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Energy transition in the light of innovation and decentralization

Summary of the report submitted on behalf of OPECST by
Messrs. Bruno Sido, senator, and Jean-Yves Le Déaut, MP.

Mr. Claude Bartolone, President of the National Assembly, requested that OPECST (Office parlementaire d'évaluation des choix scientifiques et technologiques, French Parliamentary Office for Scientific and Technological Assessment) participate in the national debate on energy transition taking place from January to September 2013. To this end, OPECST instructed its Chairman and Senior Vice-Chairman, Messrs. Bruno Sido, Senator, and Jean-Yves Le Déaut, MP, to provide a summary of the main work it has done on this subject. The rapporteurs have relied on recent or ongoing studies and completed their information with three specific hearings, on energy savings in building, marine power, and the role of innovation in energy transition.

The essential role of innovation

The concept of "energy transition" refers implicitly to previous phases of great technological change which shaped today's society: the spread of steam and electricity in the nineteenth and twentieth centuries; widespread access to comfort and convenience with the automobile and home appliances in the middle of the twentieth century, and the new revolution in electronics and information technology in the late twentieth century.

There is, however, a fundamental dissimilarity between previous "transitions" and today's "energy transition". The former resulted from "technological waves" born of the initiatives of entrepreneurs, which gradually imposed themselves on mechanisms of consumption and investment, and then on the social order, while our "energy transition" reflects, on the contrary, the expression of a social demand which seeks to impose itself on the productive apparatus.

It will be very difficult to achieve energy transition if innovation processes are not taken into account. The OPECST immediately perceived this crucial dimension of energy transition, whose importance was insufficiently emphasized during the "national debate".

In this regard, the OPECST report on "Innovation put to the test of fears and risks" published in January 2012 by Messrs. Jean-Yves Le Déaut and Claude Birraux, makes it possible to identify the main bottlenecks for innovation, and potential levers for its development.

The upstream phases of innovation are properly funded : ANR (Agence nationale de la recherche, French National Research Agency) allocates approximately 50 million euros per year for projects; for the technical validation of concepts, that is to say, valorisation, the resources of ADEME (Agence de l'environnement et de la maîtrise de l'énergie, French Environment and Energy Management Agency), reinforced by the mechanism of "Investissements d'avenir" (French program "Investing for the Future"), provides supports of the order of one billion euros to demonstrators (Futurol, BioTfuel, Gaya, for second-generation biofuels) and the institutes for low-carbon energies (eg "France energies marines", dedicated to marine power) .

However, the two most advanced innovation phases before commercialisation, those of regulatory processes and full scale industrialisation, remain problematic.

Any innovation project must indeed pass through stages of regulatory procedures, since any new product must, to a greater or lesser extent, be confronted with fundamental standards of health and safety, and any new installation involves, in one way or another, forms of prior consultation with area residents. Delays are unavoidable, putting innovative projects in a perilous situation from a financial point of view.

To promote energy transition, it is important to consider these procedures, in order to maintain their efficiency, while striving to reduce excesses which are detrimental to innovation. The OPECST has made a study of the issue of regulatory constraints to innovation in the field of technologies for energy efficiency in buildings.

With regard to public consultation procedures, Jean-Yves Le Déaut, in a previous report on the case of AZF (AZF was the name of a chemical factory in Toulouse, France, which exploded on 21 September 2001), suggested learning from the example of Swedish "environmental courts", some of whose judges are high-level technical specialists. Professionalisation of judges should, at the very least, accelerate judgments.

Another critical phase of innovation is the funding of the transition to industrialisation. It is common, at this stage, for the scale of funding needed to change from tens or hundreds of thousands of euros, to millions or tens of millions.

Many innovative small businesses are unable to find these funds, and are acquired by international groups, in the best case scenario ones of French origin. This is the stage known as "crossing Death Valley". The BPI (Banque publique d'investissement, French Public Investment Bank) will seek to intervene at this critical point in the life of companies, through an "innovation loan" that it will be possible to partially guarantee by future market returns.

An additional suggestion made by the Comité Richelieu (French Association of Innovative SMEs) would be to support sponsorship of small innovative startups by large companies, who would undertake to become their first

business customers. It is clear that solutions based mainly on the market will ensure the best sustainability and spreading of innovative energy transition solutions.

The different behaviours of stakeholders

In addition to the adjustment of supply through innovation, the success of energy transition relies on a change in demand behaviour, and the appropriation by economic agents of new forms of energy consumption. These must give an increasingly important role to both energy savings and the use of renewable energies.

In this respect, one can observe that the broad categories of economic agents, such as public administrations, companies, and households, have very different behaviours.

Basically, public administrations can only comply with the instructions of their authorities, as long as these provide them with the necessary financial resources. Companies get involved, and in some cases even become proactive, because they perceive a means of adapting their communication and image to current trends. In any case, they have a direct interest in investing in energy saving.

The reaction of households is more problematical.

There is no doubt about the growing awareness of climate change among the population, but action follows only in so far as it is cost-free and occasional. Obeying instructions for sorting waste, and cycling or walking when the weather is good, is already progress. But there is a long road from there to changing one's investment and consumption decisions, in order to consistently favour the dimension of sustainable development over price.

Thus, it is not at all fortuitous that part of the national debate on energy transition has focused on the relative merits of, one side, increasing grants, and, on the other, of new legal obligations.

In fact, from the standpoint of economic flows, both devices appear fairly equivalent. One must bear in mind that all forms of aid are financed by levies at source, which also fall mainly on the middle class. Obligations or support: it is

always a matter of enforced allocation of resources.

The problem is that this enforced allocation is carried out to the detriment of the rest of the economy. The household budget for entertainment, or clothing, for example, is thereby also reduced. Job creation in the sectors which benefit from a levy is a counterpart to the job losses in the sectors adversely affected.

The balance can be positive overall, if the effects have enough time to spread. But one must be concerned that too hefty a levy, set too high over too short a time, will have counterproductive effects.

However, the proposed financial commitment amounts to hundreds of billions of euros over three or four decades. These are huge amounts, and quite in line with the German figure of 1,000 billion euros by 2040, according to the Federal Environment Minister, Peter Altmaier. Except that the German economy is enriched every year by its trade surplus (188 billion euros in 2012), whereas our country must also cope with the financing of its external deficit (67 billion euros in 2012).

It would therefore seem reasonable on the one hand to concentrate support on less advantaged households, and on the other, to spread out the burden for the middle-class households by relaxing the schedule, allowing it to extend into the second half of the century. The effort of demand adjustment would thus be more consistent with the pace of innovation, and allow our economy to absorb the shock of the transition.

The involvement of training mechanisms

Culture and education will play a key role in the collective appropriation of constraints induced by climate change. It is obvious that the messages delivered to children by the schools, and the signals given to adults through the

cultural apparatus (entertainment and the media) encourage energy savings. In France, since the first oil crisis, we have an agency dedicated to this educational mission, the ADEME.

But the effort of culture and education will also be aimed at engineers and technicians involved in the development of new energy systems, as well as other professionals responsible for their implementation, particularly in the building industry.

For the latter, energy transition amounts to a qualitative leap: the elimination of energy losses involves moving on from an approximate

precision of one centimeter to a controlled accuracy of the order of a tenth of a millimeter. The energy transition will thus require from the construction sector in the coming decades a qualitative revolution similar to that undergone by the industry since the 1970s due to international competition and globalization.

This qualitative revolution may have destabilising social consequences if a major training effort is not made at once. It will have to be massive to be on the scale of the projected renovation of 500,000 units per year out of a total stock of 30 million dwellings.

The essential role of local initiatives

Renewables shake up the centralised management model: first, because most technological advances make possible the use of lighter infrastructure than that engaged by fossil fuels, and secondly, because resources are localised, with each portion of the territory having its own strengths in this area. Hence the special relationship which renewables are enabled to maintain with local authorities.

The proliferation of local energy development projects has a twofold impact on the power grid: first, it confirms the need to equip the grid with intelligence on the model of "smart grids", in order to ensure best management; secondly,



it will perhaps reduce the need to increase the capacity of the network.

There are two reasons for this:

- Firstly, many of these initiatives make possible the development of heating networks, thereby alleviating the burden on the other two major networks, gas and electricity. The potential use of direct heat is great in France: while heating amounts to half of primary energy consumption, only 6 % is provided by direct distribution;

- The second way in which the local initiative projects could reduce the need for adjustment in grid capacity is the future implementation of local energy storage devices. The interest shown in local production of biogas and hydrogen seems to point in this direction. Technologies in this area are yet to be assessed and possibly developed, but they are paths which have already been specifically explored in Germany. The development of storage atolls, which are Pumped-storage hydroelectricity (PSH) plants at sea, is another promising sector for northern coastal areas.

Conclusion

OPECST has been engaged in the analysis of energy issues since its second report, on the Chernobyl accident in 1987. For twenty-six years, through the 30 reports on energy among the 162 it has produced, it has shown great consistency in its approach to these issues. This approach combines on the one hand, support for the exploitation of country's industrial assets, while constantly encouraging the improvement of safety and security devices, and on the other, a genuine openness to new technologies, in particular those which increase the use of renewable energies.

The position of OPECST is not always understood, because it is neither simplistic nor partisan, yet it shows a strong coherence around support for the innovation process, by which established industrial activities produce, directly or indirectly, the income used to finance the development of emerging industrial activities until these become strong and competitive enough to get their share of the market. In France, in the field of energy, this dialectic is

based on two pillars of mature technologies: hydrocarbons (oil and gas) and nuclear energy. In most developed countries, it also rests on a third pillar: coal, which still plays a significant role in the United States and Germany, providing 40 to 50% of the electricity supply.

The possible wildcard of unconventional hydrocarbon deposits

We must not neglect the possible presence of unconventional hydrocarbon deposits beneath French soil, which may be substituted in part for those now imported, and likely to provide new public resources to State and local governments. The report on the alternative techniques of hydraulic fracturing, adopted by the OPECST on November 26, 2013, suggests that further research be carried out and experiments begun to assess the extent to which these unconventional resources could be explored and exploited in environmentally friendly conditions.

Domestic taxation of petroleum products on the one hand, and the contribution to the public service of electricity on the other, provide budget support for research programs and redemption policies, and play an important role in the development of renewable energies.

Oil, gas and nuclear thus contribute through tax levies to the maturation of technologies designed to eventually replace them, partially if not completely. Meanwhile, they fuel the machines of industrial manufacturing which is producing the first generation of equipment necessary for the use of renewable energy.

Can we accelerate the process? We can at least ensure that we do not impede it, and do not let it drift into dead ends.

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The report is available on OPECST's website :
<http://www.assemblee-nationale.fr/commissions/opecest-index.asp>
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