities were undertaken (e.g., address, climate zone, house/building type and size, operating hours/number of bedrooms, sector, equipment removed, modified, and installed etc.).
- Customer utility meter data on energy use, for both a “treatment group” (data from identifiable participants who undertook upgrades) and a “control group” (data from otherwise equivalent non-participants who did not undertake upgrades).
- Broader weather, socio-economic and industry production data from public government datasets.

Analysis of this data should consider additionality and distribution of impacts by activity, method, and customer type. Collectively, this data can support very robust statistical analysis of gross and net energy savings versus certificates / credits generated.

Best practice tip – plan ahead to ensure actual measured energy data will be available when conducting activity and method reviews.

Most calculation methods, by necessity, are initially developed using data estimates or

preliminary measurement and verification to predict long-term savings outcomes. It is common for activity and method reviews to evaluate impacts and update baselines and persistence savings with updated market data. However, method reviewers can only use this data and undertake this type of analysis if it has previously been assembled, or the timing and budget for reviews allows for its collection. Collecting this data retrospectively can be prohibitively challenging, expensive and time consuming, whereas collection of activity data and consents to obtain utility data can be easily obtained when participants provide the other information necessary to receive scheme incentives. Therefore, policy makers and scheme administrators should ensure there are simple data consent, collection, storage, and reporting systems to support robust and efficient method impact evaluation.

Key resource:

1. *California Public Utility Commission's Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Requirements for Evaluation Professionals*[41] and other resources located in Appendix B.

[41] (The TecMarket Works Team, 2006)

Chapter 9 – First principles reviews and reform of existing EEO schemes

This chapter will help policy makers understand, plan, and implement a **first principles review** and reform. The findings from this review will help to support decision making around the enhancements required to ensure your scheme's success.

A first principles review should holistically consider the following questions:

- how your EEO scheme has historically performed against policy goals (why/why not?)
- how your EEO scheme is likely to perform against policy goals (why/why not?)
- whether the policy goals are still relevant (if not, what goals are appropriate?)
- how are the current policy settings helping and/or hindering the delivery of policy outcomes?

What type of review is this?

A first principles review is when policy makers and governments step back to consider the fundamental value of an established EEO scheme (or any policy tool). These reviews seek to determine if the scheme is working as intended, if it should continue and, if so, how it can be enhanced. Every economy will have its own timelines and processes for these reviews. Some economies will have formal statutory requirements for these reviews, whereas others will have more informal processes.

Why is this type of review important?

It is good practice to periodically conduct reviews of this nature regardless of whether a formal first principles review is required by law. As shown in Part A, many critical design decisions must be based on predictions about how markets will respond to scheme incentives, and the costs and benefits of these responses. Predictions should be largely established on the best available data, which may be both limited and/or based on historical energy market conditions. If an EEO scheme is successful in achieving its policy goals, it will change the nature of the markets that it impacts, and historical-based assumptions may become out-of-date and require revision. Conversely, if a scheme is unsuccessful, it suggests that some of the predictions made in the design phase were inaccurate and the related components require revision.

When should these types of reviews be conducted?

This guide recommends a first principles review is conducted approximately every five years, unless otherwise stipulated by law. This is because market-based policy instruments take time to transform markets that deliver policy outcomes. As discussed in Section 1.4, it takes time for business to build, refine and scale the deployment of new products and solutions that help deliver EEO scheme policy outcomes. A well-designed and implemented scheme should expect to see annual targets met in its first year, however it takes several years for markets to reach the characteristic levels of transformative scale, innovation, and price competition. Therefore, first principles reviews that are completed more regularly than five-year cycles are likely to miss medium-term trends. Conversely, less frequent reviews (e.g., ten-yearly reviews) risk failing to identify and rectify major issues in time to ensure scheme enhancements can improve on the delivery of policy outcomes.

Review of the research, monitoring and evaluation activities (that first principles reviews are based on) should begin as soon as an EEO scheme commences (i.e., not wait 5 years to begin reviewing). Emerging issues should be identified and addressed through continuous operational improvement.

Who should conduct these reviews?

These reviews are typically conducted by the team that established the policy and legislative framework for the scheme. This is because these teams typically have the required policy expertise

for the relevant markets and understand the stakeholders of the scheme. If the reviewing team does not possess this knowledge and expertise, they will need to contract the relevant people to do so. These reviews are not typically conducted by the scheme administrator (see Section 5.2 for the roles and responsibilities of scheme administrators). This is because these reviews should be focused on the same strategic policy level as scheme design.

Some economies have formal statutory requirements that prescribe who can conduct these reviews, for example an independent team that is responsible for EEO scheme policy. While independence may suggest a greater degree of impartiality on review outcomes, total independence can be a disadvantage due to a lack of subject matter expertise. An implicit assumption behind the need for independence is that reviews represent a binary choice between success and retention, or failure and termination of a scheme. Best practice is to treat reviews as the recommencement of the policy cycle i.e., from issue identification through to options analysis, decision, and implementation again. Therefore, the key activities, skills and capabilities required for a first principles review overlap with scheme design. There is subsequently an advantage to carrying out this review with the same policy team that established the scheme. However, because first principles reviews need to impartially consider the option of abolishing a scheme, it is recommended that the review is not conducted by those whose employment is dependent on the continuation of the scheme.

9.1 Assess how your EEO scheme is performing against its goals, and why

Assessing how your scheme is performing against its goals should cover performance since scheme commencement and/or the most recent first principles review, and the scheme's anticipated future performance. Note, there is more to assess than solely whether EEO scheme targets have been met. Reviewers should consider the following:

1. Assessing EEO scheme performance with respect to outcomes, not outputs (Section 9.1.1).
2. Understand how and why your scheme achieved/did not achieve its goals (Section 9.1.2).
3. Consider your scheme's historical and emerging performance (Section 9.1.3).

Those responsible for a first principles review need to understand the implicit and explicit hypotheses that went into the design decisions (as covered in Chapters 1 to 6). The review process to answer these questions will be most effective if you are able to draw on research, evaluations, and other reviews (outlined in Chapter 8) that have been conducted.

9.1.1 Assessing EEO scheme performance with respect to outcomes, not outputs

Best practice evaluation seeks to understand if your EEO scheme is performing against its goals, with respect to scheme outcomes (e.g., real world energy savings, market transformation, customer bill savings) as opposed to scheme outputs (i.e. the number of certificates / credits created).

Best practice evaluation also considers outcomes both in terms of quantifiable impacts on primary policy goals, as well as qualitative considerations of the efficacy and equity of these impacts (see Chapter 2). Outputs are much easier to measure than outcomes, as these are directly produced by the program. For example, an output-focused evaluation of an EEO scheme's performance would consider only whether sufficient certificates / credits were created to meet targets. This type of evaluation would assume that certificates / credits and targets automatically translate into the broader policy goals of the scheme. However, a central consideration of outcome evaluations and first principles reviews is whether these outputs did indeed translate to the corresponding levels of the real-world changes that are expected (outcomes). This requires understanding and developing quantitative and qualitative indicators for the EEO scheme's primary and supporting policy goals that can be tested independently of the scheme. To do this, reviewers need to be able to draw on findings from research and evaluations which have been conducted prior to the review.

9.1.2 Understand how and why your scheme achieved/did not achieve its goals

Best practice evaluation seeks to understand more than whether an EEO scheme has achieved its goals. It seeks to determine how and why/why not, to inform future policy choices.

Understanding **how** outcomes were achieved involves considering the broader efficiency, equity and efficacy of how targets were delivered with respect to:

- the types of activities undertaken
- the distribution of benefits amongst participants and non-participant groups
- levels of administrative and compliance costs.

Understanding how outcomes were achieved can be done by comparing actual and forecast outcomes with those originally predicted in the EEO scheme design modelling (see Chapter 6). Variations from expectations are not problematic, as long as overall scheme outcomes are being met. Identifying variations can help policy makers focus on why they occur and validate or improve their understanding of how the EEO scheme can deliver better outcomes in the future.

Understanding **why** outcomes were achieved involves considering the reasons and implications of why:

- certain activities were taken up and others were not
- certain accredited providers and installers participated, while others did not
- savings, costs, compliance outcomes varied from expectations.

Understanding why outcomes were achieved involves testing the assumptions in the program logic and theory of change (see Section 2.2). It also involves understanding the contribution of key scheme mechanisms to these outcomes – including targets and obligations (Chapter 3), activities and methods (Chapter 4), and scheme administration (Chapter 5).

9.1.3 Consider your scheme's historical and emerging performance

Best practice involves understanding that there are delays between implementing a policy tool (like an EEO scheme) and the delivery of measurable real-world changes. This is why it is good practice to draw on both retrospective **"summative" evaluations** to understand what has already happened, as well as forward-looking **"formative" evaluations** to understand emerging trends. For both summative and formative evaluations, it is best practice to draw on holistic market impact studies that test the hypotheses in your program logic and theories of change. These can be done through process and impact evaluation research.

Best practice tip: conduct regular ongoing evaluation research and monitoring

While major reviews should occur 5-yearly, it is important to conduct regular ongoing evaluation research and monitoring. These provide the key inputs

- Evaluations:
  - Summative process evaluations
  - Summative impact evaluations
  - Summative market transformation evaluations
  - Formative process evaluations
  - Formative impact evaluations
  - Formative market transformation evaluations.
- Previous reviews:

- Target reviews
- Activity and method reviews.

- Internal program strategy documents
- Stakeholder consultation documents.

See Appendix B for links to resources on evaluation and reviews.

9.2 Consider how your EEO scheme should evolve based on your findings

Once you have assessed how your scheme is performing against its goals (and why), reviewers should holistically consider whether the current policy goals are still relevant and whether an EEO scheme is still an appropriate tool to deliver these goals.

This review is called a "first principles" review because it involves going back to the first principles you considered when deciding if an EEO scheme was an appropriate policy tool for your economy. Once you have completed your assessment of your EEO scheme's performance, it is time to re-commence the policy cycle that resulted in the design of the EEO scheme in the first place, set out in Part A of this handbook. However, the process is slightly different (as shown in the order below) as scheme objectives should be reviewed before deciding whether an EEO scheme is still the appropriate tool to achieve your policy objectives. The policy cycle under a first principles review should proceed as follows:

- Reviewing your EEO scheme's policy objectives (Chapter 2)
- Deciding if an EEO scheme is still the right tool for your needs (Chapter 1)
- Reviewing the mechanism for the demand for energy efficiency (Chapter 3)
- Reviewing the mechanism for the supply of energy efficiency (Chapter 4)
- Reviewing your scheme's market governance structure (Chapter 5)
- Developing the business case for your EEO scheme (Chapter 6).

A summary of the key considerations for each of these steps are provided in the sections below. Please refer to the original chapters and section references for further detail.

9.2.1 Reviewing your EEO scheme's policy objectives (Chapter 2)

When reviewing your EEO scheme's policy objectives, reflect on the following considerations:

- Understand whether the strategic policy problems your EEO scheme was designed to solve (e.g., energy efficiency, emission reduction, fuel poverty, energy demand reduction etc.) are still priorities for your economy.
  - Assess whether barriers to solving this problem are still in place. If so, why are they still in place?
- Assess whether the initial design decisions about the primary and supporting policy objectives of your EEO scheme remain valid, or whether they need refinement or enhancement. Examples of issues that would require policy objectives to be refined include:
  - Shifting government priorities. For example, decarbonisation or fuel poverty may be a higher priority than general bill savings, or negative energy demand or peak demand management may have emerged as pertinent issues.
  - Your EEO scheme is delivering a mix of activities that are not aligned to policy objectives. For example, if the policy goal is emissions reduction but the scheme has inadvertently reduced the emissions intensity of the energy system, scheme metrics could be updated to encourage

greater levels of fuel switching to low emissions electricity.

- Determine whether the method for measuring the scheme's performance needs to be updated (i.e., updates to the base metric and conversion factors). A review may conclude that policy objectives and metrics remain appropriate, but the conversion factors need updating to reflect changes in the broader operating environment. For example, a review may conclude that a scheme should continue to pursue emissions reduction, keeping tonnes of CO_2e as the policy metric, however update conversion factors to reflect forecast reductions in the emissions intensity of electricity. This in turn would result in an increase in the incentives for the electrification of gas appliances, compared with incentives for electricity efficiency.

Chapter 10 provides enhancement examples that policy makers of established schemes are currently considering.

9.2.2 Deciding if an EEO scheme is still the right tool for your needs (Chapter 1)

Once you have more clarity on your policy objectives, reflect on the following considerations:

- Understand if the factors that led to the selection of an EEO scheme are still valid. For example:
  - Is the level of maturity of the energy efficiency/demand management market in your economy still at a level where an EEO scheme is a useful tool?
  - Is the self-funding nature of an EEO scheme still fiscally advantageous?
- Consider what other policy tools might be effective substitutes or complementary to an EEO scheme and compare these options (see Section 6.3).

If you decide that an EEO scheme is **still** the right tool for your needs, continue following the steps in this guide that consider the detailed design aspects of your EEO scheme.

9.2.3 Reviewing the mechanism for the demand for energy efficiency (Chapter 3)

Once the high-level design decisions regarding scheme goals and relative priorities have been made, revisit decisions about the amount and distribution of energy savings the scheme seeks to deliver. This includes reviewing those issues covered in reviews of:

- **Targets, trajectories, penalties, and prices** – note that for EEO schemes with long-term targets, these issues are only considered as part of target reviews. It also includes considering the appropriateness and case for refining or enhancing the other energy savings demand mechanism components covered in Chapter 3.
- **Fuel, sector, customer inclusions and exclusions, and priorities** – policy objectives shape decisions around these design features. For example, if the review recommends refocussing an EEO scheme on fuel poverty, reviewers may wish to reduce the sectoral coverage to residential only, or they may wish to continue to spread scheme costs across business customers to keep costs lower. Alternatively, if a review recommends refocussing an EEO scheme towards smoothing demand to firm up low carbon electricity networks, fuel coverage may be narrowed to exclude gas savings.
- **Obligated parties and allocation of obligations** – decisions around obligated parties and allocations are driven by issues of market capabilities, incentives structures and regulatory conditions, rather than EEO scheme policy goals. In considering these, reviewers are likely to draw on the findings of process evaluations to understand the degree to which initial obligation design decisions helped or hindered scheme performance, and any refinements required.
- **Legal authority** – decisions around legal authority largely stem from the energy market legislative and regulatory architecture in your economy. It is unlikely a review would have cause to change the primary legislative instrument used for a scheme. However, earlier process evaluations may identify the need to change the level of the legislative tool used for different

scheme design mechanisms. For example, if an evaluation finds that the calculation methods which were previously set in legislation or regulation are unable to be updated as frequently as required, a review may recommend moving calculation methods to a more flexible legislative instrument like administrative or executive orders. Most scheme enhancements will likely require some form of amendment to EEO scheme legislation, regulation, and administrative instruments.

9.2.4 Reviewing the mechanism for the supply of energy efficiency (Chapter 4)

A first principles review provides the opportunity to make higher level decisions about which activities and methods should be included or excluded from your scheme. Activities and methods are updated during activity and method reviews (see Section 8.2). However, some policy makers will undertake these reviews in combination with first principles reviews.

For activities and methods, consider reviewing the following:

- The types of energy saving activities that will be eligible for incentives. For example, a review might recommend including new demand shifting activities under new demand-smoothing goals.
- The types of methods used to estimate and verify energy savings for each activity. For example, a review might recommend the need to revise an existing DSF method in light of more accurate evidence about calculating energy savings, quality of product/installation, persistence of upgrades, and levels of compliance.

9.2.5 Reviewing your scheme's market governance structure (Chapter 5)

If trading or administration were identified as areas for improvement, a first principles review may also revisit decisions regarding the scheme's market governance structure. If the market governance structure is not working effectively, schemes risk not delivering the net public benefits they are expected to. The efficiency and effectiveness with which the administrator exercises its role directly influences the volume of certificates / credits created and the real-world benefits that they represent.

9.2.6 Developing the business case for your EEO scheme (Chapter 6)

A formal approval process is likely to be required to endorse any EEO scheme review recommendations. As with the initial scheme design, different economies will have different processes for the review and approval of policy recommendations.

The development of a business case to support a recommendation is likely to mirror the steps and principles set out in Chapter 6, with two major differences:

- Policy makers will have a much deeper evidence base to draw on to support EEO scheme design decisions.
- Policy makers will be able to build on, but also be constrained by, existing legislative frameworks, administrative capabilities, and market stakeholders.

Best practice tip – develop and implement a practical evaluation data gathering strategy from the day you commence your EEO scheme.

Scheme reviews are only as strong as the evaluations they draw upon, which in turn are only as strong as the research and data gathering that has been conducted prior to the evaluation.

Evaluation plans can often be developed as an afterthought, with attention and resources dedicated to scheme approval, legislation, and implementation. As a result, evaluation plans can end up with a combination of extensive data gathering requirements that are not possible within the allocated budgets and/or miss the critical information policy makers will need years later for effective reviews.

To avoid this, set time aside during your scheme design and review phases to identify the most

critical information you will require to effectively evaluate your scheme. Ensure you have the process and budget to conduct research and evaluations for future reviews.

See Appendix B for links to resources on evaluation, research, monitoring, measurement and verification, and reviews.

Chapter 10 – Major current policy trends for next generation EEO scheme reforms

This chapter sets out some of the major policy trends that designers of established EEO schemes are currently considering and undertaking for future reforms. This chapter may be of potential interest to:

- Policy makers who are planning first principles reviews, to think through the decisions they may wish to consider in the future.
- Designers of new EEO schemes, who may find it useful to think through the design decisions they face and learn from the different experiences of established schemes.

As discussed throughout this handbook, there are various complementary, but distinct goals, that policy makers hope to achieve with EEO schemes. These include direct goals such as, reducing customer energy bills, greenhouse emissions from stationary energy, energy system costs through alternatives to generation, and energy system volatility through demand management. They may also include co-benefits such as improved air quality, health, economic productivity, jobs, and investment outcomes.

Many energy savings activities can contribute to more than one of these goals. However, there are also unavoidable trade-offs between these goals and different mixes of activities will deliver better outcomes. Policy makers need to decide which goals are primary and which are supporting. This will inform detailed design choices about EEO scheme metrics, targets, and activities.

Deciding which goals are primary and which supporting can be challenging as policy makers and governments may see different goals as equally important. After observing the uptake of activities under an EEO scheme, the trade-offs between different policy goals (e.g., fuel poverty, emissions reduction, wholesale energy prices) become clearer. This can prompt policy makers to contemplate the priority of individual policy goals. An EEO scheme's most important policy goal can become clearer after scheme implementation through observing the types and distribution of energy saving activities and benefits. Alternatively, the relative priority of different goals may change over time as governments, energy markets, technology and broader social and climate policies also change. The market, technology, and policy context have and continue to change since EEO schemes were introduced in North America and parts of South America over the last 40 years, and since European and Asia Pacific EEO schemes were introduced over the last 15 years. For these reasons, governments and policy makers may decide to occasionally undertake significant scheme reforms to improve and/or refocus the types of policy outcomes they deliver.

This chapter will discuss three major scheme reform trends which are currently being considered or implemented:

1. Primary goal reform – choosing between emissions reduction through electrification versus choosing stability through demand smoothing (Section 10.1)
2. Primary goal reform – addressing fuel poverty (Section 10.2).
3. Calculation method reform – Pay for Performance (Section 10.3).

The first two scheme reform trends involve a reprioritisation of a scheme's primary objectives to manage potential synergies and trade-offs between different policy outcomes. As illustrated in Figure 8 below, these emerging strategic policy goals are **demand-smoothing** versus electrification and fuel poverty.

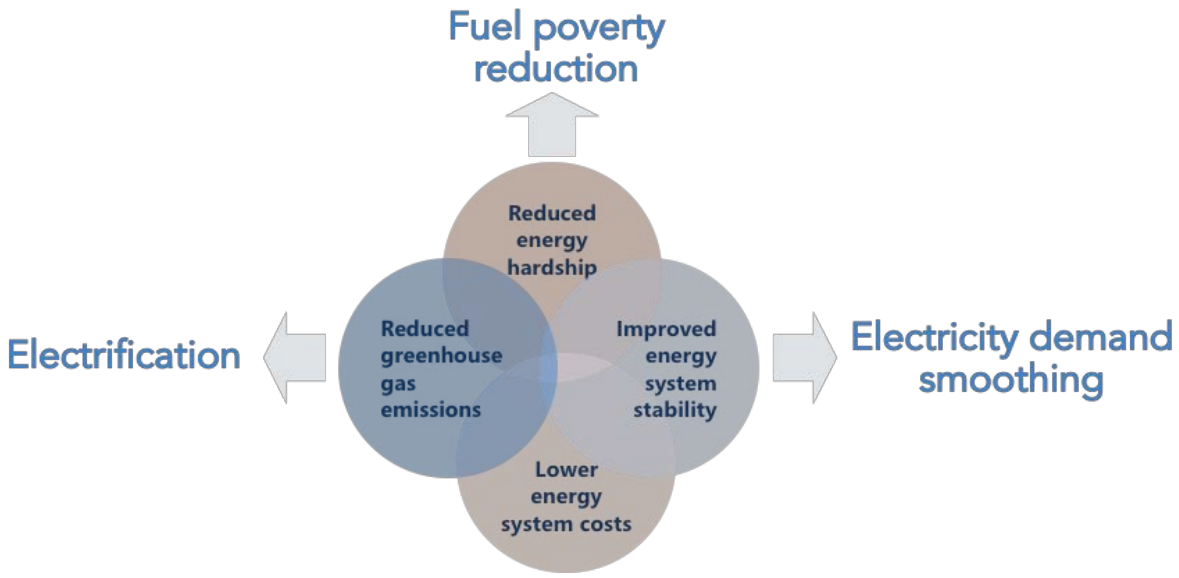


Figure 8 Synergies and trade-offs between EEO scheme strategic policy goals

In addition to these three strategic policy goals, policy makers of established schemes are increasingly contemplating reforms to fine tune the types of energy savings resulting from an EEO scheme. One major trend in mature schemes is a move towards savings calculation methods based on measurement and verification, known as **"Pay for performance" (P4P).** These reforms can be conducted as part of an activity and method review (Section 8.2). However, these will have implications for the overall EEO scheme cost-benefit analyses in future first principles reviews (Chapter 9) with respect to historical performance and future business cases (Section 7.2).

Each of the following sections in this chapter briefly outlines what the reform is, why it is being considered, and the issues and potential resources for other policy makers to examine when considering these reforms.

10.1 Primary goal reform – choosing between emissions reduction through electrification versus choosing stability through demand smoothing

10.1.1 What is this set of reforms?

This set of reforms is about reconciling the growing trade-offs between goals of direct emissions reductions and broader energy system costs reduction. Current and forecast changes in climate policy, energy markets and technology innovation mean policy makers need to choose between using an EEO scheme to directly reduce carbon emissions or reduce energy system costs (indirectly reducing carbon emissions).

- For direct emissions reduction policy goals, policy reforms are trending towards using an EEO scheme to drive the electrification of appliances and equipment that use gas and liquid fuels.
- For energy system cost goals, the policy trend is to support the reliability of electricity supply (grid-firming) by reducing peak demand, avoiding negative demand, or both (demand smoothing).

Some economies are attempting to pursue both goals by either implementing hybrid scheme metrics or developing sister EEO schemes.

Examples of existing EEO schemes grappling with these issues are listed below:

- Many US EEO schemes (EERSs) have had both energy savings (MWh), and peak demand targets (see Case Study 2 in Appendix A).

- New South Wales, Australia has legislated the 2022 introduction of a new grid-firming “Peak Demand Reduction Scheme” which will operate alongside the energy efficiency focused “Energy Savings Scheme” (see Case Study 6 in Appendix A).
- In 2020, Victoria, Australia updated the metric conversion factors for its emissions-focused “Victorian Energy Upgrades” EEO scheme to devalue electricity savings based on forecasted future emissions intensity. In addition, Victoria is currently consulting on the development of some form of electricity demand-side sister scheme.
- In 2021, South Australia replaced its broad-based energy efficiency scheme with a new scheme that has a hybrid peak demand and negative demand reduction, and fuel switching metric (see Case Study 7 in Appendix A).

10.1.2 Why are these reforms being considered?

These reforms are becoming increasingly necessary in response to the new challenges and opportunities of decarbonised electricity systems and the need to electrify transport, and space, water, and process heating. When EEO schemes were first introduced in North America, energy efficiency policy was mainly about ‘least cost planning’ i.e., avoiding high-cost power stations, whether they be nuclear, fossil, or renewable. In addition, in all but a few economies, electricity systems were also very carbon intensive. So too were technology options for space, water, and industrial process heating as they relied on gas or liquid fossil fuels. For these reasons, most energy efficiency activities tended to deliver both high levels of carbon emission reductions and reduced pressure on energy prices from avoided costs of new supply.

However, in many economies electricity systems have much higher levels of renewable energy and are now forecasted to experience very high levels of decarbonisation over the lifetime of the next generation of EEO schemes. Since the December 2015 Paris Agreement on climate change, climate policy goals have and continue to shift from small incremental reductions in emissions growth, towards total decarbonisation through commitments to achieve net zero emissions. Therefore, EEO schemes that pursue short-term emissions reductions through improving energy efficiency are becoming increasingly disregarded in medium- to long-term strategic climate policy.

Furthermore, this transition to low-carbon energy systems is resulting in new energy market challenges and technological opportunities which alter the value of various energy saving activities. In electricity systems with high and rising levels of solar energy generation, there are changes in the balance between the timing of electricity supply and demand. For example, issues with negative demand mean that at certain times, the energy system will benefit more from shifting demand from other periods and installing batteries that store surplus power for later. These changes mean that the timing and geographical location of energy savings are just as important (if not more important) than the amount of energy saved.

Paris Agreement climate goals also shift the relative value, prioritising activities that deliver incremental improvements in on-site gas and liquid fuel efficiency. While these activities continue to deliver incremental emissions reduction benefits, they lock in more efficient, but still emissions-intensive equipment, for another 10 to 20 years. More ambitious climate goals and technology innovation mean the greater priority is fuel switching (electrification) to high-efficiency electric alternatives. More ambitious climate policies and recent commitments by all major car manufacturers to phase out fossil fuel vehicles also means that the electrification of transport fuels is a key consideration for EEO scheme design. Finally, the electrification of transport and space, water and process heating have further implications for shifts in the timing of peak electricity demand, relative to supply.

In light of these trends, policy makers face starker choices between using EEO schemes for emissions reduction or delivering energy system co-benefits. Some jurisdictions are managing these choices by developing additional complementary EEO schemes: one scheme to drive the

electrification of gas and liquid fuels, and a second scheme to firm and reduce the costs of a renewable electricity grid by smoothing out peak and negative demand.

10.1.3 Issues and potential resources to consider

Whether these reforms are appropriate for your EEO scheme will depend on your government's energy and climate policy priorities, and the opportunities and challenges facing your energy system. Chapters 1 and 2 offer general guidance on whether an EEO scheme is right for your needs and how to select appropriate policy goals and metrics. Consider the points below if demand-smoothing and/or electrification aligns with your government's policy goals.

Electrification

EEO schemes that are focused on electrification represent a relatively more straight forward reform compared with existing multi-fuel schemes. This is because such schemes typically already have metrics, activities and methods which reward savings from fuel switching. The key considerations for converting a conventional EEO scheme to an electrification scheme include:

- **Program logic and theory of change** – are the existing scheme actors, influencers and their incentives the same for electrification supply chains? Can system costs and benefits be expected to be distributed evenly to customers who fund the incentives?
- **Metric and conversion factor selection** – metrics are likely to be emissions-related, or easily translated into emissions (e.g., MWh, PJ), however do you want conversion factors (based on current or future emissions intensity) to save emissions today, or help transition to the energy system you seek to build?
- **Fuel and sectoral coverage** – which fuels, sectors and end-uses do you wish to cover? E.g., Gas, heating oil, and/or transport? Are the technologies you wish to drive uptake for at a sufficient level of maturity for EEO schemes to be the appropriate policy tool? Are these technologies at comparable price points to effectively compete under one EEO market? For example, would electric vehicles and heat pumps require similar or radically different target levels and certificate / credit prices to see meaningful uptake? Are sub-targets or separate schemes required for different fuels and sectors?
- **Obligated parties** – are current obligated parties the most efficient and fair way of funding new goals? Can energy system cost savings still be expected to offset the energy bill increases that fund the scheme's incentives? Would different funding sources be more appropriate? For example, you could consider an obligation through progressive taxation or carbon levies.
- **Eligible activities** – do you wish to exclusively drive electrification, or do you want to continue to drive a mix of electrification and fossil fuel efficiency? Do decisions on fuel and sectoral coverage require developing new activities for technologies not previously covered, and/or revising eligibility criteria and calculation methods for existing activities?

Demand smoothing

Converting EEO schemes that have not previously had peak demand targets, to peak demand or demand-smoothing, or creating a new scheme with a demand-smoothing focus can be more complicated. The major complexities relate to the need to consider (at target and method levels) not just how much energy is used before and after an activity, but when it is used. The graph below shows the effect of various demand-side activities (e.g., demand response, demand shift, energy storage) in smoothing demand over a 24-hour period. The height of the bars shows the energy demand profile (in megawatts) without an EEO scheme. As shown, a mixture of demand-side management activities is effective in smoothing demand to better align with electricity supply.

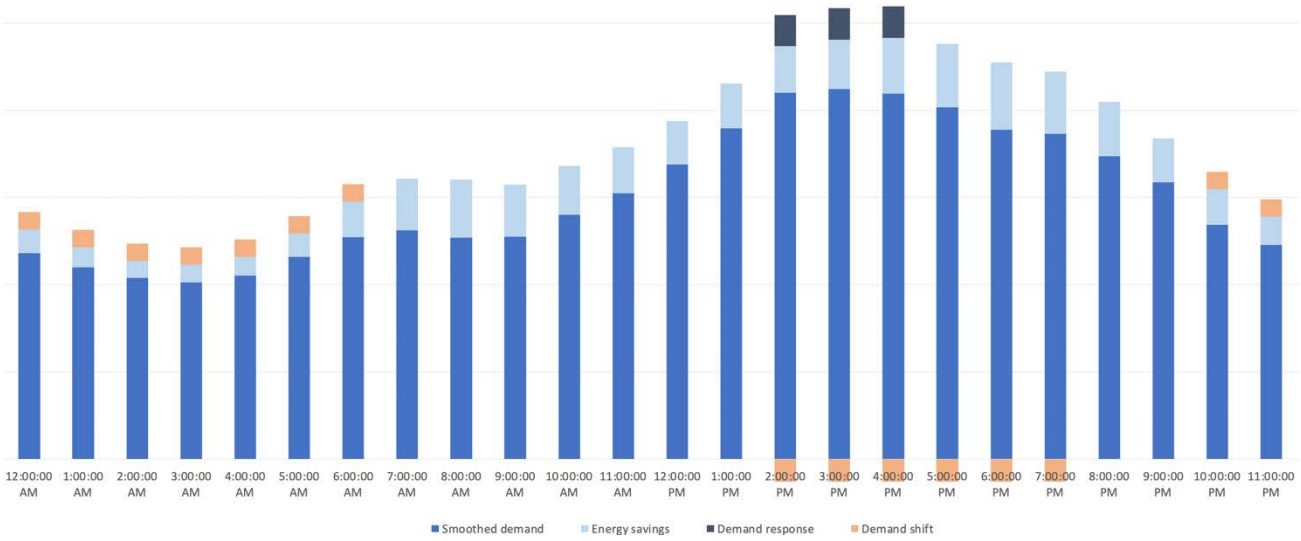


Figure 9: The effect of various demand-side management measures on smoothing demand, over a 24-hour period (source: Common Capital[42])

Key considerations for converting a conventional energy efficiency focused EEO scheme to a demand-smoothing scheme include:

- **Scheme goals** – do you want to reduce peak demand? If so, which peak (e.g., system/price/network), and do you want to reduce critical needle peak or seasonal peaks? Do you also want to increase demand in periods of negative demand? Are you still interested in energy efficiency and/or fuel switching from other fuels?
- **One scheme or more** – if your government has multiple objectives, are these best pursued in one combined scheme or by adding a second scheme with a single objective, like demand-smoothing.
- **Outcomes:** is the scheme goal to drive innovation and build up the capacity for demand-side companies to participate in energy markets? Or is the goal to pay for reductions in demand (or demand increases during times of negative demand) as part of the main electricity market?
- **Blended metrics** – if seeking electrification/efficiency as well as demand-smoothing, you will require a blended metric across these goals. If seeking demand reduction/demand-smoothing, you'll likely choose a kW or MW base metric. You will need to decide over the time period and conversion factors you will use to value the relative changes in demand at different times (e.g. peak demand reduction versus minimum demand increases).
- **Fuel and sectoral coverage** – unless you choose a blended metric, it is likely you will only cover electricity. If you are converting a dual fuel scheme – do you need to remove obligations for gas and other non-electricity suppliers? Or is there a public benefit case for their continued funding of the scheme?
- **Interaction with other schemes** – if you are creating a sister scheme that will operate alongside an existing energy efficiency EEO scheme, consider how these schemes will interact. Will you allow overlapping activities (e.g., HVAC upgrades that save energy at all times, including peak)? If so, you will need to factor these interactions into your opportunity uptake and target modelling.
- **Eligible activities** – you will likely need to update your opportunity modelling, activities, and method rules to include new activities (static and dynamic, demand response and demand

[42] (Common Capital, 2020)

shifting) and complete additional modelling to understand the timing and value of demand savings from existing activities.

- **Calculation methods** – calculation methods for demand-smoothing have additional complexities. Demand-smoothing activities that can reduce demand are important, but not as reliable as the elimination of demand through certain energy efficiency activities. For example, a demand-smoothing activity that involves signing a demand response contract to switch off energy use if required, does not necessarily guarantee customers will reduce energy when called upon. Methods might include "firmness factors" (i.e., a discount rate based on the level of confidence/uncertainty of activities to deliver changes in demand) to account for this uncertainty. For M&V based methods, new approaches may be required to calculate baselines for demand response activities that neither penalise those who dispatch demand response with lower future baselines, nor reward freeriding. Eligibility criteria are also likely to have more nuanced installation approval criteria to both protect customers and ensure benefits are delivered for more complex activities (like virtual power plants and demand response aggregation).

10.2 Primary goal reform – addressing fuel poverty

10.2.1 What is this set of reforms?

This set of reforms involves focusing your primary EEO scheme goals towards direct energy bill reductions and better targeting those goals to households most in need. Directly reducing consumer energy bills is a common policy goal for EEO schemes. Some schemes have explicit targets that ensure a portion of these reductions go to low-income households. In addition, the business case for many schemes will implicitly assume a share of the net public benefits will include some private benefits for direct household energy bill savings (see Section 6.2). Some policy makers are redesigning existing EEO scheme policy settings to ensure that a greater share of energy saving upgrade activities are conducted in households who are at risk of, or are experiencing, fuel poverty or energy hardship.[43]

10.2.2 Why are these reforms being considered?

Common challenge in addressing fuel poverty in EEO schemes include:

- **One activity dominates the EEO market** – this crowds out other energy saving activities which may deliver greater benefits for households vulnerable to energy hardship. Without additional scheme design settings, the market tends to choose the lowest cost and easiest-to-scale activities. This is an advantage when policy makers wish to deliver the greatest amount of energy savings with the greatest net public economic benefit. However, this is a challenge if policy makers wish to ensure a significant portion of, or all the direct private bill saving benefits of a scheme, go to certain customer types (i.e., those in energy hardship or fuel poverty).
- **Activities that deliver significant energy savings are typically more expensive** – EEO schemes can be an effective tool to deliver low-cost energy saving activities to vulnerable households. For example, in South Australia's EEO scheme (see Case Study 7 in Appendix A), vulnerable households can access energy saving lighting upgrades for free. However, these activities typically represent a small portion of overall household energy use and deliver correspondingly small levels of total energy bill savings. The types of energy saving activities that can result in more material reductions to the energy bills of those vulnerable to energy hardship, are typically more expensive and require significant out-of-pocket customer contributions, even after receiving scheme subsidies. Examples of activities that deliver deeper energy savings but have higher costs include installing thermal insulation, space heating and cooling, and water heating upgrades. Households vulnerable to energy poverty are typically in broader financial hardship and unable to cover upfront capital costs, unless EEO scheme

[43] (Fawcett, et al., 2019)

subsidies are high enough to cover all, or most of the costs.

- **Households may have limited influence over upgrade decisions** – public or private landlords are often responsible for upgrade decisions, while households bear the energy bill costs. Households in energy hardship may also face broader instability in their personal, family, and social environment. These broader challenges may place further barriers on their trust in, or ability to, access government energy efficiency programs, unless they are delivered through trusted channels.
- **The EEO market is likely to favour activities with lower subsidies** – if activities that deliver deeper energy savings have to compete with lower cost activities in an EEO market, the market is likely to favour activities that do not require such high subsidies. Thus, the average market price of energy savings certificates / credits would be too low to effectively support deep energy savings retrofits for households in, and vulnerable to, energy poverty or hardship.

Scheme reforms are therefore often required for EEO schemes in economies where governments have committed to ensuring the scheme helps households in, and vulnerable to, energy poverty or hardship. These reforms can involve a mix of changes to scheme targets (or sub-targets), eligible activities, calculation methods, and interaction with other programs. To manage the impact on overall EEO scheme costs and the non-financial barriers, complementary programs can be a way to better target priority groups.

10.2.3 Issues and potential resources to consider

Whether these reforms are appropriate for your EEO scheme will depend on your government's social, energy and climate policy priorities, as well as the opportunities and challenges facing your energy system. Consider the points below if your government's focus is on reducing the risk of fuel poverty/energy hardship (at the expense of emissions or energy system goals).

- **Scheme goals** – policy goals should be amended to explicitly distinguish between which outcomes are primary policy goals and which are co-benefits. If fuel poverty or energy hardship is a primary policy goal, these concepts should be objectively defined (e.g., the criteria that determine if someone is in fuel poverty). The expected role of the EEO scheme should also be clearly defined. Below are two examples for how the role of a scheme with a fuel poverty focus could be defined:
  - reduce the energy use of those already in fuel poverty
  - reduce the risk of fuel poverty by reducing the energy costs of households vulnerable to fuel poverty
- **Targets and sub targets** – for a fuel poverty-focused EEO scheme, the size of your target over a specific time frame will be guided by an assessment of the number of targeted households, the total cost of upgrades required, and the level of support available from other programs. The size of a target, relative to the size of your scheme, will give you an indication of whether your policy ambition is something that can be achieved by a sub-target (e.g., 25% of savings) or whether it will need to be the main focus of your scheme. Consideration should be given to the likely synergies between the types of upgrades and business models required to deliver your fuel poverty goals, and those of the broader scheme goals to determine whether there is an advantage to using the same scheme to deliver competing objectives.
- **Fuel, activity and sectoral coverage** – the eligibility of activities should consider the fuels (e.g., electricity/gas/heating oil) and end-use activities (e.g., heating/cooling) as they are the biggest contributors to energy costs for those in, or vulnerable to, fuel poverty. Consider excluding other activities and sectors that may risk crowding out these priority upgrade types (e.g., lower cost commercial energy efficiency activities). If addressing fuel poverty is the goal, schemes may need to consider a more diverse mix of activities than traditional energy efficiency. For example, access to onsite solar generation may drive deeper reductions in total energy bill costs than

energy efficiency measures. Other considerations for fuel, activity, and sectoral coverage include:

  - individual technological upgrades to address the cause of a problem (e.g., heating upgrades)
  - bundling complementary activities (e.g., heating upgrades and weatherisation)
  - whether an EEO scheme is likely to be the most effective tool to drive this approach.

- **Metrics** – if addressing fuel poverty is the objective, traditional energy efficiency metrics may not be optimal. A multiplier can be added to adjust energy efficiency measures to account for the energy savings from different fuel types based on the relative cost of different fuels (e.g., gas, electricity, heating oil). Policy makers may want to consider which metrics will be most closely aligned with the measurement of fuel poverty reduction outcomes. This includes understanding trade-offs between the relative retail prices of different fuels, and the extent to which metrics most effectively measure upgrade improvements in energy efficiency versus total reductions in grid energy use.
- **Interaction with other programs** – up-front costs are only one of the barriers to upgrades for those in, and vulnerable to, fuel poverty or energy hardship (as discussed in Section 10.2.2). As the primary policy lever for EEO schemes is the provision of subsidies, it is likely that other complementary programs will be required to address the non-price barriers. These might include:
  - Co-ordination programs that link social service providers who have trusted relationships with those in need, and energy utilities with government and welfare agencies who have visibility over those suffering from high or unaffordable energy costs.
  - Minimum standards and disclosures on the energy efficiency of private, public, and social housing to provide incentives for landlords to complete energy efficiency upgrades.
  - Subsided debt financing programs to provide assistance to landlords and/or tenants to cover a share of the upfront upgrade costs and reduce the amount that needs to be directly funded by the EEO scheme, thereby allowing funding to help more people.
  - A complementary program funded by the Government, that operates alongside an EEO scheme to provide further subsidies on high-cost upgrades that deliver deeper energy savings, thereby addressing the issue of crowding out higher cost activities in favour of lower cost activities.

Examples of existing EEO schemes grappling with the issues discussed in this chapter are listed below:

- The Irish Government is consulting on targets for 5% of savings from their Energy Efficiency Obligation Scheme (EEOS) to come from households in fuel poverty[44]
- In 2017, the UK Government committed to leveraging their EEO scheme, the “Energy Company Obligation”, to help upgrade all fuel poor homes by 2030.[45] This scheme includes sub-targets under a Home Heating Cost Reduction Obligation for low income, fuel poor and vulnerable households to heat their homes.[46]
- In 2021, the South Australian Government replaced their EEO scheme’s 20% low income “priority group” target, with a demand smoothing focused scheme, preferring targeted activities such as a subsidised virtual power plants for social housing, to address energy affordability issues (further explained in Case Study 7 in Appendix A).[47]

[44] (Government of Ireland, 2021)
[45] (Fawcett, et al., 2019)
[46] (Office of Gas and Electricity Markets, UK Government)
[47] (Department for Energy and Mining, Government of South Australia)

10.3 Pay for performance reform

10.3.1 What is this set of reforms?

This set of reforms involves updating calculation methods to more accurately reflect the amount of energy savings that are awarded in the form of certificates / credits. Internationally, EEO schemes have relied heavily on DSF methods which award the expected average lifetime savings upfront for a given activity. **Pay for Performance (P4P)** represents important changes to both how methods calculate annual project savings and how they calculate the period (persistence) over which these savings are considered to last. A move to P4P represents key changes in savings calculation methods, such as:

- a move to M&V-based methods (see Section 4.3.2) from DSF methods (see Section 4.3.1)
- a move from upfront ("**ex-ante**") deemed persistence-based savings on the predicted lifetime, to awarding savings after the fact ("**ex-post**") based on measured actual annual savings.

As discussed in Chapter 4, M&V calculation methods require varying degrees of project-specific measurements to estimate energy savings, compared with a site-specific baseline. This adds cost and complexity when compared to DSF methods. However, for many energy saving activity types, the project-by-project variation is too great for energy savings to be reliably predicted using DSF methods.

The move to the ex-post validation of savings persistence using M&V methods transfers site-specific savings risk from the policy maker to the project owner. However, it can also significantly shift the timing of when the financial incentive from the EEO scheme is paid for the project, as illustrated in Figure 9 below. However, in practice, many P4P frameworks involve a hybrid approach as shown below. This involves a portion of predicted future savings to be awarded after M&V demonstrates site-specific savings, with future savings awarded based on ongoing demonstrated persistence.[48]

[48] (Santini, et al., 2020)

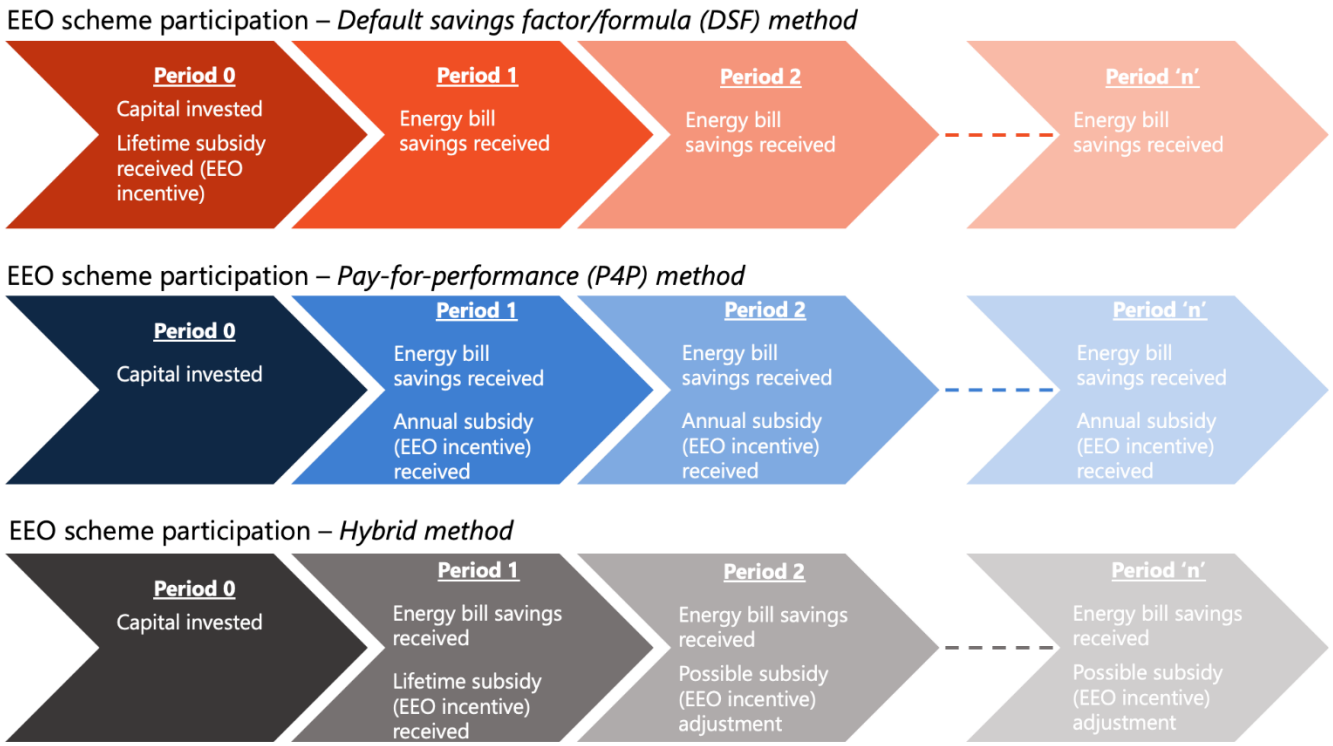


Figure 10: Timing of scheme incentive payments under a DSF method vs P4P methods (adapted from: SENSEI-2020[49])

10.3.2 Why are these reforms being considered?

The primary driver for the move to P4P is to improve the confidence in the awarded energy savings from upgrades, and thereby the cost effectiveness of EEO schemes. More effective targeting of genuine energy savings ensures the total energy savings is maximised for any given amount of public funding for an EEO scheme.[50]

The desire to increase the confidence in awarded savings stems from several factors:

- **Limits of DSF methods** – P4P methods can be used as an alternative to, or a way of improving DSF methods. Much of the historical success of EEO schemes in incentivising energy savings upgrades has been based on both the relative simplicity and the upfront financial incentive of DSF methods. These methods have provided the necessary confidence for those that install energy efficiency upgrades to invest in energy savings activities. DSF methods are only feasible if the savings can be reliably predicted. This is generally simple when upgrade equipment is relatively standardised. For example, energy savings from lighting upgrades can relatively accurately be predicted based on average operating hours, product lifetimes and the lamp-circuit power of the before and after lamps, ballasts, and control gear. However, the majority of savings from industrial, commercial, and residential equipment are not usually as easily predicted. There can be significant variation arising from factors that influence energy use (e.g., climate, hours of operation), the bespoke configuration of equipment (e.g., HVAC, commercial refrigeration, motor systems, building management systems, pumps, compressed air), and process/behaviour changes. Moreover, as EEO schemes pivot towards demand smoothing goals, the benefits of activities that provide dynamic demand shifting or demand response are also challenging to quantify without using M&V.[51] If sufficient P4P data is available, it can be drawn upon to update

[49] (Santini, et al., 2020)
[50] (Santini, et al., 2020)
[51] (KEMA, 2011)

or develop DSF methods for these more challenging activity types.

- **Energy market scepticism over energy savings** – the business case for an EEO scheme typically includes the public benefits of reduced energy prices and network charges from avoided additional investment. In practice, these benefits only eventuate if energy market planners and investors have reduced energy demand and energy infrastructure investments with fixed pass-through costs. In many energy markets, investors and regulators require a greater degree of certainty over changes in energy demand than can be provided by bottom up DSF calculations. Alongside program-level impact evaluation, shifting to P4P methods is one means of improving this confidence.
- **Reallocation of risk** – in EEO markets, there are a range of commercial risks that are shared between policy makers (on behalf of the public) and the installers of energy efficiency upgrades. P4P methods are in part a response to policy maker concerns over the appropriate allocation of these risks. These include:
    - implementation risks – risks that energy efficiency upgrades will not be implemented and/or maintained as expected and the anticipated energy savings benefits will not be realised
    - additionality risks – the risk that some or all of the demonstrated savings from a project would have happened without EEO scheme funding
    - regulatory risks – the risk that EEO scheme regulations will change or adversely affect the eligibility of upgrades for credits / certificates and thereby payment
    - market risks – risks of changes in demand, costs and prices of energy savings goods and services, including changes in the value of EEO incentive payments (i.e., certificate / credit prices).

Installers of energy efficiency upgrades bear EEO regulatory risks and market risks. As discussed throughout this handbook, the success of an EEO scheme depends on investor confidence which partly involves minimising unanticipated policy changes that increase these risks. Historically, EEO policy makers (and thereby the public) bear the majority of EEO-related implementation and additionality risks. P4P methods can be used to shift a greater degree of this responsibility away from the policy maker.

10.3.3 Issues and potential resources to consider

- Whether P4P reforms are appropriate for your EEO scheme will depend on your government's energy and climate policy priorities and the opportunities and challenges facing your energy system. The effectiveness of P4P methods however is also dependent on your design decisions regarding other eligible calculation methods and supporting programs. When designing P4P methods, consider the context of the overall program logic and theory of change. Specific issues to consider when contemplating and designing P4P methods include:
- **Ensuring the materiality of incentives** – scheme incentives are only effective if they are material enough to overcome the barriers that stop customers undertaking upgrades that are already in their financial interests. These barriers include:
    - the disconnect between the upfront capital cost of upgrades and the spread-out benefit of bill savings
    - the opportunity cost of using customers' limited capital for energy upgrades compared with non-energy related investments that could generate larger returns.
    - split incentives (where the beneficiary of bill savings is different from the person/entity who pays for the upgrade)
    - customers not confident that savings will materialise

- the risk and "hassle factor" of spending time arranging the replacement of equipment that is not broken.

- **Incentive delivery shift** – the longer the period required for post-implementation M&V, the longer the gap between when customers incur upgrade costs and when EEO scheme subsidies are received. In a mature market this issue can be managed through private financing of upgrades by participants that have confidence in the savings their upgrades will deliver. Some P4P methods involve hybrid upfront and payments in arrears to assist with this, however in most EEO schemes these methods continue to be finetuned. For example, a P4P method has been launched under the EEO scheme (an EERS) in Washington state, in which incentives are paid through a hybrid payment structure.[52] This method is currently only targeting five projects annually and would need to be further refined in order to attract more projects.[53]
- **Managing additionality** – P4P methods should in principle, improve site-specific additionality. Effective M&V improves the accuracy with which the awarded credits / certificates correlate with the verified savings for each upgrade. There are simple requirements that can be put in place for methods to rule out extreme cases of non-additionality, such as preventing issuing certificates for activities that are legally required (regulatory additionality). DSF methods tend to also include market-level baseline assumptions that consider the size of the stock of the upgraded equipment and/or the flows of upgrades occurring in absence of the EEO scheme. M&V techniques are designed to validate energy savings and the persistence of savings from an individual customer perspective. However, M&V techniques are not designed to understand if, or when, a customer would have undertaken an upgrade in the absence of the EEO scheme. It is not practical to develop single-site P4P methods that consider this level of additionality. Individual household and business customers that implement EEO-funded upgrades are unlikely to have a perfect understanding of what they would have done in 6 months, 5 years, or 10 years, had an offer from an EEO scheme not come across their path.
  - The most advanced P4P methods manage additionality with M&V, using randomised trials with control and treatment groups made up of tens of thousands of energy customers.[54] These approaches work for relatively homogenous customer groups, such as households, however other quasi-experimental design methods are required for multi-site M&V and to measure the underlying market trends for commercial and industrial premises.
  - P4P methods continue to evolve to address these issues and balance these competing additionality risks with implementation feasibility. Noting that the greater the cost of a calculation method, relative to the benefit of the incentive, the greater the risk that only projects that are certain to be implemented will go to the effort of claiming credits / certificates.
- **Level playing field for competing methods** – the effectiveness of P4P methods is interconnected with the range of other energy savings calculation methods an EEO market has to choose from. P4P methods are likely to be far less commercially attractive than DSF methods for several reasons. These include the aforementioned delays in receiving incentive payments until after M&V has been completed, and potentially spreading these payments over many years to align with demonstrated savings persistence. Customers also face the risk that promised upgrade savings will not eventuate nor the promised scheme incentives be paid. Thus, rather than providing incentives for customers to overcome existing barriers to energy saving upgrades, poorly designed or implemented P4P methods can result in adding one more barrier for the customer. If the EEO market has a choice between EEO methods with uncertain and delayed payments, and DSF methods with certain and upfront payments, DSF methods are likely to see greater uptake. If this occurs, those with DSF methods will set the marginal cost of certificates / credits at a level proportional to the upfront savings that are awarded. These lower certificate /

[52] (Santini, et al., 2020)
[53] (Santini, et al., 2020)
[54] (State & Local Energy Efficiency Action Network, 2012)

credit prices are likely to further reduce the attractiveness of P4P methods that have to compete with DSF methods.

- **Developing energy service and M&V market capacity** – investment in M&V market capacity building is an important part of supporting the introduction of P4P methods, as well as improving overall EEO scheme impact evaluations. P4P methods are typically adapted[55] from the International Performance Measurement and Verification Protocol.[56] One of the strengths of the Protocol is its flexibility in the budget level and confidence required by individual energy customers. This flexibility can however pose a challenge for the scheme administrator to ensure that some participants do not take advantage of this flexibility to claim more savings than they are entitled to. To manage this risk, scheme administrators need to make their own rulings over which M&V decisions are appropriate for different project types, under different methods. This in turn has the potential to create significant regulatory risk for participants who cannot be sure that what they consider to be an appropriate M&V approach will be accepted by the EEO scheme administrator. As discussed, this risk in turn undermines participant and customer confidence that incentives will be paid which reduces the effectiveness of the scheme. To manage this risk, it is important that scheme administrators invest in M&V capabilities[57] and a shared understanding of how M&V is to be applied in the specific activity and method contexts of the EEO scheme. This includes publishing transparent guidelines and technical rulings, training and handbooks, and joint committees and working groups to manage, review and update the interpretation and best practice of P4P methods under an EEO scheme.

To capture the benefits of P4P methods, while managing the risks listed above, policy makers can:

- Move exclusively to P4P methods with aligned rules of upfront savings (i.e., all activities create upfront savings, or no activities do). This will allow certificate prices to be set by the most cost effective P4P activity, rather than by deemed lifetime savings and avoid some activities crowding out others.
- Set sub-targets for activity/sectoral types, thus creating a separate market for activities with P4P methods – without price distortion from competing DSF methods.
- Introduce incentive payments to pay temporary premiums for P4P activities to allow M&V based markets to get to a scale and maturity that privately finance future savings income streams.

Key resources:

1. *Putting your money where your meter is: a study of pay-for-performance energy efficiency programs in the United States*[58]
2. *Experience and lessons learned from pay-for-performance (P4P) pilots for energy efficiency*[59]

[55] (Santini, et al., 2020)
[56] (Efficiency Valuation Organization (EVO))
[57] (Szinai, 2017)
[58] (Szinai, 2017)
[59] (Santini, et al., 2020)

Abbreviations

APEC	Asia Pacific Economic Cooperation
APERC	Asia Pacific Energy Research Centre
BCR	Benefit-Cost Ratio
CPUC	California Public Utilities Commission
CAPEX	Capital Expenditure
DSF	Default Savings Factor/Formulae
DR	Demand Response
DRA	Demand Response Aggregator
EV	Electric Vehicle
ERF	Emissions Reduction Fund
EEO	Energy Efficiency Obligation
EEI	Energy Efficiency Incentive
EERS	Energy Efficiency Resource Standards
ESS	Energy Saving Scheme
ESC	Energy Service Companies
ETS	Emissions Trading Scheme
EU	European Union
EWG	APEC Energy Working Group
EGEEC	APEC Expert Group on Energy Efficiency and Conservation
FCAS	Frequency Control Ancillary Services
HVAC	Heating, Ventilation and Air Conditioning
IESO	Independent Electricity System Operator
ICE	Internal Combustion Engine
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light-Emitting Diode
MBI	Market Based Incentives
M&V	Measurement and Verification

MJ	Megajoules
MWh	Megawatt-hours
NPV	Net Present Value
NSW	New South Wales
OPEX	Operating Expenditure
PDRS	Peak Demand Reduction Scheme
PAC	Program Administrator Cost
RIM	Ratepayer Impact Measure
REC	Renewable Energy Certificates
RET	Renewable Energy Target
REES	Retailer Energy Efficiency Scheme
SMARTA	Specific, Measurable, Attainable, Relevant, Timely, Alignment
tCO2-e	Tonnes of Carbon Dioxide Equivalent
TRC	Total Resource Cost
UN	United Nations
VPP	Virtual Power Plant

Glossary

Accreditation – A process, usually carried out by the scheme administrator, whereby approved providers are permitted to generate eligible energy savings, i.e., savings that contribute to meeting the overall energy savings target of the EEO scheme.

Activity – An energy efficiency or demand management measure which is approved under EEO scheme rules to deliver eligible energy savings. Activities typically involve the installation of new, or the modification of existing equipment or buildings to improve the way households or businesses use energy.

Additionality – Energy savings that would not otherwise have occurred. There are three dimensions of additionality:

- Regulatory additionality, in which energy savings are not a result of any other policy, regulatory, or legal requirements to reduce energy consumption.
- Program additionality, in which activities in an EEO scheme complement, rather than duplicates, activities covered in other programs.
- Market additionality, in which the results of energy saving activities are greater than what could reasonably be expected to occur in the relevant economic sector(s).

Annual energy savings – Energy savings that were accrued only during the target year.

Approved provider – An organisation authorised to create energy efficiency certificates / credits. Certificates / credits are created by implementing eligible energy saving activities in accordance with energy savings calculation methods. Approved providers may include either obligated parties and/or approved third party energy efficiency solution providers.

Banking of energy savings – Enabling excess energy savings from the current obligation period to be used to meet an energy savings target in a future obligation period.

Benefit: cost ratio – Shows the relationship between benefits and costs. The total benefits are divided by the costs, projects with a ratio greater than 1 have greater benefits than costs and will therefore have positive net benefits.

Borrowing of energy savings – Enabling energy savings that will be realised in a future obligation period to be used to meet an energy savings target in the current obligation period.

Competitive energy market – An energy market where there is reasonably free entry; several reasonably comparable competitors (firms offering similar competitive products); and an absence of single-firm dominance (where one firm has a market share of 40 percent or more).

Compliance period – A time period over which an obligated party must achieve or procure the mandatory quantity of eligible energy savings to meet its energy savings target. Typically, scheme administrators set compliance periods as calendar years or financial years.

Continuous operational improvement – the ongoing improvement of internal processes through incremental actions.

Control group – Identifiable non-participants in a scheme who did not undertake energy efficiency upgrades.

Cumulative energy savings – Total energy savings accrued from the date when an energy savings activity was completed, to the end of the target year.

Cumac – Cumulative and discounted. Refers to the annual energy savings resulting from an energy savings activity, summed over the lifetime of the activity, and discounted at a standard annual rate.

Default Savings Factor/Formulae (DSF) method – A method that is activity or technology-specific and typically involves easy-to-use formulas or factors that estimate the baseline and operating

energy use to calculate energy savings.

Demand-side management – The adjustment of consumer energy demand through various methods such as financial incentives and behavioural change through education. This is also known as energy demand management or demand response.

Demand response – A measure where an energy consumer alters their energy use to better match total energy demand with energy supply.

Demand shift – A measure where an energy consumer alters the time of their energy use to better match total energy demand and supply.

Demand smoothing – changing consumer's energy demand to better match total energy supply. This can be achieved through various initiatives such as demand response or demand shift.

Designated Consumers – Facilities in India's Perform, Achieve and Trade scheme with the highest energy consumption, within the selected industrial sectors. These facilities are the obligated parties under this EEO scheme.

Eligible energy savings – Energy savings that contribute to meeting the overall energy savings target of an EEO scheme. Eligible energy savings are measured and expressed in the chosen scheme metric (e.g., megawatts (MW) of peak demand reduction or tonnes of CO_2 avoided). In this handbook the term "energy savings / demand management" is used generically to describe the outcomes of energy savings and demand management activities.

Energy efficiency – Minimising the amount of energy required to power a particular task, without affecting its performance.

Energy efficiency certificates / credits – The legal instruments that represent eligible energy savings. These instruments are surrendered by obligated parties to comply with their energy savings obligations. Certificates / credits are approved by the scheme administrator as being created in accordance with correct calculation methods. The term "certificate" is used to describe tradable eligible energy savings, while "credits" are typically non-tradable eligible energy savings.

Energy efficiency obligation – A regulatory mechanism that requires obligated parties to meet energy saving targets. This is achieved by delivering or acquiring eligible energy savings generated by implementing approved energy efficiency activities. In the USA, energy efficiency obligations are referred to as Energy Efficiency Resource Standards (EERS), and in the European Union they are known as energy supplier (or distributor) obligations.

Energy provider – An organisation that supplies electricity, gas and/or other fuels to customers. In traditional regulated electricity and gas markets, energy providers are vertically integrated energy providers. This means the energy provider owns or controls the energy generator(s) and distributor(s). In unbundled electricity and gas markets, energy providers may be energy retailers and/or transmission and distribution system operators and/or electricity generators. In other energy markets, energy providers may supply a range of fuels, such as heating fuel and/or road transport fuel.

Energy savings – A quantity of saved energy determined by measuring and/or estimating consumption before and after the implementation of an energy savings activity. Savings calculations should account for external conditions that affect energy consumption.

Enhancement – the improvements to a scheme as a result of periodic evaluations and/or major scheme reviews.

Evaluation – Analysis of performance against expected outcomes, the causes of success and variation, and lessons for future policies/programs. Evaluations can be conducted at the scheme, process, method or administration levels.

Evaluation research – The collection and analysis of data on the scheme's processes, methods,

performance, and administration to support evaluation and reviews. Research can either be primary (e.g., interviews, surveys) or secondary (e.g., literature surveys), and either qualitative or quantitative.

Ex-ante data – Energy savings based on forecasts rather than actual savings.

Ex-post data – Energy savings based on measured actual annual savings.

Final energy – The quantities of energy delivered to, and used by, consumers.

First-year energy savings – Energy savings that were accrued within a year from the date when an energy savings measure was implemented.

Formative evaluation – forward-looking evaluations that seek to understand emerging trends.

Freeriding – Receiving an incentive to complete an activity that you would have completed in the absence of the incentive.

Fuel poverty – Subset of low-income households that struggle to afford the energy required to light and heat/cool their homes.

Grandfathering – Occurs when an old rule continues to apply to some existing situations and a new rule will apply to future situations.

Grid firming – Ensuring electricity supply is sufficient to meet energy demand. This is particularly important as renewable energy sources begin to make up a larger proportion of energy supply. Renewable energy, such as wind or solar can be a variable and intermittent power source depending on the availability of wind and sunshine.

Impact evaluation – An evaluation that considers both gross outcomes (kW, kWh, CO_2e etc) and adjusted net outcomes (both historical and forecast). These evaluations seek to understand the additionality, persistence of savings, customer/geographic/timing distribution of impacts for EEO scheme contribution and attribution.

Lifetime energy savings – Energy savings that were accrued from the date when an energy savings activity was implemented, to the end of the lifetime of the activity. Lifetimes of individual energy savings activity are usually set by the EEO scheme administrator.

Market transformation evaluation – An evaluation that seeks to understand the nature and likely changes an EEO scheme has influenced on market structure, dynamics, and performance. This evaluation draws upon the program logic and theories of change, behavioural studies, and supply chain network studies.

Measurement and Verification (M&V) – A method that determines energy savings by comparing measured use before and after an energy efficient activity is implemented.

Method – An established procedure, technique, or way of measuring/calculating energy savings in accordance with scheme rules and regulations.

Monitoring – Proactive engagement with EEO scheme key performance indicators (e.g., compliance) and interim research findings as they emerge which lead to the identification and management of emerging risks and issues.

Negative energy demand – When the electricity grid is supplying too much energy for the level of demand.

Net public benefit – The total benefits of a project after all public and private costs have been deducted.

Obligated party – An entity that is legally required to deliver a defined share of an EEO scheme's overall energy savings target. Obligated parties create and/or purchase energy efficiency certificates / credits and later surrender a sufficient number of these to meet their individual shares

of the scheme's energy savings target. Obligated parties can be energy providers, energy end-users, or dedicated organisations specifically set up to achieve the scheme target(s).

Opportunity model – dataset covering the range of potential demand-side activities your EEO scheme can target, their costs (operating and capital) and benefits (energy bill and maintenance savings) to customers who choose to adopt them, and their current levels of market penetration and uptake growth under current policy settings.

Pay-for-performance (P4P) – a method used to measure and reward energy savings as they occur, usually by analysing data from energy meters.

Peak energy demand – The times of the day when electricity consumption is at its highest.

Process evaluation – An evaluation that seeks to understand how and why scheme processes have led to scheme outcomes. This evaluation considers the efficiency, equity and efficacy of objectives, supply and demand mechanisms, and scheme administration.

Review – The process of synthesising and translating findings of combined evaluations into actions.

Scheme metric – Describes the common base unit that is used to quantify eligible energy savings, obligated parties' individual obligations, and energy efficiency certificates / credits. Scheme metrics vary depending on the policy goals for a specific EEO scheme. For example, a metric could be either:

- petajoules (PJ) of energy saved
- tonnes of carbon dioxide equivalent (tCO_2e) of greenhouse gas emissions avoided
- megawatts (MW) of peak demand reduction or negative demand increased.

Scheme target – Describes the legislated target for the total amount of eligible energy savings an EEO scheme must deliver each year. Scheme targets are divided and allocated as individual obligations to each of the obligated parties.

Spill over – When an unrelated consequence occurs as the result of a certain action.

Summative evaluation – Retrospective evaluations that seek to understand what has already occurred in the scheme.

Treatment group – Identifiable participants who undertook energy efficiency upgrades.

Vertically integrated energy provider – Energy retailer that owns all levels of the energy supply chain, including energy generation, transmission, and distribution.

Virtual Power Plant – A network of decentralised power generating units (e.g., wind farms, solar parks) as well as flexible power consumers and storage systems (e.g., households with solar panels).

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Appendix A – International EEO case studies

Table 9: Overview of the specific scheme components for each case study (continued over two pages)

Scheme Components		Brazil	California	China	France	India	New South Wales, AUS	South Australia, AUS	Vermont, USA
Policy Objectives	Reduce energy costs						X	X	X
	Enhance energy security and reliability	X						X	
	Reduce GHG emissions		X				X		X
	Limit future infrastructure upgrades						X		X
	Energy independence	X							
	Market transformation		X						
	Demand management			X	X	X	X	X	X
Legal Authority	Single-purpose legislation	X	X		X	X	X	X	X
	Regulation	X		X			X	X	
Fuel Coverage	Electricity	X	X	X	X	X	X	X	X
	Natural gas	X	X	X	X	X	X	X	
	LPG	X		X		X	X		
	Heating fuel					X			
	Transport fuels	X		X	X	X			
	Residential	X	X	X	X		X	X	X

Scheme Components		Brazil	California	China	France	India	New South Wales, AUS	South Australia, AUS	Vermont, USA
Sector Coverage	Commercial	X	X	X	X		X	X	X
	Industrial	X	X	X	X	X	X		X
	Agriculture		X	X	X		X		X
Obligated Parties	Integrated energy utility		X	X					
	Energy retailers				X		X	X	
	Distribution networks	X			X				X
	Energy generators						X		
	Energy end-users					X	X		
	Dedicated organisations				X				X
Method	Default Savings Factor/Formulae	X	X	X	X	X	X	X	X
	Measurement and Verification	X	X	X		X	X	X	X
Trading	Yes			X	X	X	X		

Case Study 1: Brazil's Energy Efficiency Obligation on Electricity Distributors[60]

Table 10: Specific components of Brazil's EEO scheme

Scheme Components – Brazil	
Policy Objectives	Enhance energy security and reliability
	Energy independence
Legal Authority	Single-purpose legislation
	Regulation
Fuel Coverage	Electricity
	Natural gas
	LPG
	Transport fuels
Sector Coverage	Residential
	Commercial
	Industrial
Obligated Parties	Distribution networks
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	No

In Brazil, the 52% state-owned electricity utility, Eletrobras, is responsible for 38% of Brazil's electricity generation, for most of its transmission and for six of the smaller distribution companies. There is extensive involvement in energy efficiency and demand-side management by both the federal government and by the electricity regulator, Agência Nacional de Energia Elétrica (ANEEL). The federal government has funded extensive energy efficiency programs through Eletrobras. ANEEL has imposed a progressively more stringent energy efficiency obligation on electricity distribution utilities that has created a public benefits charge.[61] Brazil is one of only a few developing economies that has created such a charge.

Policy Objectives

- Brazil's emphasis on energy efficiency dates back to the oil crisis of the 1980s and is rooted in its desire for greater energy independence.
- The policy objective of the EEO scheme is to promote the efficient and rational use of electricity in all sectors of the economy. This is achieved through completing projects that demonstrate how to fight waste and improve energy efficiency in relation to equipment, processes, and energy end-uses.

Legal Authority

- Brazilian energy policy is set in both legislation and regulation.
- The energy efficiency program was established by regulation in 1985.
- The electricity regulator, ANEEL, was established in legislation in 1996.

[60] *Information included in this case study is sourced from* (Allen & Crossley, 2014).

[61] *A system benefits charge is a funding mechanism that enables programs to be implemented that have public benefits, such as energy efficiency programs. A public benefits charge typically involves the collection of a small per-kWh surcharge as part of the revenue of an electricity distribution utility or the distribution function of a vertically integrated utility. The revenue from a public benefits charge is used to fund public benefits programs administered by utilities or by some designated government or independent organisation. Also known as a public goods charge, system benefits charge, or wires charge.*

- ANEEL's EEO scheme was codified in legislation in 1998. This Law required that a proportion of the net revenues of electricity utilities be allocated for energy efficiency. This legislation was later modified in 2010 to clarify that at least 0.5% of utility revenue was to be invested in R&D and energy efficiency respectively and that, additionally, 60% of the investment in energy efficiency was to be targeted towards low-income energy end-use customers.

Fuel, Sector and Facility Coverage

- The energy efficiency program funds or co-funds a wide range of energy efficiency projects that extend beyond the electricity sector.
- Activities are focused mainly on research, development, and demonstration; education and training; testing, labelling and standards; marketing and promotion; private sector support; utility demand-side management programs; and direct implementation of efficiency measures.
- Electricity distribution utilities use funds from the Energy Efficiency Program, administered by ANEEL, to invest in public sector projects, residential, commercial, and industrial sector projects, educational projects, community-based projects, and rural energy efficiency projects.

Energy Savings Target

- 109 terawatt-hours (TWh) of cumulative targeted annual electricity savings by 2030.

Obligated Parties

- Electricity distribution utilities (includes vertically integrated utility, Eletrobras, responsible for six of the smaller distribution companies).

Compliance Regime

- ANEEL carries out thorough accounting audits of energy efficiency program expenses. ANEEL also requires evaluation plans to be provided for delivered programs (but these plans do not require independent evaluations.

Performance Incentives and Penalties

- Electricity distribution companies receive funding from a public benefits charge collected by ANEEL. Penalties are applied to companies that have a surplus of funds that exceeds their prior year's energy efficiency expenditure.

Eligible Energy Savings

- Starting in 2001, ANEEL requires a minimum cost-benefit ratio of 0.85 to accredit (i.e., approve) an energy efficiency project.

Eligible Energy Savings Activities

- Energy savings activities implemented under the energy efficiency program initially focused on lighting efficiency upgrades. Energy savings activities are now more broadly focused.
- A portion of scheme funds goes to education and training and marketing and promotion, including educating schools, communities, and low-income consumers on energy efficient technologies.
- The ANEEL Energy Efficiency Manual allows for up to 5% of administration and marketing costs to be included in the costs of program delivery.
- ESCOs have played an important role in designing Brazil's energy efficiency activities and the delivery of energy savings. Some of the largest electricity providers in the country have outsourced the design of energy efficiency projects to ESCOs. In these cases, the energy providers decide the types of projects they intend to pursue and ESCOs compete to design and implement the projects.

Measurement, Verification, and Reporting

- More stringent measurement and verification is required to ensure that activities focusing on replacing equipment actually results in the retirement of inefficient equipment.

Trading of Energy Savings

There is no trading of energy savings in Brazil.

Funding

- The scheme uses funds from the public benefits charge. PROCEL invested an average of USD$14 million per year during 1994-2003.
- During the 1998-2004, obligated utility investments averaged USD$57 million per year. Obligated utilities must collect a percentage of their net operating revenues as a public benefits charge. A share of these collections is allocated to energy efficiency.
- While the total obligation has remained at 1% of utility revenue, the proportion allocated to energy efficiency programs has varied between 0.9% and 0.25%. In 2007, Congress reinstated the energy efficiency allocation to 0.5%, half of which must be spent on energy efficiency measures targeted at low- income households.
- Some energy efficiency programs implemented in Brazil are self-funding. For example, energy performance labelling programs and a ban on incandescent light bulbs require no explicit involvement of utility energy efficiency programs.

Scheme Administration

- The electricity regulator ANEEL acts as the scheme administrator.

Case Study 2: California's Energy Efficiency Resource Standard[62]

Table 11: Specific components of California's EEO scheme

Scheme Components - California	
Policy Objectives	Reduce GHG emissions
	Market transformation
Legal Authority	Single-purpose legislation
Fuel Coverage	Electricity
	Natural gas
Sector Coverage	Residential
	Commercial
	Industrial
	Agriculture
Obligated Parties	Integrated energy utility
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	No

The United States has established many Energy Efficiency Resource Standards (EERS) that establish specific, long-term targets for energy savings that obligated parties must meet through implementing customer energy efficiency programs. California has long been a leading US state in terms of utility-sector customer energy efficiency programs. Energy efficiency programs implemented by energy utilities in California have been in operation since the mid-1970s and have grown and evolved substantially since then.

Policy Objectives

- California has established energy efficiency as its highest priority energy resource in the procurement of new resources. In September 2008, the CPUC published the California Long Term Energy Efficiency Strategic Plan. The Plan establishes a roadmap for energy efficiency in California through the year 2020 and beyond. It articulates a long-term vision and goals for each economic sector and identifies specific near-term, mid-term and long-term strategies to assist in achieving those goals.
- The Plan employs energy efficiency market transformation as its unifying objective. Market transformation is achieved when all cost-effective energy efficiency is adopted as a matter of standard practice.
- Additionally, the Plan recognises that the process of energy efficiency market transformation cannot, and should not, be driven by ratepayer-funded utility programs alone. While utilities will play a continued role in stimulating market transformation across sectors, non-utility actors may well be better positioned to drive the "push" of new technologies to market, or the "pull" for customers and business to adopt available efficiency technologies or practices.

Legal Authority

- Energy efficiency and demand response aspects were codified by legislation in 2005. The legislation requires the procurement plans of California's four investor-owned energy utilities (IOUs) to meet each utility's unmet resource needs through all available energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible.

[62] *Information included in this case study is sourced from* (Allen & Crossley, 2014).

- In 2006, Californian legislation required both the four IOUs and the more than 40 publicly owned utilities (POUs) to acquire all cost-effective energy efficient resources identified by the CPUC and California Energy Commission (CEC).

Fuel, Sector and Facility Coverage

- Energy efficiency activities are directed to customers across all sectors of the economy: residential, commercial, industrial, and agricultural, and cover both electricity and natural gas.
- Utilities also implement programs advocating and facilitating the adoption of energy efficiency codes and standards, particularly through supporting the transition of new energy-efficient products and practices into code-appropriate industry standards.

Energy Savings Targets

- In 2013, the CPUC updated energy savings targets for 2015 to 2024 to approximately:
  - 21,800 gigawatt hours (GWh) of cumulative electrical energy savings
  - 4,000 megawatts (MW) of cumulative peak demand reduction
  - 550 million therms of cumulative gas savings

Obligated Parties

- The obligated parties are four investor-owned utilities (Pacific Gas and Electric, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company), and more than 40 publicly owned utilities.

Performance Incentives and Penalties

- California provides a shared savings incentive mechanism, called “energy savings performance incentives” (ESPI) which was adopted in 2012. ESPI pays incentives based on units of energy saved, instead of as a percentage of targets. For energy savings achieved, utilities can earn a performance-based award of up to 9% of energy efficiency program expenditures (minus codes and standards program expenditures). ESPI also added a small bonus for complying with CPUC procedures.

Eligible Energy Savings

- The CPUC approves energy efficiency portfolio plans for specified periods designed to support the Long Term Energy Efficiency Strategic Plan. The CPUC requires IOUs to implement state-wide programs that are consistent throughout all the obligated utilities’ service areas, as well as some local and pilot programs.
- State-wide programs include an array of energy efficiency activities in residential; commercial; industrial; agricultural; new construction; lighting; heating, ventilation, and air conditioning; codes and standards; demand-side management integration and coordination; workforce education and training; marketing, education, and outreach; and emerging technologies.

Eligible Energy Savings Activities

- In designing energy efficiency activities, utilities consider energy savings potentials that capture savings for the four priority customer sectors. Within the policies, guidelines and targets set by the CPUC and the CEC, individual utilities determine the markets in which they will offer energy efficiency activities. Programs are designed to address specific barriers to energy efficiency that have been identified in each market.

Measurement, Verification, and Reporting

- M&V of energy savings activities are taken very seriously as utilities can receive substantial performance incentives.

- The CPUC oversees the energy efficiency portfolios implemented by the IOUs. The CPUC conducts evaluations that are specifically tied to the impacts (energy savings, costs, and emissions) of the IOU portfolios. The CPUC organises evaluations of all IOU energy efficiency activities, plus relevant research studies. Some of the evaluations and research studies are undertaken by the CPUC itself; for others, they engage independent contractors.
- Each IOU submits annual reports to the CPUC on the energy savings they claim to have achieved through each energy efficiency program. The savings claims are subject to a variety of field validation and verification to understand what was actually achieved. The field research is important to validate the actual impacts of the investments and inform future updates to savings estimates and improvements in program design. Evaluation also estimates net savings that are directly achieved by a program intervention as compared to "gross savings" that result from all factors affecting energy use. This information is used to understand the relative cost-effectiveness of activities and transitions in the market.
- POUs submit reports to the CEC on the energy savings they claim to have achieved through energy efficiency activities. Each POU is required to annually report the results of an independent evaluation that measures and verifies the energy efficiency savings and reduction in energy demand achieved by its energy efficiency and demand reduction programs.

Trading of Energy Savings

- There is no trading of energy savings in California.

Funding

- There are two sources of funding: a public goods charge[63] and utility resource procurement budgets set by the CUPC.
  - From 1996 to 2011, utilities collected a public goods charge to fund energy efficiency activities. The charge was about USD$0.003/kWh, capped at 3% of a customer's bill. A natural gas demand-side management charge was also applied to the customer's bill. At that time, about one-quarter of the utility energy efficiency portfolio budgets were funded by the public goods charge. In 2011, the public goods charge was not reauthorised.
  - The remaining majority portion of the portfolio budgets was funded through utility resource procurement funds and was unaffected by the expiration of the charge. Utility resource procurement budgets are recovered through rate cases brought before the CPUC. In 2009, the CPUC approved a USD$3.1 billion IOU energy efficiency program budget for 2010 to 2012 – a 42% increase over the previous three-year period. The publicly owned utilities budgeted USD$150 million for the 2008 to 2009 year.
- 4% of the energy efficiency budget is allocated to evaluation, measurement, and verification (EM&V) of energy savings.

Scheme Administration

- The CPUC is the scheme administrator. It establishes key policies and guidelines, sets targets for annual state-wide energy efficiency savings and demand reduction programs, and approves utility spending levels.

[63] *A public goods charge is a funding mechanism that enables programs to be implemented that have public benefits, such as energy efficiency programs. A public goods charge typically involves the collection of a small per-kWh surcharge as part of the revenue of an electricity distribution utility or the distribution function of a vertically integrated utility. The revenue from a public goods charge is used to fund public benefits programs administered by utilities or by some designated government or independent organisation. Also known as a public benefits charge, system benefits charge, or wires charge.*

Case Study 3: China's Grid Company Energy Efficiency Obligation[64]

Table 12: Specific components of China's EEO scheme

Scheme Components - China	
Policy Objectives	Demand management
Legal Authority	Regulation
Fuel Coverage	Electricity
	Natural gas
	LPG
	Transport fuels
Sector Coverage	Residential
	Commercial
	Industrial
	Agriculture
Obligated Parties	Integrated energy utility
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	Yes

Commencing in the 1980s, the People's Republic of China developed a suite of broad and comprehensive energy conservation programs stemming from a realisation that, if energy is not used more efficiently, China's economic growth will be compromised by inadequate energy supply. After many years' experience with demand-side management, the central government in China realised that vertically integrated electricity utilities (known in China as "grid companies") can take an important role in achieving energy savings through end-use energy efficiency measures. In 2010, an EEO was placed on the grid companies.

Policy Objectives

- The EEO on grid companies is seen as contributing to demand-side management in the electricity sector.
- Demand-side management is a mechanism that helps to deal with power shortages as well as long-term sustainability issues, such as: achieving end-use energy efficiency at lowest cost; reducing greenhouse gas emissions; improving environmental quality; integrating demand-side resources into energy, social, and economic planning; and enhancing grid security and reliability.

Legal Authority

- In November 2010, the central government issued Guidance on Electricity Demand-Side Management Regulations (关于印发《电力需求侧管理办法》的通知 (发改运行 [2010] 2643)) that imposed an EEO on State Grid Corporation of China and China Southern Grid Company (the two large government-owned entities that operate electricity transmission and distribution networks and sell electricity directly to end-use customers in the majority of China).
- The guidance document was issued by six central government agencies under the support of the State Council, the chief administrative authority of the People's Republic of China.

Fuel Coverage

- The scheme covers electricity. Energy savings from other fuel types may be converted to the

[64] *Information included in this case study is sourced from* (Crossley & Wang, 2015).

equivalent electricity saving using standard coefficients published by the National Statistics Bureau and can then be counted toward the energy savings target.

Sector and Facility Coverage

- The energy savings and demand reduction targets can be met with end-use energy savings from all economic sectors and from any facility. A reduction of losses in transmission and distribution networks can also be used to meet part of the targets.
- There is no targeting of energy efficiency activities to particular sectors, nor are certain sectors excluded, as occurs in some EEO schemes in other economies.

Energy Savings Target

- The EEO requires the grid companies to produce energy savings equivalent to at least 0.3% of electricity sales in the previous year and to reduce load by at least 0.3% of maximum load in the previous year.
- A sub-target is also established that requires the installation of load monitoring equipment on 70% of the peak load and load control equipment on 10% of the peak load in any locality. This provides an opportunity for the implementation of demand response programs. There are no other sub-targets relating to particular economic sectors nor to specific groups of end-users, as are included in some EEO schemes in other economies.

Obligated Parties

- The obligated parties are the State Grid Corporation of China and China Southern Grid Company, the two large government-owned entities that operate electricity transmission and distribution networks and sell electricity directly to end-use customers in the majority of China.

Compliance Regime

- In 2011, a Compliance Evaluation Scheme for the EEO scheme was issued by the National Development and Reform Commission (NDRC) on a trial basis and was updated in 2014. Evaluation of grid company performance in relation to the EEO is based on a scoring system that awards points for both energy savings achieved, and implementation actions completed. The maximum achievable score is 100 points, with measures related to the EEO target receiving a maximum of 60 points and demand-side management implementation receiving a maximum of 40 points. There are four defined performance levels in the draft scheme: Excellent (>90 points), Good (80-90 points), Qualified (70-79 points), and Failed (<70 points).
- The 2014 update of the Compliance Evaluation Scheme was based on the grid companies' experience in achieving their EEO targets. There were some changes in the allocation of points to sub-categories. Two new sub-categories were created that assigned points for grid companies achieving end-use energy savings (as distinct from supply-side savings such as reducing line losses) and for grid companies' progress in building data platforms to monitor energy savings.

Performance Incentives and Penalties

- The Compliance Evaluation Scheme states that those grid companies that achieve an "Excellent" result will be rewarded by NDRC, but there are no further details about how performance incentives are provided. In 2015, no penalties were applied to grid companies that fail to meet their EEO targets, but details of non-compliance were published.

Eligible Energy Savings

- In practice, there are five types of activities that grid companies can undertake to produce eligible energy savings that contribute to meeting their energy savings targets, subject to constraints specified in the Compliance Evaluation Scheme:

  - directly implement energy efficiency projects in the grid company's own premises and in their end-use customers' premises;
  - establish an ESCO affiliated with the grid company to implement energy efficiency projects;
  - purchase energy savings by means of business transactions/trading (not to exceed 40% of total eligible energy savings);
  - promote energy efficiency to the grid company's end-use customers; and
  - directly carry out grid system upgrades and operational management improvements that save energy and reduce losses in transmission and distribution networks.
- Grid companies can claim 100% energy savings value only for those energy savings that are audited by a third party or recorded by online monitoring equipment; otherwise only 80% of the value can be claimed.
- The grid companies also use their claimed eligible energy savings to calculate load reductions that contribute to meeting their load reduction targets. Load reductions are calculated as the annual eligible electricity savings (not including energy savings converted from other fuel types), divided by the average annual operating hours of electricity generation units.
- The EEO guidance document states that promoting energy efficiency to the grid company's end-use customers is an eligible energy efficiency measure. In response, the grid companies have implemented a range of marketing, education and outreach activities to contribute towards meeting their EEO targets.

Eligible Energy Savings Activities

- The guidance document does not include provisions for approving eligible energy savings activities nor for deeming energy saving values for specific activities, as occurs in other economies. The guidance document does require each province to develop its own implementation rule that will identify provincial eligible energy efficiency activities based on best practices adapted to local situations.
- In the Compliance Evaluation Scheme NDRC recommends, but does not require, implementation of the following energy efficiency measures:
  - energy saving in transmission and distribution systems
  - energy efficient electric motors, energy efficient upgrade of boilers, using waste heat and pressure, installation of heat pumps
  - energy saving in buildings, green lighting; and electricity thermal (ice) storage and other energy management projects
- NDRC also encourages grid companies to reduce transmission line losses at different voltage levels, to use efficient power transformers, to improve power supply coverage, and to enforce power factor correction at customers' premises

Measurement, Verification, and Reporting

- Claimed energy savings were originally self-reported by the grid companies using their own EM&V methodologies, including deemed savings values developed for some energy efficiency activities by China Electric Power Research Institute (a subsidiary of State Grid).
- In early 2013, NDRC circulated a draft procedures manual for measurement, reporting, and verification of energy savings for trial by the grid companies and provincial governments that was largely based on EM&V practices in the United States. This methodology was subsequently revised based on experiences in the trial.
- The EEO placed on grid companies also requires the installation of load monitoring equipment

on 70% of the peak load. The energy use data being collected from this equipment and aggregated through data platforms will eventually form a valuable national resource that will provide a unique insight into how energy is being used in China. This data will also open up major opportunities for the development and implementation of highly accurate EM&V of energy efficiency activities.

Trading of Energy Savings

- Trading of eligible energy savings surplus to those required to meet grid company individual targets is allowed, but only between obligated grid companies.

Funding

- In the EEO guidance document, NDRC states that demand-side management program implementation, management, and evaluation costs can be funded in four ways:
  - through a city utility surcharge (城市公共事业附加费), collected through electricity tariffs;
  - through revenues from differential electricity prices (差别电价)[65], mainly through implementing differential prices for energy-intensive industries;
  - through demand-side management special funds financed with surcharges on electricity prices imposed and managed by some provincial governments; these provincial special funds may provide subsidies for key energy efficiency projects, as well as communication, education, and evaluation of energy efficiency programs; and
  - through other fiscal means, for example, an energy saving, and emission reduction special fund (节能减排专项资金) established through central and provincial government budgets.
- The EEO guidance document also states that reasonable demand-side management expenses incurred by grid companies can be recovered as part of power supply costs. Typically done by including all demand-side management expenses under a broad accounting category “power supply cost.” Grid companies that establish ESCO subsidiaries to implement energy efficiency activities may be eligible for targeted ESCO funding from central and provincial governments.
- Despite the various funding sources available, grid companies in China face significant costs in acquiring energy and demand savings. In addition, grid company revenues are reduced because they sell less electricity. The regulatory regime in China does not compensate grid companies for this reduction in revenue. Chinese grid companies are concerned about both the costs involved and the revenue reduction that results from encouraging customers to use electricity more efficiently.

Scheme Administration

- At the central government level, the scheme is administered by the NDRC, the central government’s macroeconomic management agency, which has broad administrative and planning control over China’s economy. They are the main authority responsible for demand-side management short-term and long-term planning, strategic policy design, and electricity pricing regulation.
- The State-owned Assets Supervision and Administration Commission is responsible for overseeing public assets and evaluating the grid companies’ performance in general.
- The National Energy Administration is nominally responsible for confirming that demand-side

[65] *In China, differential electricity pricing is applied to energy-intensive enterprises in eight industries. Enterprises are divided into three categories according to resource consumption and technology level. The three categories and their applicable prices are: “permit and promote” paying the standard provincial industrial power price; “restrict” paying a surcharge of CNY 0.05 to 0.1/kWh; and “eliminate” paying a surcharge of CNY 0.2 to 0.3/kWh in addition to the first class power price.*

management is included as a resource in power generation, transmission, and distribution development, and that the grid companies produce good results in reducing electricity consumption and improving end-use energy efficiency.

- The National Energy Council is involved in energy policy design and coordination of the various central government agencies.
- At the provincial government level, provinces are responsible for developing detailed implementation rules.
- In general, provincial Development and Reform Commissions or Economic and Information Commissions are responsible for implementing the EEO in their provinces.
- Other provincial agencies assist in specific fields, including demand-side management planning; setting annual demand-side management targets for provincial grid companies and reviewing their demand-side management implementation plans; and investigating the demand-side management resource potential in their respective provinces.

Case Study 4: France's Energy Efficiency Certificate Trading Scheme[66]

Table 13: Specific components of France's EEO scheme

Scheme Components - France	
Policy Objectives	Demand management
Legal Authority	Single-purpose legislation
Fuel Coverage	Electricity
	Natural gas
	Transport fuels
Sector Coverage	Residential
	Commercial
	Industrial
	Agriculture
Obligated Parties	Energy retailers
	Distribution networks
	Dedicated organisations
Method	Default Savings Factor/Formulae
Trading	Yes

France has mandatory quantitative energy saving targets for obligated parties (energy retailers), and a scheme of tradable energy efficiency certificates (certificats d'économies d'énergie) to track energy savings and determine compliance with the targets. The French certificate scheme is notable for the breadth of its coverage of fuels, economic sectors, and facilities.

Policy Objectives

- The certificate scheme aims to realise the potential for energy efficiency in France, particularly in the residential and tertiary sectors. These sectors are responsible for 40% of final energy consumption and one quarter of emissions in France.
- The scheme comprises part of France's broader policy goal to reduce the nation's final energy intensity by 2.5% per year from 2016 to 2030. This target is expected to bring France in line with the energy efficiency target specified in the European Union (EU) Directive on Energy End-use Efficiency and Energy Services.

Legal Authority

- The certificate scheme was established in Law in 2005. The legislation mandates a reduction in the nation's final energy intensity by 2.5% per year from 2016 to 2030. The Law established both France's national energy intensity targets and the certificate scheme.
- Energy savings obligations, and rules regarding certificates and management of a certificate registry were established in subsequent decrees.
- Specific targets for the certificate scheme are established by the government in consultation with ADEME, the French environment and energy management agency.

Energy Savings Target

- Initially, two 3-year energy saving targets were set.
  - The target for the second compliance period was set at 345 TWh cumac[67] to be achieved in

[66] *Information included in this case study is sourced from* (Crossley, et al., 2012).
[67] *Cumulative and discounted.*

the period from 1 January 2011 to 31 December 2013.

- The target for the second period was divided among retailers of electricity, natural gas, heating oil, LPG, and district heating and cooling (255 TWh cumac), and wholesale suppliers of transport fuels (90 TWh cumac).

Fuel Coverage

- Originally covering retailers of electricity, natural gas, and heating oil, the scheme was extended in 2011 to include importers of road transport fuel. Any fuel can be saved by the obligated parties.

Sector and Facility Coverage

- Standardised energy efficiency measures with deemed energy saving values have been established for six sectors including, residential buildings, commercial sector buildings, manufacturing industries (excluding those covered by the EU emissions trading scheme), networked industries (district heating and cooling, lighting, and electricity), transport, and agriculture.
- In addition to these sectors, certificates can be created for non-standardised energy savings activities, programs targeting fuel poverty, information programs, training, and innovations targeting reductions in energy demand.

Obligated Parties

- The energy savings obligation was originally placed on retailers of electricity, natural gas, and heating oil. The obligation was then extended to include importers of road transport fuel. Any fuel can be saved by the obligated parties.
- Although around 2,500 companies are obligated under the scheme (mainly heating oil suppliers), 80% of the obligation falls to the two largest obligated companies, Electricité de France, and Gaz de France.

Compliance Regime

- Compliance under the certificate scheme is achieved by surrendering the quantity of energy efficiency certificates that corresponds to each obligated party's individual target at the end of each three-year compliance period.
- Certificates are tracked through a national registry.
- Lifetime energy savings are confirmed through random sampling.

Eligible Energy Savings

- Obligated parties have a variety of options for meeting their individual targets under the scheme. They may:
  - implement energy saving programs within their customer base;
  - buy energy efficiency certificates;
  - pay a penalty; or
  - some combination of the above.
- Obligated parties and some non-obligated parties can generate eligible energy savings by implementing eligible energy savings activities. The savings are then used to create certificates.

Eligible Energy Savings Activities

- Standardised energy savings activities are specified in individual sheets (known as "fiches").

Measures are categorised into the six end-use sectors, each of which is subdivided into five different categories: building envelope, heating/cooling, lights and appliances, other equipment, and services. Each sheet (usually one-page) specifies the following parameters for one energy savings measure:

- eligible end-use application;
- brief description of the measure, its applicability, and any relevant technical standards;
- requirements concerning installation of the measure;
- measure lifetime; and
- deemed energy saving (e.g., per unit, per square meter), including any variations between the three French climatic zones.

Measurement, Verification, and Reporting

- Certificates are issued for the deemed savings value of an energy efficiency measure after the measure has been carried out, but before energy savings have actually been achieved.
- A number of criteria are considered in establishing deemed saving values, including: the type of equipment or goods employed; the process used to save energy; the state of the market for energy savings; and the level of grid congestion that might be relieved in the geographic area where the measure is being undertaken.
- Energy savings achieved through implementing non-standard energy efficiency measures require approval of both the methodology and the level of savings achieved.

Trading of Energy Savings

- Trading of energy efficiency certificates has been limited, largely because the bulk of the EEO obligation falls on the two largest energy retailers.
- Registered trading accounted for less than 3% of all certificates in the first compliance period. Trading has further been limited by the fact that most obligated parties prefer to implement projects either themselves or through agreements with equipment suppliers and installers.
- Trading of energy efficiency certificates occurs over the counter, as no formal market has been established by the French government. Ownership of certificates is established contractually, with the contract submitted at the time certificates are claimed to ensure issuance to the proper party.
- Banking of certificates is allowed for up to nine years (three compliance periods).

Funding

- The energy industry regulator is authorised to take into account energy retailers' costs of achieving energy savings targets in setting tariffs. Retailers have buffered the cost by targeting energy efficiency activities that qualify for tax rebates. Tax credits of up to 50% of the capital costs are in place for householders who have certain energy efficiency activities installed professionally (e.g., insulation, efficient heating). These tax credits may be claimed by households in conjunction with energy efficiency certificates that may be transferred to an obligated energy retailer. This has resulted in (by international standards) very low subsidy levels required to be offered to households by electricity and gas suppliers.
- In addition, the cost of achieving energy savings targets has been subsidised for gas retailers in part through funds raised by France's natural gas consumption tax.

Scheme Administration

- The following organisations are involved in administering the French energy efficiency certificate

scheme:

- Directorate for Energy and Climate within the Ministry of Ecology, Sustainable Development, Transport and Housing sets the scheme rules and the level of the obligation.
- National Energy Efficiency Certificates Centre under the control of the Directorate accredits eligible energy efficiency projects and issues and records the certificates.
- French Environment and Energy Management Agency, ADEME, provides “back office” functions on behalf of the Directorate, including technical analysis, expert advice, and evaluation.
- Energy Environment Technical Association is a forum in which actors in the energy savings market (e.g., energy suppliers, manufacturers, retailers) work together to propose new standardised energy efficiency activities to the Ministry. The Association develops feedback on the certificate scheme and contributes to the adaptation and evolution of the scheme over time.

Case Study 5: India's Perform, Achieve and Trade Scheme[68]

Table 14: Specific components of India's EEO scheme

Scheme Components - India	
Policy Objectives	Demand management
Legal Authority	Single-purpose legislation
Fuel Coverage	Electricity
	Natural gas
	LPG
	Heating fuel
	Transport fuels
Sector Coverage	Industrial
Obligated Parties	Energy end-users
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	Yes

The Perform, Achieve and Trade (PAT) scheme reduces specific energy consumption in energy-intensive industries in India, with an associated market-based mechanism to enhance cost effectiveness through certification of excess energy savings which can be traded.[69] The PAT scheme involves identifying facilities with the highest energy consumption in each of several selected industrial sectors. These entities are termed Designated Consumers (DCs). The scheme is notable because the obligated parties are energy-intensive facilities, rather than energy providers.

Policy Objectives

- About 45% of total energy consumption occurs in the industrial sector. The PAT scheme was designed in response to the Indian government's commitment in the 2008 National Action Plan on Climate Change (NAPCC). As part of its National Mission on Enhanced Energy Efficiency, the government was required to put into place a "market-based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded."[70]
- Designing energy consumption and energy efficiency standards for India was a challenge. After facilities were audited, it was found that in every sector there were some of the world's most energy efficient units and some that used two to six times the most efficient quantity of energy to produce a tonne of product. The public policy problem was the large variation in energy consumption and energy efficiency among energy-intensive industrial facilities.[71]

Legal Authority

- The Energy Conservation Act (2001) provides the legal framework, institutional arrangement, and a regulatory mechanism to initiate energy efficiency related services in India.
- Under the Act, the Bureau of Energy Efficiency (BEE) was established in 2002 as the regulatory institution responsible for providing the national policy framework and direction for energy efficiency initiatives.

[68] *Information included in this case study is sourced from* (Allen & Crossley, 2014).
[69] Please refer to: https://beeindia.gov.in/content/pat-read-more
[70] (Mathur, 2018)
[71] (Mathur, 2018)

- Prior to the establishment of the PAT scheme, the Act already provided for:
  - energy-intensive industrial facilities to be identified as 'designated consumers' (DCs)
  - energy consumption standards to be specified for DCs
  - accreditation of energy auditors who could assess energy use in DCs
- In 2010, the Energy Conservation Act was amended to provide a legal mandate for the issuance and trading of energy savings certificates. In March 2012, the Bureau of Energy Efficiency established the initial rules and targets for the PAT scheme; these were amended in 2016.

Fuel, Sector and Facility Coverage

- The scheme is focused on Designated Consumers (DC), facilities with the highest energy consumption in each of several selected industrial sectors.
- The scheme operates in cycles lasting three years. During each cycle, each DC is required to improve its specific energy consumption (SEC), which is defined as the ratio of net energy imported into the facility boundary to the total quantity of product exported from the facility boundary.
- The boundary of the facility is defined to capture the entire net energy imported into the boundary. Energy imported into the plant boundary includes electricity, solid fuel, liquid fuel, and gaseous fuels. To standardise across fuel inputs, the calorific value of each fuel is converted to tons of oil equivalent. The SEC does not include energy consumed by residential facilities, mining operations, transportation, and construction activities. Energy from renewable sources is also not included.[72]

Targets

- For each three-year cycle, the BEE assigns targets for reducing specific energy consumption to the DCs.
- First, the total PAT cycle targets are divided among sectors in proportion to their corresponding energy consumptions.
- The sectoral targets are then further broken down into sub-sectoral targets based on the utilised processes. For example, the aluminium sector includes smelter and refinery sub sectors; for textiles, the sub-sectors are processing, spinning, and composite or fibre. The targets for each sub-sector are calculated in a similar manner to the targeted sector savings.
- Finally, within each sector, individual facility targets are calculated based on facility level baseline SECs. These baseline SECs are estimated based on self-declared data submitted by DCs and approved by designated energy auditors. Estimation of the facility baselines was originally based on data collected between April 2007 and March 2010. These values have since been normalised and adjusted based on site-specific characteristics. The targets are expected to become progressively more stringent.[73]
- The target for each facility is defined as a percentage reduction from the corresponding baseline SEC. Facilities are benchmarked against the best performing facility within the sector. The best performing facility receives the lowest target and the other facilities in the sector are assigned proportional targets. Therefore, the target SEC reduction for each DC is based on their present energy consumption and energy efficiency, so that the most energy efficient DCs are assigned smaller target reductions and less efficient DCs are assigned larger target reductions. At the end of each cycle, energy auditors accredited by the Bureau of Energy Efficiency assess the relative

[72] (Bhandari & Shrimali, 2018)
[73] (Bhandari & Shrimali, 2018)

energy efficiency and energy consumption for each DC and verify the eligible energy savings achieved.[74]

  - PAT Cycle-I (2012-13 to 2014-15) was designed to reduce the specific energy consumption of 478 DCs from eight energy-intensive sectors: thermal electricity generation, textiles, iron and steel, aluminium, cement, chlor-alkali, fertilizer, and paper and pulp.
  - In Pat Cycle-II, (2015-16 to 2017-18) three new sectors were added: railways, petroleum refineries, and electricity distribution. Energy reduction targets were assigned to 621 DCs (out of which 448 were existing, 89 additional DCs from existing sectors and 84 DCs from the new sectors).
  - PAT Cycle –III (2017-18 to 2019-20) was implemented on a rolling basis with new DCs being added every year. In this cycle, 116 new DCs were added from the existing 11 sectors.

- In subsequent cycles, two new sectors were added to the PAT scheme: petrochemicals, and a non-industrial sector, commercial buildings (specifically hotels).[75]

Obligated Parties

- The more than 700 energy intensive DCs. The number of obligated parties is likely to increase in the future as more DCs are added to the scheme.

Compliance Regime

- Obligated parties (DCs) meet their SEC reduction targets by achieving eligible energy savings verified by accredited auditors. DCs that achieve verified energy savings in excess of their individual targets receive Energy Savings Certificates (ESCerts) to the value of their excess savings issued by the BEE. Each ESCert is equivalent to one ton of oil equivalent and is tradable and bankable in a market.

Performance Incentives and Penalties

- An obligated party that does not meet their SEC reduction target is required to either buy ESCerts to make up the shortfall or pay a penalty.
- Failure to comply with the energy targets would result in a penalty that shall not exceed one million rupees. In 2018, the BEE calculated the price of a metric ton of oil equivalent as USD$200 based on the amount and cost of total energy consumed by all the DCs. This per unit price of energy is subject to recalculation based on BEE discretion and in December 2020 was worth about USD$130. At that time, one million rupees is worth about USD$13,500. A non-compliant DC will therefore pay a lump sum penalty of USD$13,500 in addition to the product of the ESCert shortfall and USD 130. This penalty would be expected to be higher than the trading price of Energy Savings Certificates.[76]

Eligible Energy Savings

- Energy savings self-reported by DCs must be verified by a third party energy auditor accredited by the BEE.

Eligible Energy Savings Activities

- There are no particular energy savings activities specified under the PAT scheme.

Measurement, Verification, and Reporting

- M&V is primarily carried out by third party energy auditors accredited by the BEE.

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[74] (Hudedmani, et al., 2019)
[75] *Please refer to: https://beeindia.gov.in/content/pat-read-more*
[76] (Bhandari & Shrimali, 2018)

- A DC has to hire an accredited energy auditor from a panel maintained by the BEE. Each year, the energy auditor verifies the DC's self-reported annual energy consumption and the quantity of product produced in the facility. The auditor conducts an energy audit to determine the energy performance of various key equipment, energy balance, energy saving potential, and any energy efficiency measures implemented in the facility.
- The auditor submits a certificate of verification through to BEE within three months from the last day of the financial year. The auditor submits a positive recommendation only if the energy efficiency project activity undertaken by the DC complies with all the requirements stipulated under the PAT scheme. The verification by the auditor of project documentation provided by the DC is based upon both quantitative and qualitative information.
- In the final year of a three-year PAT scheme cycle (compliance period), the verification report submitted by the energy auditor goes through an independent review by BEE.[77]

Trading of Energy Savings

- The electronic trading of certificates takes place at two energy exchanges, Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL).
- Buyers of ESCerts are obligated parties under the PAT scheme (DCs) that do not achieve their SEC reduction targets and need to buy certificates to make up the shortfall.
- Sellers of ESCerts are obligated parties that over-achieve their targets and are issued certificates to the value of their excess energy savings.
- Trading of ESCerts is only possible between DCs. There is no secondary market for the trading of certificates. Each ESCert is unique, and a database of traded certificates is publicly available. The certificate price is determined by the market. Banking of ESCerts is permitted but only for one PAT scheme cycle. Communication and exchange of information between the DCs, BEE, and the energy auditors occurs through an online interface PAT-NET.[78]

Funding

- Obligated parties (DCs) fund all the necessary activities to comply with their obligations under the scheme. Once the incremental cost of achieving energy savings exceeds the benefits resulting from the reduced energy intensity of its operations, the DC will have an additional incentive to invest in energy efficiency.
- Administration of the PAT scheme is funded directly from the budgets of various, mainly government, bodies.

Scheme Administration

- The scheme is administered by a range of organisations with specific responsibilities, including:[79]
  - Bureau of Energy Efficiency (BEE) that is responsible for developing and administering the rules for the scheme, for accrediting and certifying energy managers and energy auditors, and for issuing Energy Savings Certificates to obligated parties.
  - Designated Consumers (DCs) that must: establish standards for energy consumption by their facility; appoint a facility-level accredited energy manager; appoint a facility-level accredited energy auditor; conduct an annual energy audit of their facility; submit an annual report to BEE and State Designated Agencies regarding the energy consumed and the quantity of product produced in their facility, and energy efficiency actions taken by their facility.

[77] (Bandyopadhyay, 2016)
[78] (Bhandari & Shrimali, 2018)
[79] (PricewaterhouseCoopers, 2014)

- Accredited Energy Managers who work inside DCs and are responsible for all key activities carried out by a DC under the scheme.
- Accredited Energy Auditors who are engaged by DCs and are responsible for carrying out annual energy audits and for the M&V of eligible energy savings achieved through energy efficiency activities.
- State Designated Agencies in each state in India work with BEE and are responsible for enforcing compliance.
- Central Electricity Regulatory Commission (CERC) is the regulatory body for trading of Energy Savings Certificates.
- Power System Operation Corporation Limited (POSOCO) maintains the registry for ESCert trading.
- Energy Trading Exchanges, the two energy trading exchanges in India, Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL), enable the electronic trading of ESCerts among DCs.

Case Study 6: The Energy Savings Scheme in New South Wales, Australia[80]

Table 15: Specific components of New South Wales' EEO scheme

Scheme Components – New South Wales	
Policy Objectives	Reduce energy costs
	Reduce GHG emissions
	Limit future infrastructure upgrades
	Demand management
Legal Authority	Single-purpose legislation
	Regulation
Fuel Coverage	Electricity
	Natural gas and other gases
	LPG
Sector Coverage	Residential
	Commercial
	Industrial
	Agriculture
Obligated Parties	Energy retailers
	Energy generators
	Large energy end-users
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	Yes

New South Wales (NSW) is one of four Australian states and territories that have implemented EEO schemes. In 2003, NSW implemented the first mandatory greenhouse gas emissions trading scheme in the world, the Greenhouse Gas Reduction Scheme (GGAS). GGAS included an energy efficiency component, called "demand-side abatement", that effectively established an EEO scheme in NSW. The NSW government recognised that significant barriers to energy efficiency persisted so from 2009, demand-side abatement was no longer credited under GGAS and instead, transitioned into a standalone, expanded EEO scheme called the Energy Savings Scheme (ESS). The ESS provides financial incentives to install, improve or replace energy savings equipment and appliances in NSW households and businesses. The ESS is notable for being one of a handful of EEO schemes worldwide that include active trading of energy efficiency certificates.

Financial incentives are in the form of tradeable certificates, called Energy Savings Certificates (ESCs). Each ESC represents one notional megawatt hour (MWh) of energy savings. Households and businesses who fund energy savings activities transfer the right to create ESCs to Accredited Certificate Providers (ACPs) in return for a discount on the cost of the energy saving activity. The notional megawatt hours attributed to activities determines the number of ESCs that can be created. The ESS enables ACPs to create and register ESCs for eligible energy savings. ESCs are then purchased, mainly by electricity retailers to meet their share of a legislated annual energy savings target, thereby creating a market for ESCs.

Policy Objectives

- The principal objective of the scheme is to create a financial incentive to reduce the consumption

[80] *Information included in this case study is sourced from* (Allen & Crossley, 2014); *other information is sourced from the ESS website at https://www.ess.nsw.gov.au and from documents accessible on that site.*

of energy by encouraging energy saving activities. Other objectives are:

- to assist households and businesses reduce energy consumption and energy costs
- to make the reduction of greenhouse gas emissions achievable at a lower cost
- to reduce the cost of, and need for, additional energy generation, transmission, and distribution infrastructure

Legal Authority

- The ESS is governed by a combination of legislation, regulation, and rules.
- The Act sets out the legal and technical framework of the ESS and also sets out the functions and responsibilities of the scheme administrator and scheme regulator.
- The Act is supported by the Regulation, which describes the core functions of the scheme administrator and the scheme regulator. For the scheme administrator, the Regulation sets requirements for accrediting and auditing Accredited Certificate Providers (ACPs), and rules around the creation and transfer of energy saving certificates. The Regulation also provides the principles governing compliance with the individual scheme participants' energy savings targets.
- The ESS Rule sets outs eligibility, implementation and equipment requirements for eligible energy savings activities and details the calculation methods for determining the number of energy savings and the associated certificates.

Fuel Coverage

- Originally, the ESS covered electricity only. In 2015, the NSW government decided to:
  - expand the ESS to include gas[81] by increasing the energy savings target on electricity sales only[82]
  - apply a primary energy certificate conversion factor for converting gas savings to ESCs
  - limit access to financial incentives to switch from gas to electricity in the ESS Rule to mitigate the risks of increased peak demand
- In 2019, the NSW Government announced that it would introduce a new peak demand reduction scheme and add a much wider range of fuel efficiency and fuel switching activities to the ESS. In 2020, it consulted on expanding fuel coverage to include biomass, hydrogen and other fuels using non-renewable primary energy conversion factors.[83]

Sector and Facility Coverage

- Electricity and gas savings from the residential, commercial, and industrial sectors and from all premises and facilities within these sectors, are eligible to contribute to ESS targets.

Energy Savings Targets

- Each obligated party in the ESS must meet an individual energy savings target each year (calculated as a percentage of its energy sales in that year). Electricity used by trade-exposed, emissions intensive industries are partially exempt from an individual target. Target percentages are specified in the Electricity Supply Act and are subject to amendment by regulation.

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[81] *A wide range of gaseous fuels is covered by the ESS. The main types are natural gas distributed in a pipeline; liquefied natural gas; compressed natural gas; liquefied petroleum gas; town gas; coal seam methane; coal mine waste gas; and biogas (methane) from landfill or sludge.*

[82] *Increasing the energy savings target on electricity sales was chosen, rather than creating a new target on gas sales, to avoid the need to establish new obligated parties, exemptions, and cost pass through mechanisms to consumers, and to avoid any impact on retail gas prices. Increasing the target on electricity sales resulted in only a modest increase in retail electricity prices.*

[83] *Please refer to: https://energy.nsw.gov.au/media/2031/download*

- The target percentage increased from 5% to 7% in 2016 to accommodate the inclusion of gas in the ESS, and then increased by 0.5% each year until reaching 8.5% in 2019.
- In 2022, the target increases to 9% and then increases by 0.5% each year until it reaches 13% in 2030.

Obligated Parties

- Obligated parties are known as scheme participants. There are three groups of scheme participants to ensure all electricity used in NSW is covered:
  - all holders of NSW electricity retail licenses (i.e., electricity retailers)
  - electricity generators that supply electricity directly to retail customers in NSW
  - market customers in NSW who purchase electricity directly from the wholesale Australian National Electricity Market.

Compliance Regime

- Scheme Participants must self-assess their individual energy savings target for each compliance year and determine whether they have an energy savings shortfall by completing an Annual Energy Savings Statement (AESS) and submitting it to the scheme administrator.
- Scheme Participants may be required to arrange for an audit of their AESS.
- It is the responsibility of the scheme participant to organise the engagement of an auditor and pay for the audit.
- The AESS includes sections for a scheme participant to calculate their individual energy savings target for the year and to state the total number of ESCs that they have offered for surrender to meet their target. Scheme participants offer ESCs for surrender through the ESS Registry.
- A scheme participant has met its individual energy savings target if the quantity of ESCs offered for surrender is equivalent to (or exceeds) their individual energy savings target. When an energy savings shortfall is identified, the scheme participant must either purchase and surrender additional ESCs or pay a penalty.
  - the base penalty rate for 2021 is $30.95 per notional MWh
  - the scheme penalty rate for the 2021 calendar year is $29.09 per notional MWh
- A Scheme Participant can carry forward up to 10% of their individual target to the next year.

Eligible Energy Savings

To be qualified to create ESCs, energy savings must have been generated through implementing a Recognised Energy Saving Activity (RESA).

Eligible Energy Savings Activities

- The requirements for an energy saving activity to be eligible as a RESA include:
  - modifying end-user equipment or the way it is used (including installing additional components);
  - replacing end-user equipment with other end-user equipment that consumes less energy;
  - installing new end-user equipment that consumes less energy than other comparable equipment;
  - removing end-user equipment so that energy consumption is reduced (as long as there is no negative effect on production or service levels);
  - not result in a reduction in energy consumption by reducing production or service levels

(including safety levels);

- be implemented at a site or sites in NSW or in an economy with an approved similar scheme to the ESS; and
- not be unlawful to carry out.

- RESAs may be implemented by scheme participants but are more commonly implemented by aggregator ACPs. Before a RESA can be implemented, the ACP must be the original energy saver or be nominated by the original energy saver, defined as the person who is:
  - the purchaser of the upgrade or equipment; or
  - the person liable to pay for the energy consumption at the site where the energy saving activity occurs; or
  - the retailer for the sale of new appliances; or
  - the person contracted to remove old appliances; or
  - the person on the National Australian Built Environment Rating System (NABERS) rating certificate where NABERS is used to calculate the number of ESCs created from a project.

Measurement, Verification, and Reporting

- Four methods are used for calculating energy savings, these are:
  - The **Project Impact Assessment Method** calculates savings from one-off energy savings projects. This method is most appropriate when: energy savings are small compared to the site's consumption; baseline energy consumption data for the site is unavailable, or the variation in the baseline energy consumption due to other factors is high. One of the advantages of the Project Impact Assessment Method is that it is possible to make an up-front assessment of estimated future energy savings (known as forward creation of ESCs). This is an incentive where projects achieve small annual savings that might be insufficient to warrant accreditation under the ESS. However, discount factors apply to any forward creation. This method is no longer applicable to new projects.
  - The **Project Impact Assessment with Measurement and Verification Method** is based on internationally recognised M&V principles to calculate energy savings. To use this method, the ACP must engage a M&V Professional to validate the energy models. This method allows 'equipment level' energy savings to be deemed for up to 10 years, using persistence and confidence factors to discount initial certificate creation. The calculation of energy savings under this method is based on comparing the results of a baseline energy model with those from an operating energy model. This requires:
    - clear definition of the site boundary, eligible activities and any exclusions required for the energy models to be developed;
    - baseline and operating energy use to be measured and modelled before and after an implementation; and
    - independent variables and site constants to be determined and included in the energy models.
  - The **Metered Baseline Method** involves measuring the energy consumption before the RESA commences to establish a baseline energy consumption for the site and then measuring consumption again after the RESA has commenced to establish new levels of energy consumption. The difference between these measurements represents the impact of the RESA. This method comprises five sub-methods for measuring energy consumption:

- the baseline per unit of output sub-method, used where energy consumption is strongly linked to output;
- the baseline unaffected by output sub-method, used where energy consumption is not linked to output;
- the normalised baseline sub-method, used where the energy consumption baseline has to be normalised to remove variation from the baseline, such as changes to ambient conditions or input characteristics;
- the NABERS sub-method is based on the normalised baseline approach and is used for buildings that have a NABERS energy rating; and
- the aggregated metered baseline sub-method allows for energy savings to be calculated on the basis of measured savings across a group of energy end-use customers, using statistical techniques. To use this sub-method, the ACP must engage an accredited statistician to perform the randomised site allocation and validate the statistical methods employed.

o The **Deemed Energy Savings Method** is used for the replacement, installation, removal, and sale of common end-user equipment, such as refrigerators and energy-efficient lighting. The Rule includes lists of specific equipment types, together with their deemed energy savings values and lifetimes. This method allows ESCs to be claimed at the time of implementation of an activity, for the energy savings that will occur over the deemed lifetime of the activity. The administrator may publish a list of products for which this method can be used. ACPs and other parties may apply to the administrator to have a product accepted and included in the list. This method includes eight sub-methods for calculating energy savings:

- sale of new appliances;
- commercial lighting energy savings formula;
- public lighting energy savings formula;
- high efficiency motor energy savings formula;
- power factor correction energy savings formula;
- removal of old appliances;
- home energy efficiency retrofits; and
- high efficiency appliances for businesses.

Trading of Energy Savings

- The scheme administrator does not get involved in any market transactions or negotiations involving buying and selling ESCs but does facilitate the market by managing ACPs and scheme participants.
- The administrator operates a web-based registry that tracks the creation, ownership transfer, and surrender of ESCs.
- When an ESC is created by an ACP, the registry records information about that ESC including the type of energy saving activity, the compliance period (known as the “vintage”), and the creation date. The registry also tracks the certificate status (live, surrendered, or forfeited) and the ownership history. The Registry is not a trading platform and does not record the price paid when ESCs are sold. Trading of ESCs occurs outside of the registry. When such a trade occurs, the change in ownership of those certificates must be recorded in the registry.
- ACPs are authorised by the scheme administrator to create a set number of ESCs for each energy savings project they implement. A fee is payable to register ACPs through the Registry.

- In 2021, the registration fee is AUD$0.89 per ESC. The revenue from this fee covers the majority of the administrative costs of the ESS.

- Anyone who owns ESCs can negotiate directly with scheme participants or other parties to sell their ESCs. Some participants require small numbers of certificates to meet their obligations and prefer to negotiate with sellers directly to avoid dealing with standard parcel sizes (typically 5,000 ESCs) traded in markets. Most ESCs are traded through bilateral contracts between an ACP and a buyer.
- ESCs can also be traded through markets maintained by independent market makers. There are no standard contracts for trading ESCs, but three types of contracts are commonly used:
  - spot contract – a contract for a physical exchange of a specified quantity of ESCs at an agreed price;
  - forward contract – a contract for the exchange of a specified quantity of ESCs at a predetermined price on a fixed date; and
  - option contract – the buyer pays the seller a premium to acquire a right, but not the obligation, to buy or sell a quantity of ESCs at a predetermined price.

Funding

- The costs of meeting targets are implicitly assumed to be costs of doing business and, where possible, are passed on to customers.
- For ACPs, funds to carry out energy savings projects are obtained by selling ESCs.
- For the scheme administrator, the majority of administrative costs are covered by the revenue from the ACP registration fee.

Scheme Administration

- The NSW Independent Pricing and Regulatory Tribunal (IPART) carries out the functions of both the scheme administrator and the scheme regulator.
- As the scheme administrator, IPART:
  - assesses applications for accreditation to undertake eligible energy saving activities and to create ESCs;
  - assesses applications to be a M&V Professional or an ESS auditor;
  - monitors compliance of ACPs;
  - monitors the performance of M&V Professionals;
  - assesses emerging lighting technologies and accepts them for use in the scheme; and
  - manages the online registry and ESS portal.
- As the scheme regulator, IPART monitors compliance of participants with their obligations, including through audits.
- Auditors who are members of the ESS Audit Services Panel are an integral part of the ESS and perform some of the administrator's statutory functions to ensure the ongoing compliance of participants and ACPs. Companies may apply to IPART to join the Audit Services Panel
- The NSW Department of Planning, Industry and Environment is responsible for developing the policy behind the ESS and for the ESS legislation.

Case Study 7: South Australia's Retailer Energy Productivity Scheme[84]

Table 16: Specific components of South Australia's EEO scheme

Scheme Components – South Australia	
Policy Objectives	Reduce energy costs
	Enhance energy security and reliability
	Demand management
Legal Authority	Single-purpose legislation
	Regulation
Fuel Coverage	Electricity
	Natural gas
Sector Coverage	Residential
	Commercial
Obligated Parties	Energy retailers
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	No

From 1999 to 2020, an EEO scheme called the Residential Energy Efficiency Scheme (REES) operated in South Australia. In 2020, a review of the REES noted that South Australia's load profile and supply mix has changed with the high uptake of distributed energy resources and large-scale renewable energy. The review found that significant customer and system benefits could be achieved through the optimisation of energy use. The review recommended that South Australia should continue to have an EEO scheme from 2021. South Australia decided that the Retailer Energy Productivity Scheme (REPS) should replace the REES in 2021. REPS supports South Australia's transition to a modern, flexible energy system and aims to improve energy productivity for businesses and households. New activities support energy demand management and demand response, alongside improved energy efficiency activities. The REPS is notable for continuing the focus on low income households that was also an objective of the REES.

Policy Objectives

- There were three objectives for the REES:
  - to improve residential energy efficiency and reduce greenhouse gas emissions;
  - to prepare for likely increases in energy prices associated with policy responses to reduce greenhouse gas emissions; and
  - to reduce energy costs for households, and particularly low-income households.
- The REES review recommended that the REPS should "improve energy productivity for households, businesses and the broader energy system, with a focus on low-income households. This will reduce energy costs and greenhouse gas emissions, also potentially improving human health".

Legal Authority

- The REPS was established through a mixture of regulation and legislation.

[84] *The information in this case study is sourced from the website of the South Australian Department of Energy and Mining at: https://energymining.sa.gov.au/energy_and_technical_regulation/energy_efficiency/retailer_energy_productivity_scheme_reps and from the website of the Essential Services Commission of South Australia at: https://www.escosa.sa.gov.au/news/rees-news/sep20-news-2020-reps2021-initiate as well as from documents accessible on those websites.*

- The regulations established the Essential Services Commission of South Australia (ESCOSA) as the scheme administrator. ESCOSA made the REPS Code which enables the administration of the REPS in accordance with a policy framework established by the South Australian Department of Energy and Mining.
- In 2020, the Statutes Amendment Act amended various legislative provisions that established obligations under the REES to establish equivalent obligations under the REPS.

Fuel Coverage

- Electricity and natural gas are covered under the REPS.

Sector and Facility Coverage

- Residential sector dwellings and small business premises are covered under the REPS.

Obligated Parties

- The obligated parties in the REPS scheme are electricity or gas retailers. There are two types of obligated parties in the REPS:
  - Primary obliged retailers – an electricity or gas retailer who has residential customer numbers equalling or exceeding the primary obligation threshold. The primary obligation threshold is set as customer numbers exceeding 5,000 residential electricity customers or 5,000 residential gas customers. A primary obliged retailer is set an energy productivity target and a priority group household energy productivity sub-target and may set further energy productivity sub-targets.
  - Secondary obliged retailer – an electricity or gas retailer (who is not a primary obligated retailer) that purchases, in the year immediately prior to the commencement of a REPS year, an amount of electricity or gas equalling or exceeding a secondary obligation threshold for on-selling to customers. The secondary obligation threshold is set as purchases exceeding 20,000 MWh of electricity or 133,000 GJ of gas for on selling to South Australian customers. A secondary obliged retailer is set an energy productivity target and is not set a priority group household energy productivity target but may be set further energy productivity sub-targets.
- Obliged retailers have flexibility to design their own incentive programs and may offer incentives to any customer, not just their own customer base.

Energy Productivity Targets[85]

- The Minister sets annual energy productivity targets in five-year periods, 2021 to 2025 and 2026 to 2030. The targets are expressed as the annual amount of energy productivity improvements (in normalised gigajoules) that must be achieved by energy retailers through the carrying out of energy productivity activities. For each REPS year, the Minister also sets the values of the annual energy productivity target to be achieved through the provision of energy productivity activities to priority group households and to residential customers. The targets for the period 2021 to 2025 (in normalised gigajoules) are shown in Table 17 below.[86]

[85] *Under the REPS scheme, energy productivity is measured instead of energy savings.*
[86] (Government of South Australia, 2020)

Table 17: REPS energy productivity targets for 2021 to 2025[87]

Year	Annual energy productivity targets	The amount of each annual productivity target that is to be achieved by the provision of energy productivity activities to priority group households	The amount of each annual productivity target that is to be achieved by the provision of energy productivity activities to residential customers
2021	2,500,000	500,000	500,000
2022	2,812,500	500,000	500,000
2023	3,125,000	500,000	500,000
2024	3,437,500	500,000	500,000
2025	3,750,000	500,000	500,000

- From time to time, the Minister may set further energy productivity sub-targets which are designated proportions of the energy productivity target which must be met in a specified manner. For example, a sub-target may relate to a particular customer class or a certain type of energy productivity activity.
- ESCOSA allocates each annual energy productivity target among REPS obligated parties using a formula that calculates the energy purchases (electricity or gas) made by an obliged energy retailer in the previous year as a proportion of the total energy purchases by all energy retailers in that year. The formula also includes a normalisation factor of 1 for electricity and 0.4 for gas.

Compliance Regime

- An obliged retailer is required to undertake energy productivity activities sufficient to achieve the energy productivity targets and sub-targets that apply to that retailer for that year.
- Every year ESCOSA determines the extent to which the energy productivity activities reported contribute towards the satisfaction of an obliged retailer's energy productivity targets and determines whether the obliged retailer has satisfied its energy productivity targets for that year. If an obliged retailer accrues an energy credit[88] in relation to energy productivity activities, the retailer may apply to ESCOSA for the energy credit to be taken into account in determining whether or not the obliged retailer has met its energy productivity targets in any subsequent year. This arrangement is similar to banking energy credits for use in meeting REPS targets in later years.
- If a retailer fails to meet its energy productivity targets in a year, the energy productivity shortfall is added to the targets that apply to the retailer in the subsequent year. An obliged retailer meets its targets if it undertakes energy productivity activities sufficient to achieve at least 90% of the targets. In this case, the energy productivity shortfall is still added to the retailers' targets in the subsequent year.

Performance Incentives and Penalties

- If ESCOSA determines that an obliged retailer has failed to achieve its target, rather than making up the shortfall in the subsequent year, the retailer may choose to either pay a shortfall penalty or be subject to prosecution.

[87] (Essential Services Commission of South Australia)

[88] *In the REPS, an energy credit is the difference between the amount of eligible energy savings (in normalised gigajoules) actually achieved by an energy retailer in a year through the conduct or acquisition of energy productivity activities and the energy productivity target that applies to the retailer for that year (if the difference is positive).*

- The shortfall penalty comprises a base penalty plus an additional amount calculated to reflect the extent of the shortfall.
    - In 2021, the base penalty is AUD$10,000 and the additional amount is the energy productivity shortfall (in normalised gigajoules) multiplied by AUD$21.45.

Eligible Energy Productivity Improvements

- To be eligible to contribute to meeting REPS targets, energy productivity must have been improved through implementing one or more of the activities notified by the Minister.

Eligible Energy Productivity Activities

- The Minister determines which energy productivity activities undertaken by energy retailers are eligible. The notice includes: a description of the activity; the minimum specification with which the activity must be performed; and the amount of eligible energy savings (in normalised gigajoules) deemed to be achieved, or the method of calculating such an amount.
- Obliged retailers may choose the energy productivity activities they provide to their residential and business customers from the list of activities notified by the Minister. An initial list of 29 eligible activities was published in 2020. The list is occasionally revised when the Minister decides to add new activities or remove existing activities. A person may make an application for an energy productivity activity to be varied or deleted, or a new energy productivity activity to be approved.
- Most recipients of REPS energy productivity activities (i.e., end-use customers) must make a co-payment to the installer for the goods and services provided, with a minimum payment of AUD$33 (in 2021).
    - The minimum co-payment must not be reimbursed, credited by a third party, or made by in-kind payment.
    - The co-payment applies once per premise regardless of the number of activities delivered.
    - The minimum co-payment requirement does not apply to priority group recipients.

Measurement, Verification, and Reporting

- Because energy productivity activities have associated deemed energy productivity values, the M&V required relates more to the number and type of activities, rather than the energy productivity achieved. Each obliged retailer is required to collect and record information in relation to the minimum specification of each energy productivity activity at the time it is implemented.
- Occasionally ESCOSA may require an obliged retailer to conduct field audits of the energy productivity activities it has implemented to meet their obligations.

Trading of Energy Productivity Improvements

- There is no trading of energy savings however, if an obliged retailer accrues an energy credit, the retailer may at any time, transfer the credit to another retailer.
- Also, a retailer may enter into an arrangement with another person (including another retailer) for that person to undertake energy productivity activities on its behalf. Despite any such arrangements, an obliged retailer remains liable for any offence or penalty arising from a failure to meet a target or sub target that applies to that retailer.

Funding

- The REPS costs for obliged retailers are typically passed on to customers' energy bills.

Scheme Administration

- ESCOSA is the scheme administrator and is responsible for:
  - determining obliged energy retailers;
  - calculating and notifying obliged retailers of any targets that apply on an annual basis;
  - monitoring retailer behaviour and holding them accountable for meeting their obligations; and
  - annually reporting on retailers' progress in achieving the required targets.
- The South Australian Department of Energy and Mining is responsible for establishing and maintaining the policy framework for the REPS.

Case Study 8: Vermont's Energy Efficiency Utility, USA[89]

Table 18: Specific components of Vermont's EEO scheme

Scheme Components - Vermont	
Policy Objectives	Reduce energy costs
	Reduce GHG emissions
	Limit future infrastructure upgrades
	Demand management
Legal Authority	Single-purpose legislation
Fuel Coverage	Electricity
Sector Coverage	Residential
	Commercial
	Industrial
	Agriculture
	Distribution networks
	Dedicated organisations
Method	Default Savings Factor/Formulae
	Measurement and Verification
Trading	No

Vermont is committed to least-cost integrated planning for electricity and natural gas supply and transmission planning. The objective is to develop the least-cost solution that has an acceptable level of cost risk, meets established reliability criteria, and complies with environmental regulations. State policy for least-cost energy planning highlights energy efficiency as a key tool to meet the state's energy needs in the most cost-effective manner. In 1999, the Vermont Public Utility Commission approved a settlement involving all of the state's twenty-two electricity distribution utilities, the Vermont Department of Public Service, and a dozen consumer and environmental groups that provided for the creation of a state-wide energy efficiency utility that would deliver energy efficiency services to Vermonters. The Vermont energy efficiency utility can satisfy an electricity distribution utility's obligation to provide energy efficiency services. The energy efficiency utility is a unique solution for managing Energy Efficiency Resource Standards.

Policy Objectives

- Policy objectives include reducing the need for future electricity purchases; reducing greenhouse gas emissions; limiting the need to upgrade the transmission and distribution infrastructure; and minimising costs and providing energy efficiency as part of a comprehensive resource supply strategy.

Legal Authority

- Vermont legislation allows the Vermont Public Utility Commission (which regulates the state's publicly owned electricity utilities) to create an energy efficiency utility. It specifies that the energy efficiency utility can satisfy an electricity distribution utility's obligation to provide energy efficiency services. The Public Utility Commission may appoint an entity to administer the energy efficiency utility.[90]
- In 1999, an energy efficiency charge was created through legislation and by Public Utility Commission Order, which capped the funding level. In 2005, legislation lifted the cap on funding.

[89] *Some of the information included in this case study is sourced from* (Crossley, et al., 2012)

[90] *Despite the language of the legislation, the energy efficiency obligation does formally remain with the utilities.*

Fuel Coverage

- Electricity is the only fuel covered.

Sector and Facility Coverage

- Efficiency Vermont implements energy efficiency programs directed to homebuilders and buyers, low-income Vermonters, farmers, and residential, commercial, and industrial customers. The programs help these energy consumers capture the greatest energy-saving opportunities available through the installation and use of efficient construction designs, products, and equipment.

Energy Savings Targets

- Every three years, the Vermont Public Utility Commission conducts a regulatory proceeding to identify energy savings targets and short- and long-term energy efficiency budgets, plus other compensation matters related to the delivery of energy efficiency services by Vermont's energy efficiency utilities.
  - The results are documented in a Demand Resources Plan (DRP). Each DRP includes annual quantitative energy savings targets for Efficiency Vermont, known as Quantifiable Performance Indicators (QPIs).
    - For the period 2018 to 2020, the QPIs for Efficiency Vermont included an energy savings target of 357,400 MWh per year. The summer and winter peak demand reduction targets were 45.9 MW and 62.4 MW, respectively.
    - The target for lifetime energy savings is 3,582,200 MWh.[91]
  - The targets are denominated in MWh for energy savings and MW for peak demand reductions. The targets aim to achieve the maximum amount of cost-effective energy efficiency while limiting impacts on the electricity prices paid by end-use customers.
  - Targets are informed by energy efficiency potential studies conducted every two years by contractors engaged by the Vermont Department of Public Service.[92]

Obligated Parties

- The regulated electricity distribution utilities.
  - For most utilities, the obligation is satisfied by energy efficiency programs delivered by the energy efficiency utility, Efficiency Vermont. The City of Burlington Electric Department is also an obligated party and delivers energy efficiency programs in its own territory.

Performance Incentives and Penalties

- Each three-year DRP for Efficiency Vermont includes significant financial compensation, structured as a performance-based incentive and an operations fee.
  - The amount of the compensation is dependent on actual performance. Minimum Performance Requirements (MPRs) and QPIs measuring a range of performance parameters are established in each DRP. Financial compensation is paid based on the attainment of three-year targets for MPRs and QPIs.
  - Failure to meet MPRs results in forgoing the opportunity to earn some or all of the financial compensation that could be earned for meeting QPI targets. QPIs include a weighting factor that determines the amount of compensation for achieving each QPI target.

[91] (Vermont Public Utility Commission, 2017)

[92] Please refer to: *https://publicservice.vermont.gov/content/efficiency*

- Each QPI is divided into three target levels: minimum, 100%, and "super-stretch."
- For the 2018-2020 period, the 100% target levels were 95% of the super-stretch target levels and the minimum target levels were 70% of the super-stretch target levels.
- Financial compensation is awarded progressively to Efficiency Vermont as targets are achieved. Over the 2018-2020 performance period, 60% of the awarded financial compensation was set aside for achievement of the minimum QPI target levels. An additional 27% of the award was set aside for the 100% target levels, and another 13% for achieving super-stretch target levels.[93]
- For the 2018-2020 period, QPIs for Efficiency Vermont comprised defined levels of achieved energy savings and demand reductions. MPRs included: achieving a minimum benefit/cost ratio for all energy efficiency programs; minimum spending levels on energy efficiency programs directed to residential and low-income customers; and a minimum number of small business customers contacted. By meeting these targets, over the 2018-2020 period, Efficiency Vermont could have earned $4,543,500 as a performance-based incentive and $1,948,181 in operations fees. This total financial compensation of $6,491,681 was 4.8% of Efficiency Vermont's approved three-year budget of $134,564,949 for electric resource acquisition.

- Financial penalties are applied if the budget is overspent.[94]

Eligible Energy Savings

- Eligible energy savings are produced by Efficiency Vermont by delivering energy efficiency services to all Vermonters (except those in the City of Burlington).

Eligible Energy Savings Activities

- Energy efficiency programs are designed and delivered by Efficiency Vermont and approved by the Public Utility Commission.
  - Activities implemented in these programs include energy efficient technologies; efficient lighting and appliances; fuel substitution; and whole building retrofits.

Measurement, Verification, and Reporting

- Vermont legislation requires an audit of the reported energy savings, demand reductions and the cost-effectiveness of all energy efficiency utility services.
- The Department of Public Service manages the M&V of the reported results of all energy efficiency utility services in accordance with annual M&V plans approved by the Public Utility Commission. The Department reviews activities and verifies energy savings, coincidental peak savings, and Total Resource Benefit amounts claimed.
  - The goal of this evaluation activity is to provide energy end-users and the Public Utility Commission with an independent evaluation of energy efficiency utility programs. This goal is met through a range of evaluation techniques, including impact assessments; market characterisations and assessments; process evaluations; and research. Some M&V activities are carried out by independent contractors and others are performed by Department in-house staff.[95]
- Initial M&V of energy efficiency programs is undertaken by Efficiency Vermont using deemed

[93] (Vermont Public Utility Commission, 2017)
[94] (Vermont Public Utility Commission, 2017)
[95] *Please refer to: https://publicservice.vermont.gov/energy_efficiency/eeu_evaluation*

and actual energy savings. Efficiency Vermont has developed a technical reference manual with documented methodology for calculating energy savings (including allowances for free riders and free drivers). Annual energy savings and demand reductions claimed by Efficiency Vermont are reviewed and verified by the process undertaken by the Department of Public Service and, following verification, are certified by the Public Service Commission.

Trading of Energy Savings

- No trading is allowed, Efficiency Vermont must obtain energy savings through its own energy efficiency programs.

Funding

- Energy efficiency programs in Vermont are primarily funded by a benefits charge (called an energy efficiency charge) that is shown separately on all end-use customers' bills (except those in the City of Burlington). The Vermont Public Utility Commission determines the energy efficiency charge, and the energy efficiency budgets for the state.
    - In 2020, the energy efficiency charge was USD$0.00757/kWh for industrial customers and USD$0.01188 /kWh for residential customers.
- Additional funding for energy efficiency in Vermont is available from payments for capacity by ISO-New England[96] and from the state's participation in the Regional Greenhouse Gas Initiative.[97] Vermont legislation requires this revenue to be directed to heating and process fuel efficiency programs, rather than to electricity energy efficiency programs.

Scheme Administration

- Vermont Energy Investment Corporation, trading as Efficiency Vermont, is contracted to act as the administrator of the state-wide energy efficiency utility.
- Efficiency Vermont prepares annual plans that detail the strategies, initiatives, and projected budgets for the different energy efficiency programs. Efficiency Vermont has the ability to determine the strategies and measures needed to achieve the targeted energy savings and demand reductions.
- Most of Efficiency Vermont's budget applies to electricity services and initiatives, with a fraction going to unregulated fuels and services.
- The Vermont Department of Public Service represents the public interest in matters regarding energy efficiency. The Department has a specific responsibility to manage the M&V of reported energy savings and demand reductions and the cost-effectiveness of all energy efficiency utility services in accordance with M&V plans approved by the Public Utility Commission. Some M&V activities are carried out by independent contractors and others are performed by Department in-house staff.

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[96] *The Independent System Operator of the New England electricity grid (ISO-NE) has created a Forward Capacity Market to ensure that the region has sufficient capacity to meet its peak demand needs. This market-based initiative allows for demand resources, including energy efficiency, to compete directly with generation resources to provide capacity. Efficiency Vermont bids their energy efficiency program portfolios into the Forward Capacity Market and receives revenue from ISO-NE.*

[97] *The State of Vermont is a participant in the Regional Greenhouse Gas Initiative (RGGI), a mandatory, market-based emissions trading system implemented by 10 states in the north-east United States, which is designed to cap and reduce CO_2 emissions from the electricity sector. Vermont legislation requires 100 percent of the state's RGGI emission allowances to be auctioned and proceeds from the sale of the allowances to be deposited in an energy efficiency utility fund.*

Appendix B – Additional resources for policy makers

Below are additional resources for policy makers to provide context and examples for the best practice principles and tips described in this handbook.

Chapter 1: Deciding if an EEO scheme is the right tool for you

Topic	Description	Organisation Name	Link
EEO scheme elements	In this webinar presentation, Edith Bayer and Eoin Lees discuss key elements of energy efficiency obligation (EEO) schemes. These include considerations for designing, implementing, and (over time) improving EEOs; best practices in successful EEO schemes; and strategies for overcoming common barriers to effective EEO implementation.	Regulatory Assistance Project (RAP)	Click here
EEO scheme elements	A database of resources for California's Energy Efficiency Resource Standard (EERS).	California Public Utilities Commission	Click here
EEO scheme elements	An introduction to EEO schemes and how they can meet energy savings targets.	European Bank for Reconstruction and Development	Click here
Costs and benefits of EEO schemes	This paper outlines the costs and benefits of EEO schemes and includes a discussion on the long-term trends of EEO schemes.	Regulatory Assistance Project (RAP)	Click here
Costs and benefits of EEO schemes	This paper discusses the costs and befits of EEO schemes including a comparative analysis between several European economies.	Regulatory Assistance Project (RAP)	Click here
Energy efficiency	An overview of energy efficiency, including a discussion on non-energy costs and benefits.	Regulatory Assistance Project (RAP)	Click here
Market transformation	A discussion on market transformation as a central policy objective, with a focus on transforming energy efficiency markets.	Lawrence Berkeley National Laboratory, University of California	Click here
EEO scheme interaction with Emissions Trading	This report analyses case studies of environmental policy making with a focus on how policies influence each other. This report includes a case study that analyses the	European Union and CARISMA	Click here

Topic	Description	Organisation Name	Link
Schemes (ETSs)	interaction between the European Union ETS and the Renewable Energy Directive.		

Chapter 2: Choosing your policy objectives

Topic	Description	Organisation Name	Link
Policy handbook	This resource provides a guide to the complete public policy making process in Australia (this is not a free guide and must be purchased).	Catherine Althaus, Peter Bridgman, and Glyn Davis	Can be purchased from Routledge
Policy options analysis	This guide provides the five-step process to identifying policy options.	European Union	Click here
Policy options for analysis	Best policy practices for promoting energy efficiency.	United Nations	Click here
Energy efficiency policy	This webpage provides an overview of California's energy efficiency policies and programs. This resource also provides tools and resources pertaining to energy efficiency programs.	California Public Utilities Commission	Click here
Program logic	This evaluation toolkit provides advice and resources on conducting a program evaluation.	NSW Department of Premier and Cabinet	Click here
Theory of change	A guide to working with the theory of change. Provides a detailed summary of the concept as well as steps to developing your own theories and key tools.	Ecosystem Services for Poverty Alleviation (ESPA)	Click here

Chapter 3: Creating a mechanism to increase the demand for energy efficiency

Topic	Description	Organisation Name	Link
Demand-side components	Details of EEO scheme components for existing and planned EEO schemes in the European Union. Outlines the specifics of each economy's scheme, including targets and obligated parties.	European Union	Click here
Targets	Database that provides details on the targets for all the states in the USA with EEO schemes.	American Council for an Energy-Efficient Economy	Click here
Targets	Detailed targets for the South Australian Retailer Energy Productivity Scheme (REPS). These targets are in normalised gigajoules of energy.	Department for Energy and Mining, Government of South Australia.	Click here
Targets	2020 and 2030 energy efficiency targets for the European Union.	European Commission	Click here
Targets	The energy efficiency targets for 2016-2025 under the Victorian Energy Upgrades program.	Victorian Department of Environment, Land, Water and Planning	Click here
Targets	Schedule 5 of the Electricity Supply Act 1995 No 94 outlines the targets for the New South Wales Energy Savings Scheme (ESS) up until 2050.	NSW Government	Click here
Penalty rates	Penalty rates for scheme participants under the New South Wales Energy Savings Scheme (ESS) that fail to meet individual targets.	Independent Pricing and Regulatory Tribunal (IPART), New South Wales	Click here
Obligated parties	Obligated parties under the New South Wales Energy Savings Scheme (ESS).	Independent Pricing and Regulatory Tribunal (IPART), New South Wales	Click here
Legal authority	The legislation that governs the New South Wales Energy Saving Scheme (ESS). This resource also includes the annual reports detailing the scheme's performance.	Independent Pricing and Regulatory Tribunal, New South Wales	Click here

Topic	Description	Organisation Name	Link
Legal authority	The Acts and regulations for the Victorian Energy Upgrades program.	Victorian Department of Environment, Land, Water and Planning	Click here

Chapter 4: Creating a mechanism to increase the supply of energy efficiency

Topic	Description	Organisation Name	Link
Eligible activities and equipment	This webpage outlines the eligible activities, projects, and equipment under the New South Wales Energy Saving Scheme (ESS). This resource also details specific activities, projects and equipment that are excluded under the ESS.	Independent Pricing and Regulatory Tribunal, New South Wales	Click here
Eligible activities and equipment	This webpage outlines the eligible activities specifications under the South Australian Retailer Energy Productivity Scheme (REPS). Every eligible activity has a specification sheet with further detail on eligibility and installation requirements.	Department for Energy and Mining, Government of South Australia.	Click here
Eligible activities and equipment	An introduction to Ireland's EEO scheme, including eligible activities and sectors.	Sustainable Energy Authority of Ireland	Click here
Eligible activities and methods	This document is a guide to the protocols for the California Energy Efficiency Resource Standard (EERS).	California Public Utilities Commission	Click here
Broad calculation methods	Outlines all of the calculation methods accepted under the New South Wales Energy Savings Scheme (ESS). Includes links to both M&V and DSF methods that explain when to use the method and provides specific guidelines.	Independent Pricing and Regulatory Tribunal, New South Wales	Click here

Topic	Description	Organisation Name	Link
Broad calculation methods	This resource provides several examples of how a methodology would work for specific eligible activities. It also provides the detailed methodologies for EEO schemes in Denmark, France, and the United Kingdom.	Regulatory Assistance Project (RAP)	Click here
Broad calculation methods	This report provides an overview of the pros and cons of several calculation methods as applicable to members of the European Union.	European Commission	Click here
Broad calculation methods	This document provides guidance on method approaches to calculating energy savings resulting from energy efficiency programs. It outlines several standard approaches that can be used for calculating savings and provides advice on key measurement issues. This resource also has a list of key efficiency evaluation resources.	United States Environmental Protection Agency	Click here
Broad calculation methods	This technical reference manual provides descriptions of eligible energy efficiency activities and all the necessary algorithms and default assumptions for estimating the energy savings.	Efficiency Vermont	Click here
Measurement and Verification (M&V) method	A best practice guide to the measurement and verification of energy savings. This guide includes chapters on when to use the M&V method, different M&V options, how to effectively manage your data for M&V, and an appendix with international guidelines.	Energy Efficiency Council (EEC)	Click here
Measurement and Verification (M&V) method	This webpage resource has several integrated M&V training guides. The trainings are based on the Performance Measurement and Verification Protocol (PIMVP) methodology. Note: the training guides are in Portuguese.	Agência Nacional de Energia Elétrica (ANEEL)	Click here
Measurement and Verification (M&V) method	M&V method activity guide for project-based activities.	Essential Services Commission	Click here

Topic	Description	Organisation Name	Link
Measurement and Verification (M&V) method	M&V guidelines for each sector included under India's Perform, Achieve and Trade (PAT) scheme.	Bureau of Energy Efficiency, Government of India	Click here
Measurement and Verification (M&V) method	An M&V manual for participants in the Victorian Energy Upgrades (VEU) program. This manual has detailed information on the entire M&V process, including a chapter specifically on the various M&V calculations.	Common Capital (for the Victorian State Department of Environment, Land, Water and Planning)	Click here
Default Savings Factor/Formulae (DSF) methods	This report provides a full overview of the common DSF methods available to estimate net energy efficiency savings, and the corresponding advantages and disadvantages.	National Renewable Energy Laboratory (NREL)	Click here

Chapter 5: Designing your EEO scheme market governance structure

Topic	Description	Organisation Name	Link
Scheme administration	Policy guidelines with a chapter dedicated to scheme administration, includes a table of responsibilities for the scheme administrator.	European Bank for Reconstruction and Development	Click here
Scheme administration	The scheme administrator and regulator for the New South Wales Energy Savings Scheme (ESS).	Independent Pricing and Regulatory Tribunal (IPART)	Click here
Scheme administration	Details of EEO scheme administration responsibilities for existing and planned EEO schemes in the European Union.	European Union	Click here
Trading	This paper discusses the circumstances where trading is, and isn't, beneficial to improving demand-side energy efficiency. This paper summarises some of the EEO schemes in Europe and details the level of trading (if any) and the impact of specific choices.	Institute for Power Systems and Energy Economics Energy Economics Group (EEG)	Click here

Topic	Description	Organisation Name	Link
Trading	This paper describes the concept and the main elements of a tradable EEO scheme, giving examples from existing schemes in Europe.	Paolo Bertoldi and Silvia Rezessy	Click here
Trading	This paper provides an overview of Australian EEO schemes and compares the effectiveness of having tradeable EEOs versus non-tradable EEOs.	Centre for Energy and Environmental Markets (CEEM)	Click here

Chapter 6: Developing the business case for your EEO scheme

Topic	Description	Organisation Name	Link
Economic analysis of demand-side programs and projects	This Standard Practice Manual contains details on California's method to evaluating energy saving investments using various cost-effectiveness tests.	California Public Utilities Commission	Click here
Energy efficiency cost-benefit frameworks	An overview of various states' cost-effectiveness tests that account for the health and environmental benefits of energy efficiency.	American Council for an Energy Efficient Economy (ACEE)	Click here
Energy efficiency benefit analyses	Overview and best practice guidelines for understanding the full benefits associated with improving energy efficiency.	Regulatory Assistance Project (RAP)	Click here
Cost-effectiveness evaluation framework	This webpage contains various resources to analyse how cost-effective your scheme is or will be.	California Public Utilities Commission	Click here
Developing a business case	A resource that lays out the steps of developing a business case and includes guidelines on the	Department of Finance, Australian Government	Click here

Topic	Description	Organisation Name	Link
	risk analysis, estimation of costs, and the cost-benefit analysis.		
Developing a business case	Government business case guidelines with a focus on helping to link the proposed intervention with outcomes and priorities. Includes detailed steps on completing a cost-benefit analysis and style tips.	New South Wales Government Treasury	Click here
Developing a business case	These guidelines are based on the internationally recognised best practice standard, the five case model. It includes a section on the methods and tools that can be used to develop a business case.	New Zealand Government Treasury	Click here
Developing a business case	Guidelines on the important considerations when developing a business case. These include, financial and economic analyses, market sounding, regulatory issues, and public interest assessments. This resource also includes process and product checklists.	Queensland Treasury	Click here
Developing a business case	A guide to developing a business case which includes a five-step methodology for the preparation of business cases. This resource includes detailed steps on determining the strategic context for your proposal.	HM Treasury, Welsh Government	Click here
Developing a business case	This webpage contains templates for a range of documents, including business cases, economic evaluations, and project budgets.	Victoria State Government	Click here
Developing a business case	Detailed steps of the business case development process.	Department of Finance, Northern Ireland	Click here
Cost-benefit analysis	This report analyses the costs and benefits of the EEO schemes in Europe.	European Council for an Energy Efficient Economy	Click here

Topic	Description	Organisation Name	Link
Cost-benefit analysis	Best practice guidelines on completing a cost-benefit analysis.	The Office of Best Practice Regulation, Australian Government	Click here
Cost-benefit analysis	Best practice regulation for Ministerial Councils and National Standard Setting Bodies. This resource includes an Appendix on the cost-benefit analysis.	Council of Australian Governments	Click here

Chapter 8: Ongoing monitoring, maintenance, and enhancement of existing EEO schemes

Topic	Description	Organisation Name	Link
Ongoing EEO monitoring	The evaluation details for the California Public Utilities Commission's energy efficiency program.	California Public Utilities Commission	Click here
Potential and goals study for energy efficiency	An energy efficiency potential and goals study for the California Public Utilities Commission energy efficiency program.	California Public Utilities Commission	Click here
Energy efficiency evaluation plan	A toolkit with several resources on guidelines for conducting energy efficiency evaluations and action plans.	California Measurement Advisory Council	Click here
Energy program evaluation planning	A new framework has been developed for the California Public Utilities Commission. A primary goal of the new framework is to establish an evaluation approach that provides reliable information, while also supporting continued program improvements and helping to meet the information needs of policymakers and program managers.	American Council for an Energy-Efficient Economy (ACEEE)	Click here

Topic	Description	Organisation Name	Link
Enhancing energy efficiency schemes	This paper describes how restructuring electric utilities can impact energy efficiency. The paper uses California and the Republic of Korea as case studies.	European Council for an Energy Efficient Economy	Click here
M&V review	This webinar provides a 'refresher course' to those with a basic understanding of M&V methods and focus on a few best practice examples, including M&V methodologies for EEO schemes. The webinar will explain what types of M&V might work best within different policy contexts, regulatory drivers, and other constraints (e.g., data availability).	Energy Evaluation Asia Pacific	Click here
M&V review	This project shares best practices for the effective implementation of M&V standards and methodologies.	APEC	Click here
Activity and method reviews	Previous reviews and reforms of the NSW Energy Savings Scheme. Includes the activities and methods that have been enhanced.	NSW Government	Click here
Activity and method reviews	Completed reviews and consultations on the Victorian Energy Upgrade program, including activity and method reviews.	Essential Services Commission, Australia	Click here
Method evaluation	Outlines the different types of method assessments and the specific steps to carry out in order to evaluate a method.	American Council for an Energy-Efficient Economy (ACEEE)	Click here
Target review	A review of the Retailer Energy Efficiency Scheme (REES) Guideline, which sets out reporting requirements for the data that retailers report to the Commission to enable it to apportion REES targets.	Department for Energy and Mining, Government of South Australia	Click here

Chapter 9: First principles review, and reform of existing EEO schemes

Topic	Description	Organisation Name	Link
Why evaluation is important for EEO schemes	The keynote speaker of the EM&V forum, Ed Vine offers insights on why a functional evaluation process is so critical for EEO schemes as drastic challenges brought about by climate change eventuate.	California Efficiency + Demand Management Council	Click here
Why energy evaluation is important in Asia Pacific	This brief leaflet provides an overview of the importance of energy evaluation in Asia Pacific. This leaflet also provides a list of related resources that may be useful in this context.	Energy Evaluation Asia Pacific	Click here
Research versus evaluation	Ways of framing the difference between research and evaluation.	Patricia Rogerts, Better Evaluation	Click here
Energy evaluation capacity building	This presentation provides capacity building for policy makers on energy evaluation.	Energy Evaluation Asia Pacific	Click here
Program evaluation	A guide for managing general program evaluation studies. Includes guidance on types of program evaluations, selecting the right type of evaluation, and advice on managing an evaluation.	Department of Energy, United States of America	Click here
Energy performance evaluation methodology	The project seeks to summarise and analyse energy performance evaluation methodologies, guidance and practices in APEC economies and other economies. In addition, it seeks to develop a comprehensive energy performance evaluation methodology for industrial enterprises and provide best practices case studies.	APEC	Click here
Policy and program impact evaluation	A handbook for policy and program impact evaluations. Both strategic planning frameworks and standard methodologies are provided.	Department of Energy, United States of America	Click here

Topic	Description	Organisation Name	Link
Energy efficiency program impact evaluation	A guide on key energy efficiency evaluation and M&V practices. Includes definitions, concepts, and steps for calculating savings, avoided emissions, and other impacts.	State and Local Energy Efficiency Action Network	Click here
Policy evaluation practices	A review that seeks to characterise the policy evaluation practices regarding public policies on energy, with a focus on the metrics: concerns, objectives, and indicators. Emphasis is placed on finding attributes and metrics that can be used to assess effectiveness, not only efficacy or efficiency.	Dania Ortiz and Vitor Leal	Click here
Energy efficiency evaluation framework	This report presents an integrated methodological framework to assess prospectively the energy, economic, and environmental impacts of energy efficiency policy measures.	Lawrence Berkeley National Laboratory	Click here
Policy evaluation framework	This report proposes a new framework for policy analysis and evaluation. The proposed framework was developed to identify factors that cause policy outcomes to diverge from the intended results.	Tinbergen Institute	Click here
Considerations when designing an evaluation	The Magenta Book provides a comprehensive overview of evaluation in government: its scoping, design, management, use and dissemination, as well as the capabilities required of government evaluators. It provides new material on the evolving approaches and methods used in evaluation; and emphasises the value of evaluation in providing evidence for the design, implementation, and review stages of the policy cycle.	HM Treasury, United Kingdom Government	Click here
Policy design, evaluation, and review	Methods and approaches to support the policy design, implementation, and review phases of the policy cycle.	Intergovernmental Science-Policy Platform on Biodiversity and	Click here

Topic	Description	Organisation Name	Link
		Ecosystem Services (IPBES)	
Evaluation guidelines	Evaluation policy and guidelines for evaluations for the Dutch Policy and Operations Evaluation Department. It situates evaluation policy in the government-wide framework for the evaluation of government policy in general.	Ministry of Foreign Affairs, Holland	Click here
Evaluation strategies for EEO schemes	Evaluation strategies for EEO schemes based on a review of the literature, participation in workshops, and interviews with over 50 program implementers, evaluators, and regulators in the United States and Canada.	Lawrence Berkeley National Laboratory	Click here
Building a sustainable energy evaluation system in the Asia Pacific	This paper proposes a framework to determine the most effective energy evaluation capacity building strategies for achieving various individual and group level outcomes, most effective strategies for certain types of participants, and design of different strategies to maximise their impact in a sustainable way.	Global Energy Interconnection Development and Cooperation Organization	Click here
Strengthening energy policy/program evaluations	This article discusses how to improve energy program/policy evaluations to maximise value.	Edward Vine	Click here
Energy efficiency program evaluation	A survey of state policies and practices for energy efficiency program evaluation in the United States.	American Council for an Energy-Efficient Economy (ACEEE)	Click here
Evaluation methodology in the UK	The evaluation methodology used for the UK's Energy Savings Opportunity Scheme review.	Energy Evaluation Asia Pacific	Click here
Swedish policy evaluation practices	Insights from a systematic review of Swedish policy evaluation practices.	Sofie Sandin, Lena Neij and Per Mickwitz	Click here

Topic	Description	Organisation Name	Link
Evaluation practices in the EU	This project explored energy evaluation practices in the European Union and developed resources on how they could be improved. These resources can provide shared learnings for other economies.	Energy Evaluation Asia Pacific	Click here
Policy evaluation	Theory-based policy evaluation of 20 energy efficiency instruments.	Mirjam Harmelink, Lars Nilsson, and Robert Harmsen	Click here
Policy best practices for energy efficiency	Best policy practices for promoting energy efficiency.	United Nations Economic Commission for Europe	Click here
Covid-19 impact on evaluation	Ed Vine presents his views on evaluating energy programs and policies and the impact of Covid-19 on these evaluations.	Energy Evaluation Asia Pacific	Click here

Chapter 10: Current policy trends for the next generation of EEO scheme reforms

Topic	Description	Organisation Name	Link
Covid-19 impact on energy efficiency trends	Tracking energy efficiency trends and policy impacts during Covid-19	Energy Evaluation Asia Pacific	Click here
Emerging challenges of energy efficiency evaluations	Emerging challenges to harmonising energy efficiency evaluations in an ever-changing policy environment.	Fabian Voswinkel, Fraunhofer Institute for Systems, and Innovation Research	Click here
Impact assessment	Victoria released a Regulatory Impact Statement that details the updated emissions intensity	Department of Environment, Land,	Click here

Topic	Description	Organisation Name	Link
	factors, based on anticipated future decarbonised electricity.	Water and Planning, Victoria	
Energy sector transformation	This paper discusses seven main challenges as the energy sector undergoes a transformation.	RMI (Rocky Mountain Institute)	Click here
Demand smoothing	In 2021 the South Australian Government replaced their “Retailer Energy Efficiency Scheme” with its 20% low income “priority group” target with a demand smoothing focused “Retailer Energy Productivity Scheme”, preferring targeted programs such as a subsidised virtual power plant for social housing to address energy affordability issues.	Department for Energy and Mining, Government of South Australia	Click here
Demand smoothing	This analysis was designed to be a comprehensive examination of the issues surrounding the development of accurate methods that focus on improving capacity-based demand response products.	KEMA	Click here
Demand smoothing	Opportunities and practices for peak demand savings from energy efficiency.	Lawrence Berkeley National Laboratory	Click here
Demand smoothing	This paper outlines the purpose of the new NSW peak demand reduction scheme, including a discussion on the activities which will be included.	NSW Department of Planning, Industry and Environment	Click here
Pay for performance	This paper outlines the opportunity to increase energy savings through pay for performance efficiency programs	NRDC (Natural Resources Defense Council)	Click here
Pay for performance	Lessons learned from pay for performance pilots for energy efficiency schemes, particularly in the United States. The paper provides recommendations for the market and regulatory conditions that would be necessary to replicate these pay for performance schemes.	Marion Santini, Dimitra Tzani, Samuel Thomas, Vassilis Stavrakas, Jan Rosenow, and Alessandro Celestino	Click here
Fuel poverty	15% of the overall target for Ireland’s EEO scheme (EEOS) must be delivered in residential	Department of the Environment, Climate	Click here

Topic	Description	Organisation Name	Link
	sector. The Irish Government has proposed that at least a third must be achieved through measures delivered in energy poor homes. This represents 5% of all savings required under the EEOS, a similar proportion of savings as was required under the 2014-20 EEOS.	and Communications, Government of Ireland	
Fuel poverty	In 2017, the UK Government committed to leveraging its EEO, the "Energy Company Obligation", to help upgrade all fuel poor homes by 2030.[98] This scheme includes sub-targets under a Home Heating Cost Reduction Obligation HHCRO for low income, fuel poor and vulnerable households to heat their homes.	Ofgem	Click here
Scheme goals	A post-implementation review of the Energy Efficiency Improvement Scheme (EEIS) was commissioned in 2017 to assess whether it remains appropriate, and how effective and efficient it has been in tackling the original policy problems and scheme objectives. This review process indicated that the EEIS should continue beyond 2020, with amendments to best support the ACT Government's priorities. This review provides a set of recommendations for updating the scheme, including short term opportunities (up to 2020) and longer-term possible improvements (post 2020).	ACT Environment Planning Sustainable Development Directorate	Click here

[98] (Fawcett, et al., 2019)

Further resources on case study EEOs

Case Study	Description	Link
1 – Brazil's Energy Efficiency Obligation on Electricity	The majority of the information in this case study was sourced from this report which details Brazil's specific choices for the components of this scheme.	Click here
	ANEEL M&V training guides based on the Performance Measurement and Verification Protocol (PIMVP) methodology. Note: the training guides are in Portuguese.	Click here
2 – California's Energy Efficiency Resource Standard	The majority of the information in this case study was sourced from this report which details California's specific choices for the components of this scheme.	Click here
	The California Public Utilities Commission webpage provides useful resources and databases, including energy efficiency best practices, cost-effectiveness calculators and federal guidelines.	Click here
3 – China's Grid Company Energy Efficiency Obligation	A case study on China's Grid Company Energy Efficiency Obligation, including full details of the components of this EEO scheme.	Click here
	Detailed EM&V processes under China's EEO scheme.	Click here
4 – France's Energy Efficiency Certificate Trading Scheme	The majority of the information in this case study was sourced from this report which details France's specific choices for the components of this scheme.	Click here
5 – India's Perform, Achieve and Trade Scheme	The majority of the information in this case study was sourced from this report which details India's specific choices for the components of this scheme.	Click here
	A training manual for energy efficiency written by the Bureau of Energy Efficiency, Government of India.	Click here
	An analysis of the effectiveness of India's EEO scheme.	Click here

Case Study	Description	Link
6 – The Energy Savings Scheme in New South Wales	The majority of the information in this case study was sourced from this report which details NSW's specific choices for the components of this scheme.	Click here
	IPART's website provides further detail including updated targets and legal authority for the ESS.	Click here
	A resource listing all of the calculation methods accepted under the New South Wales Energy Savings Scheme (ESS). Includes links to both M&V and DSF methods that explain when to use the method and provides specific guidelines.	Click here
7- South Australia's Retailer Energy Productivity Scheme	The majority of the information in this case study was sourced from this report which details South Australia's specific choices for the components of this scheme.	Click here
	Additional details were sourced from the website of the Essential Services Commission of South Australia, including documents accessible on this website.	Click here
8 – Vermont's Energy Efficiency Utility	The majority of the information in this case study was sourced from this report which details South Australia's specific choices for the components of this scheme.	Click here
	Efficiency Vermont has developed a technical reference manual, documenting the methodologies for calculating energy savings.	Click here
	This webpage provides details of the historical performance of Vermont's Energy Efficiency Utility.	Click here