European Commission

Joint Research Centre
Institute for Energy and Transport (IET)

Are energy efficiency policies promoting a change in behaviour and sufficiency?

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Introduction (1)

- There is a strong consensus that energy efficiency alone is not enough to reach ambitious climate and energy targets.
- The EU 2020 energy saving target of -20% is expressed as a maximum consumption level. Given the magnitude and the nature of the EU 2020 energy saving target, a change in the behaviour of citizens and organisations will be requested in order to achieve the requested energy reduction.
- Further energy savings targets have been agreed for 2030 (-27-30%) and for 2050 (-80% CO2).

Introduction (2)

Energy savings (ES) and reduction in energy demand can be achieved:

- by improving the energy efficiency (EE) of the services provided (technological aspect) and/or
- by changing the energy consumption pattern without necessarily making technological improvements (behavioural aspect, for instance avoiding overheating/overcooling or reducing Km driven) or
- a combination of the two

Introduction (3)

- Energy Efficiency (EE) describes how much useful work, activity or service can be generated for each unit of energy consumed.
- EE is an important component to achieve Energy Savings (ES), as it allows having the same services and goods with reduced energy consumption.
- However, improved EE - i.e. replacing an installed technology with a more energy efficient one - does not *per se* assure ES, and there are numerous examples where introducing a more efficient technology results in an increase of the actual consumption, due to the rebound effect.

Introduction (4)

- One example is the increase in consumption due to replacing an old inefficient appliance with more efficient one, though larger (e.g. doubling the size of a refrigerators, the EU energy label may improve, but the energy consumption may also increase)

- Other examples could be adding an A-class air conditioner where there was none before or leaving an energy efficiency TV always on to hear music, etc.

- There is a general trend to add more appliances and equipment in such a way that the EU residential electricity consumption is slightly increasing despite all the progress in "efficiency" of appliances.

Traditional Policies (1)

- Traditionally barriers hindering the uptake of EE improvements have been investigated.
- To overcome these barriers, governments have introduced policies and programmes over the last 30 years focusing on improving energy efficiency of equipment and technical systems.
- Traditional policies includes labels and standards, building codes, information campaigns, voluntary agreements, energy/carbon taxation, investment subsidies, suppliers' obligations and financial incentives.

Traditional Policies (2)

- Some equipment minimum efficiency standard or energy labels may be more favourable to larger equipment and these tend to be more efficient for technical reasons, when the efficiency is defined as energy consumption divided size or volume.
- This was the case in the EU for refrigerators where the efficiency was defined as consumption per unit of volume and larger refrigerators with a more favourable surface to volume ratio have a better energy efficiency rating.
- Also building performance certificates (as introduced by the EPBD) based on kWh/m2 ratio do not give the information on the total building energy consumption.

Policies to address energy sufficiency and correct behaviour : Examples from Italy

- In Italy there is a low since the early 90ties imposing the maximum indoor temperature in winter at 20C in homes and offices/schools, as well the maximum daily heating hours in function of the geographical location (8 hours in Sicily to 14 hours in Milan). Also the heating season is regulated by law (e.g. 15 October to 15 April). However it is difficult to enforce this law!

- Another interesting example from Italy is a common maximum 3 kW electricity supply (the additional cost for more kW is substantial). This coupled with high energy prices has discouraged the penetration of residential air-conditioners or cloth driers.

Policies to address energy sufficiency and correct behaviour: information campaigns (1)

- The most common type of policies adopted by national and local governments and agencies to change end-user behaviour has been information campaigns.

- Since the oil crisis in the '70 there have been information campaigns try to stimulate consumers to reduce energy consumption based on different societal goals such as: security of energy supply (e.g. in the '70ties after the oil embargo to reduce transportation fuel and also heating oil)

- In more recent years to reduce electricity consumption in California, Brazil, etc. in order to avoid black outs.

Policies to address energy sufficiency and correct behaviour: information campaigns (2)

- The impact of information campaigns has been well analysed in Diffney 2013 where there is a complete literature review on the topic. Altough some author reports large savings in some specific advertisement campaigns (Reiss, 2008), most of the authors' analyses agree that the effect of advertisement and persuasion campaign have a short life and the effect tend to decrease over time (Nolan, 2008).

- More targeted campaign may have more success but still the energy saving they generate fade way over time (Diffney 2013). This is also the conclusion of Simcock, 2014.

Policies to address energy sufficiency and correct behaviour: smart billing and meters (1)

- The potential of behavioural change on the side of the consumer can be harnessed with the help of informative or improved (smart) electricity bills and smart meters.
- If properly designed, these tools - especially in combination - can offer detailed, customized and consumer friendly information and trigger energy savings.
- It has been shown that a more frequent bill with customized feedback about households' consumption combined with tips to address possible inefficiencies has enabled the owners to reduce their electricity consumption up to 7% on the long term.

Policies to address energy sufficiency and correct behaviour: smart billing and meters (2)

- In a literature review on metering, billing and direct displays on gas and electricity consumption mostly from the USA, Canada, Scandinavia, the Netherlands and the UK, Dr. S. Darby (2006) concludes that the norm is for savings from direct feedback (immediate, from the meter or an associated display monitor) to range from 5-15%, while the indirect feedback (feedback that has been processed in some way before reaching the energy user, normally via billing) has been reported to bring savings in the range of 0-10%.

Policies to address energy sufficiency and correct behaviour: smart billing and meters (3)

- In cases when ex-ante goal setting and/or success reward was integrated with feedback in the field experiment or the policy design, the reduction potentials grew to 15-22% significantly increasing the awareness and willingness of the electricity users independently whether the target was set by themselves or assigned.
- The level of savings depended on the size of the goal set: for instance in an experiment with groups assigned to save 2% electricity consumption and 20%, the former achieved an average of 5.7% reduction, while the latter 15.1%.
- Savings were proven to be attained by target setting but without feedback, however significantly lower than in a combined design (20% goal leading to a 5% reduction result.

Policies to address energy sufficiency and correct behaviour: energy saving feed-in tariff (1)

- The feed-in tariff (FiT) for energy savings can be considered a **performance-based subsidy**, whereby action undertaken by end-users – both in terms of investment in energy efficiency technology and in terms of energy reduction resulting from behaviour change– is financially rewarded based on the energy savings delivered.

- Behavioural change is rarely eligible for traditional direct financial support (technology based incentives).

- Unlike *energy supplier obligations* – whereby energy suppliers have to deliver energy savings at their consumers' premises based on new technologies (and measured through deemed savings), the FiT can directly support action by the end-user based on the amount of energy saved, through technology and behaviour type actions.

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Policies to address energy sufficiency and correct behaviour: energy saving feed-in tariff (2)

- Unlike investment *grants*, which are rewarding consumers based on the size of their investment, a FIT rewards end-users based on the operational performance of their investment in terms of energy savings.
- The FiT could work with an *energy tax or high energy prices* by using the additional public money (e.g. money raised through the tax) to 'reward' to energy saved

Policies to address energy sufficiency and correct behaviour: taxation (1)

- Energy or carbon taxation is a very powerful instrument, which is also effective in limiting the rebound effect.
- However it is quite complex to define an optimum level of taxation and to avoid unintended effects as fuel poverty
- High energy prices tend to reduce the energy consumption particularly in less affluent households.
- In 2010 a sharp increase in fuel price in Italy resulted in a drop of transport fuel for private vehicle of about 10%.
- High fuel price coupled with other charges (congestion charges, parking charges, etc.) is one of the most effective policy to reduce transportation energy consumption.

Policies to address energy sufficiency and correct behaviour: taxation (2)

- In addition to energy or carbon taxation, also property taxation based on the property CO2 emissions or energy consumption could be a driver to reduce energy consumption by selecting a property with low CO2 emissions.
- This concept is already used for new cars sale tax and for the annual road tax in a number of EU Member States.
- However, this results in higher sales a low emission vehicle rather than reduce the use of the vehicle (strong rebound effect with low consumption vehicles, the energy tax on fuels is more effective)

Policies to address energy sufficiency and correct behaviour: Personal Carbon Allowances

- Personal Carbon Allowance is an interesting policy instrument to reduce CO2 emissions and energy consumption.
- This policy concept is not yet adopted in any jurisdiction and has encountered several objections. It may include only CO2 emissions from energy usage (including the transport sector and the aviation sector) or it may include all the CO2 emission including waste production and food consumption.
- The allowances could be distributed in equal measure to each citizen or based on historic emissions.
- The allowances could be traded in such a way to allow citizens consuming more to pay more energy virtuous citizens not using all their allowances

Policies to address energy sufficiency and correct behaviour: progressive standards and codes

- Appliance efficiency standards could be progressive and request higher efficiency with the increase of the overall consumption (the efficiency requirement for a large refrigerator being much higher than the level for a small refrigerator) and absolute cap for the consumption of a give equipment could be also introduced.

- The same could apply to building codes, for example, with higher level of requirements expressed in (kWh/m2/year) with the increased size of the building or in absolute consumption limits (kWh/person/year).

Conclusions (1)

- The EU energy saving target for 2020 and 2030 will require a change in the energy consumer behaviour. This is essential to reach the long term de-carbonisation goals.

- So far most of the "energy efficiency" policies have promoted the technical efficiency through technical standards or incentive for investments in energy efficiency appliances and energy consuming equipment.

- A number of policies help in triggering a behavioural change and in inducing a real reduction of energy consumption at personal level and at household level.

Conclusions (2)

- In addition to more traditional policies to promote energy savings and behaviour change such as energy taxation, information campaigns, there are innovative policies and programmes.

- These includes: Energy savings feed-in tariff, personal carbon allowances, energy consumption feedback coupled with energy saving targets, smart meters, progressive standards and building codes.

- The EU and its Member States should consider and pilot test the innovative policies described in the previous slides, and in general pay more attention to policy that foster a genuine a long lasting reduction in energy consumption.

Thank you for your attention!

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