Enerdata

Training Seminar

Evaluation of energy efficiency trends and potentials

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Scope and Policy Implications

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Agenda

Energy efficiency policies: objectives, rationale and evaluation

Instruments and measures

Background and objectives

- **General goal:** ensure a given level of service and production with an energy consumption which is optimal as regard economic and environment costs
- **Specific goal for Developping Countries:** release the macro-economic constraints due to the energy imports and investments, increase the level of service and production with a limited energy supply
- **Observation:** industrial countries have sucessfuly implemented energy demand management policies over the last 25 years, with convaincing results, and keep on going today in the same direction

Macro-economic foundations

- **Optimize the use of economic ressources:** do more and better with less energy imports requirements and less energy investments
- **Correct energy market imperfections:** better informed consumers; a transparent price system, covering all the costs; a diversified offer; mechanisms to correct the perverse effects of financing and decisional constraints
- **Fully integrate the impacts of infrastructure choices on future energy consumption :** urbanisation codes and construction codes, transport infrastructures, location of industrial platforms, etc…

Diagnosis

- **Consumption reveals imperfectly the actual demand:** if energy supply is limited, energy consumption reveals only the current available supply: the comparative analysis of the observed consumption and the actual affordable demand indicates the real ability of the energy system to meet the requirements of the economic system. This is the first role of the energy efficiency indicators
- **Economic growth generates increased energy needs and may therefore be limited by energy supply constraints :** more production implies more energy; more wealth to distribute results in a better satisfaction of needs and aspirations of the people, which also implies more energy; a limited supply may constrain the production and limit the satisfaction of people's needs : one needs appropriate indicators to analyse and understand

Diagnosis (follow-up)

- **More efficiency in energy use decrease the draw-backs of the supply constraints :** efficient processes and equipment, a better management of available energy allows to produce more and to better satisfy the needs, with the same amount of energy; one must evaluate what is the situation and what remains feasible as to energy efficiency : this is the other main role of energy efficiency indicators are supposed to show
- **All energy forms have not the same end-use efficiency, and do not participate in the same way to the growth :** substituting LPG or kerosene for fire wood in households end-uses decreases the total energy consumption of the households without affecting their needs: one must evaluate the « useful » energy, and not only the recorded final energy

Potentials for energy efficiency

- **Potential = actual affordable demand – « optimal » demand : la « optimal » demand is what would take place in an energy market free of imperfection, and free of supply constraints; when the demand is constrained by supply shortage, the potential for energy efficiency refers to the ability to reduce the gap between the actual consumption and the affordable demand (i.e. the ability to produce more and better satisfy the needs with the existing supply)**

- **Expoitation of the energy efficiency potential is a decreasing yield process: comme as for an oil field, the exploitation of the first toe of energy efficiency is less costly than the following : one must sort out the components of the energy efficiency potential according to their exploitation costs**

Potentials for energy efficiency

- **Energy efficency potential is also dynamic, mostly in developping countries : the more important the expected development of production capacities and infrastructures, the more necessary to consider carefully the related energy consumption : the dynamic potential for energy efficiency is the difference between these future energy demand according to existing techniques and behaviours, and those « optimised ». Energy efficiency indicators must account for this dimension, in particulat through international benchmarking**

- **The exploitation of the dynamic potential is similar to the installation of new energy production capacities : as for power plants or refineries, the investment required to exploit the dynamic potential for energy efficiency must be planned along with the economic development. Energy efficiency indicators must be used to follow-up this exploitation**

Economic criteria for energy efficiency technical choices

Consumers decide according to short term priorities : in reality, energy consumers decide to implement an energy efficiency measure – when they decide to do so! – only when they can pay back the investment in very short time period (less than two years usually)

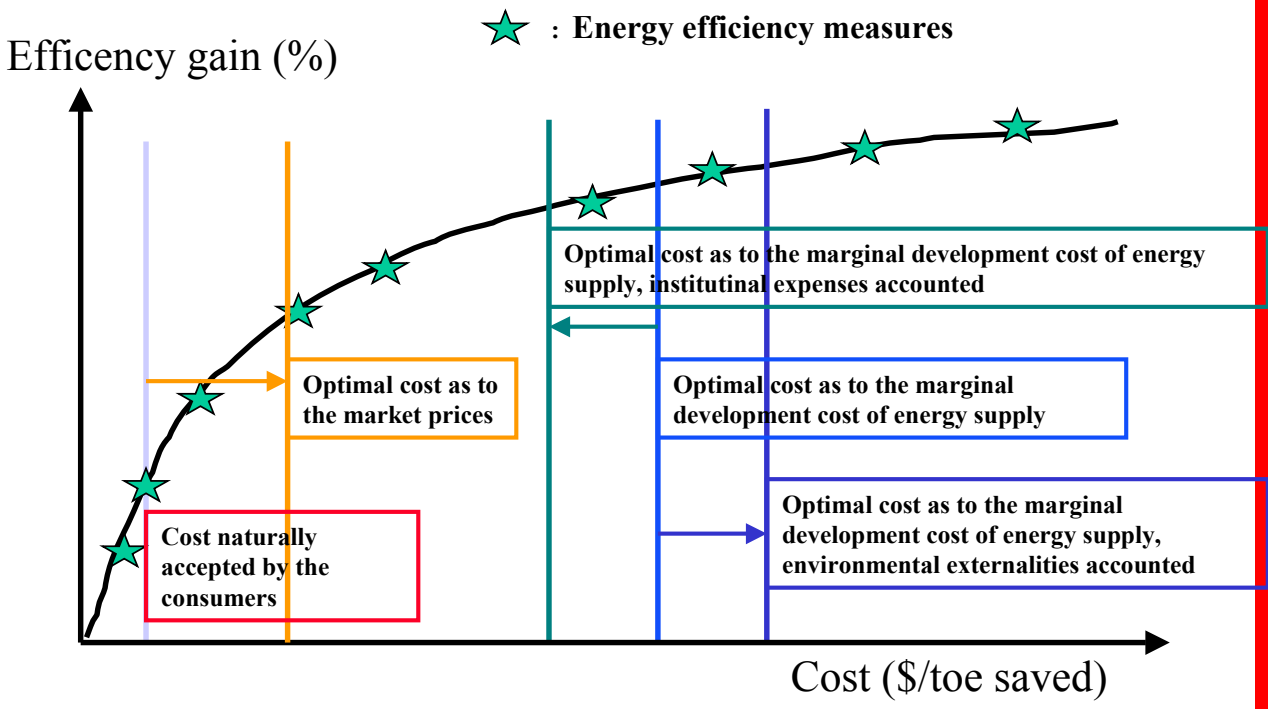
Usually, Governments decide their economic support to energy efficiency on longer time horizon, but with strict budget constraints: an energy efficiency investment which is paid back in 7 to 10 years at current energy prices might be considered as optimal by public decision makers; it is therefore necessary either to convaince consumers to enlarge their time horizon for decision, or to help them doing so, in order to exploit accurately the energy efficiency potential; the choice of public actions is limited by financial constraints

Economic criteria for energy efficiency technical choices

Consumers usually do not take part in the decisions on infrastructures and related energy efficiency options : decisions about infrastructures generally concern the long term, and institutionally there is no place for the consumer in the decision process: the economic criteria that prevail in the decision about related energy efficiency options are therefore those of the public authorities

For long term decisions, public authorities must refer to the concepts of global discounted costs and marginal development cost : the comparison between immediate expenses (investments) and future expenses and benefits implies to use a discount rate that permit to convert all these economic quantities in today's values; one must compare the cost of the toe that will be not consumed because of energy efficiency option with the cost to produce or purchase this toe in the distant future, which might be well above the current prices

Quantification of policy objectives in energy efficiency



Quantification of policy objectives in energy efficiency

- **Include energy efficiency in the energy forecast : the impacts on energy demand of economically acceptable energy efficiency measures must be evaluated on the short, medium and long term, along with the forecast of energy needs, for each relevant sector/end-use**
- **Evaluate the potential for energy efficiency which is open for public action : it is calculated as the difference between a « business as usual » projection (pure market mechanisms) and a projection which account for energy efficiency measures which meet the public authorities economic criteria**
- **Evaluate the acceptable rate of exploitation of the potential open for public action : the discrepancy between short term criteria of the market and long term criteria of the public authorities obliges the latter to intervine on the market in order to get closer to the « optimality »: the cost and modalities of this intervention do not allow to expoit anything else than a fraction of the potential**

Ex-post evaluation of results achieved by energy efficiency policies

- **Has the economy globally improved its energy efficiency? A downward inflection of the GDP energy intensity trend indicates that the economy is using energy in a more productive way**

- **To which extent GDP energy intensity evolution is due to energy efficiency measures? A downward inflection of the GDP energy intensity trend, at constant GDP structure, shows the overall impact of energy efficiency measures**

- **To which extent the impact of energy efficiency measures is due to the public action? A downward inflection of the specific energy consumption trends, per dwelling, per car, per ton of product, per employee,…shows the effectiveness of the Government action if these dwellings, cars, products, employees,… were really action targets**

Comparing ex-ante and ex-post evaluations : a condition to actually measure the results of energy efficiency policies

- **Being sucessful with energy efficiency policies does not mean necessarily that energy consumption decrease! Improving living conditions and well-being is also a policy objective which usually results in increasing energy consumption. Energy efficiency may well be targetted to curb down the increase. It has to be announced before!**
- **Comparing ex-ante and ex-post energy efficiency macro indicators is the only way to evaluate the degree of success of an energy efficiency policy. These indicators show how far the level of wellfare achieved with a certain amount of energy is in line with the initial objective**
- **Comparing ex-ante and ex-post energy efficiency technical indicators is the only way to evaluate the degree of success of energy efficiency measures. These indicators show how far the measures have contributed to a level of exploitation of the potentials in line with original objectives**

Agenda

Energy efficiency policies: objectives, rationale and evaluation

Instruments and measures

Main instruments of energy efficiency policies

- **Regulation**
- **Voluntary Agreements**
- **Labeling**
- **Economic incentives: tariffs, taxation, subsidies, certificates,…**
- **Information, audits**

Regulation

• Main targets: thermal insulation of buildings, thermal equipment efficiency, performance of electrical appliances and motors

• Main features of regulation: public cost to prepare and implement the regulation; public cost to control; potential savings much higher than what can be expected from market mechanisms alone; rebound effects

Voluntary agreements

• Main targets: energy intensive industries (steel, chemicals, cement, etc..); car manufacturers

• Main features of voluntary agreements: low public cost; potential savings similar to what can be expected from market mechanisms alone; issue of control

Information, labelling, audits

- **Main targets: producers and distributors of electrical appliances; real estate; consumers**

- **Main features of labelling: low public cost; reluctance of distributors; issue of fair competition among producers of different sizes**

Economic instruments

- **Main targets: big industries; transports; space heating; promotion of renewables**

- **Main features of labelling: low public cost; reluctance of consummers; usually low sensitivity to energy prices; distorsions in competition**

Subsidies and financial incentives

- **Tax deduction (eenrgy saving equipment, renewables); accelerated amortizing**
- **Investment subsidies; low interest loans**
- **Guarantee funds for investments**
- **Minimum price offered for renewable electricity (wind, solar, co-géeneration)**