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View

Our energy for the future

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The World is going to face three major challenges in the energy sector during the coming decades:

– A challenge for security of supply: will there be enough energy available for consumers' needs?

– A challenge for environment protection: how to sharply reduce CO_2 emissions?

– A challenge for economic growth: are high energy prices putting development at risk?

Security of supply first: what is a cause of concern is not the amount of geological resources, which are probably bigger than many fear. The concern is that, in order to make energy services available to consumers, major investments are needed: exploration and production, rigs, Liquefied Natural Gas terminals, refineries, power plants, pipelines, transmission grids, vessels, wind farms, etc. The International Energy Agency reckons that the amount to be invested from now to 2030 should be in excess of 20 trillion dollars. The concern is that we are not on track to meet this number. Why? Firstly, because of growing political and regulatory uncertainty, which means that investors, facing higher risks, expect higher returns, hence selecting fewer projects .An example is power production: how to select a technology, nuclear or coal, which will last fifty years, if you do not know what the CO_2 regime will be after 2012, end of the Kyoto period? Secondly, because of the well-known NIMBY syndrome (Not In My BackYard). Citizens and communities enjoy being provided full scale energy services, but do not accept the related infrastructure to be located close to their home. Thirdly, energy nationalism, which means that in an increased number of countries, including those with largest remaining oil and gas reserves, investment is de jure or de facto permitted only for national investors.

It is not easy to correct these concerning trends. The main responsibility relies on governments, which should improve predictability and stability of their regulations, avoid nationalistic behaviour and explain the rationale of their energy policies to their citizens. An important feature is diversity: do not put all your eggs in the same basket, not only coal, not only gas, not only nuclear, prefer LNG to piped gas because the former brings more flexibility than the latter, develop inter-connexions which improve diversity and market fluidity. And energy efficiency is the most important tool, as the energy you do not consume is the most secure. I will come back to energy efficiency later on, as it is a key tool for all challenges, not only this one.

The second challenge is global warming, which results in a very strong carbon constraint. According to the IPCC, CO_2 emissions should peak in 2015 and then sharply decrease if we want to limit the average temperature increase to 2°C. As the world emissions are around 24 billion tonnes per year, increasing by 500 million tonnes a year, the order of magnitude of what is needed is a reduction of one billion tonnes per year, each year, compared to present trends. It is not easy to have in mind what avoiding one billion tonnes of CO_2 means. It is the amount of CO_2 emitted each year by 300 coal-fired power plants of 500MW each.

One solution could be to avoid consuming this electricity. It is possible: phasing out all incandescent light bulbs worldwide and replacing them with fluorescent bulbs would reduce CO_2 emissions by one billion tonnes a year. But it is a one shot gun: what will you do the following year?

Another solution would be to replace coal-fired power plants with emission-free plants: nuclear or renewables. The need then would be 150 new 1000MW nuclear units each year (challenging, isn't it?) or 14 current global wind generation or 270 current global photovoltaic generation each year (no comment).

Another solution would be to keep the coal-fired plants running, while capturing in the stacks the CO_2 produced and sequestrating it in geological traps. Some promising experiments have been conducted, but in the range of one million tonnes a year, not one billion.

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The picture looks depressing. It should not. But it brings two lessons: first, there is no silver bullet, it is totally impossible to reach the IPCC objective with only one solution, whatever the solution. Only a combination of more energy efficiency, more nuclear, more renewable and more fossil fuels with carbon capture and sequestration can solve the problem. The second lesson is that all these partial solutions carry specific problems which have to be addressed. Energy efficiency is a difficult strategy because it needs a collection of many small scale, small result policies and behaviour changes, nuclear needs public acceptance, which can be achieved only with impeccable safety and a convincing solution for nuclear waste disposal, renewable and carbon capture and sequestration need strong cost reductions as you cannot base sustainable policies on sustainable subsidies. All those issues call for strong research and development efforts.

Now comes the last challenge, which is a consequence of the two previous ones: energy prices will probably remain high, because demand trends exceed supply capacities, because cheap oil remaining fields are located in fewer countries, mainly the Middle East and former Soviet Union, and because CO_2 mitigation comes with a cost. Some argue that it is good news: high prices trigger energy efficiency and substitutes. This may be true and harmless for rich countries, where total energy expenses represent a small share of GDP, but we should never forget that for the poorest countries, the cost of high energy prices can be a tragedy for governments' accounts. We should make efforts to implement sustainable energy policies even with moderate prices, and for that purpose, start with least-cost options.

The good news is that some policies—not all, think of coal—are effective in addressing the three challenges together. Nuclear is certainly one of them. But the best example is energy efficiency, which provides better energy security of supply, reduces greenhouse gas emissions, and is very often cost-effective: the additional capital costs, if any, are generally more than offset by reductions in the energy bills during the lifetime of the facility or of the appliance. Energy efficiency is not only a win-win strategy; it is a win-win-win one.

Some may raise the question: if so why market mechanisms do not deliver? The short answer is that this kind of market is far from perfect. The landlord does not pay the energy bill resulting from his investment decisions, his tenant does, but has no say in the landlord's decisions, the taxi driver sometimes does not pay his gasoline consumption, etc. Even in liberalized markets, some regulation is needed.

One of the most concerning sectors is certainly transport, as it relies more than 95% on oil products, simply because filling a vehicle tank is so easier with a liquid! That is the reason why biofuels are interesting: they provide the only credible alternative—or at least complement—to oil, but they are acceptable only under three conditions: to be cost-effective, to significantly reduce CO_2 emissions and to avoid destroying the environment. With these criteria, and with current technologies, only ethanol made from sugar cane in tropical areas is acceptable. All other biofuels can be justified only by farm policy needs. Here again, research and development is urgently needed, with the aim of bringing new kinds of biofuels to the market (cellulose, new crops, GMO). Hydrogen and fuel cells may provide another solution in the longer term, if and when the challenges of producing, storing and delivering hydrogen without CO_2 emissions at acceptable costs can be solved.

Is the global picture a cause for pessimism or optimism? Probably both! N the dark side, we have to recognize that the overall challenge is huge. Frankly, I doubt that the +2°C scenario of the IPCC is still achievable. We are probably going to cope with a temperature increase in the range of 3 to 4°C, which means that adaptation policies should be considered together with mitigation policies. On the bright side, there are some no regret policies which can be implemented immediately and which are badly needed. Energy efficiency is an obvious one. Nuclear may be another one, at least in some countries. All what is needed is strong and sustained political will.