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International Energy Agency

WORLD ENERGY OUTLOOK

What energy-mix can keep the lights on?

REPORT

Winter 2015

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What energy-mix can keep the lights on?

Official Brussels launch of the
International Energy Agency's World Energy Outlook 2014

Winter 2015

Global energy: Climate of uncertainty, climate under pressure

The global energy system is showing strong signs of stress due to pressure to fight climate change and uncertainties over traditional supplies, **Fatih Birol**, the International Energy Agency Chief Economist, said presenting the IEA's World Energy Outlook (WEO) 2014 at Friends of Europe's high-level conference.

What are the stakes for next year's Climate Change Conference in Paris? According to Birol, they could hardly be higher. A slowdown in global warming needs urgent reduction in carbon emissions. "This can only happen if there is an international, legally binding agreement from Paris. **If we cannot get a clear signal from Paris next year, we can say goodbye to the world we knew for centuries.**"

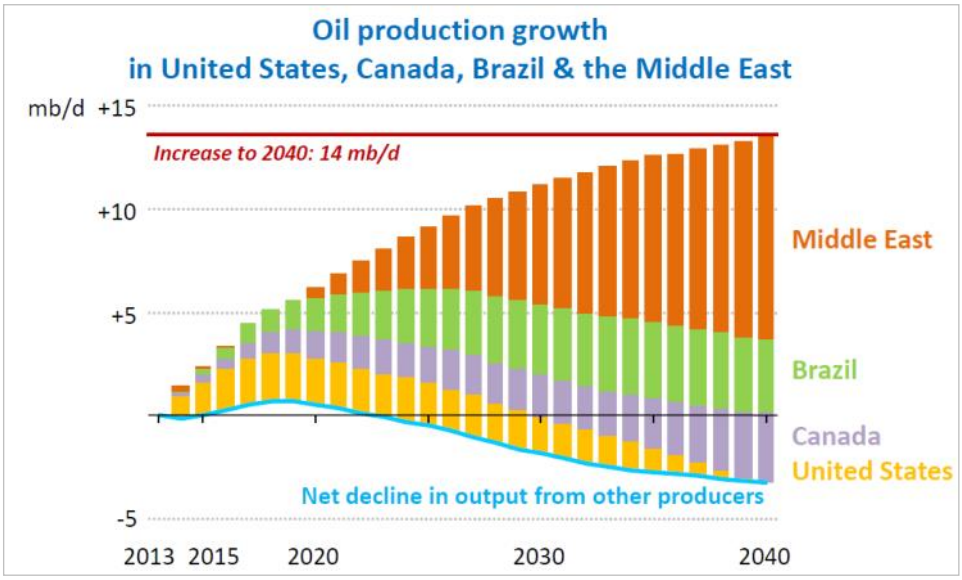
Climate change is however just one of the growing pressures on world energy supply. Global energy demand will grow 37% by 2040, according to a central scenario in the IEA's WEO 2014. That will present major challenges, especially given instability in oil-producing countries in the Middle East and the crisis in Ukraine started by Russia, a major source of gas. In addition to the biggest sources of oil and gas being imperilled by instability; coal damages the environment; nuclear energy is unpopular; and renewable energy looks expensive.

Still, the past months have provided some reasons for optimism. Oil prices have fallen, taking some pressure off industry. EU leaders agreed in October to reduce greenhouse gas emissions by at least 40% compared to 1990 levels by 2030. In November, China and the U.S. made a common declaration to reduce carbon emissions from the 2020s – a commitment Birol described as "historic" as it raises hopes of a global accord in Paris. An increasing worldwide emphasis on energy efficiency is starting to bring results. And the IEA estimates that three out of four new cars sold in world are now subject to energy efficiency standards.

"**This is a very propitious time**," said **Chris Burns**, Friends of Europe's Editor and Media Director, who moderated the conference. "We've been debating this for quite some time: **what energy mix do we need to keep the lights on?**"

Uncertainties over energy supplies

The $20 fall in the price of a barrel of oil from September to November shows a temporary easing of pressure on supplies as result of a weaker demand coming from the EU and China and an increased oil production in the U.S. But demand will grow in coming decades, according to the IEA. For each barrel of oil no longer used in OECD countries, two barrels more are used in the rest of the world, pushing daily demand from 90 mn barrels in 2013 to 104 mn in 2040.



Source: IEA, 2014

The current low price of oil will likely not continue, said **Erik Waerness**, Chief Economist at Statoil, since a low price discourages investment and encourages demand, which will eventually push the price up. "That's why we have to adapt, not to the oil price today, but to an average oil price that is sustainable over the long term. The problem is that we do not know exactly where that is. Is it 90, 95 or 100?"

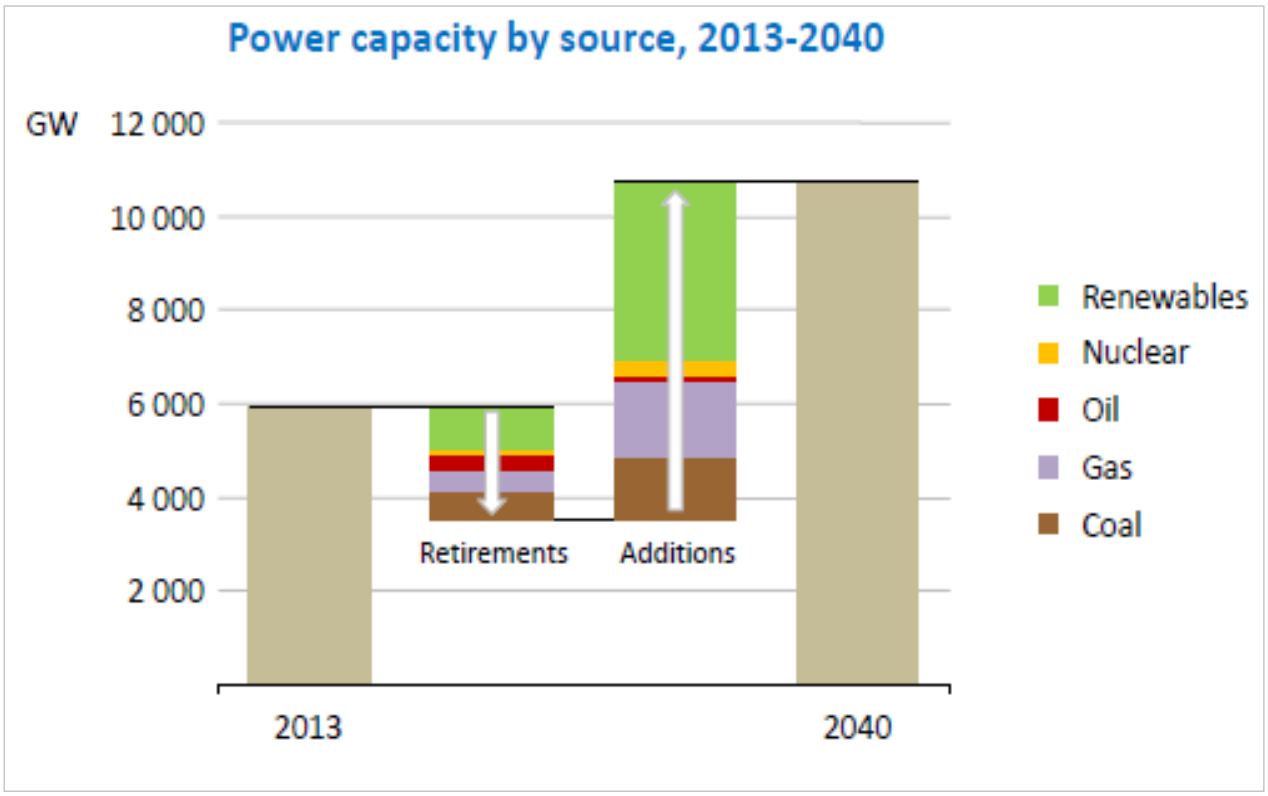
While shale oil in the U.S. has been an important new source, this will decrease from the 2020s. Brazil's deep-sea fields are difficult to exploit. Russia will struggle to access finance and technology for new investments because of sanctions. As a result, according to the IEA, half of the growth in production will have to come from Iraq, where the conflict makes investment unattractive.

"The risk is that the current instability will deter investment," said Birol. "As a result, we might see a shortfall in supply – not tomorrow, but in a few years' time, when this new production should come on stream."

Coal is abundant, but demand will stop growing due to policies capping its emissions – most notably in the U.S., Europe and China - with CCS set to play a greater role. The IEA thinks coal use will peak around 2030, and will only rise 15% over current demand by 2040, with India becoming the second largest coal consumer.

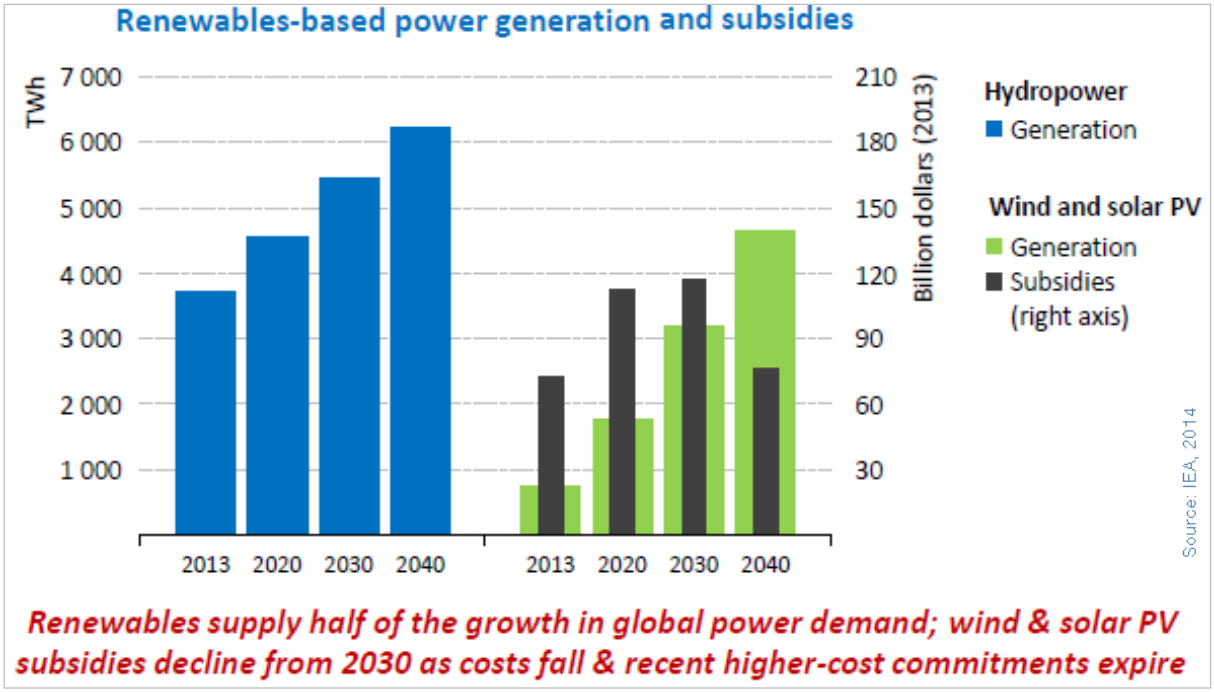
Gas will take coal's place as the leading fuel for OECD countries by around 2030. Supply will come from a growing range of exporters, including Mozambique and Tanzania. LNG will see its share rising in global gas trade, coming mainly from U.S., Canada, Australia and Africa.

Overall power generating capacity will more than double by 2040, the IEA expects – by 7,200 gigawatts, from the nearly 6,000 gigawatts installed today.

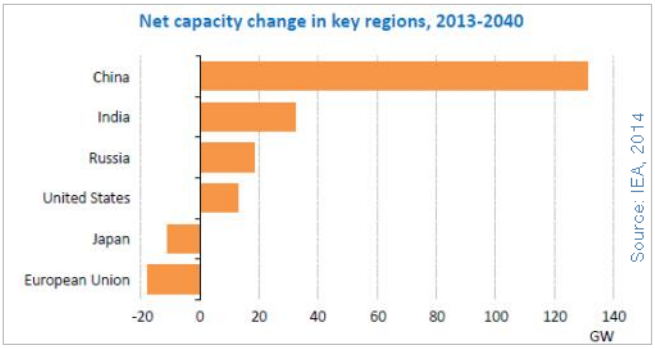


Source: IEA, 2014

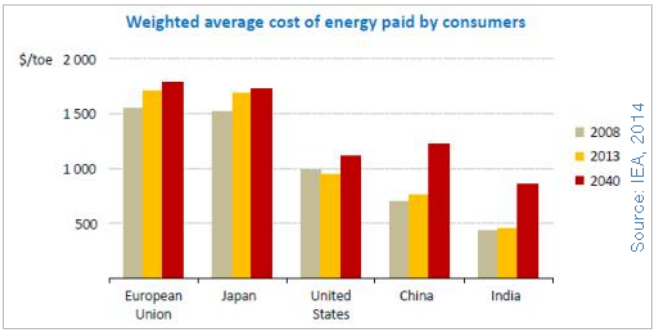
Renewables – mainly solar, wind and hydropower – will fill much of the excess demand. The IEA thinks their share of electricity production will rise from one-fifth today to one-third in 2040, as wind and solar power become increasingly cost-competitive and require fewer subsidies.



Nuclear energy has a varied reputation. On the one hand, it does not produce greenhouse gases, and there are fewer supply restraints on the raw materials it uses. On the other, nuclear power stations are expensive to build and are controversial because of the potential damage from an accident. As a result, public pressure has led Japan and some EU countries to plan reductions in their nuclear capacity. Almost half of new capacity is coming from China, and just half the world's nuclear plants will be in OECD countries in 2040, down from 80% now. The expected retirement of 200 nuclear plants by 2040 and the lack of permanent solution to dispose nuclear waste remain however major concerns.

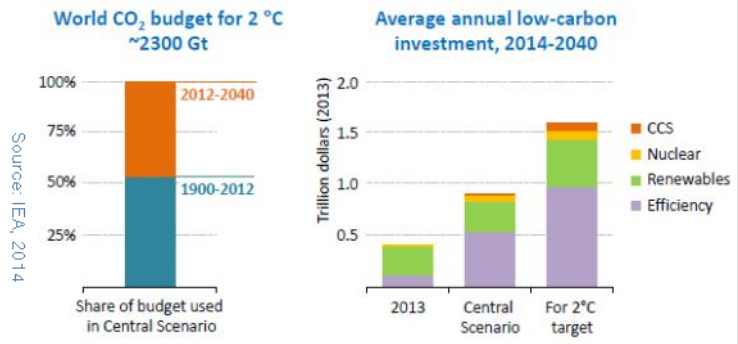


Despite the big shifts in energy mix, the relative cost of energy in OECD countries will remain similar. Japanese and EU consumers will still pay around 50% more for their energy than Americans. But the average cost in China is set to rise sharply, as China replaces cheap coal with pricier gas, and overtake that of the United States by 2040 providing an important competitive advantage to American industry.



Energy security or climate change?

The increasing demand for energy comes as the Earth moves towards the limits of its capacity to cope with greenhouse gases. Scientists say we need to stop global temperatures from rising more than 2 °C in order to avoid harmful effects such as rising sea levels, an increase in extreme weather conditions and disruption to food production. To stay within this limit, humankind can emit at most 2,300 gigatonnes of carbon dioxide, the Intergovernmental Panel on Climate Change has said. We have already produced half of that over the past century, and if current trends continue we will reach the full amount around 2040.



The entire global CO_2 budget to 2100 is used up by 2040 – Paris must send a strong signal for increasing low-carbon investment four times beyond current levels

That's why it's important to get a result in Paris, Birol said. A sustainable global energy supply requires four times the current $400 billion annual investment in clean energy, and investment will only follow from the new regulations that would result from a strong international deal.

But some governments – mainly in emerging economies – still have policies that are driving the world closer to the edge: fossil fuel subsidies reached $550 bn in 2013. "This means governments are telling citizens they will pay them if they pollute the world and use energy in an inefficient way," Birol said.

One positive trend is towards energy efficiency, which has helped keep European households' electricity consumption flat for almost 15 years, in spite of the array of new gadgets people are using. Birol said that China was responsible for half the growth in energy use over the past 10 years, but its demand is slowing thanks to efficiency policies and a move away from heavy industry.

Further gains could come from a greater focus on energy use, said **Marie Donnelly**, Director for Renewables, Research and Innovation and Energy Efficiency at the European Commission Directorate General for Energy. New technology should enable consumers to understand better how much energy they use for what, helping reduce their bills. "Till now, the system has been run by engineers for engineers," she said. "Probably the most important part of transition is a move away from discussion in terms of supply and rather to look at demand."

Ingredients for an "Energy Union'

Indeed, demand management can be one of the key pillars of the so hoped-for energy union. "Control of the energy mix has remained with the member states, and it allows them to choose nuclear energy or not," Donnelly said. "**It is on the demand side that we need a union**. Until people realise that **this is a joint effort across all member states**, we won't be able to move forward."

Waerness of Statoil said it was important for countries – and for the whole of Europe – to move away from old ideas about energy independence. **"Stop the obsession with becoming energy independent,"** he said. "It's like Norway trying to become independent of French wine. **That's going to be costly**. Europe should continue to work under the assumption that both Europe and

Asia will be energy importing regions. Then it's about diversifying sources of supply, building interconnectors and making markets efficient."

Better connections would be a particular benefit for renewables, as power generated from the sun and wind fluctuates dramatically with the weather and the time of day. Last Christmas, wind farms on the Iberian Peninsula produced 110% of Spain's electricity needs for nine or 10 days and 130% on some days, said **Thomas Becker**, CEO of the European Wind Energy Association. But there was no grid to share the excess with other parts of Europe. "To me, that's absurd," he said. "The energy union is among other things an intelligent grid system in Europe."

Many current energy installations will have to be replaced in 10 or 15 years, providing an opportunity to establish a European grid, Becker said. That would mean that member states no longer had to focus on meeting peak demand, and they would save enormous amounts of money. "The extreme overcapacity we are facing right now is economically not very smart and is being paid for by consumers," he said.

Energy production, too, needs a single market, said **Jean-Pol Poncelet**, Director General of Foratom, a nuclear industry trade association. Member states have their own systems of subsidy and regulation, making it impossible to invest in low-carbon energy on a large scale. "Where is the free market when you have 28 policies?" he said. "This is obviously a market failure in the EU."

"The good news is, **the lights will stay on, and nuclear will contribute significantly to that situation,**" he said. But the nuclear industry has to deal with member states' different safety and operating rules. "The only way to compensate for this would be to introduce a carbon tax," he said. "And so far the EU system is not working."

But taxes are politically sensitive. Renewables have been criticised for an alleged dependence on subsidies. If, however, the costs of 'external' factors like air quality, human toxicity and climate change are taken into account, fossil fuels too appear to be subsidised. "We need to handle all those negative externalities in an efficient manner, and that means stop subsidising fossil fuels," Waerness said. "One of the reasons why the United States will have low energy prices for the consumer is that they don't tax CO2 emissions". After such distortions have been fixed, markets can be left to decide, Waerness said. "We cannot afford to pick winners and losers on the basis of hope and costly bets," he said. "We must let the market decide."

When external factors are taken into account, onshore wind is already cheaper than coal, gas or nuclear energy, according to an interim EU report published in October. "And now we have the World Energy Outlook confirming that wind energy can compete with fossil fuels," Becker said. **"I think the tide is out on the subsidies debate, and we can now see who is swimming naked."**

You can find the photo-gallery of this debate on Friends of Europe's Flickr channel

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