EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

A step into the unknown: feed-in tariff for energy saving

Paolo Bertoldi,
European Commission, Directorate General JRC

Silvia Rezessy,
Renewable Energy and Energy Efficiency Partnership (REEEP)
and Central European University

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Structure and content of the paper

- Review of major RES support schemes: energy efficiency and energy savings need support schemes following similar logic and operational principles;
- Saving quotas coupled with tradable certificates are being successfully introduced for energy efficiency. The introduction of an equivalent FIT for energy savings in electricity does not exist yet;
- The paper discusses the main theoretical and practical issues involved in establishing a FIT for energy savings (discussion limited to electricity).
- The paper places the discussion in the broader context of rewarding energy efficiency only or rewarding genuine energy savings, and strongly advocates for giving incentives to energy savings rather than strictly energy efficiency.

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Introduction: energy efficiency and energy saving

- Reduction in energy demand can be achieved by improving the *energy efficiency* of the service provided (technological aspect) and/or by realising *energy savings* without necessarily making technological improvements (behavioural aspect).
- Improved energy efficiency - i.e. replacing a technology with a more energy efficient one - is not per se assuring energy savings, and there are numerous examples where as results of introducing a more efficient.
- Traditionally policies and programmes have been designed to improve the ratio between the energy consumed and the service provided, i.e. energy efficiency. Policies (apart energy taxation) have not always supported real and sustainable genuine energy savings, nor behaviour changes;

Joint Research Centre

ECEEE - 5.62007 3

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Energy Savings and Renewable Energies

- Energy efficiency polices and programmes have taken many different forms: labels and standards, building codes, information campaigns, voluntary agreements, taxation, investment subsidies and financial incentives.
- For RES policies have been focussed around creating financial incentives for the investment uptake and for the operation of RES installations.
- With respect to RES the discussion among policy makers and policy analyst has been on which types of incentives are most effective and cost-effective in stimulating the uptake of RES, rather than on the need or justification for incentives.

Joint Research Centre

ECEEE - 5.62007 4

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Support schemes for RES-E (1)

- Feed-in tariffs
  - usually different rates for different technologies (or even differentiated by location), decreasing over time
  - If long-term commitments with fair pricing, FIT can provide a stable investment environment. It can also result in a diverse ownership structure for green power involving farmers and municipalities, which leads to more rural and economic development.
  - The additional costs of FIT schemes are paid by suppliers in proportion to their sales volume and are passed through to the power consumers by way of a premium on the kWh end-user price (also known as a wire charge or a public benefit charge).
  - The first successful FIT was introduced in Germany in 1990. Feed-in tariffs exist in most of the Member States of the EU: Germany, Denmark, Spain, Finland, France and Portugal, Austria, Greece, Luxemburg, and the Netherlands (from July 2003), Italy (since 2005), Czech Republic, Hungary, Estonia, Slovenia and Latvia.

ECEEE - 5.62007 5

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Support schemes for RES-E (2)

- RPS+TGC
  - Because of the focus on low-cost green electricity, the TGC approach has been most successful in stimulating wind power development. To support other green electricity resources, an RPS can assign distinct targets for each green power source.
  - a secondary market of certificates independent from the physical flow of electricity develops
  - green certificates may pose a higher risk for investors and long-term, currently high cost technologies are not easily developed under such schemes
- Tendering
- Financial or tax incentives

ECEEE - 5.62007 6

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Prices versus quantities: the classical debate

- FIT, indicate the exact price, or cost of compliance, without giving any clear indication as to the exact quantity to be produced at this price. Conversely, the quantity model (RPS) stipulates in advance the exact outcome to be achieved, without giving indications on the cost of compliance, except that marginal cost of compliance is normally equalized across sources.
- There are views that a preferable set-up kick-starts the market with a FIT and introduces the quota-driven approach only when markets and technologies are more mature.

ECEEE - 5.62007 7

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Support Schemes for Energy Efficiency

- Demand-side utility programs;
- Public Benefit Charges;
- Demand response;
- Demand-side bidding (tendering);
- White certificate schemes;
- Taxation;

ECEEE - 5.62007 8

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Traditional Policies for EE and ES

- Most of policy instruments target EE and not ES.
- The most common and effective policies to promote EE include standards and labels (including building codes and certification), financial incentives traditionally in the form of investment subsidies, information and training, energy audits and energy management systems. Some are mandatory, other are voluntary.
- Can be combined to eliminate the worst equipment from the market and at the same time to expand the market share of the most efficient equipment.
- Demand side management policies and incentives have been used in a more limited manner in Europe, compared to the US.
- More recently the attention of policy makers has been drawn by the possibility to use market-based instruments to promote EE (white certificates).

ECEEE - 5.62007 9

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

'Feeding in' for Energy Savings

- Recognise energy savings as a *virtual source of energy* (among the cheapest and certainly the cleanest);
- *Behavioural changes* are rarely eligible for direct financial support, and are ignored by WhC schemes.
- Example of behavioural savings are: the user deciding to switch off equipment, decrease/increase the set temperature point ,r decrease the size of equipment and finally dispose of some equipment.
- Rather than trying to 'punish' consumption (and inefficiency) with an energy tax, public money can be used to 'reward' and give incentives to energy saved, as a result of technology implementation, or as a result of change in behaviour;
- The core challenge is how to create an 'automatic' FIT based on a unit of energy saved, similar to the FIT for RES-E (reward for unit of electricity produced).

ECEEE - 5.62007 10

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Feed-in Tariff for Energy Saving: Thinking of the Design (1)

Joint Research Centre

- In *Demand response programmes*, incentives are used to trigger temporary power demand reduction, rather than rely only on the impact of higher electricity prices.
- Demand response programmes hedge participants from very high peak prices (may be cost-effective). *Additional incentives* for power saving are offered (and may be neede), because of the additional societal economic benefits of demand response.
- The same reasoning and principle could be established for saved energy, because also saved energy (cost-effective) offers many additional societal economic benefits.
- The analogy with the demand response incentives stops here, as instantaneous power can be measured at any time !

ECEEE - 5.62007 11

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Feed-in Tariff for Energy Saving: Thinking of the Design (2)

Joint Research Centre

- In *demand-side bidding* authorities calls for 'bids' from energy saving projects that will deliver energy savings to reach a national or regional energy saving target.
- An feed-in for energy savings however is not necessarily linked to a quantified energy saving target;
- A feed-in for energy saving would establish a pre-defined amount of money to be attributed to each unit of energy saved (even if differentiated by technology), rather than rely on a tendering process.
- In this respect a feed-in for energy savings can be considered a performance-based subsidy, whereby projects are awarded based on their performance

ECEEE - 5.62007 12

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Feed-in Tariff for Energy Saving: How to measure Energy Savings?

CEU

Joint Research Centre

- One of the main problems with the design of a feed-in tariff for energy savings is how *to measure energy savings* and how to attribute energy saving to different factors.
- RES-E does not face the problem of evaluation: additional kWh generated are metered, and no adjustment is needed for climatic condition (e.g. wind or solar radiation), which could also have a big impact on the energy produced.
- The following elements can all be part of an energy saving action, or in some cases can constitute an energy saving action or bring an unintended saving effect of their own:
  - technology improvements (usually defined as energy efficiency),
  - behavioural changes (reducing overheating or overcooling, switching of the lights, using dishwashers or clothes washers at full loads), or
  - external factors (warm weather, changes in production output).
- Most of the traditional energy efficiency incentives are based on the implementation of technologies that improve systems' efficiency. On the basis of assumption about the likely conditions (or keeping the same condition as before the efficiency implementation) the resulting energy savings are calculated.

ECEEE - 5.62007 13

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Feed-in Tariff for Energy Saving: M&V (1)

CEU

Joint Research Centre

- Monitoring and Verification (M&V) protocols: assessment of the energy saving due to the technology or technique implementation;
- Savings are evaluated either *ex-ante* by substituting an existing technology with a more efficient one and keeping all the other system conditions the same (size, usage, external conditions such as weather, etc.) or *ex-post*, by doing some metering or energy analysis and again adjusting the results in order to compare consumption at the same system conditions;
- Examples of the ex-ante saving evaluations are the savings calculations for CFLs or appliances in the White Certificates Schemes in Italy, France and in the Energy Efficiency Commitment in Great Britain.
- The major problems with ex-ante evaluation are the threat of partial realisation of savings and poor additionality. For instance, an ex-ante assessment may fail to assess real energy savings, as one consumer may replace an existing appliance with a larger one (even though more efficient appliance) or a subsidised or free given-away CFLs never get installed, resulting in reality in zero energy saving.

ECEEE - 5.62007 14

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Feed-in Tariff for Energy Saving: M&V (2)

CEU

Joint Research Centre

- Energy savings also depend on structural or temporal changes imposed on the participants by other circumstances beyond their control or having higher priority for them.
- Many schemes and M&V methods adjust ex-post the energy savings for climatic condition, e.g. a very hot summer or a cold winter, building occupancy, production levels, etc.. This point has not been challenged very much in energy policy evaluations
- However since energy savings are considered as an instrument in climate policy, it is worth noting that in emission trading schemes, the emission cap refers to absolute emission reductions no matter in which conditions emission reduction or increase are achieved. At present no ex-post adjustment are allowed in the ETS!

ECEEE - 5.62007 15

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Feed-in Tariff for Energy Saving: M&V (3)

CEU

Joint Research Centre

- When energy saving are evaluated against a reference situation - which could be consumption of the house, building or plant for the previous period, (e.g. the previous year or averaged over the three previous years) - there are a number of situations where energy consumption is decreased because of an external change that distorts the comparison of the post-retrofit situation with the reference scenario.
- An example could be children leaving their parent house, or all occupants getting a job outside the house and thus leaving the house empty for long time (or the opposite situation where someone starts working from home, using electricity and heat all day).
- A key question is whether it is correct to award this type of 'unintended' energy savings and penalise other situation (e.g. house occupied for longer periods).

ECEEE - 5.62007 16

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Feed-in Tariff for Energy Saving: Proposals on initial M&V

- Include only a number of well understood eligible technologies or saving options (e.g. lighting, appliances, insulation, etc.);
- An applicant for ES FIT presents its action: technologies, behaviour changes and the other conditions affecting the saving.
- ES FIT expressed in Euro/unit energy saved (if necessary corrected for external conditions or differentiated by technology).
- A metering (or sub-metering) period before and after the implementation to monitor the savings.
- Differentiated saving feed-in tariff (e.g. low for CFLs, high for building insulation), savings can be awarded for different duration to reflect the different lifespan of various projects.

Joint Research Centre

ECEEE - 5.62007 17

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

Final remarks (1)

- An ES FIT would establish a strong correlation between the amount of support granted and the *result of the action* (savings), departing from the current inefficient logic of investment-based subsidies and establishing a *performance-based* scheme.
- An ES FIT can ensure that energy efficiency measures really take place and *produce genuine additional savings* and that the implemented measure *stay in place* for a reasonable number of years.
- An ES could offer long-term support and certainty on the market for energy efficiency technologies.
- An ES FIT can be tailored to reflect the technical and economic saving potentials available in the various end-use sectors and technologies (e.g. incentives higher for project associated with longer PBP or with high social value) and the possibility to gradually phase it out or even pre-define its duration by type of measure.

Joint Research Centre

ECEEE - 5.62007 18

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Final remarks (2)

- An ES FIT could be both technology oriented, and could also include behavioural changes;
- An ES FIT supporting only electricity savings may be an initial step, and could be introduced as part of the feed-in tariff for RES-E (net metering). Alternatively the RES FIT could be increased to give additional benefit to the end-user when implementing energy saving measures (under the condition that the saving equal at least the RES-E);
- The measurement of the energy saving is one of the most critical issue in a possible FIT for saved energy..

ECEEE - 5.62007 19

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

The paper is intended to raise the issue and start a discussion among energy saving policy makers and analysts.

The authors believe that it is worth investigating the energy savings FIT further, as it could offer some interesting benefits, such as providing a performance-based support.

ECEEE - 5.62007 20

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Thank you for your attention!

Paolo.Bertoldi@ec.europa.eu

Silvia.Rezessy@reeep.org

ECEEE - 5.62007 21

EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre

CEU

Joint Research Centre

Feed-in once, feed-in twice: combining RES FIT and ES FIT

- Reward with a 'combined' FIT only the net metering, i.e. electricity minus own electricity consumption over a certain period (example over a full year).
- In this case an existing RES-E feed-in tariff would also cover energy saving, and with the same amount of support for the achieved RES-E generation and an equivalent energy savings.
- An interesting option would be to increase (e.g. double) the feed-in tariff to reward also the additional energy saving, but still reward the RES-E production *only if* equivalent savings are implemented.

ECEEE - 5.62007 22