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CAN COMPETITION ACCELERATE ENERGY SAVINGS? OPTIONS AND CHALLENGES FOR EFFICIENCY FEED-IN TARIFFS.

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ABSTRACT

Numerous studies have documented the critical market barriers that suppress consumer investments in energy efficiency well below economically optimal levels. Meanwhile, the policy imperatives for increasing such investments – particularly the need to address global climate change – have never been more compelling. This paper examines how a new policy construct – an energy efficiency feed-in-tariff (EE FiT) – might be designed to address this problem. While an EE FiT will not always be the best approach, its potential benefits merit serious consideration where alternative programmatic routes to efficiency are not well-established. In particular, EE FiTs offer the potential to create new markets and enable new market entrants to uncover and deliver EE resources. This market-based approach may also have advantages in jurisdictions facing political objections to other methods of funding efficiency initiatives. However, as the European experience with FiTs for renewable power reveals, any jurisdiction considering adoption of an EE FiT will need to consider a range of questions, both fundamental and practical. This paper identifies key policy issues and options for EE FiT design. No jurisdiction to date has created an explicit EE FiT; this paper draws on experience in Europe with white certificate programmes, and in the US with utility efficiency mandates and regional capacity markets, in particular the “standard offer” programmes that have been offered by obligated entities over the past two decades. The standard offer programmes differ from a pure efficiency FiT, as they have been offered as part of a portfolio of measures designed jointly to meet an energy savings obligation, not as the fundamental policy construct for achieving savings. Nevertheless, they offer valuable insights into the policy and implementation choices that would need to be made to enable an EE FiT to effectively deliver on its promise.

Keywords: Energy efficiency, feed-in tariff, policy

1. INTRODUCTION

In October 2012, the European Parliament and Council adopted the Energy Efficiency Directive (EED) [1] 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 to achieve, in aggregate, specific savings targets, usually expressed as incremental annual savings. A number of 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, and paying for large-scale efficiency programmes.¹

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.² In this paper we examine the benefits and challenges of one such technique, known as an Energy Efficiency Feed-in Tariff, or “EE FiT.”

Energy Efficiency Feed-in Tariffs

Energy efficiency FiTs are an alternative approach to delivering efficiency and improving the balance between demand-side and energy supply-side resources.³ 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 savings 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

¹ For a comprehensive overview of experience with Energy Efficiency Obligations globally, see [2].

² EED Article 7, Paragraph 9(b) (italics added).

³ Additional detail on many of the topics addressed in this paper can be found in [3].

be paid for efficiency savings and let the market determine the quantity of savings that will be delivered.⁴

- **Competitive third-party delivery:** EE FiTs do not depend upon performance by regulated utilities or energy suppliers alone. Nor do they depend upon direct action by end-users in direct financial relationships with the FiT administrator. They create an open competitive market for the delivery of efficiency services by qualified ESCOs, energy suppliers, distribution utilities, and potentially, construction firms and related professionals.
- **Paying for performance, not for expenditures:** A basic goal of a 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. 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 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.

With these criteria, our definition of an Efficiency Feed-in Tariff differs somewhat from some earlier proposals. In early work on this topic, Bertoldi, et al examine options for a Feed-in Tariff for Energy Saving that would reward only *measured energy savings* (literal consumption reductions, perhaps normalized for changed circumstances, but stripping out any rebound effects); and would pay for them only *on an ex-post basis* [4][5]. In this paper we suggest that an EE FiT could be designed to reward performance in the delivery of *efficiency measures*; that savings, minus rebound effects, can be measured and “deemed” via statistical sampling; and that payments *can often be made ex ante*, at the time customers are investing in efficiency improvements. While both approaches share some basic similarities, and there are merits to both approaches, the EE FiT approach discussed here aims to avoid some of the transaction costs and measurement challenges of those earlier proposals.⁵

A comparison to policies used to promote renewable power generation is appropriate here. Across the globe, many governments have used a number of policies to accelerate the uptake of renewable electricity. Usually, the centerpiece of those policies is either a Renewables Obligation (specifying the quantity of renewables generation desired and leaving price to competitive market forces) or a Feed-in-Tariff (specifying a price for additional renewables supply, but leaving quantity to the market). There is a great deal of experience globally with both of these approaches to

⁴ 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.

⁵ A substantial challenge to a strict Energy-Savings FiT is calculating the savings to be credited on an individual customer basis: “Normalisation of the consumption numbers may be required e.g. for occupancy levels (reduction in per capita consumption), changes in opening hours, changes in production, weather variations, etc.” [5], *supra*, at p 124. Eyre [12] advances very similar reasoning to support the use of deemed savings and up-front payments under a suggested Energy Saving FIT.

promoting renewables generation, and with the merits of using them for different purposes in different circumstances, and even using them in combination. With respect to efficiency, on the other hand, the overwhelming experience to date⁶ is with Efficiency Obligations (like Renewables Obligations, setting the quantity only); there is very little experience with Efficiency FiTs.

Considering that many readily-available efficiency resources are less expensive than conventional generation, and much less expensive than the usual feed-in tariffs for renewables generation, it seems that both system efficiency and social welfare would be well served by programmes that would defer supply-side investments in favor of cost-effective demand-side alternatives. Just as FiTs for renewable power have opened doors to new providers of distributed energy, bypassing industry inertia and opposition to new technology, EE FiTs could offer the potential for new markets and new market entrants to uncover and deliver EE resources that are currently not being reached.

2. METHODOLOGY

No jurisdiction to date has created an explicit energy efficiency FiT. This paper can therefore not draw on a detailed analysis of such schemes but focuses on the key policy issues facing any EE FiT designers, and sets out some of the options facing them. Our observations draw on well-developed experience in Europe with white certificate programmes, and in the US and Australia with utility efficiency mandates and regional capacity markets. In particular, important lessons can be drawn from the US experience with “standard offer” programmes⁷ that have been offered by distribution utilities and/or other obligated entities in New Jersey, New York, California, Texas and several other states over the past two decades. Such programmes essentially offer a specific price per kWh for every unit of energy savings that customers or energy service companies (ESCOs) can document as having been achieved. These programmes differ from a pure efficiency FiT primarily in that they are offered as part of a *portfolio of programmes* designed jointly to meet an energy savings obligation, not as *the* fundamental policy construct for achieving savings. Nevertheless, they provide valuable insight into how markets react to offers of fixed price payments per unit of energy savings.⁸

The experience in the northeastern US states with allowing efficiency resources to compete with generators in forward capacity markets provides an additional ground of experience for EE FiT design [7]. In some ways, they are a *capacity savings* analog to

⁶ There is, of course, a great deal of experience in Europe and elsewhere with the use of codes and standards to raise the level of end-use efficiency in buildings, appliances, and equipment. These important elements are needed as a foundation for both EEOs and EE FiTs.

⁷ “Standard offer” is just one of many names given to these programmes. Others include “performance contracting” and “pay-for-performance”.

⁸ There is a significant body of research and analysis of the North American standard offer programmes, containing a great deal of data about individual measures, cost-benefit analyses, and design features. We do not attempt to summarize that empirical work here. This paper focuses on the basic policy questions underlying the choice to pursue an EE FiT, drawing on that experience to identify the key design questions that a FiT programme design must address. For more information on the US experience, see [6].

an *energy savings* FiT. They also have a number of well-established and documented rules that guide the participation of efficiency and other demand resources in the market. Thus, they provide valuable insights into the issues a grid operator has to address when creating market mechanisms for such resources.

As the European experience with FiTs for renewable power reveals, it is important to design any FiT quite carefully. Any jurisdiction considering adoption of an EE FiT will need to consider a range of questions, both fundamental and practical. Key questions include the following:

- What are the target markets - that is, which end-uses, customer categories, and fuels will be covered by the programme?
- How much should the FiT pay for savings and how should payments be structured?
- Who will deliver qualified savings, and how is quality protected?
- Where would the FiT revenues come from, and how should costs be allocated?
- How will savings be evaluated, measured and verified (EM&V)? and, finally
- How will the initiative be administered?

We address each of these issues briefly below.

3. DESIGN ELEMENTS OF AN EE-FIT

3.1. Target markets

3.1.1. Which end-use sectors should be eligible?

The first fundamental question that policy-makers must consider is whether an efficiency FiT would be intended to acquire savings from all customers, and across multiple fuels, or just a subset of end-use sectors and/or fuels - for example, just electricity savings among larger commercial and industrial customers.

There are at least two separate issues here. First there is the question of national priorities: is the programme focusing largely on meeting power sector challenges such as reliability, transmission constraints, and rising market prices; or is the focus more on the building stock, heating bills, and carbon reduction, as in the UK's CERT⁹ programme? Is the programme focusing on industrial competitiveness, or residential bills? Different jurisdictions are justified in taking different approaches, but whichever approach is taken, it will be important to be clear about programme objectives, and to avoid compensating measures that merely shift consumption from one fuel to another without improving societal energy efficiency.

A second challenge is transaction costs. Participation in a FiT can impose substantial transaction costs – to document that qualifications are met, to address EM&V¹⁰ requirements, etc. (these are discussed further below). Thus, in most programme designs, residential and small commercial customers could only

⁹ The Carbon Emissions Reduction Target programme CERT (2008-2011) required energy suppliers, including electricity suppliers, to deliver carbon emission reductions in existing households, with a major focus on heating improvements.

¹⁰ EM&V stands for Evaluation, Monitoring, and Verification, the set of standards and protocols used to ensure that efficiency measures have been implemented, are additional, and are reducing demand as claimed.

realistically participate through aggregators such as commercial energy service companies (ESCOs). However, ESCOs have historically had little to no interest in contracting with small customers. Indeed, almost all of the savings from standard offer programmes in the US have come from larger commercial and industrial customers; virtually none has come from residential customers and very little has come even from small commercial customers.¹¹

Thus, 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. As a result, if policy-makers want the FiT to address all market segments, they must structure the FiT to allow for payment for mass market programmes as well as individual building retrofit projects.

3.1.2. Individual projects and mass market programmes?

The experience of numerous distribution utilities and other obligated parties in Europe, North America, and elsewhere demonstrates that substantial savings can be acquired from residential and small commercial customers, at levelized costs that are well below 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. A wide array of products have been addressed, including CFLs, boilers, clothes dryers, commercial refrigeration and air conditioning equipment, motors, LED lighting fixtures and many others.

If an efficiency FiT is designed to acquire documented savings from programmatic as well as project-specific initiatives, some challenges need to be addressed. To begin with, for small and distributed measures, appliances, and equipment, it is not practical to meter the efficiency savings at each end use. Thus, an EE FiT programme, unlike the typical Renewables FiT, will need to rely on a set of "deemed savings" rates for various measures, and develop methods to routinely monitor and statistically verify these savings rates. In this way the EE FiT can pay for, and maintain a focus on, energy savings while encouraging low-cost interventions via mass market programmes that can benefit a large number of smaller customers. This has been the dominant approach in the European white certificates programmes, including Italy's.¹²

¹¹ The one notable exception to this rule has been the Texas programme, which has succeeded in annually achieving some residential savings. However, the magnitude of those savings has been quite small (at least relative to the magnitude of the savings being achieved, planned or debated in leading jurisdictions in North America and Europe).

¹² "As is common in most European EEO schemes, the overwhelming majority of energy efficiency certificates are issued for measures with deemed or ex ante energy saving values." [2] at p.55.

However, 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.¹³

3.1.3. Which energy sectors? – Moving beyond electricity

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 sector¹⁴, 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 generally, or across a national economy. European policy instruments, such as the Energy Efficiency Directive and the Energy Performance of Buildings Directive quite rightly address efficient consumption across multiple fuels, expressed in a common currency, such as Mtoe. As demonstrated by the existing European schemes, an efficiency FiT could apply one or more uniform savings metrics across electricity, gas, fuel oil and other energy markets.¹⁵

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

¹³ This is easily accomplished. For example, 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.

¹⁴ One programme cutting across transportation and non-transport end uses is the Bioenergy Producer Credit Programme in the Canadian 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>.

¹⁵ All of the major European schemes cover multiple fuels, with varying metrics for measuring, and sometimes trading, savings across fuel types [2].

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 decarbonized electric grid [8]. Thus, in the long run, **all** building efficiency investments may ultimately be saving electricity.

3.2. Pricing and payment

3.2.1. *What price should programmes pay for proven savings?*

Pricing will be the most influential aspect of any FiT. At first glance, it may appear easy – just set the FiT price equal to the price paid for electric supply and the market will determine how much efficiency should be pursued. In theory, this simple formulation could well lead to larger savings, and societally efficient results.¹⁶ However, there are significant barriers to such an approach.

First there is the question of funding the FiT programme. A payment stream for the FiT programme must be identified, and the funds must be collected from customers, taxpayers, or others.¹⁷ Even where efficiency programmes are demonstrably cost-effective, there is a practical, often political, limit to the total costs that can be applied to the FiT effort. Moreover, a “gold rush” approach to delivering efficiency services could lead to rapid entry of new firms, wasteful spending and customer confusion, and eventual loss of public confidence in the policy.¹⁸

¹⁶ Economists and consumers alike understand that 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 do have an opportunity to design the EE FiT to deliver maximum societal savings at even lower cost to final consumers, and should be mindful of that opportunity.

¹⁷ Different jurisdictions have employed a variety of financial supports for efficiency programmes, including tax credits and direct governmental expenditures (e.g., the US national Weatherization Assistance Program); assigning the costs to competitive energy retail suppliers (e.g., New South Wales, or the UK's Carbon Emissions Reduction Target programme); collecting funds through regulated wires charges and utility rates (as in Ontario, Flanders, Denmark, and most US states); and the dedication of carbon allowance revenue (as in Germany, and the Regional Greenhouse Gas Initiative in the US). All of these mechanisms would be available options to finance an EE FiT programme.

¹⁸ Fortunately, as experience with broad-based efficiency programmes grows, the potential to increase rates of investment grows as well. Utility-scale efficiency programmes in the leading states of Australia, the US, and Canada are delivering substantial year-on-year savings at programme costs that are in the range of 3% to 5% of the total cost of service. This is a rise from 1% to 2% among such programmes in the past. Total utility-scale efficiency programme spending in the United States grew from \$1.4 billion in 2004 to \$7.0 billion in 2011, and is projected to rise to between \$10.8 and \$16.8 billion by 2025 [9]. While some critics complain about the growing size of programme budgets, proponents observe that EE is still much less expensive than supply, and that at least 95% of the total customer bill is still devoted to generating and delivering power. Thus there is substantial capacity to increase the size of energy savings budgets, whether through EE FiTs, EEOs, or other means.

In addition, an EE FiT that pays the same “avoided cost” price for all savings is likely to significantly over-pay for relatively inexpensive efficiency savings. This is because there are substantial levels of savings still available in the economy at costs well below the avoided costs of energy supply. Thus, while a FiT that pays the avoided cost of supply will theoretically provide adequate stet for the acquisition of energy savings that are marginally cost-effective, it may provide much more than is necessary to acquire the still vast reservoirs of savings available at the lower reaches of the efficiency supply curve.¹⁹ Further, where there is little effective competition among ESCOs, ESCOs will tend to - and be able to - maximize their return on capital by investing in only the lowest-cost savings, leaving many cost-effective savings untapped. In a well-developed programme, with greater competition among ESCOs, a greater portion of the FiT payments will be passed through to customers, who may or may not use the benefit to deepen their level of savings. In either case, a single-price FiT pegged at the avoided cost of supply will pay more than needed to capture low-cost savings, and may fail to deliver deeper, more comprehensive savings in many customer locations.

Indeed, this has been the experience with markets for efficiency resources in which there was a single price paid for all such resources, regardless of how difficult or expensive they were to acquire. 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 was completed in 1998 [10]. It concluded that 83% of the efficiency savings produced were due to lighting retrofits in large commercial buildings. The programme was far less successful in capturing savings from non-lighting measures such as HVAC and motors (which, together, accounted for less than 6% of efficiency savings) [10].²⁰ Moreover, the programme paid an average levelized cost of 3.9 cents/kWh for those large lighting retrofits [10]. The 3.9 cent cost of savings was, of course, lower than the full cost of power supply and delivery, and thus saved consumers and society significant sums. But at the same time, it might have been possible to acquire those savings *at even lower cost*. For example, utility-run rebate programmes for commercial lighting

¹⁹ This is a variant of the widespread situation in which total supply-side costs, and often even the supply-side FiT premium, exceeds the incentive that would be needed to save the same quantity of energy. One example 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. However energy efficiency investments that would avoid fossil fuels and provide equivalent environmental benefits at lower cost are not eligible for these premium payments. See

http://www.decc.gov.uk/en/content/cms/meeting_energy/renewable_ener/incentive/incentive.aspx.

²⁰ Note that fuel-switching measures were also eligible to participate and were the second largest source of savings after lighting measures. Lighting measures accounted for 60%, fuel-switching accounted for 27% and HVAC and motors accounted for 5% of total (efficiency plus fuel-switching) savings.

retrofits in other jurisdictions at the time typically cost ratepayers roughly 2 cents/kWh saved, 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.

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 cheapest savings begins to “dry up”, the ability to capture other more expensive (but still societally cost-effective) savings will have been diminished in the process. This is because customers incur transaction costs in making efficiency improvements, particularly retrofit improvements, and it will be more difficult to convince 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, 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 more efficient T8 fixtures, 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). This is because the customer would have to bear the costs of both sets of fixtures, and 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 (a) differentiates between different types of savings and (b) 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.²¹

²¹ Thoughtful analysis of the pricing structure for purchased efficiency can be found in [11], see also [3], *supra* note 4, at pp. 7-9.

3.2.2. 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 payments that recognize all of the savings produced over their useful lives.* Arbitrary caps on the lives of measure savings – which some EU and US initiatives have put in place– will inherently undervalue longer-lived measures and lead to less than optimal levels of investment in such measures.²² Many programmes have found that it is useful to establish deemed measure life assumptions for common measures. For complex installations and less common measures, documentation should be provided by the parties bringing the savings to the market, with review and approval by scheme administrators or designated independent evaluators. However, *recognizing* the value of long-lived measures and creating incentives for them is not the same as *paying for every saved kwh or therm across the life of the measure.* FiT payment levels can be structured to pay enough to overcome the market barriers to important measures without necessarily having to pay for each unit of savings on the same basis across time.²³

3.2.3. 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). There is, of course, some tension between the need to recognize long-lived measures that will deliver savings in the future, and the practical necessity to encourage and finance the needed investments up-front, at the time the customer and ESCO incur the capital costs of measures.²⁴ As with Renewables FiTs, programme administrators need to set the FiT levels high enough to encourage robust market activity, but unlike Renewables FiTs, should be able to stimulate significant EE investments at payment levels well below the long-term avoided cost of conventional supply.

Whatever the level of payments, in general, the greater the fraction that is paid up front, the more attractive the offer will be to prospective market participants. Up-front

²² For example, until 2011, the Danish obligation scheme credited only the first year of savings for any measure, which greatly undervalued the total savings that could be achieved from long-lived measures such as building insulation. [2] at p.45. Under the PJM Reliability Pricing Model (the Mid-Atlantic states' forward capacity market), efficiency measures are allowed to receive payments for a maximum of only four years.

²³ Standard Performance Contracts are often structured in this way [8].

²⁴ Where future energy savings are estimated in advance, and compensated at the time of installation, the EE FiT is actually paying in advance for future expected performance – it is, in effect, *paying for the feeding-in of a stream of energy-saving measures*, rather than making performance-based payments for documented savings as they occur over a period of years. As Eyre observes, what appears to the customer as a price-based incentive is a standard practice even when energy companies are delivering *quantity-based* EEOs, and thus provide “*prima facie* evidence that a feed-in tariff system could be viable.” [12] at p.192. As discussed below, while a practical approach in most circumstances, it places a public policy premium on the manner in which deemed savings are calculated and adjusted over time.

payments reduce transaction costs for market participants (as well as for the FiT administrator), reduce real or perceived risks associated with future payment streams and diminish or eliminate the customer's need to raise long-term capital to finance efficiency projects. Where there is significant 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.²⁵ New York's performance-based incentive programme paid out incentives "over a two-year measured performance period" [6].

By largely front-loading payments for efficiency resources, the EE FiT programme differs from many renewables FiTs, which pay for performance over time.²⁶ There are good reasons for this difference. The savings from most efficiency measures are very predictable on average, and for the most part do not require continuing incentives to make sure they are "dispatched" to the grid. Moreover, there are significant market barriers to their installation which can best be overcome by sharing long-term benefits with investors and building owners at the time their capital costs are being borne.²⁷

3.3. Who Can Qualify to Deliver Qualified Savings?

Energy regulators, ministries, and legislators have sought for many years to create regulatory regimes and business models that would inherently support delivery of cost-effective end-use efficiency resources as part of a balanced energy portfolio. One persistent problem is that power generators, fuel suppliers, and pipes and wires

²⁵ The current programme is different from the 1990s standard offer in several other ways as well: (1) it is targeted only to medium and large commercial and industrial customers (there must be a minimum baseline demand of 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).

²⁶ However, it should be noted that many renewables projects are also supported by tax credits, grants and subsidies that are paid at the time of initial installation.

²⁷ See, e.g. [12], which finds that an EE FiT could be a "powerful tool for incentivizing energy efficiency" and recommends that FiT supports be paid as capital grants, not annual performance payments.

companies are all organized on business models that almost always reward higher consumption and greater throughput on their systems.²⁸ While there are notable instances of successful EEOs as the result of regulation, in most cases traditional suppliers and utilities have been slow to adopt new customer service models. For these reasons, efficiency advocates have often sought to open up the efficiency business to new entrants. Just as the renewables sector has seen an upsurge in investment and sustained cost-reducing “learning curves” from the growth of the Independent Power Producer (IPP) industry, opening programmatic efficiency markets to new entrants could possibly lead to a burst of efficiency attainment, innovation and new services, and greater market penetration.²⁹ This hopeful view has led some Governments to propose programmes in which quite a wide range of businesses would be eligible to provide qualified services, and be paid for doing so.³⁰ A related motivation is the desire by some Governments to promote competition in the underlying energy markets themselves. During the move to “restructuring” in the United States, regulators seeking to promote competition in electricity did not want to allow incumbent energy companies to use their historic relationships with customers to, in effect, bundle energy supply and energy efficiency services so as to perpetuate their dominant position in the energy market, while forestalling new entrants to the efficiency markets as well. For this reason states such as California, New York and Texas required utilities to offer Standard Performance Contract options to competitive demand-side providers.³¹

One of the chief advantages of an efficiency FiT is the open door it would create for new entrants and the opportunity it would provide for innovative service offerings. However, there are at least five reasons to be cautious about an absolutely open-ended invitation to “all comers” who might wish to be paid for delivery under an efficiency FiT:

²⁸ In the context of Energy Efficiency Obligations some techniques, such as “decoupling” profits from sales, can remove disincentives to energy suppliers to succeed at reducing sales, while “performance-based” bonuses can positively reward such success. Designers of EE FiTs may well wish to apply these techniques to regulated companies in FiT regime as well, since it is desirable to ensure financial stability for supply and delivery companies when their customers become more efficient.

²⁹ The stimulative effect of renewables FiTs has been widely documented. See, e.g., [22]: “... a growing body of evidence from Europe demonstrates that FIT policies have on average fostered more rapid RE project development than these other policy mechanisms.”; and Adam Vaughan, *Feed-in tariff sees solar panel installation breakthrough*, (Guardian.co.UK, Thursday 23 February 2012): “Since the scheme was launched in 2010, the amount of the renewable energy has grown by more than 41 times.”

³⁰ The Italian white certificates scheme has been open to any accredited energy service provider; they can deliver measures and earn tradable savings certificates for doing so. More than 80% of the total savings in the Italian scheme have been secured in this way. [2] at p.55. See also the UK Government’s 2012 proposals on the so-called “Green Deal” housing retrofits programme.

³¹ Annual revenues of the US ESCO industry grew from less than \$1 Billion in 1994, to roughly \$4.1 Billion by 2008, with a substantial fraction of this growth due to the business opportunities provided by regulated utilities’ energy efficiency programmes [13]. Regulators in some jurisdictions, including California, have also recognized that the scale and financial resources of the utilities are important assets for delivering large programmes to millions of end-users, and have supported numerous efficiency programmes delivered by the utilities themselves. Thus, utilities, ESCOs and numerous utility contractors now deliver efficiency services through a variety of programmes, many of them in the “custom rebate” category.

- First, there is a fundamental problem of consumer confusion, and the importance of consumer trust as the foundation of effective efficiency efforts. Efficiency is largely an “invisible” product; long experience with programmatic efficiency efforts reveals that customers must trust the information they are receiving and trust the providers of efficiency products and services if the persistent market barriers to efficiency are to be overcome. Competing programmes, competing brands, competing claims and offers – all tend to discourage consumer enrollment in efficiency programmes, especially for residential and small commercial markets. As a result, many successful programmes are careful to create broadly-recognized efficiency “brands” even when actual implementation will be in the hands of numerous suppliers and contractors.³²
- Second, and closely related, is the important issue of quality control. To be successful, an efficiency FiT must deliver results over a long period of time, recruiting new customers, and delivering additional savings every year for decades to come. It does not take many bad examples to seriously damage public perceptions and public support for an efficiency programme. For example, when first launched, the Australian Home Insulation Programme provided payments to a very wide range of building contractors for home insulation jobs, without serious pre-qualification requirements or adequate oversight. Unfortunately, some contractors performed badly, leading to poor results, the deaths of four insulation workers, and numerous fires in buildings caused by improper installation of insulation. The resulting controversy³³ led to cancellation of the entire programme, and a long-term setback for energy efficiency in Australia.
- Predictable, reliable efficiency results are also important to utility managers and system operators, who must integrate knowledge of load growth and the shape of demand into their system plans for generation expansion, reliability services, and transmission and distribution upgrades. At a minimum, these managers need high-quality information on expected demand reductions, and they need to know the installers’ estimates are reliable. There is very good experience in this area within the forward capacity markets now operating in the large wholesale power markets in the northeastern US. In two of those markets, efficiency and demand response providers are able to compete head-to-head with supply resources to provide system capacity on a forward-looking basis, and are paid the same price as generators for doing so. Because system capacity is linked to reliability, the system operators have been very careful to ensure that the efficiency and demand-response resources bid into these markets are highly likely to be delivered as promised. They have instituted a series of procedures - including pre-qualification of the bidders, testing a sample of the actual installations, and

³² See, e.g., the demonstrated value of common branding of efficient products (Energy Star in the US, Canada and the EU, and the common efficiency programme brands used in Vermont (“Efficiency Vermont”) and several other US states.

³³ This is widely known as the “pink batts scandal.” See, e.g., <http://www.theaustralian.com.au/national-affairs/unsafe-batts-cost-273m-to-redress/story-fn59niix-1226360652221>

imposing enforceable penalties for non-performance - to ensure delivery of the resources the system is paying for [14].

Ideally, utility and system managers would also be able to work with efficiency entities to target efficiency investments to the locations and time periods that would be most cost-effective for the power and gas supply systems as a whole. This kind of coordination is hard to achieve unless efficiency suppliers are enrolled in quality-control and information-sharing programmes with some operational consistency. This is a role consistent with the business model of many ESCOs, and one can imagine some new entrants being able to meet such standards, but it is not likely to be achieved by a large number of retail stores, electricians, or small building contractors.

- There is also the sensitive topic of customer data. Efficiency programmes will be more cost-effective, and will reach the most important end-uses and locations, when programme managers have the kind of access to customer usage data that utility and energy service companies have today. Customer usage data is, however, appropriately protected under privacy laws, and it is hard to imagine a programme design that would include posting that information so that a large number of competing efficiency contractors could access it for marketing purposes. Efficiency programmes that rely on third-party administration have developed protocols for the use of, and protection of, consumer data with some success. Applying those protections in the case of an efficiency FiT is certainly feasible, but the resulting transaction costs and obligations would likely mean that only a few larger entities in any jurisdiction would want to participate in the programme at that level. Smaller entities would likely end up working as implementing contractors for aggregators who would themselves be the official FiT providers.
- Finally, there is the question of whether end-use customers themselves could qualify for FiT payments based on their own energy-savings investments, or whether the investments must be made through a qualified third-party vendor. On the one hand, explicit *payments for energy savings* might break down some barriers to customer participation, much as “net metering” provisions for rooftop PV installations have spurred a great deal of investment by end-users in a number of jurisdictions. On the other hand, it would be harder to distinguish “free riders” from those who are acting because of the incentives, and it would be more difficult to ensure that high-quality work is in fact being done. Moreover, working through competitive ESCOs and mass market retailers ensures that customers are in fact seeing direct discounts and incentive payments so as to encourage their enrollment. However, programme managers might make an exception for the largest customers, who might be certified to self-administer investments and receive payments on the same terms as ESCOs under an EE FiT programme.³⁴

³⁴ Some existing EE programmes funded by broad-based system benefit charges on utility tariffs permit the largest customers to avoid payments into the common efficiency fund by requiring or permitting them to self-administer an efficiency investment programme of their own. See, e.g. [15].

While these are all important issues, we do not conclude that they stand as essential bars to successful implementation of an efficiency FiT. As noted, techniques exist to address each of these potential problems, and thus the challenges of opening energy efficiency markets to numerous delivery agents can be addressed through careful certification and active oversight, including randomized spot checking of work in the field.

3.4. How can an Efficiency FiT be funded?

In the present age of governmental austerity, public-purpose programmes face daunting challenges to find public funding, even when the programme's benefits are widespread and exceed programme costs. Energy efficiency programmes have long faced this challenge, but fortunately there is now a broad base of experience across many nations on ways to pay for energy efficiency investments.

As a starting point, it is important to remember two things about efficiency resources, particularly in the context of networked services (principally, electricity and gas, but also district heating). First, from a public policy point of view, end-use efficiency is a system resource, just like generation capacity, transmission upgrades, spinning reserves, and the distribution pipes and wires, and can be a partial substitute for all of them. If it is acceptable to pay for investments in those assets via power system revenues and charges, non-by-passable delivery tariffs, and fees, it should be acceptable to pay for end-use efficiency in a like manner. It is not necessary to fund efficiency services via explicit Government revenues. Second, efficiency investments at particular customer locations often deliver substantial, external, public benefits to system reliability and other customers on the network. Thus it is not necessary, and would be counter-productive, to create a programme design that requires each end-use customer to pay for all of the costs of efficiency measures at their own locations.

Good programme designs seek to enlist customer payments for as much of the cost as possible, but there is a large range. In some customer classes (e.g., ESCO performance contracts with large industries) the customer is in effect paying for almost all of the costs of efficiency upgrades. In other cases (e.g., boiler replacements and insulation in fuel-poor households) the public programme will need to carry almost all of the costs. For many other programmes (e.g., commercial lighting retrofits, most housing retrofits, appliance replacements) subsidized audits and incentive payments are needed to stimulate customer investments. These costs typically amount to 20% to 50% of the total investment needed.³⁵

Where can, or where should, these needed funds come from? Of course there are a large number of options, and different jurisdictions will surely choose different approaches. Four of the leading options in use today are:

³⁵ When discussing the costs of efficiency programmes it is useful to remember that much of the required investment will often come from participating customers, either through cash payments or loans. One of the reasons that efficiency investments are powerful job creators is that programme support can often leverage a relatively large total investment in new plant and equipment in addition to lowering energy costs going forward.

- **Utility service charges, including “wires and pipes” charges**

Globally it is a common practice for regulators to require network operators to collect funds for efficiency programmes on a broad-based, non-by-passable basis. In the United States more than 30 states now have EEO mandates, and they raise and invest over \$5 billion annually through such utility charges on electricity and natural gas bills.³⁶ In some cases, both the revenue and the spending are contained within the same service territory, but in other cases, different energy suppliers or utilities contribute to a common pool of funds, which is then used to administer broader programmes across multiple territories. It would not be difficult for administrators of an efficiency FiT to estimate, and later true-up, an efficiency charge at the distribution level that would raise the funds needed to pay efficiency suppliers for delivering FiT resources.

- **Mandatory purchase of EE FiT resources by energy suppliers or regulated utilities**

Instead of requiring utilities or energy suppliers to collect funds to pay for FiT resources, Governments could simply require those companies to purchase the resources, albeit at a fixed price (or, as we recommend, a set of fixed prices). The obligation could be pro-rata, in proportion to each energy company’s size or sales, and the cost of compliance would vary with the portfolio of qualified resources that efficiency providers actually deliver. In essence, this is just an efficiency version of the obligations on energy companies in many European and North American programmes to purchase a pro rata share of renewable power at fixed rates.³⁷

- **Recycling carbon revenues**

One of the most important new opportunities in public finance is the new revenue stream provided by the auction of carbon allowances under the European Trading Scheme. Because energy efficiency investments are a very effective and low-cost path to carbon reduction, and because investing in efficiency lowers the cost of

³⁶ These collections have in recent years been rising at the rate of about \$1 billion per year. While these investments are significant and important, they still represent only a small fraction (1% to 3% of total system revenues).

³⁷ There is also the potential for a “contracts for differences” approach: In some countries, there is a concern that mandatory purchase of a resource at a fixed price (i.e., a FiT) creates a Government assessment or tax, while a mandatory purchase of a resource at a market-based cost (such as a Renewables Obligation) is simply a performance obligation and not part of the national system of Government accounts. In our view, efficiency investments in network energy industries are system resources on a par with transmission upgrades and the cost of reserves, and should be treated as system costs, not Government expenditures. However, where this view does not hold, one way to deal with this system of accounting would be to require energy suppliers to contract with efficiency FiT suppliers under contracts for differences. Here, the energy supplier would first contract to purchase power or gas to cover total anticipated customer demand, and would then purchase the required FiT resources to offset that cost. The saved power or gas would be released back into the market and the net savings (the “difference”) would appear as a *credit* to the energy supplier, not a Government-imposed cost. This is similar to the method now proposed in the UK to deal with Renewables Obligations, except that in the case of the RO, the net difference between the market cost and the renewables cost is a positive number, and in the case of efficiency, it would almost certainly be a net savings.

attaining carbon reduction goals, investing carbon revenue in efficiency is consistent with both environmental and economic objectives. Some Governments have recognized these facts and have made carbon revenues available for efficiency investments. Germany, for example, will place all of its carbon revenues in a special Energy and Climate Fund, which will support efficiency investments as well as other public goals. Another leading example has been in effect in the 10 US states of the Regional Greenhouse Gas Initiative (RGGI), where about 60% of allowance revenues have been dedicated to efficiency, with very positive effects on power costs, power revenues, and carbon prices. A recent analysis of the RGGI programme found that the carbon programme actually lowered overall power costs in the region, and reduced carbon at a “cost” of *negative* \$73 per ton ([16], see also [17]).

- **National Energy Efficiency Funds**

Another approach to funding energy efficiency, including EE FiTs, is to create a broad pool of funds, which could derive from a variety of sources. One leading example is the German KfW Bank, which finances one of the largest energy savings programmes in Europe and has supported efficiency improvements in hundreds of thousands of buildings. Reflecting that example, the EED states that “Member States may set up an Energy Efficiency National Fund,” and may provide that energy suppliers and distributors who would be required to deliver savings under an Efficiency Obligation could instead “fulfill their obligations ...by contributing annually to the Energy Efficiency National Fund an amount equal to the investments required to achieve those obligations.”³⁸ Thus, Member States could pay for EE FiT resources by creating an EE National Fund, and requiring energy service companies and/or distribution companies to contribute their pro rata share of the cost of the FiT programme. Additional funds could also be derived from energy taxes, fossil fuel royalties, carbon auction receipts, and other sources.

3.5. Evaluation, Measurement and Verification (EM&V)

3.5.1. *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 a savings obligation scheme, 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.

³⁸ EED, Article 20 paragraphs 4 and 6. Paragraph 7 also explicitly authorizes the use of ETS auction revenues to support innovative financing schemes for efficiency improvements, including building retrofits.

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.

That was the case when the initial standard offer programmes were launched in New Jersey in the early and mid-1990s. Under PSE&G's programme, each FiT project had to have a pre-approved M&V plan. Standardized M&V protocols made available by the programme 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" ([10], p. 2-12). These requirements imposed significant costs on prospective programme participants and were cited by a number of ESCOs as a significant barrier to participation [18].

TXU Electric (serving parts of Texas) took a different approach to M&V requirements for its standard offer programme in order to ensure that the benefits of M&V (in the form of increased precision of savings estimates) were commensurate with the costs. Thus, in contrast with PSE&G's extensive, "one-size-fits-all" requirements, TXU's programme had a three tiered M&V structure: (1) deemed savings;³⁹ (2) simple M&V;⁴⁰ and (3) full M&V.⁴¹ 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 [6]. This approach is still used in the current Texas standard offer programmes, with almost all participants using the deemed savings option.

Texas' more balanced approach is a better one almost regardless of which markets are targeted by an efficiency FiT. However, it is particularly important in the context of a FiT that aims to address savings opportunities in all sectors, including residential customers.

3.6. FiT Administration

As with any policy instrument, an efficiency FiT would require some administrative rules and processes in order to function efficiently. Based on the experience of utility managers and public administrators of "standard offer" programmes in the US and Australia, the New England Independent System Operator's management of its forward capacity market, and the experience of administrators of the European white certificates programmes, we have identified the following issues as among those that should be addressed by such rules and processes:

³⁹ 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.

⁴⁰ For example, conducting short-term testing to develop inputs to pre-set savings calculations.

⁴¹ For example, whole building analysis, calibrated simulation modeling or extensive metering of end use equipment or systems.

- **Who should administer an energy efficiency FiT?** 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. A key lesson from international experience is that EE FiT programmes will need expert supervision and a process of continuous improvement. There is no single best approach to the choice of efficiency administrators, which have varied, and will vary among jurisdictions.⁴² In general, there are four basic approaches to efficiency programme administration: (1) Oversight by the energy regulator(s) responsible for other aspects of energy regulation, such as distribution tariffs, power supply, and market operations; (2) Direct administration by Government, either through a general-purpose ministry (such as the ministry for energy, environment, housing, or economics); or through a special-purpose efficiency agency; (3) Administration by an appointed or competitively selected private entity with an efficiency mandate; and (4) Administration by one or more entities in the power sector (energy suppliers, the TSO or ISO, and/or distribution companies).

Across the globe, there is now substantial experience with each of these options. There are successful programmes in place under each of the four main approaches, and a growing use of what might be called “hybrid” models among them. The American Council for an Energy-Efficient Economy has routinely evaluated the many programmes in the US: a look at their rankings of the top programmes reveals a wide variation in the administrative structures used by the leading jurisdictions. The keys to success are to create a structure with the following essential characteristics: (a) it provides the promise of medium- to long-term stability in basic programme rules and methods of operating; (b) it includes a long-term savings goal that has a relatively high degree of public political support; (c) it contains the means for the administrator to assess in concrete terms the performance of the programme implementers, and their success in the field; and (d) it provides an adequate, stable and reliable source of funding for the EE programme.⁴³ If those criteria are satisfied, the opportunity for adequate administration will be greatly enhanced, and it will be possible to adjust the programme and supervise its implementation effectively over the years of work that will be required to make lasting progress. Whichever agency or entity administers the EE FiT programme, it should be given the responsibility 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.

⁴² This is also true for energy efficiency programmes generally. See [19].

⁴³ These administrative issues are documented in [20]. For a recent review of the administrative question, and recommendation for Germany, see [21].

- **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.** To keep administrative costs at a reasonable level, it will likely be necessary to require a minimum level of savings in order to participate in the market. The 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 1000 annual MWh of energy savings. With that cut-off, the ISO had fewer than 70 different efficiency resource “projects” (from approximately 25 different companies) clear the market in its first year.
- **Expressions of intent to participate.** It will be important for the FiT Administrator to be able to forecast, within some reasonable margin of error, expected savings levels and programme costs. One idea would be to require prospective EE FiT providers to file a notice that they intend to participate in the programme, including a forecast of expected savings, several months before the start of a programme period.
- **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.

4. CONCLUSIONS AND RECOMMENDATIONS

Efficiency FiTs are an intriguing new concept for accelerating investment in end-use energy efficiency. Efficiency FiTs 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 on the supply side. By inviting many businesses (rather than just energy suppliers), to participate in generating energy savings, efficiency FiTs have the potential to unearth and harness innovations in delivering cost-effective energy savings that have not been seen to

date.⁴⁴ That potential could be critical to minimizing the costs of meeting long-term greenhouse gas emission reduction obligations, while maintaining 21st-century reliability standards, and lowering the fossil fuel burden on modern economies. Moreover, all of the essential mechanisms needed to implement an EE FiT exist in practice in numerous jurisdictions that have implemented energy saving programmes across the past two decades.

However, there are substantial challenges to effectively 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 more complicated to administer, could result in “cream-skimming” or could raise the average cost of energy saved, as compared with a more straightforward energy supplier obligation.

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 judge how it compares to energy savings 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 encourage efficiency investments and ensure no double-counting of savings results;
- It will be most effective if established for at least electric and natural gas savings, and could include other fuels as well;

⁴⁴ 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.

- It should encourage market entry and efficiency service innovations by multiple providers, and by different types of providers, but must supervise participation to minimize consumer confusion and ensure a high quality of service delivery;
- It must be supported by viable, long-term revenue sources to fund the FiT payments and to leverage 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/projects and (2) the depth of savings achieved, and may vary to reflect other important values, such as addressing energy poverty, addressing peak load costs, 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 and gas systems as a whole);
- Savings claims by market participants should be validated by independent third parties, and periodically audited by the FiT administrator;
- Administrative systems for the EE FiT programme should be developed through a process that engages a range of potential stakeholders, with the final products being as clear and transparent as possible; and
- Finally, because efficiency FiTs have not yet been widely 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.

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