

# THE WORLD ENERGY OUTLOOK : CONVERGENCE AND DIVERGENCE

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*Ladies and gentlemen, dear friends and colleagues, it is an honour and a pleasure for me to introduce this event dedicated to the world energy outlook.*

*For a Group like EDF, decisions taken today will have a very long range impact, well into the century (2060-2100). Thinking about the future is therefore a truly useful exercise in the decision-making process.*

*We are at a crossroads. It has been somewhat perplexing to see how widely future scenarios have tended to diverge. So, which path should be taken if all seem equally viable? Thankfully, it seems to me that we are in fact moving towards greater convergence on core issues. I'm going to attempt to draw out the main points as to why this may be the case.*

*I will first discuss the various scenarios, then the time, technological and political dimensions of the energy outlook.*

## 1. The scenarios

A number of sharply divergent scenarios have emerged over the past few years. Their baseline cases differ considerably:

- The first set simply assumes the linear continuation of current trends.
- Others focus on the use of existing technologies such as renewable energies, nuclear, carbon capture and sequestration.

Many of these scenarios only project thirty years into the future, and cannot therefore integrate major variables such as

- The increasing scarcity of raw materials, and the accumulation of greenhouse gases in the atmosphere,
- And the effects of the emergence of new technologies in a long development cycle.

Some convergence is, however, starting to emerge based on some shared base assumptions about demographic trends, urbanisation and economic development. There is a general consensus that

- The world population will grow from 6 to 9 billion between now and 2050
- We will face increasing urbanisation worldwide
- And that we will witness rapid economic development in the most densely-populated areas of the world

These trends frame the way in which we think about the energy challenge. Currently, three new fields of convergence are appearing:

- the time dimension
- the technological dimension
- the political dimension.

I'd like to say a word on each of these.

## 2. The time dimension.

As you know, energy requires a view to the long-term. I began my remarks by suggesting that the time horizon for decision-makers in the energy sector is at least 50 years.

Of course, these time scales vary according to our various sector-specific issues. This is true for actual usage (from transportation to insulation of construction and buildings) as well as for the means of funding this. If we consider large scale investment or the development of a new technology – I am thinking of investment in nuclear, hydro or the development of technologies such as carbon capture associated with coal-fired generation – it means:

- 10-20 years of fundamental research
  - 10-20 years of testing and impact studies
  - 3 to 10 years of facility construction
  - 15 years to more than 60 years of lead time on the delivery of works,
  - up to 40 years for decommissioning.
- The result is a cycle of some 100 to 150 years! When you take this into account, a 50-year time span is by no means excessive. Our planning today will have forward consequences on this time scale. Moreover, we have to keep in mind structural market factors: the prospect of peak oil and CO<sub>2</sub> emissions will drive long-term energy prices higher, making necessary and indeed inevitable the development of a number of new technologies. I'll come back to this point.

Thankfully, this issue is currently being addressed by national and international bodies who are looking at the energy constraints which are likely to face in the next fifty years:

- The World Energy Council is already looking into this in its scenario study, as Ed Weeda will outline for you.
- The IEA is addressing the same issues in its ongoing study, as is the European Commission in the appendix to its Green Paper.

### 3. The technological dimension

In our business, demand or generation led technologies play a key role and we are in a position to consider those that offer solutions over fifty years or more.

- We already know and master the best technologies for the next thirty years. I am thinking of hydro, nuclear, wind power, clean coal, and energy efficiency initiatives such as solar water heaters or heat pumps.
- The technologies that will become available 20 to 50 years hence are already being researched or designed. We can already speak specifically about some of them, for instance capture and sequestration of CO<sub>2</sub> from coal, fourth generation nuclear, storage of electricity and the use of hydrogen.

Jack Jacometti and Lars Josefson will address these topics later. Changing demand-side technologies, especially in public transportation, must also be taken into account. Pierre-Rene Bauquis will be speaking about this.

*Allow me to stress how very crucial the issue of technology choice is for the electricity sector.*

In the coming thirty years, there will be a tremendous worldwide need to renew generation facilities and augment capacity. China alone will require 800 GW. If we exclude Japan, the rest of Asia will require the same amount, as will the United States and Europe. Naturally, this raises the question of how to finance this new capacity. Jamal Saghir will share his insights with us on this matter. The need for new equipment is actually an opportunity as it opens up a whole range of possible choices.

We will have to decide which technologies to implement and how to best combine them, leaving none aside, for all energies will be needed. In this respect, I am convinced that, at least early on, coal and nuclear are inevitable components of the energy mix if we are to meet fast-growing needs without prematurely “running the wells dry”, so to speak, in terms of fossil fuels. Clearly, at present public opinion is less favourable to coal and nuclear than to other technologies. The issue here is to create the conditions that will make them acceptable.

The French experience, for one, has showed that nuclear can indeed meet with public acceptance and, at today’s market price, be both reliable and competitive. It also shows the importance of public decision and policy making. That is why the political dimension, which we will now look at, should be taken into account in the scenarios proposed. The policies of many large countries like India, China and the United States demonstrate this.

### 4. Our policy choices

No government, not even the least interventionist and most market oriented, can disregard the energy issue given its importance. Energy is strategic, choices have long-term consequences, and significant investment is required for development and supply security.

It is therefore sensible to introduce public policy issues into energy scenarios, both at national and international levels.

**4.1. At national level**, cultural diversity and varying development levels are obviously fundamentals to take into account as they lead to differentiated and adapted tools. There are a number of options:

- The first is to tax CO<sub>2</sub> and set up emissions permits. Of course, the implementation of these mechanisms requires a certain number of precautions in the early stages. The excessive volatility we are observing at present is characteristic of all new markets and presumes a framework in the first years. But it is a step in the right direction, a direction we must pursue.
- The second is the purchase obligation, through which today's consumers support tomorrow's technologies. These are applied toward wind power in Europe and the United States.
- The third is to set up public – private partnerships, which allows for the development of demonstrators for capture and storage of CO<sub>2</sub>, for instance, in some countries.

These approaches vary widely, but they all aim to promote the development of sustainable generation. Moreover, I have observed that governments share the common objective of energy efficiency. There is convergence here: it lies in the common goal of governments and the private sector to create a stable environment that will meet the challenge and the test of time.

**4.2. At international level**, we must reach a common vision of the global future leading to development and cooperation in an “interdependent world”, the theme of next year's WEC in Rome.

Energy can be a source of geopolitical friction and hence a hindrance to stability and growth. But interdependence can also lead the way to cooperation between the major regions of the world and their sustainable development.

We should be able to resolve the issue of supply security serenely. It is never healthy to live in complete dependence on outside resources. Nor is it healthy to seek refuge in a ruinous autarky. Creating wealth through the international division of labour and specialisation is a rule that also applies to energy.

## 5. CONCLUSION

To conclude, despite the appearance of major divergences in opinion, I see a number of points of convergence taking into account the variety of means to meet needs and achieve sustainable energy development. It's important, in sum, that in our forecasts we integrate three main factors:

- A view out to fifty years,
- The role of technologies, and
- Public policy

This will help us to develop scenarios that are increasingly convergent, to eliminate divergences of method, thus enabling constructive dialogue.