Fundamentally rethinking efficiency to mobilise efficiency providers

Hans Nilsson
FourFact AB
Grubbensringen 11
SE-112 69 Stockholm
Sweden
hans@fourfact.se

Keywords
energy efficiency policy, market development, business models

Abstract
This paper explores how common energy efficiency policy instruments can be repositioned to mobilize greater efficiency. The first section explains how two existing concepts – economic rationality and business perspective – are fundamental to rethinking efficiency. The second section outlines seven policy instruments and indicates their ability to impact and develop these fundamental concepts.

The Commission to the European Parliament presents the Energy Union with the following words: "It is necessary to fundamentally rethink energy efficiency and treat it as an energy source in its own right, representing the value of energy saved […] the Commission will ensure that energy efficiency and demand side response can compete on equal terms with generation capacity."

Such rethinking must go beyond the traditional aspects from neoclassical economy which assumes that energy efficiency is hampered only by a set of barriers that prevents the market from working properly and once these barriers are removed or lowered the economy will settle in an optimal state – an equilibrium.

Experience however shows that this economically harmonic state is hard to establish and it seems as if there is a direct need to reconsider the tools we use and rethink efficiency fundamentally. Such rethinking has (at least) two aspects.

- **Economic Rationality** – one is to improve the traditional rational case for energy efficiency as the cheapest resource.
- **Business perspective** – the other is the need to widen the view of the benefits of energy efficiency and to develop the business perspective of energy (and resource) efficiency in new directions.

The tools will however not have to be new, but reformed, and may only have to be new in the European context. This paper aims to provide some examples on how this can be done.

Huge chunks of efficiency are still tucked away
The International Energy Agency (IEA) has for several years provided material on the importance of energy efficiency. In the World Energy Outlook 2012 (IEA WEO 2012) there was a calculation made showing how big is the resource of profitable energy efficiency measures not undertaken, i.e. the "potential" to make the energy system more resource efficient.[1]

Actually the size of this profitable potential on a global scale should be enough to cover the deficit between "business as usual" and the two degree scenario (2DS) trajectory. This means that profitable energy efficiency measures should (almost alone) solve the problem with global warming (Figure 1 left)!

This calculation was followed up by showing that, unless changes are made, approximately two thirds of this potential will remain unharvested in the decades to come (Figure 1 right). So in spite of the fact that, by serving our best economic

1. Traditionally the IEA WEO shows first where the trends are heading us, called business as usual or "current policies scenario" and then where we could go if the policies decided upon will have the impact that they intend to have, called "new policies scenario". Since a few years they also show where we should be in order to meet the targets for global warming and keep it below 2 degrees. This is called the "450 scenario" since it was generally agreed that a concentration of 450 ppm CO_2-equivalents is necessary.

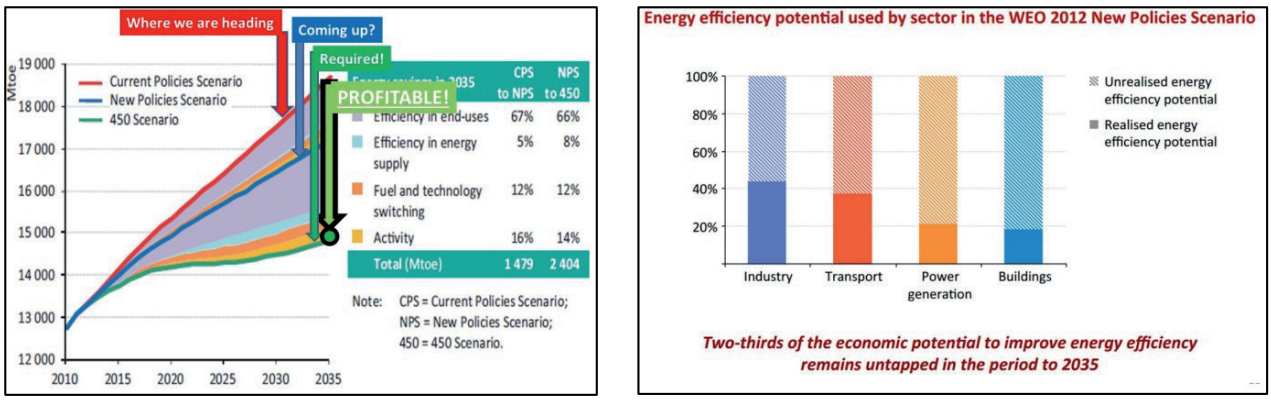

Figure 1. Profitable potentials remain unharvested (for details see IEA WEO 2012).

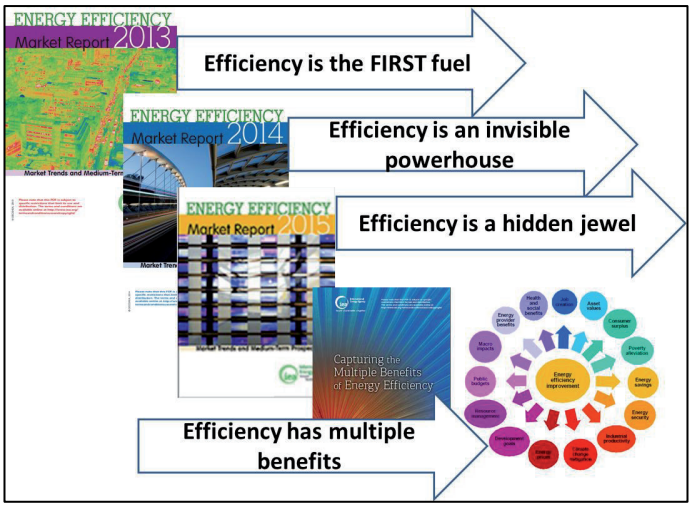

Figure 2. The IEA strengthen its messages in the efficiency market reports and analysis of benefits.

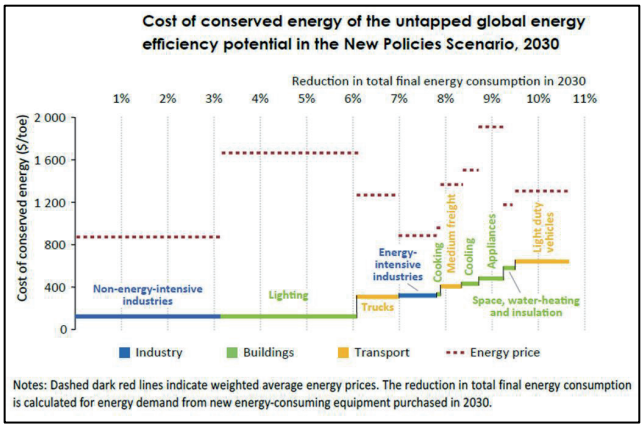

Figure 3. Actual "gap" between costs to supply energy or to reduce demand (WEO 2015 chapter 10).

interests by doing what is economically rational, we leave this resource and continue to waste money and environment!

Since 2012 the IEA has each year published an "Efficiency Market Report" which elaborates the theme. Further the IEA has published numerous reports that shows that energy efficiency also entails several other aspects, called multiple benefits.

Finally the IEA has made some remarks on why energy efficiency does not receive more attention in the deliberations of companies. In the World Energy Investment Outlook 2014 (IEA WEIO 2014) it was observed that:

- "Energy efficiency currently *lacks the attractiveness of investment in clean energy supply, such as renewables*, reflecting different policy frameworks and a set of specific barriers, […]
- In contrast to traditional energy-supply investment, energy efficiency investments offer expectations of future cost savings *rather than an asset generating a specific cash flow*."

These observations counteract with the simplistic perception of the rational behaviour of "economic men" making the decision in society. This explanation would result in either a need to train staff responsible for investment decisions in banks and companies in considering the efficiency projects differently and/or to widen the concept of rationality for them.

Rational (up to a point)

The economic man is the traditional model for how societies and companies makes choices and decide upon them – whether to act or not. This Standard Economic Model (SEM) is most often used to describe, understand and prescribe user/customer/actor behaviour, is quite cynical. People are assumed to egoistically be maximizing their own welfare. It is postulated that by doing so the market will automatically find a state where all beneficial changes have been made and an optimal solution been achieved. This is the magic of the market – the invisible hand with a magic wand (Nilsson 2015).

It can however be put in doubt if this model really is fully applicable in real life. The IEA has in their works shown that there is a gap between prices paid for supply for different purposes and the cost for the alternative solution, Figure 3. If the user finds an alternative solution in installation, for which the cost is lower than the energy price, the rational choice would be to choose this solution and avoid buying the energy. In reality however most of us are not rational neither in a short nor in a long perspective (Nilsson 2015). We may recognise the opportunity but have great difficulty in acting according to our best wishes and intentions.

Numerous studies show that such choices exist and show their magnitude and profitability. Some of the more well-known are those published by the consultancy company McKinsey and

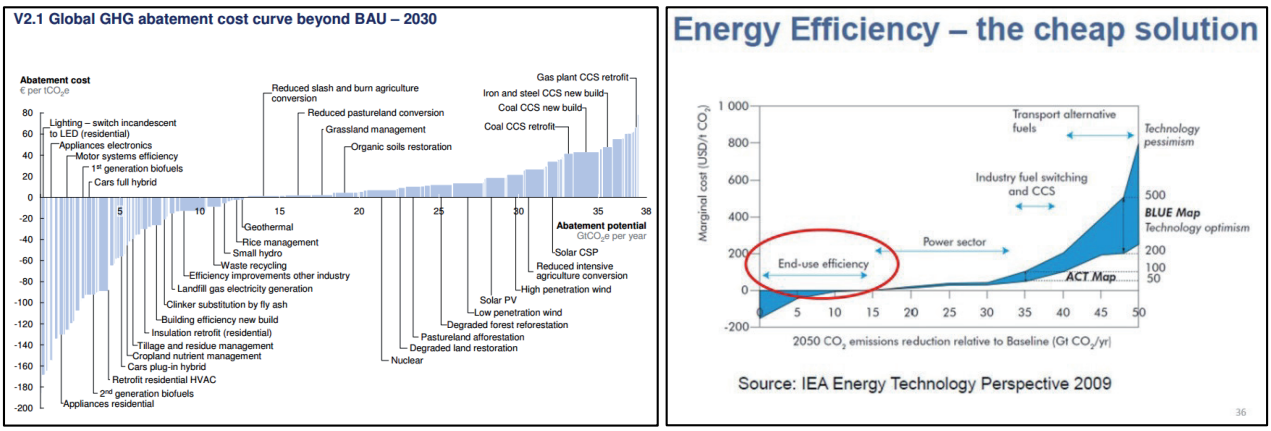

Figure 4. Different calculations showing that energy efficiency has "negative" costs. McKinsey (left) and IEA (right).

those by the IEA in their Energy Technology Perspectives. The idea was used and presented already in a 1990 study by Clark Gellings and Amory Lovins in Scientific American as "supply curves" for efficiency improvements. This seems to prove that, as the IEA DSM-Programme puts it, "energy efficiency is not difficult – only complicated".

The technique to show these curves is however more illustrative nowadays in the works of McKinsey[2] and IEA since it defines the cost as the payment for the installation with a deduction of the cost for the energy that is saved. Thereby the result is a "negative cost", i.e. the resulting saving once (and if) the installation is chosen. Lovins then made it even more illustrative by saying that efficiency is "the free lunch that you are paid to eat"! One would then anticipate that these illustrations would convince people who make decisions on operations in buildings and processes that they could be more efficient and that there is a "win-win" situation for them to share and to make other rational choices than "business as usual". But it seems as if the everyday rationality takes you only so far.

Step 1: Stretch Rationality further

Analysts have tried to explain why some of the potential for profitable energy efficiency improvements are not undertaken. Their argumentation is based on a hierarchy of decisions where opportunities are restricted by (1) availability of technologies, (2) economic restrictions and (3) market limitations to adopt what is suggested. For example Hibbard, Franklin and Okie (2014) are therefore identifying different potentials:

1. Technical potential is not available or companies might have even better alternatives for their scarce resources or might have capital constraints.
2. Economic potential (some of it may require too burdensome investigations and therefore have high associated/hidden costs).
3. Achievable potential (what is realistically left and is part of the ongoing improvements of economic performance in the operations).

2. Figure 4 left: A cost curve for greenhouse gas reduction: http://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/a-cost-curve-for-greenhouse-gas-reduction.

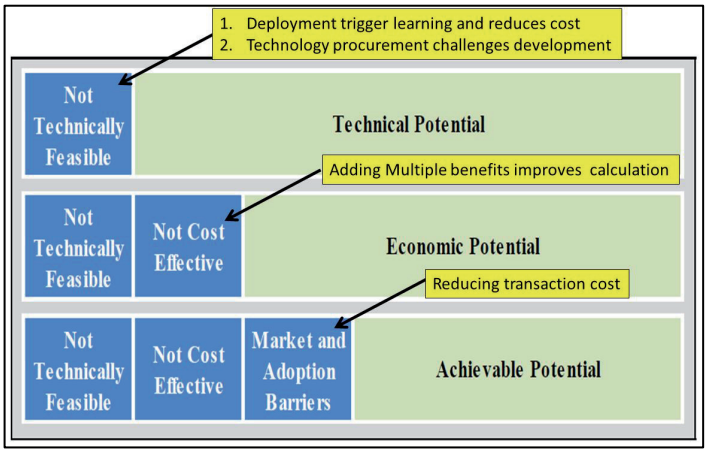

Figure 5. Hierarchical reduction of the rational basis for decision and suggestions for countermeasures (based on Hibbard, Franklin and Okie 2014).

This model is still based on the thinking that the people who are faced with suggestions to improve efficiency in their companies are rational but if the technology does not exist, if the costs are not acceptable or if the barriers are too high, they will have to reject the proposal. The everyday approach, not the least in industry, is that decisions as delegated within the company structure are basically "perfect" and rational but still needs to be restricted. This is perfectly reasonable since all organisations have to ensure that the economy is kept in order. You cannot allow everyone to make decisions as they please or find fit. The risks are obvious and there must be a responsibility for the overall soundness of business. The issue is how can we improve it and find ways to make better use of the growing opportunities for profitable energy efficiency rather than forego them in routine inertia. This may require more openness within business but also supporting activities from the government.

1. **The technical potential** may be improved as a result from deployment programmes which in turn will have an effect by cost reductions due to market learning (c.f. PV-photo voltaics) or by challenging technology suppliers by technology procurement.
2. **The economic potential** may be improved with development of methods to take multiple benefits into account in

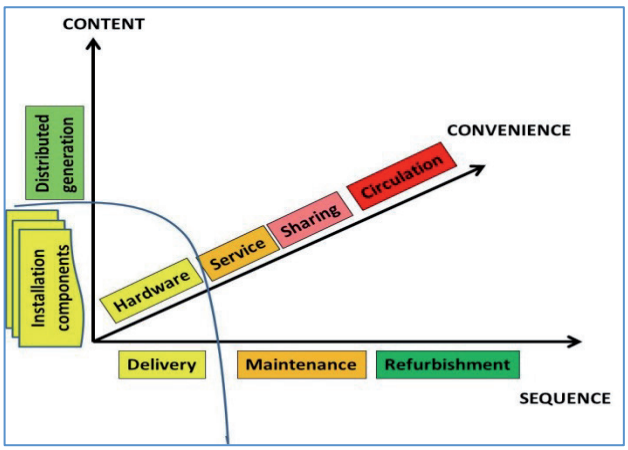

Figure 6. Development of the efficiency business perspective in three dimensions.

the calculations. The IEA has identified and created a typology for different multiple benefits that could add to the value of the efficiency improvement itself (IEA 2014-1). Naturally also access to incentives due to policies (Nilsson 2015) or price changes will have an impact.

3. **The achievable potential** may be improved by use of programmes to reduce transaction costs i.e. such as energy management and industry networks. Most countries have programmes for these issues and are often designing policies to address "barriers" that impose hinders to implementation. (IEA/OECD 2003).

There are good reasons and good opportunities to make the decisions more rational and open the door to harvest the vast potential that presently lies idle. But then the appropriate tools must be developed.

Step 2: Elaborate the business perspective

It is quite obvious that there is a need to "rethink" energy efficiency if we should be able to make the best of our resources and there is a set of alternative and complementary aspects on energy efficiency that could be of importance for making energy efficiency measures more widely accepted. The IEA has in their WEO 2012 made a "shopping list" (called six steps) to make energy efficiency first priority and impact the business models. In this context we will deal with the IEA steps from the two angles:

1. How we can strengthen the economically rational case, and
2. How we can improve the business perspective, involving more/new and motivating actors to make energy efficiency their business?

The business models for energy efficiency may still develop in several aspects. As shown in Figure 6, traditionally models have been focused on delivery of hardware for installations and to some extent associated service and maintenance, such as the energy service company model (ESCOs), to make the result comparable with delivery of energy (kWh). Some companies are now combining their products with distributed generation and other further developments are also possible. Installations can be refurbished as they age and as new equipment is made available and efficiency concepts can be further developed by sharing and concepts relation to the "circulation economy" develops, either as a part of the traditional business or in partnership with other companies.

The IEA has in its World Energy Outlook 2012 provided a fairly extensive analysis of the "efficiency gap", the fact that we have a profitable potential that still remains unharvested. In particular they developed a checklist, as in the table below, which provides six steps for policymakers to look into when they design policies and tailor instruments that would help the market and its actors to be more active. The re-orientation of business does not come out of a hat by itself but will require support from several institutions in the society (IEA/OECD 2003). So the issue is: "How can we translate this into practical operations", "How can we develop existing and new instruments". How far do we need to RETHINK?

Codifying a new way of thinking

The need for reforms must be translated into policy instruments. Some of them are already tested but may be in need of repackaging or could be combined to get a full impact. The following is not an attempt to deliver a full-scale solution but to indicate some paths that can be explored.

Table 1. The IEA six steps from WEO 2012 and how they address the two development aspects.

IEA Steps	Concerns actors views and mind	
	Economic Rationality	Business Perspective
Visible (The energy performance of each energy end-use needs to be made visible to the market.)		X
Priority (The profile and importance needs to be raised.)	X	
Affordability (Create and support business models, financing vehicles and incentives)	X	
Normal (Energy efficiency needs to be normalised. Resulting benefits from learning and economies of scale help make the most energy-efficient option the normal solution.)	X	X
Real (Monitoring, verification and enforcement activities are needed to verify claimed energy efficiency)		X
Realisable (Achieving the supply and widespread adoption of energy efficient goods and services depends on an adequate body of skilled practitioners in government and industry.)	X	X

Table 2. Examples of redesigned instruments to address the steps that IEA has identified and which potentials they could impact.

Instrument	Concerns IEA step						Address potential		
	Visible	Priority	Affordable	Normal	Real	Realisable	*Technical*	*Economic*	*Achievable*
A. Least Cost Planning	X	X	X	X			X	X	X
B. Energy Efficiency Obligations (EEO)	X	X	X		X	X	X	X	X
C. Recognition of Multiple Benefits			X	X	X			X	
D. Models to distribute Split Incentives	X		X		X				X
E. Use of Behavioural Economics and "Nudges"	X		X	X	X	X			X
F. Development of and Certification of energy services	X			X	X	X	X		X
G. Obligations for resource management and circular economy		X				X		X	

Table 3. EEO policy objectives as recorded in Lees E and Bayer E RAP 2016.

Examples of EEO Policy Objectives for 11 Member States

Policy Objective	AT	BG	DK	ES	FR	IE	IT	LT	PL	SI	UK
Deliver cost-effective energy savings/reduce energy bills	X	X	X	X	X	X	X		X	X	
Environmental/CO_2 reduction								X			X
Improve energy security by reducing imports							X				
Assist low-income households to install efficiency measures						X					X
Tackle fuel poverty*					X	X**					X
Stimulate energy services market	X						X	X			

* *Fuel poverty refers to that subset of low-income households that struggles the most to heat their homes affordably.*
** *Only five percent of the target is to be met by actions in fuel-poor households.*

A. LEAST COST PLANNING (LCP)

Least cost planning has rather been a buzzword in Europe but has been less applied. There exist, however, promising experiences from the US where energy efficiency has been compared with supply on equal grounds. The basic idea is that "energy efficiency should be treated as an energy source in its own right, representing the value of energy saved" as is described in the Energy Union Package by the Commission and as such be "The First Fuel", (EU COM(2015) 80 final). This method has been applied in many states in the US but the principle has often been distorted in Europe and applied for comparison between different supply sources only not involving the demand side. Therefore application of LCP in Europe would require fundamental rethinking. There are, however, several examples of LCP from the US that can be used for inspiration (Cowart 2014).

This will, however, also require profound impact in the regulation principles which may be easier in countries who have also adopted the Energy Efficiency Obligations as required in EED article 7, (Bayer eceee 2015).

B. ENERGY EFFICIENCY OBLIGATIONS (EEO)

Energy Efficiency Obligation, EEO, have been used in several countries in the world on all continents, IEA DSM Task 22, 2012. Such obligations have been a part of the Energy Efficiency

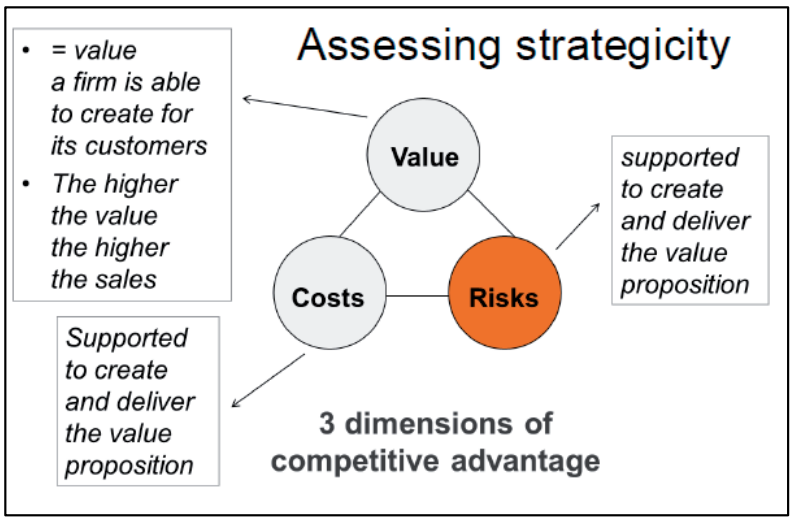

Figure 7. The three dimensions of competitive advantage (Cooremans eceee 2015).

Figure 8. The palette of Multiple Benefits according to IEA.

Directive (article 7) but only applied in a few of the EU countries. The reason for their use has varied in the EU countries, as shown in table below, but a dominating aspect has been that they should be fostering dissemination of cost-effective services. It is interesting that in the design also different multiple benefits have been targeted.

As can be seen, only a minority of countries have noted the development of energy services market as an objective. The majority of countries that use EEO seems to take the perspective that actors on the market fully understand the rationality of the business proposition in energy efficiency and does not need any further assistance by e.g. energy service companies to develop a package deal.

Development of EEOs as an instrument for the Energy Services companies seems to be an instrument to be sharpened and honed.

C. RECOGNITION OF MULTIPLE BENEFITS

Multiple Benefits have successfully been dealt with by the IEA in publications but there is limited knowledge about how they can be part of formal calculations. The IEA DSM-Programme is about to begin a work (Task 26) to find formats and routines to make such calculations a standard tool in particular in industry.

This work will in great part be based upon studies of how companies can make energy efficiency a strategic issue and a competitive edge, see picture below, (Cooremans eceee 2015). Cooremans has created the expression "strategicity" to describe the business concept that covers how a company addresses their competitive advantages.

Many actors already have a fairly good view and understanding of the existence of benefits that goes beyond the simple cost-benefit-calculation based on savings and investments related to buying new equipment. To a growing extent such cal-

Table 4. Examples of problems where split incentives may occur.

Class of benefit	Remark
Macroeconomic	Benefits may impact trade balance or employment
Public budget	Different parts of administration and services e.g. water and energy supply but also education and health
Health and well-being	Investing in buildings may have a huge impact on health
Industrial sector	Responsibilities for operation and quality may have different interests
Energy delivery	Energy suppliers maximising their profit may feel a threat from reducing supply and thereby prices and revenue.

culations are also recognising Life Cycle Costs (LCC) and take the life-time of the equipment into account. But mostly they stop short of trying to also monetarize the other benefits and make a formal decision that is comprehensive.

D. MODELS TO DISTRIBUTE SPLIT INCENTIVES

The IEA have created a list of 16 different "Multiple Benefits" that are associated with the technologies applied to improve energy efficiency, IEA 2014-2. In this work a typology was developed of different classes of such benefits. Some of those are quite straight forward and making use of them is a matter of identification and development of appropriate routines in management. But in some cases even when proper identification is made there is a problem of so called "split incentives" i.e. that the benefits and costs are divided between different actors and thereby also the responsibility to handle them.

There may be an urgent need to find and develop new models to divide responsibilities between actors in order to find global optima rather than local sub-optima.

E. USE OF BEHAVIOURAL ECONOMICS AND NUDGES

In many cases the traditional models for decision making assume that actors are, at least mostly, guided by self-interest and profit-maximizing. Modern behavioural economics have revealed that economic rationality alone is rather rare and that decisions are made with much more limited views on what can and should be made, (Nilsson and Ruhbaum 2014, Nilsson 2015, World Bank 2015).

The Behavioural Insights Team, BIT, in UK has developed a model called EAST that provides some rules for how policies can be designed to create a higher interest in changes (Service O. et al 2016). The acronym stands for making it:

- **Easy** (Harness the power of defaults. Reduce the 'hassle factor' of taking up a service. Simplify messages.)
- **Attractive** (Attract attention. Design rewards and sanctions for maximum effect.)
- **Social** (Show that most people perform the desired behaviour. Use the power of networks. Encourage people to make a commitment to others.)
- **Timely** (Prompt people when they are likely to be most receptive. Consider the immediate costs and benefits. Help people plan their response to events.)

There is a vast field of alternative policies to be applied, often captured in the word "Nudges", and that need to be explored, tested and developed.

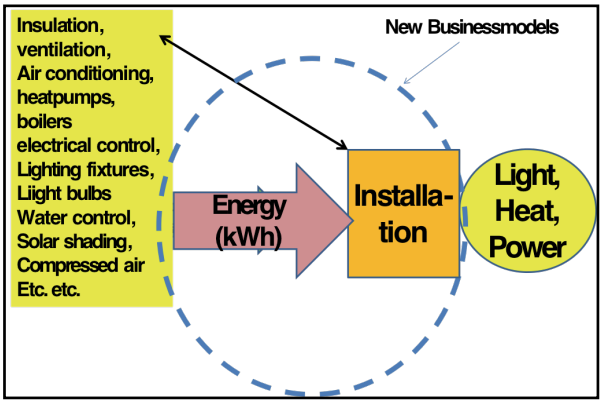

Figure 9. Delivering and altering the service (Light, Heat, Power) can be made with many different sets of equipment in the installation.

F. CERTIFICATION OF ENERGY SERVICES

Customers are facing a great variation of how energy efficiency can be improved. It is not only an issue of which measures that are the most suitable and how they can be calculated but maybe even more who can be trusted to deliver, "Energy efficiency is not difficult it is only complicated" (Nilsson 2015).

Energy efficiency measures also have distinct "knock-on" effects since they are mutually dependent. Once you have undertaken one it will have an impact on other measures that may not reach their full effect. It is therefore important that calculations and installations are considered as packages.

The existence of a building certification and labelling scheme certainly helps but there is still an issue of finding the necessary craftsmanship. Such certification will require that the efficiency industry also develops methods and guilds for certification.

Presently there is under development systems to create "investor confidence" in business propositions that take both the technical dependencies and the calculations and measurement and verification into account.

G. OBLIGATIONS FOR RESOURCE MANAGEMENT AND CIRCULAR ECONOMY

Finally as the awareness of how limited resources must be managed and that the circular economy evolves there might be a case for authorities to ensure that resource management is not overlooked but becomes an obligation to serve and deliver sustainable solutions.

In a circular economy that reduces waste and promotes recycling there may be new business opportunities for energy efficiency services to consider.

Conclusion

The rethinking will require a break with the simplistic and traditional view that the market automatically adjusts in response to prices. It will require some "support" and/or pressure from institutions in particular in the European Union. Forming of an Energy Union based on the principle "Efficiency First" is necessary.

Developing of the specific instruments may certainly have to be designed according to different countries own tradition and circumstances, but the EU as an institution has shown its ability to handle such alignments.

Firstly we must recognise the profitability of a huge potential for efficiency improvement, but also that this opportunity is far from obvious for the many actors that needs to be activated to have it released. The energy efficiency businesses must be much better in cooperation across their technological borders.

Secondly we must much better in addressing customer concerns and to do so at the right moment. To use the UK BIT advise make energy efficiency Easy, Attractive, Social and Timely.

Finally we must demand that the decision makers develop instruments that are more appropriate and coherent. Naturally and traditionally policy is focused on energy supply and it is a big hurdle to understand that efficiency is a fuel that could compete with the supply options both in economic terms but also in terms of reliability and, not the least, in terms of risk. Energy efficiency makes the society more robust and competitive. To arrive there we need:

- The governments to provide policies based on least cost planning and obligations for energy efficiency as part of the energy supply.
- Full recognition of the multiple benefits and use of nudges as part of a business culture that is based on behavioural economics.
- Improvement of business praxis that gives customers confidence in deliveries and more developed package services.

Till we get there the market will be characterised as providing random services to occasional customers.

References

Bayer Edith. Realising Europe's efficiency pipeline. eceee proceedings 2015.

Cooremans C. Competitiveness benefits of energy efficiency: a conceptual framework. eceee proceedings 2015.

Cowart Richard, Unlocking the Promise of the Energy Union: "Efficiency First" is Key. RAP December 2014.

EU COM(2015) 80 final, ENERGY UNION PACKAGE.

Hibbard, Franklin and Okie 2014 The Economic Potential of Energy Efficiency. Analysis Group for US EPA.

IEA DSM Task 22 Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes 2012 (together with RAP).

IEA/OECD (2003), *Creating Markets for Energy Technologies*, International Energy Agency/Organisation for Economic Co-operation and Development, Paris.

IEA WEO 2012 (World Energy Outlook)(http://www.iea.org/publications/freepublications/publication/WEO2012_free.pdf).

IEA 2013 (Energy Efficiency Market Report 2013) (http://www.iea.org/publications/freepublications/publication/energy-efficiency-market-report-2013.html).

IEA 2014-1 (Energy Efficiency Market Report 2014) (http://www.iea.org/w/bookshop/463-Energy_Efficiency_Market_Report_2014).

IEA 2014-2 Capturing the Multiple Benefits of Energy Efficiency.

IEA WEIO 2014 (World Energy Investment Outlook 2014). Factsheet Energy Efficiency (http://www.worldenergyoutlook.org/media/weowebsite/2014/weio/WEIO2014FactSheet4EnergyEfficiency.pdf).

IEA 2015-1 (Energy Efficiency Market Report 2015).

IEA 2015-2 World Energy Outlook.

Lees E and Bayer E. Toolkit for Energy Efficiency Obligations. RAP 2016.

Nilsson and Wene (2011). It is not the barriers, but the disorganised learning that holds us back! Paper 8-414-11 eceee summer study 2011.

Nilsson et. Al. (2012) We are lost if we don't develop new business-models. Paper 3-106-12 eceee summer study 2012.

Nilsson (2013) Advocating energy efficiency with a proverbial approach. Paper 1-242-13 eceee summer study 2013.

Nilsson and Ruhbaum (2014) Understanding and addressing the client's needs: How can we frame energy efficiency? eceee proceedings 2014.

Nilsson (2015) Being human is a market failure. Paper 1-477-15 eceee summer study 2015.

Service Owain et al.. Behavioural Insight Team. EAST – Four simple ways to apply behavioural insights.

Thaler, Richard H. And Sunstein, Cass R. (2008) Nudge. Improving decisions about Health, Wealth and happiness.

World Bank. 2015. *World Development Report 2015: Mind, Society, and Behavior.* Washington, DC: World Bank. doi: 10.1596/978-1-4648-0342-0. License: Creative Commons Attribution CC BY 3.0 IGO.