

# Energy efficiency feed-in-tariffs: key policy and design considerations

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## Abstract

The energy efficiency of the buildings in which we live and work is well below economically optimal levels. One reason is that the markets in which families and businesses make efficiency investments are separate and fundamentally different from the markets in which investment decisions for power plants, transmission lines and distribution substations are made. Building owners typically have both much less information and much less focus on the energy implications of their investment decisions than do those who make investments in the energy supply infrastructure. In addition, they typically have much shorter investment horizons than those investing in energy supply infrastructure.

Energy efficiency feed-in-tariffs (FiTs) are a potential new approach to addressing these barriers. In a way, they are the obverse of energy efficiency obligations. Instead of establishing the quantity of energy savings desired and letting the market determine the price of meeting them, they establish a price that will be paid for energy savings and let the market determine the quantity of savings that will be delivered.

To date, no jurisdiction has adopted an efficiency FiT as its fundamental policy construct for generating energy savings. However, extensive experience with related concepts in the US and Europe – “standard offer” efficiency programmes, capacity markets and tradable white certificates – offers valuable insight into issues a grid operator would have to address when creating market mechanisms for efficiency resources and how markets

react to offers of fixed price payments per unit of energy savings. This paper draws on that experience to assess the potential pros and cons of efficiency FiTs, as well as to explore the following critically important design considerations:

- What is the target market?
- How should pricing be structured?
- How should payment be structured?
- How should savings be evaluated, measured and verified?
- How should it be administered?

## Introduction

In October 2012, the European Parliament and Council adopted the Energy Efficiency Directive (EED) (European Union 2012) to provide a stronger legal framework for Member States, energy companies, businesses and consumers to capture a growing fraction of the cost-effective energy efficiency potential still untapped in European economies. Well-crafted energy savings programmes and policies could provide substantial benefits across Europe: added employment and economic growth, improved energy security, and multiple environmental gains. A large portion of the energy savings sought in the EED will need to be delivered through Energy Efficiency Obligations (EEOs), or equivalent alternative measures, which Member States must create on terms set out in Article 7 of the Directive. In this setting, and in a period of seriously constrained public finances, policy-makers are rightly considering a range of techniques that could deliver the benefits of deep energy savings with only minimal reliance on public funding.

Substantial global experience over at least three decades reveals that there is no single “best” way to deliver large-scale energy-savings programmes. During debates over the EED, a great deal of attention was given to EEOs, which usually, but not always, require energy suppliers to work directly with final customers to deliver energy saving measures. Under such schemes, the obligated parties are required to help their customers achieve, in aggregate, specific savings targets, usually expressed as incremental annual savings. Some jurisdictions have achieved relatively high levels of new annual savings under such policies – in some cases for a number of years. In many of these schemes, energy suppliers or distribution companies play a dominant role in designing, delivering, paying for, and raising funds for, large-scale efficiency programmes (Crossley et al., 2012).

But other models have proven successful as well, and the Directive also anticipates that Member States may choose other mechanisms, including “*financing schemes and instruments or fiscal incentives that lead to the application of energy-efficient technology or techniques*” that will result in reduced end-use energy consumption (European Union 2012). In this paper we examine the benefits and challenges of one such technique, known as an Energy Efficiency Feed-in Tariff, or “EE FiT.”

### The Concept of Energy Efficiency Feed-in-Tariffs

EE FiTs are an alternative approach to delivering efficiency and improving the balance between demand-side and energy supply-side resources. For the purpose of this discussion, we define EE FiTs as having the following key characteristics:

- **Focus on prices, not quantities:** EE FiTs are in some measure the obverse of energy efficiency obligations. Instead of establishing the *quantity* of energy savings desired and letting the market (via the obligated energy companies, or otherwise) determine the price of meeting them, they establish a *price* that will be paid for efficiency savings and let the market determine the quantity of savings that will be delivered.<sup>1</sup>
- **Competitive third-party delivery:** EE FiTs do not depend upon performance by regulated utilities or energy suppliers alone. They create an open competitive market for the delivery of efficiency services by any qualified entity. That can include Energy Savings Companies (ESCOs), energy suppliers, distribution utilities, individual consumers, and even construction firms, equipment vendors, and related professionals.
- **Paying for performance, not for expenditures:** A basic goal of an EE FiT is to focus the policy instrument on energy saving results, not on the cost of achieving them. In its purest form, an EE FiT would pay only for measured energy savings as they occur over time (Bertoldi and Rezessy 2007, Bertoldi and Rezessy 2009). However, as discussed below, it is appropriate to take a broader approach to the definition of “performance,” including payments based on well-supported estimates in some savings categories (“deemed

1. Hybrids are also possible. For example, an EE FiT could offer a price for a capped quantity of savings, and pay less, or nothing, for savings beyond the initial target level(s). However, an abrupt cut-off could lead to an erratic market development.

savings”). It is also appropriate to consider paying up-front – at the time that energy-saving equipment is installed in customers’ premises – for the projected stream of savings reasonably expected to occur over the life of the installed measures. Similar arguments have recently been advanced by others (Eyre 2012).

The first of these features – the focus on price offered to deliver savings, rather than the quantity of savings delivered – is the most important in that it is unique to the concept of an EE FiT. Thus, we devote considerable attention to the issue of setting EE FiT prices in this paper.

The other two features of an EE FiT are also very important, but not unique to an EE FiT. For example, the inclusion of tradable white certificate schemes in the construct of Energy Efficiency Obligations (EEOs) has been implemented in some countries, perhaps most broadly in Italy, to open markets for delivery of energy savings to a wide range of potential market participants (Bertoldi et al. 2010). However, experience with a market that is as open as we envision an EE FiT should ideally be for the buildings and industrial sectors<sup>2</sup> –crediting savings of any fuel, from different customer classes, from both market-wide activities and individual projects, and delivered by a wide range of potential market participants – is limited. Thus, a portion of this paper is devoted to exploring the issue of target markets and who should be eligible to participate. Similarly, the concept of offering several different methods for estimating savings – including the use of deemed savings assumptions for some measures – and paying for lifetime benefits up front rather than over time, is common to most EEOs. However, because of the number of transactions and market players that will need to be addressed, the evaluation challenges under the EE FiT will likely be much more substantial than under most EEO schemes in use today. Thus, we devote a portion of this paper to exploration of evaluation, measurement and verification issues. Finally, because of the potential breadth of market participation and the related transactions costs of managing them, we explore a variety of issues related to the administration of an EE FiT.

No jurisdiction to date has created an EE FiT as its core policy construct for advancing investment in cost-effective efficiency. However, experience with a variety of related concepts in both the U.S. and Europe provides valuable insight into the critical design issues discussed above and the advantages and disadvantages of an EE FiT (relative to the alternative of an Energy Efficiency Obligation). Chief among these are:

- **“standard offer” programs in New Jersey, New York, California and Texas** in which Energy Efficiency Obligations have been met in part through the offer of standard payments per kWh of electricity saved and/or per therm of gas saved;<sup>3</sup>

2. Although broader programmes could be designed, we do not contemplate the potential application of the concept to additional sectors, such as agriculture and transportation in this paper.

3. The heyday of these programs was in the 1990s, but variants still exist today (sometimes under different names such as “pay-for-performance”). They differ from an EE FiT primarily in that they have generally been offered as just one part of a large portfolio of programmes designed to collectively meet an energy efficiency obligation (with no long-term commitment to continue to offer them), not as the fundamental policy construct for achieving savings. Also, the prices they offer are well below the market clearing price for energy because they are designed to optimize the amount of savings per dollar spent rather than to acquire all cost-effective savings.

- **the State of Illinois' electric efficiency procurement policy** in which the Illinois Power Agency (IPA) is required to procure all energy savings that are cost-effective and not already being acquired through the electric distribution utilities' energy efficiency obligation, in part through an open competitive solicitation (Ameren Illinois 2012, Commonwealth Edison 2012);<sup>4</sup>
- **the bidding of energy efficiency into forward capacity markets in Northeastern and Midwestern U.S. states** – where efficiency resources are allowed to compete with generators and demand response providers (through auctions) to provide resources to meet projected future (three years ahead) system peak capacity needs (Jenkins et al, 2009, Gottstein and Schwartz, 2010);<sup>5</sup> and
- **tradable white certificate schemes in Europe**, particularly those in Italy and France (Bertoldi et al. 2010).<sup>6</sup>

## Target Market

In this section we address several critically important questions regarding the potential target market and participation in an EE FiT:

- Which energy sectors should an EE FiT address?
- For which customer groups should payment for savings be provided?
- Should an EE FiT provide payment for both savings from retrofits of individual buildings and savings from broader market intervention programmes (e.g. influencing sales of efficient products at the point of sale)?

At least within the context of the buildings and industrial sectors, we argue that an expansive application of an EE FiT would be most appropriate. The principal potential advantage of an EE FiT is its ability to encourage creative approaches to generating energy savings by opening the market to a wide range of potential market actors. In general, the more expansive the scope of the EE FiT, the more likely that benefit is to be realized.

4. The policy was first implemented in 2012, with dozens of proposals submitted to the two electric distribution utilities charged with making recommendations to the IPA on what additional efficiency initiatives to acquire. The policy is different from an EE FiT in that it is only intended to "fill the gaps" in the utilities' efficiency programme portfolios, rather than serve as the core policy construct for achieving savings. Also, prospective bidders are not told in advance what price they will be paid for energy savings. Instead, they will be given whatever payment they request as long as it is less expensive than supply alternatives.

5. In New England, the first annual auction in which efficiency resources competed with generators was held in 2008 for delivery of peak capacity in the summer of 2010. The first auction in which efficiency could participate in the PJM region (Mid-Atlantic/Midwestern states) was held in 2009 for delivery in the summer of 2012. These markets are different from an EE FiT in that they are focused on peak demand rather than on annual energy and the price is set by the market (like a tradable white certificate scheme) rather than prescribed ahead of time.

6. In Europe, trading of white certificates has been permitted in Italy, France and the United Kingdom (UK). However, only "horizontal trading" among obligated parties has been permitted in the UK, dramatically limiting the number of potential market players and the amount of trading. In France, "vertical trading" between obligated parties and other market actors has been permitted, provided parties could deliver at least 1 GWh of lifetime savings and could demonstrate that the savings did not result in an increase in the total value of goods or services sold. That latter restriction is important. It appears, to have precluded retailers (e.g. of appliances or light bulbs) from participating. The Italian trading scheme is the most developed and the most open.

## WHICH ENERGY SECTORS?

In general, Feed-in-Tariffs have historically been considered primarily in the context of electricity markets, since they were initially conceived as means to increase the amount of electricity produced by wind, solar and other clean renewable energy sources. While production incentives for transportation bio-fuels are well-known, there has been much less development of renewable energy FiT equivalents in the gas sector<sup>7</sup>, and the concept of a FiT has not often been seen to be relevant to gas markets. However, that changes when the FiT concept is expanded to encompass energy savings from efficiency investments in buildings. There is no reason why an efficiency FiT could not apply equally to both electricity and gas consumption in the buildings sector.<sup>8</sup>

There are important reasons to consider establishing efficiency FiTs for both electricity and gas. First, many efficiency measures save both fuels in the same building. For example, adding insulation, replacing inefficient windows, and reducing air infiltration into buildings reduces both winter gas heating loads and summer electric cooling loads. An electric only FiT would therefore lead to under-investment in cost-effective efficiency by valuing only a portion of the benefits of some efficiency measures. Second, comprehensive energy roadmaps and policy models suggest that economically meeting long-term carbon emission reduction goals (i.e. 80 % emission reductions by 2050) may require making significant investments in the thermal efficiency of buildings and then fuel-switching most building space heating (as well as water heating and perhaps other end uses served by gas) to electricity from a de-carbonized electric grid (European Climate Foundation 2010). Thus, in the long run, **all** building efficiency investments may ultimately be saving electricity (a similar argument was advanced in Eyre 2012). For individual building owners, an electricity-only FiT might create an inefficient incentive encouraging some consumers to fuel-switch to standard electric heat before making thermal efficiency improvements,<sup>9</sup> "locking in" some inefficiency<sup>10</sup> and adding undesirable levels of demand to the power grid.

## WHICH CUSTOMER GROUPS?

Policy-makers must consider whether an efficiency FiT would be intended to acquire savings from all customers, or just a subset of end-use sectors – for example, just larger commercial and industrial customers. The one potential argument for limiting

7. One programme cutting across transportation and non-transport end uses is the Bioenergy Producer Credit Programme in the Province of Alberta, which pays different premiums for the production of second generation ethanol and bio-diesel as liquid fuels, and for bio-gas used in electric generation, as well as for direct biomass combustion for electricity (see <http://www.energy.gov.ab.ca/BioEnergy/1826.asp>).

8. One close analogue is the recently-adopted Renewable Heat Initiative (RHI) in the United Kingdom. Under the RHI, the Government requires payment of a price premium – essentially a FiT – to various systems deriving heat from renewable sources, including biogas and methane recovery, ground-source heat pumps, geothermal heat, solar thermal heat, and biomass boilers. Energy efficiency investments that would avoid fossil fuels are not eligible for these premium payments (see <https://www.gov.uk/government/policies/increasing-the-use-of-low-carbon-technologies/supporting-pages/renewable-heat-incentive-rhi>).

9. This might occur because customers with gas heating, for example, would not be able to access incentives from an electric only FiT unless they fuel-switched.

10. If fuel-switching occurs before the thermal envelop of the building is retrofitted to optimal levels of efficiency, the new electric heating systems will be over-sized, with adverse economic consequences (larger systems cost more) and potentially adverse impacts on efficiency (some over-sized systems do not operate as efficiently).

participation to savings from larger customers is that the entity administering the FiT could incur substantial transaction costs – to verify that qualifications to participate are met, to verify the reasonableness of savings claims, to police against double-counting of savings, to manage the transfer of data on savings claimed, to manage transfer of payments, etc. – if many small customers participated. However, because the transaction costs borne by participants will also be non-trivial – to document that qualifications to participate are met, to address Evaluation, Measurement and Verification (EM&V) requirements, etc. – it is highly likely that residential and small commercial customers could only realistically participate through aggregators such as ESCOs anyway. Moreover, in order to keep the market as open as possible to innovation, any concerns about transaction costs to administering an EE FiT would be best addressed through rules that address the issue of concern – a minimum size of any FiT claim – rather than the source of the savings in that claim. This has been done effectively in rules governing both participation in European tradable white certificate programs and in the North American forward capacity markets that allow efficiency resources to bid.<sup>11</sup>

#### INDIVIDUAL PROJECTS AND MASS MARKET PROGRAMMES?

The experience of numerous distribution utilities and other obligated parties suggests that substantial savings can be acquired, at levelized costs that are well below even today's energy prices, through programmes designed to influence customers' decisions during natural equipment replacement and/or other purchasing cycles. Such programmes typically combine customer rebates for efficient products with both marketing support and related efforts to recruit and train retail sales staff and business equipment vendors on how to sell efficient equipment. The range of products for which such programmes have been and are currently being delivered include CFLs, heat pump clothes dryers, commercial refrigeration and air conditioning equipment, furnaces and boilers of all sizes, commercial cooking equipment, motors, LED lighting fixtures and numerous others.

Though these programme approaches can be and often have been applied effectively to larger commercial and industrial customers, they are particularly important for capturing electric savings from residential and small commercial customers. Although there is substantial electric efficiency savings potential in the residential and small commercial markets, it cannot be affordably accessed through the building-by-building retrofit approach typically taken by ESCOs. Instead, it must be acquired by simultaneously influencing many efficiency investment decisions by many customers at the time new appliances and other energy consuming products are being purchased. Even some measures that can be cost-effective in a retrofit context – e.g. replacing incandescent light bulbs with CFLs – can be much more cost-effectively delivered through initiatives designed to influence retail sales.

11. For example, the French scheme only allowed market actors that produced at least 1,000,000 kWh in lifetime savings – the equivalent to anywhere between several thousand and 10,000 CFLs, depending on assumptions about CFL savings – to earn a certificate (Bertoldi et al. 2010). Similarly, the New England ISO requires a minimum of 100 kW of peak demand savings – the equivalent of roughly 20,000 CFLs based on local data regarding peak coincidence of savings – in order to bid an efficiency resource into its forward capacity market.

Thus, it is important that an efficiency FiT be designed to allow for payment for documented savings from programmatic as well as project/site-specific initiatives. There are some challenges that need to be addressed in such a design. For example, allowing both mass market programmes and individual efficiency projects in specific buildings to participate creates a potential for two different parties – the party providing a programme rebate for the measure and the party installing or arranging for the installation of the measure through a specific building project – to claim credit for the same savings. Rules for determining “ownership of savings” and careful monitoring to ensure such rules are followed, so that there is no double-counting of and paying for savings, will be necessary. This is an eminently addressable challenge. Indeed, the New England Independent System Operator (ISO) in the northeastern US has been effectively administering implementation of its Forward Capacity Market with such rules and systems for several years. Distribution utilities and other organizations that run efficiency programmes have developed a simple adaptation to these rules: any customer accepting a rebate legally signs over the rights to the market value of its energy savings to the programme administrator. Thus, those customers who are approached by independent ESCOs who want to acquire peak capacity savings must either (1) accept the programme rebate and reject the ESCO's offer, or (2) work with the ESCO and turn down the programme rebate.

#### Pricing and Payment

##### WHAT PRICE SHOULD PROGRAMMES PAY FOR PROVEN SAVINGS?

Pricing will be the most critical aspect of any FiT. At first blush, it may appear easy – just set the price equal to the price for electric (and/or gas) supply and the market will determine how much efficiency should be pursued. At a high level of generality, this could well lead to larger, societally efficient results.<sup>12</sup> However, that approach would lead to significant over-paying for relatively inexpensive efficiency savings.

Indeed, this has been the experience with markets for efficiency resources in which there was a single price paid for all such resources. Consider the “standard offer” programme offered by Public Service Electric and Gas (PSE&G) in New Jersey in the 1990s. That programme – one of the biggest, if not the biggest programme of its kind to date (PSE&G spent over \$1 billion on it) – offered ESCOs a fixed price per kWh saved (differentiated by the season and time of the savings) for any measures that they caused to have installed. A detailed evaluation of the programme concluded that 83 % of the efficiency savings produced were due to lighting retrofits in large commercial buildings (Edgar et al. 1998). The programme was far less successful in capturing savings from non-lighting measures such as HVAC and motors (which, together, accounted for less

12. In competitive markets, oil from low-cost wells receives the same market price as oil from high-cost wells and power from low-cost generators receives the same market price as power from high-cost generators. The same principle could be applied to energy efficiency savings delivered to a power system, with the same market-clearing price offered for all savings that are less expensive than supply-side resources. However, considering that an EE FiT is itself a market intervention designed to overcome market failures, policy-makers can design it to deliver maximum societal savings at even lower cost to consumers, and should be mindful of that opportunity.

than 6 % of efficiency savings).<sup>13</sup> Moreover, the programme paid an average levelized cost of 3.9 cents/kWh for those large lighting retrofits. That was lower than the full cost of power supply and delivery, but it might have been possible to acquire those savings *at even lower cost* (utility-run rebate programmes for commercial lighting retrofits in other jurisdictions typically cost ratepayers roughly 2 cents/kWh (or less).

The “problem,” if we can call it that, is that there is a very large gap between the cost to deliver the cheapest large-scale efficiency measures, and the cost of power supply and delivery that they displace. How much of the net savings should be (a) reserved to participating end-use customers, (b) paid to ESCOs, installers, utilities, and other efficiency prospectors, or (c) invested in delivering greater quantities of higher-cost efficiency or renewables resources?

Designers of EE FiTs will need to balance competing objectives in setting the FiT rates. On the one hand there is a need to provide an adequate profit margin for efficiency providers, to encourage their growth, strengthen their ability to attract staff and capital, and to innovate and test new programme designs. On the other hand, there is the common problem of “cream-skimming,” where efficiency entrepreneurs actively promote only the largest, least expensive measures with the largest short-run pay-offs, leaving “stranded efficiency” opportunities in the buildings initially served.<sup>14</sup>

Without conscious attention, “cream-skimming” could be a lasting consequence of badly-designed EE FiTs. While the degree of such “cream-skimming” under a single price FiT might change over time, as the “well” of cheap savings begins to “dry up,” the ability to capture other more expensive (but still societally cost-effective) savings will likely have been diminished in the process. This is because customers incur transaction costs in making efficiency improvements, particularly retrofit improvements. Thus, it may become difficult to convince at least some customers to invest the time and disruption required to deal with a second or third retrofit treatment. Moreover, participation in an initial efficiency project may lead some customers to inaccurately conclude that they have fully addressed their efficiency issues.

Finally, and perhaps most importantly, the installation of some inexpensive, “basic” efficiency measures can render the installation of more advanced measures with greater savings

uneconomic for many years. For example, once a decision is made to replace T12 commercial lighting fixtures with standard T8s or even high performance T8s, the opportunity to install even more efficient LED fixtures may be lost for 15 years or more (i.e. until the new T8s need to be replaced) because the customer will have to bear (a) the full cost of the new LED fixtures (rather than just the incremental cost relative to the T8s that would have been incurred had the LEDs been installed the first time), (b) a second set of installation costs (first for the T8s and again for the LEDs) and (c) the cost that an ESCO or vendor will charge to cover its transaction cost of recruiting the customer for a second round of retrofits.

How can good design address this problem? Put simply, an efficiency FiT will impose fewer costs on consumers and be most effective in generating savings – particularly in the long-term – if its pricing structure differentiates between different types of savings and rewards more comprehensive treatment of efficiency opportunities. Just as a renewable energy FiT should not pay the same price for wind energy as for solar – or for systems of different sizes or scales – because the same price is not needed to drive investments in those technologies, an efficiency FiT should not pay the same price for the easiest and cheapest savings as it does for the most difficult and expensive savings. Thus, FiT pricing should ideally be differentiated in one or more of the following ways:

- **By measure:** pay less for basic measures (e.g., CFLs and standard T8s) than for advanced measures with much lower market penetrations (e.g. LEDs).
- **By end use or value of savings:** pay more for end uses whose efficiency measures are less commonly pursued in the market and/or that drive peak demands and, therefore, will have greater benefits by reducing stresses on the grid. For example, California’s programme in the late 1990s offered incentives per unit of first year savings of \$0.05/kWh for lighting, \$0.08/kWh for motors and other measures, and higher amounts (\$0.165/kWh) for air conditioning and refrigeration measures, which would deliver high-value demand reductions in peak power periods (Schiller et al. 2000).
- **By market segment:** pay more for savings from hard-to-reach markets such as residential and small commercial customers; savings from low-income customers may be paid the highest premium.
- **By depth of savings:** consider paying bonuses for depth of savings. For example, the current New Jersey Pay-for-Performance programme offers a payment of \$0.18/kWh and \$1.80/therm of first year savings for projects that just meet the minimum requirement of 15 % savings. However, for every one percentage point greater savings the payment for all savings increases by \$0.01/kWh (with a cap of \$0.22/kWh) and \$0.10/therm (with a cap of \$2.50/therm).<sup>15</sup> That

13. Note that fuel-switching measures were also eligible to participate and were the second largest source of savings after lighting measures.

14. To be sure, concerns about cream-skimming are not unique to an EE FiT; they are ubiquitous in EEOs as well (e.g., lots of loft insulation and little solid wall insulation in the UK, lots of efficient boilers and little else in France, lots of efficient lighting and little else in Italy). The difference is in the price consumers pay for the cream-skimming. In the UK, for example, the energy providers have every incentive to keep the cost of meeting their obligation low because that cost gets embedded in the price they charge their customers for energy. Thus, if it costs them £0.01 per kWh saved from a CFL, that is the cost consumers will ultimately pay. In contrast, if an EE FiT offered £0.10 per saved kWh, consumers would pay ten times as much. The potential for such large profits should heighten incentives to cream-skin. Also, the use of a market-based mechanism like an EE FiT does not lend itself to regulation of the kinds of energy savings being acquired in the way that many EEO schemes do. This is one of the potential disadvantages of EE FiTs (particularly if not structured consistent with our recommendations on pricing). Actually, it is the disadvantage of any mechanism that offers a single market clearing price for efficiency products, because the cost of efficiency measures that are only marginally cost-effective relative to supply is so much higher than the cost of many other efficiency measures (in other words, the supply curve for efficiency is not flat or even close to flat if you go all the way up the curve to a point at or near the alternative cost of supply). Thus, this concern applies to tradable white certificate schemes as well.

15. These are the combined 2<sup>nd</sup> and 3<sup>rd</sup> (final) payments per kWh and therm. The first payment is a payment per square foot of building space to offset part of the cost of an efficiency assessment and plan. Note that the caps only provide additional marginal incentives to increase electric savings to 19 % and to increase gas savings to 22 %. That is not an ideal structure, as savings well above 22 % are often cost-effective (for more details see: <http://www.njcleanenergy.com/files/file/Pay%20for%20Performance%202011%20Forms%20and%20Applications/P4P%20EB%20Incentive%20Structure%20002-10-11.pdf>).

means the marginal payment for the 16<sup>th</sup> percentage point of savings is \$0.34/kWh and \$3.40/therm – or roughly double the payment for each of the first 15 percentage points of savings.<sup>16</sup> This obviously encourages deeper savings, but even with these higher marginal rates, both the marginal and overall efficiency investments are still quite cost-effective.<sup>17</sup>

#### WHAT SAVINGS LIFE SHOULD BE RECOGNIZED?

In addition to establishing the initial price(s) paid per kWh, an efficiency FiT must be clear about the number of years of savings for which it will pay. If efficiency resources are to be fully valued, *it is critical that they receive payment that recognizes all of the savings produced over their useful lives.* That has been the approach taken with most U.S. standard offer programmes, the Illinois Power Agency's procurement requirement, and the New England ISO's forward capacity market. Arbitrary caps on the lives of measure savings – which some initiatives have put in place<sup>18</sup> – will inherently undervalue longer-lived measures and lead to less than optimal levels of investment in such measures.

In that context, it would likely make sense to initially establish deemed measure life assumptions, at least for common measures. Such assumptions could be updated over time as new information becomes available. Ideally, such updates would only apply to any new savings brought to the market after the update, and would not pose a financial recovery risk to customers or ESCOs with respect to efficiency investments already committed.

Measure life assumptions for less common or custom measures would need to be established through documentation provided by the parties bringing the savings to the market, with review and approval by the system operator or other designated party.

#### WHEN SHOULD PAYMENTS BE MADE?

An efficiency FiT policy must also establish when payments for efficiency savings will be made. Options range from a full up-front or first-year payment for the projected lifetime savings, to paying each year for only that year's savings (e.g., ten separate payments – one each year – for a measure or project with a ten year life).

In general, the greater the fraction that is paid up front, the more attractive the offer will be to prospective market participants. Up-front payments reduce transaction costs for market participants (as well as for the FiT administrator), reduce real or perceived risks associated with future payments and diminish or eliminate the need to raise long-term capital to finance efficiency projects. To the extent that there is significant enough

uncertainty about the magnitude of savings, there will be some advantage and even need to defer some payments until savings can be better documented through EM&V (see discussion below). However, that is likely to be the case only for more complex, custom commercial and industrial efficiency projects. Moreover, even in such cases, it should not take more than a year or two after installation to establish a reasonable estimate of annual savings.

For those reasons, standard offer-type programmes in the US have evolved from making annual payments for annual savings to significantly accelerating payments for delivered measures in anticipation of their long-term savings. For example, PSE&G's standard offer programme in New Jersey in the 1990s offered contracts to participating customers or ESCOs in which it committed to payments over a 5 to 15 year time horizon, depending on the types of measures being installed. In contrast, the current "pay-for-performance" programme in the state makes three separate payments: one for completion of an energy reduction plan, a second for installation of measures based on projected energy savings and a third typically a year later based on actual measured reductions in consumption.<sup>19</sup> New York's performance-based incentive programme paid out incentives "over a two-year measured performance period" (Schiller et al. 2000). Similarly, entities that submitted proposals which were ultimately accepted by the Illinois Power Agency will be paid for all costs requested in their bids, therefore indirectly covering the full lifetime value of the savings, within a year of the work being completed. Some payments may be made as expenses are incurred, with holdbacks to allow for adjustments resulting from evaluation of actual savings achieved.

One could argue that paying for the full lifetime savings of efficiency measures or projects immediately after the measures are installed or the projects are completed would be treating efficiency resources differently, indeed more favorably, than the way supply resources are treated. However, efficiency resources and supply resources are different in ways that suggest different payment approaches may be appropriate. In particular, non-renewable supply resources are both dispatchable and incur significant variable costs (primarily fuel costs) when they are dispatched. Thus, their production cost and power market revenues vary considerably from year to year. Moreover, they incur significant variable costs (primarily fuel costs) when they are dispatched, so paying them in full for a lifetime of electricity production would eliminate any incentive to actually run when they are needed. Many renewable supply resources, including wind and solar, are non-dispatchable. However, their production can still vary considerably from year to year, and support schemes are designed to encourage maintenance and operational decisions that will maximize production from these high-capital-cost facilities.

In contrast, the savings from most efficiency measures are both non-dispatchable, very predictable (at least on average),

16. Although the increase in payment is only about 5 % higher (i.e. 0.19/kWh for 16 % savings vs. 0.18/kWh for 15 % savings), the increased payment applies to all 16 % of the savings, not just the increment above 15 %.

17. The premiums paid are just for the "first year" savings; since the efficiency measures will deliver savings for many years (typically 10 to 15 years or more), the premium paid is much lower than the system avoided cost when calculated on a lifetime basis. Indeed, the marginal incentive of \$0.34 per first year kWh in the note above is equivalent to \$0.03 per kWh when levelized over a 15 year life using a 5 % real discount rate.

18. For example, under the PJM Reliability Pricing Model (the Mid-Atlantic/Mid-western states' forward capacity market), efficiency measures are allowed to receive payments for a maximum of only four years.

19. The current programme is different from the 1990s standard offer in several other ways as well: (1) it is targeted to only commercial and industrial customers with a minimum baseline demand of at least 200 kW), whereas the 1990s programme was open to customers of all sizes; (2) it requires that a minimum facility savings of 15 % be achieved in order to receive any payments, whereas the 1990s programme had no minimum; (3) its payment per kWh of electricity saved and per therm of gas saved increases as the savings percentage increases (see discussion above); and (4) its M&V requirements are much less onerous (see discussion below).

and do not require continuing incentives to make sure they are “dispatched” to the grid. Moreover, as discussed above, there are significant market barriers to their installation which can be overcome by revealing their values to investors and building owners at the time their capital costs are being borne.

## Evaluation, Measurement and Verification (EM&V)

### BALANCING PRECISION AND COST

If all consumers are to pay for delivered energy savings, and if power and gas systems are to rely on them for energy security and grid stability, then it is imperative that the delivered savings be “real”. That is true regardless of whether savings are delivered through a binding savings obligation, an efficiency FiT or any other policy mechanism. However, EM&V will likely be more complicated under an efficiency FiT primarily because the number of parties participating and delivering savings is likely to be greater than under a savings obligation scheme imposed on a discrete number of energy suppliers. Under most savings obligation schemes,<sup>20</sup> it is usually enough to assess the accuracy of savings estimates from an appropriately sized representative sample of customer efficiency projects, and apply any resulting “correction factors” to the portfolio of savings reported by the obligated party to determine whether it met its targets. Under an efficiency FiT, it will be necessary to ensure that any party contemplating participation in the market expects savings claims to be carefully scrutinized before payments are made.

In the past, some have assumed that such scrutiny requires that savings from an EE FiT – or related efforts like standard offer programmes – be verified ex post, on a project-by-project basis (Bertoldi and Rezessy 2007, Bertoldi and Rezessy 2009). However, that approach has proven to be unnecessarily cumbersome and expensive, undermining the objective of attracting a wide range of potential market participants. For example, under PSE&G’s standard offer programme in New Jersey in the mid-1990s, each project had to have a pre-approved M&V plan that typically involved continuous metering of hours of operation of efficiency measures for many years, even though most of the measures installed involved “constant load, constant operating hour, non-weather sensitive end uses such as lighting system retrofits and constant load motors” (Edgar et al. 1998). These requirements imposed significant costs on prospective programme participants and were cited by a number of ESCOs as a significant barrier to participation (Kushler and Edgar 1999).

There are reasonable alternatives to such onerous requirements. TXU Electric’s standard offer programme had a three tiered M&V structure: (1) deemed savings;<sup>21</sup> (2) simple M&V;<sup>22</sup>

and (3) full M&V.<sup>23</sup> The method chosen for particular types of investments and customer types depended on the availability of data from past studies on usage data and/or savings, the predictability of equipment operation and/or precision vs. cost trade-offs (Schiller et al. 2000). This approach is still used in the current Texas standard offer programmes, with almost all participants using the deemed savings option.

Like the Texas standard offer programme, the Illinois Power Agency’s efficiency procurement relies heavily on deemed savings values recently documented in the state’s new Technical Reference Manual (TRM). That is particularly important for Illinois because the procurement is focused exclusively on residential and small business customers for which the costs of site-specific M&V would be prohibitive. Though the use of the TRM helps reduce performance risk to prospective bidders, it does not eliminate such risk. There are two Illinois-specific reasons for this. First, bids for efficiency resources are requested a little more than a year before the programmes would actually be launched. Bidders are told that they will be required to use the savings values in the TRM on the day that the programmes are launched, not on the day that bids are submitted. It is possible that the values in the TRM will be changed in the intervening 12+ months. That is not a huge risk, as the TRM values have been painstakingly vetted and evaluations to update values are targeted to a relatively small number of measures each year. Nevertheless it is a risk. The bigger risk is that net-to-gross adjustments – i.e. adjustments to reflect free ridership and spillover effects – are not deemed for new programmes until an evaluation of such programmes has been completed.

In short, it will be important for any FiT initiative to balance the desire for precision with which actual achieved savings are estimated and compensated, against the costs for evaluation activities themselves and the dampening effect that evaluation uncertainty will have on the willingness of market actors to participate. Such balance will be particularly important in the context of a FiT that aims to address savings opportunities in a range of sectors, including residential customers.

### EVALUATION INDEPENDENCE

A second key EM&V consideration relates to who is responsible for conducting EM&V reviews. Obviously, those entities seeking payment for efficiency savings need to be prepared to clearly document and report on the savings they believe they have achieved. However, such savings claims also need to undergo some level of independent assessment.<sup>24</sup>

At a minimum, the independent assessment will involve a review of any EM&V data collected and submitted as part of the savings claim. Ideally, it would also involve the FiT administrator in conducting its own EM&V (or at least directing the conduct of the EM&V), rather than allowing project sponsors who have a vested stake in the outcome to manage the M&V process. That is the approach taken by the New England ISO in documenting efficiency savings delivered through

20. The exception would be those which use white certificates and allow vertical trading between obligated parties and a wide range of potential market actors. As with an EE FiT, the application of EM&V to such schemes should require adequate assurance that savings are reasonably accurate not at the portfolio level, but rather for every market actor claiming payments for savings delivered.

21. Savings assumptions for measures that are stipulated in advance of their installation. Numerous jurisdictions in the US now have extensive (i.e. hundreds of pages long) Technical Reference Manuals that document deemed savings assumptions, any calculations or formulae underlying them and the sources of all assumptions.

22. For example, conducting short-term testing to develop inputs to pre-set savings calculations.

23. For example, whole building analysis, calibrated simulation modeling or extensive metering of end use equipment or systems.

24. The principle of independent verification reinforced in the EU’s 2012 Energy Efficiency Directive, which states that Member States must develop and file a report on “monitoring and verification protocols and how the independence of these from the obligated, participating or entrusted parties is ensured” (EED Annex V at (4)(j)).

its Forward Capacity Market. First, its M&V Manual requires that all bidders commit to having an independent third-party review and endorse their savings claims. The third party that will play that role must be identified through the M&V plan submitted by prospective bidders as part of a qualification package that must be submitted and approved by the ISO before participants can participate in the Forward Capacity Market auctions. The ISO has hired its own independent efficiency evaluation experts to help it review those plans. It also periodically conducts "audits" of the procedures market participants use to claim savings.

### FiT Administration

As with any policy instrument, an efficiency FiT would require some administrative rules and processes in order to function efficiently. Based in part on the experience of the New England Independent System Operator's management of its forward capacity market, we have identified the following issues as among those that should be addressed by such rules and processes:

- **Programme policy, design, and continuous improvement.** As noted in this paper, there are a number of foundational design choices in setting up any efficiency FiT. Aside from broad policy decisions, most of these design details are appropriate for administrative, rather than legislative, decision-making. Energy regulators, energy ministries, or special-purpose efficiency agencies should be given the responsibility to supervise an efficiency FiT, to set and update deemed savings rates, to ensure quality control and protect consumers, and to make forward-looking adjustments that will lower costs and raise savings levels.
- **Pre-qualification process.** The efficiency FiT administrator will need some assurance that businesses that are delivering energy savings are reputable and trustworthy, so that the prospects for fraud or even difficulties with data tracking and reporting are minimized. One option would be to create a pre-qualification process in which businesses interested in participating in the market must demonstrate that they meet minimum requirements for participation.
- **Minimum size requirements to participate.** The efficiency FiT administrator will incur transaction costs – to manage the transfer of savings data, to police against double-counting of savings, to assess the reasonableness of the savings claims, to periodically audit savings claims, to manage the transfer of payments for verified savings, etc. – for each participant bringing energy savings to the market. One option for keeping administrative costs at a reasonable level would be to require a minimum level of savings in order to participate in the market. Any minimum threshold should balance the desire to minimize administrative costs with the desire to spur entrepreneurial efforts to acquire savings. As a point of reference, the New England Independent System Operator (ISO) has set a minimum of 100 kW for bidding into its capacity market. That is equivalent to the peak savings of approximately 20,000 CFLs or between 500 and 1,000 annual MWh of energy savings. With that cut-off, the ISO had fewer than 70 different efficiency resource "projects" (from approximately 25 different companies) cleared the market

in its first year.<sup>25</sup> Note that a pre-qualifications process may itself be sufficient to preclude very small bids. For example, the level of effort required to assemble and submit a bid in the Illinois procurement process appears to have been substantial enough to keep the number of bidders at a manageable level.

- **Expressions of intent to participate.** It will be important for the FiT Administrator to be able to forecast, within some reasonable margin of error, how much savings are expected to be brought to the market. That would allow for planning regarding how much revenue should be collected in rates to cover the costs of acquiring the energy savings, as well as planning for system transmission and distribution upgrades, power supply needs, and the like. One way to do that would be to require prospective market participants to file a notice that they intend to participate in the EE FiT programme, including a forecast of how much savings they expect to deliver, several months before the start of a programme period. There may need to be limitations on how much a provider's actual savings in that year can deviate from its forecast.
- **EM&V manuals.** The FiT administrator will need to develop and maintain a set of rules regarding how savings are estimated and claimed. This would likely include a "Technical Reference Manual" in which deemed savings values and deemed savings algorithms are clearly articulated. It would also include guidance on how custom assessments of savings (e.g. for larger commercial and industrial retrofits) can be conducted. Further, there will need to be a transparent process governing how such assumptions and guidelines are periodically updated.
- **Auditing of savings claims.** As noted above, the FiT administrator will need to conduct periodic audits of participants' savings claims to make sure savings are real and accurate. Protocols for how such audits are conducted and how they are paid for will need to be developed.

### Pros and Cons of an Efficiency FiT

Throughout much of this paper we address a variety of design issues that would need to be carefully addressed by any jurisdiction that decides to use an EE FiT to increase investment in cost-effective efficiency measures. However, that discussion begs the most fundamental question about an EE FiT: whether and where it would be the best approach. Put another way, is it a better policy construct for increasing investment in efficiency than an Energy Efficiency Obligation (EEO)? If so, under what conditions?

As noted in the discussion above, there are a number of potential advantages and disadvantages of an EE FiT. At the highest level, we believe that the key issues to consider can be broken down into the following six categories:

- **Costs to consumers.** The costs of both an EE FiT and an EEO will ultimately be borne by all electric and gas con-

25. Based on analysis of raw data on participation provided to interested parties in a Microsoft spreadsheet by ISO New England.

sumers (and, to the extent it is important locally, consumers of other fuels too). Which scheme will cost the most for a given level of efficiency improvement? As in most areas of public policy the relevant question is “compared to what?” Regarding consumer costs, we must consider both the *direct cost* of the efficiency program, and the *total savings* delivered by the program. As noted above in the discussion of cream-skimming, the public policy question is not “which approach yields lower costs per saved kwh?” but rather, “which approach yields the greatest net savings to consumers and the economy?” In general, an EEO without tradable white certificates will be less expensive to consumers than an EE FiT because obligated entities either have a strong incentive to minimize the costs passed on (in a competitive retail environment such as in the UK) or have regulators limiting the costs that can be passed onto consumers. In contrast, mechanisms such as EEOs with “vertically tradable white certificates”<sup>26</sup> or EE FiTs which establish a single market clearing price for energy savings, could result in significantly higher payment for much of the savings acquired. As discussed above, this disadvantage can be minimized by setting different prices for different types of energy savings, but it cannot be eliminated. On the other hand, because an EE FiT has the advantage of opening up additional savings opportunities to more independent actors, and thus tapping a deeper pool of savings in more places, it might offer the potential to ultimately save consumers and society more, when compared either with supply-side costs, or with demand-side programs open to only a limited number of delivery agents.

- **Regulatory/Administrative complexity.** Most jurisdictions prefer policies that are less complex to administer, because it results in lower costs to government, less need for specialized expertise that may be in short supply, less likelihood of unanticipated problems, and less need for ongoing adjustments. Market based mechanisms that are truly open to a wide range of potential market participants, such as EEOs with vertically tradable white certificates and EE FiTs, will by necessity be more complex to administer than an EEO imposed on a much smaller number of obligated entities. That said, we believe that this complexity is eminently manageable. We also believe that the additional costs it imposes on consumers is likely to be very modest relative to the level of investment in efficiency measures. Moreover, governments often find it difficult to ensure a high level of performance by just a few traditional utility actors than it might be to supervise high quality performance among a larger number of firms that are truly competing to deliver energy savings.
- **EM&V complexity.** Market based mechanisms that are open to a wide range of potential market participants, such as both EEOs with vertically tradable white certificates and EE FiTs, will by necessity be more complex to evaluate than an EEO imposed on a much smaller number of obligated entities. For example, the savings generated by an

obligated entity’s program to retrofit 1,000,000 homes can be accurately evaluated by assessing a random sample of homes treated, with the sample size a function of the level of statistical precision desired. In contrast, if the retrofitting of 1,000,000 homes was accomplished, in aggregate, by 1,000 different market participants (retrofitted an average of 1,000 homes each), the number of homes whose savings would have to be assessed to achieve the same level of statistical precision for the savings claims of each of the 1,000 different market participants would be substantially higher. As discussed above, we believe that the EM&V complexity associated with both an EE FiT and an EEO with tradable white certificates can be minimized without significant sacrifices to accuracy and is eminently manageable. However, it will be more challenging than for a standard EEO with fewer obligated parties and less variety in savings measures and approaches.

- **Certainty that a desired level of savings will be achieved.** By definition – assuming EM&V is sufficiently rigorous – an EEO, with or without tradable white certificates, should produce something close to the level of savings desired. In contrast, also by definition, one cannot precisely predict how much savings an EE FiT will produce. Instead, an EE FiT should produce whatever amount of savings is cost-effective and marketable at a particular price. Some might consider the inability to forecast how much savings will be produced by an EE FiT a disadvantage. Alternatively, some might suggest that the appropriate policy objective should not be to produce a prescribed amount of savings, but rather to produce as much savings as is cost-effective, and to uncover new ways to drive the cost of attainment lower. Under that view, an EE FiT would have an advantage over EEOs.
- **Certainty/“bankability” of revenue streams for efficiency product and service providers.** By fixing and making transparent the price that will be paid for energy savings, an EE FiT provides certainty to the market about the value of an efficiency investment. It has been argued that price-based mechanisms have increased the “bankability” of renewable energy projects (Eyre 2012) Presumably the same would be true for efficiency projects, with the added advantage that EE FiTs would mostly be paid ex ante, and the risk of loss from a later change in policy would be less.<sup>27</sup> Perhaps similar financial security could be realized through a well-designed set of efficiency programs under an EEO – e.g. with the offer of a specific rebate level, guaranteed to remain unchanged for a prescribed period of time<sup>28</sup> – but third-party delivery agents will require contracts in advance from obligated entities, which creates a rather small market pool of buyers for efficiency under the usual EEO scheme.

26. We borrow this term from Bertoldi et al. 2010 to refer to certificates that can be generated by a host of independent third parties and sold to obligated entities.

27. See, e.g., the recent decision in Spain to lower the feed-in rates paid to existing renewables projects that were built in reliance on higher expected long-term feed-in tariffs.

28. The key question would be why an obligated entity would want to lock in a specific rebate level for any length of time. There would need to be sufficient inducement, either in the way the EEO was structured (multi-year savings targets rather than single year targets would certainly help) or through regulation of the obligated parties to ensure both short-term and longer term objectives are considered (as is done in many U.S. jurisdictions).

- **Openness to a Wide Range of Potential Market Participants.** In general, the more open a market is to new ideas and new entrants, the more likely it is to produce innovation and creative solutions. In the context of efficiency, that means the more likely it is to unearth new reservoirs of cost-effective savings. Both EE FiTs and EEOs with open entry and vertically tradable white certificate schemes offer this potential. In either case, it is important to drive innovation by designing the acquisition program to minimize cream-skimming, reward deeper savings and savings in hard-to-reach segments, and to permit entry by a variety of qualified providers. The few white certificate schemes that have seen a meaningful amount of trading have not yet accomplished these objectives.

In summary, if judged purely on likely outcomes, the decision on whether to pursue an EE FiT or an EEO would likely boil down to whether the perception of the potential for deeper savings and greater innovation through the involvement of more market participants will outweigh the potential of higher costs per unit saved to consumers, greater administrative complexity due to more participants, and less certainty about savings levels. Until an EE FiT is actually tested at scale, it will be difficult to forecast the magnitude of its advantages and disadvantages.

Nevertheless, it should be noted that in some jurisdictions EE FiTs may be politically more attractive than EEOs. In some cases, this is due to the predominant economic philosophy supporting competition and open entry to efficiency markets; in others it may be driven by the rules governing the means of passing different kinds of costs onto consumers. And in many jurisdictions, the question turns on the historic level of trust in the incumbent energy providers or delivery companies, and whether the government wants these entities to dominate the efficiency sector either as delivery agents or as monopsonist purchasers of efficiency services. Particularly in jurisdictions in which there is no existing EE delivery agent with a strong track record, an EE FiT may be easier to adopt than an EEO, and its potential benefits merit serious consideration.

## Conclusions and Recommendations

Efficiency FiTs are an intriguing new concept for accelerating investment in end-use energy efficiency. Efficiency FiTs may offer the potential to overcome much of the inertia on end-use efficiency that has characterized most power and natural gas systems across the globe. Many jurisdictions have seen an explosion in interest in PV installations, in biofuels, and in wind power following creation of FiTs. By inviting many businesses (rather than just energy suppliers), to participate in generating energy savings efficiency, efficiency FiTs have the potential to unearth and harness innovations in delivering cost-effective energy savings that have not been seen to date.<sup>29</sup> That potential could be critical to minimizing the costs of meeting long-term greenhouse gas emission reduction obligations, while main-

taining 21<sup>st</sup>-century reliability standards, and lowering the fossil fuel burden on modern economies.

However, there are substantial challenges to effective implementing of efficiency FiTs. Unlike savings obligations imposed on energy suppliers, they do not necessarily ensure that a prescribed level of savings will be achieved; if a jurisdiction wishes to ensure that particular savings targets are met, programme administrators must retain a certain amount of administrative flexibility and the ability to change incentive levels over time. Moreover, badly-designed FiTs could be complicated to administer, encourage “cream-skimming” and/or raise the average cost of energy saved, as compared with a more straightforward EEO.

These challenges are not in themselves reasons to avoid creating an efficiency FiT. As with many other innovations in energy policy – including Renewables Obligations, competitive retail power markets, demand response programmes, “smart” metering, and many others – experience on the ground is needed in order to test the idea and learn. Until an efficiency FiT is tested on a large scale, it is difficult to make definitive determinations as to how it compares to energy efficiency obligations and/or other policy mechanisms for generating energy savings. Indeed, whether it is the best approach in any jurisdiction may well depend in large part on local conditions, including whether it is politically possible to establish a system-benefits charge funding mechanism; the degree to which there are obvious parties to “obligate” to meet savings targets; the degree to which those parties are trusted; the degree to which there are prospects for a well-functioning, competitive, and high-quality ESCO industry; evidence as to the ability and willingness of incumbent utilities, distribution companies, and energy service providers to promote deep, sustained savings; and the political and practical history of energy-savings programmes in that jurisdiction.

One thing that is clear is that the *design* of any efficiency FiT will be critically important to its prospects for success. As discussed above, experience with similar or related mechanisms leads us to a number of conclusions regarding design:

- It should be structured to allow both mass market programmes and individual retrofit projects to participate
- It must establish “ownership” rules to ensure no double-counting of savings results;
- It will be most effective if simultaneously established for both electric and gas savings;
- It must be supported by a viable, long-term source of revenues to support private investments by customers, ESCOs and other potential market participants;
- The price paid for energy savings should vary by both (1) expected costs of different kinds of measures and (2) the depth of savings achieved, and may vary to reflect other important values, such as addressing energy poverty, addressing peak loads, improving reliability in congested load pockets, etc;
- Payment should be made for the full estimated quantity of lifetime savings of measures/projects (though not necessarily the full value of the savings to the power system as a whole);
- Payments should be made up-front for any measures with deemed savings (or that use deemed savings algorithms);

29. To give but two examples, we simply do not know whether customer aggregation via new “social media” sales techniques would enable a more rapid penetration of new efficiency measures across thousands or tens of thousands of households and small businesses; or whether an efficiency FiT could be combined with a rooftop solar FIT to lower the costs and raise the penetration rate of both. But we do know that both the potential for efficiency savings, and the potential for innovation in programme design remain quite large.

but can be made across appropriate time periods for larger, individualized projects to ensure that payments for savings from such projects accurately reflect the results of required EM&V programs;

- Savings claims by market participants should be validated by independent third parties, and periodically audited by the FiT administrator; and
- Administrative systems that will need to be put in place should be developed through a process that engages a range of potential stakeholders, with the final products being as clear and transparent as possible.

Finally, because efficiency FiTs have not yet been tested, they will almost certainly require fine-tuning as experience with their implementation is gained. Perhaps most importantly, pricing structures will need to be refined once the market response sheds light on which prices may be too high or too low to optimize investment in different types of efficiency measures and programmes.

## References

- Ameren Illinois, "Electric Energy Efficiency Compliance with 220 ILCS 5/Sec. 16-111.5B: Program Year June 1, 2013–May 31, 2014", July 12, 2012.
- Bertoldi, Paolo and Silvia Rezessy, "A Step into the Unknown: Feed-in-Tariff for Energy Saving", *European Council for an Energy Efficient Economy*, 2007 Summer Study Proceedings, pp. 93–102.
- Bertoldi, Paolo and Silvia Rezessy, "Feed-in-Tariff for Energy Saving: Thinking of Design", *European Council for an Energy Efficient Economy*, 2009 Summer Study Proceedings, pp. 121–129.
- Bertoldi, Paolo et al., "Energy Supplier Obligations and White Certificate Schemes: Comparative Analysis of Experiences in the European Union", *Energy Policy*, 38 (2010), pp. 1455–1469.
- Commonwealth Edison Company, "Load Forecast for Five-Year Planning Period: June 2013–May 2018", submitted to the Illinois Power Agency, July 15, 2012.
- Crossley, David et al., "Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes", published by the International Energy Agency and the Regulatory Assistance Project, 2012.
- Edgar, George, Martin Kushler and Don Schultz, (all on behalf of the Wisconsin Energy Conservation Corporation), "Evaluation of Public Service Electric and Gas Company's Standard Offer Program", prepared for PSE&G, October 14, 1998.
- European Climate Foundation, *Roadmap 2050: Practical Guide to a Prosperous, Low-Carbon Europe*, Volume 1, April 2010. See [www.roadmap2050.eu](http://www.roadmap2050.eu).
- European Union, Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2012/30/EU and repealing Directives 2004/8/EC and 2006/32/EC, OJ L 315/1, 14.11.2012.
- Eyre, Nick, "Energy Saving in Energy Market Reform – the Feed-in-Tariffs Option", *Energy Policy*, 52 (2012), pp. 190–198.
- Gottstein, Meg and Lisa Schwartz, "The Role of Forward Capacity Markets in Increasing Demand-Side and Other Low-Carbon Resources: Experience and Prospects", Regulatory Assistance Project, May 2010.
- Jenkins, Cheryl, Chris Neme and Shawn Enterline, Energy Efficiency as a Resource in the ISO New England Forward Capacity Market, 2009 ECEEE Summer Study Proceedings, pp. 175–183.
- Kushler, Martin and George Edgar, "Lessons from Granddaddy: Observations from the Evaluation of the New Jersey PSE&G Standard Offer Program", in Proceedings of the International Energy Programme Evaluation Conference, Denver, Colorado, 1999.
- Schiller, Steven, Charles Goldman and Brian Henderson, "Public Benefit Charge Funded Performance Contracting Programs – Survey and Guidelines", in Proceedings of the 2000 ACEEE Summer Study on Energy Efficiency in Buildings.