

The time has come for a world energy revolution



Our energy supply and consumption patterns are unsustainable environmentally, economically and socially, says **Fatih Birol**, the International Energy Agency's chief economist. What we now need is nothing short of an energy revolution

Humanity's future, to say nothing of its prosperity, will depend on how we tackle the two central energy challenges that face us: securing the reliable supply of affordable energy, and switching rapidly to efficient low-carbon energy. European governments have led the way with their plans to reduce greenhouse gas emissions, and at the UNFCCC negotiations in Copenhagen at the end of this year it will be imperative that despite the economic slowdown this momentum should continue.

The IEA's latest World Energy Outlook has a Reference Scenario calculated on policies that governments had enacted by the middle of last year. It offers a baseline against which we can assess how much we need to change course. It sees annual world primary energy demand growing 1.6% on average up to 2030, from 11,730

million tonnes of oil equivalent (Mtoe) to just over 17,010 Mtoe – an increase of 45% in just over 20 years.

China and India account for just over half of this increase, with Middle East countries contributing a further 11% to demand. Non-OECD countries account for 87% of the increase, so their share of world primary energy demand rises from 51% to 62%.

Most oil production increases are expected to come from just a few countries – mainly in the Middle East, and also Canada with its vast oil-sand reserves, the Caspian region and Brazil. Gas production in the Middle East triples, and more than doubles in Africa, where there are large low-cost reserves.

The trend in which consuming countries grow steadily more and more reliant on

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energy from a small number of producing countries threatens to exacerbate short-term energy-security worries, and although the EU is less affected by this than some regions, it sees in the Reference Scenario a slight rise in its oil import dependence from 11m barrels a day in 2007 to 11.5 mb/d in 2030. Of greater concern, given the recent supply stand-off between Russia and Ukraine, is the EU's increasing dependence on gas imports, which rise to 86% of demand by 2030 from 57% in 2006.

Increasing import dependence does not necessarily mean less secure energy, any more than self-sufficiency guarantees uninterrupted supply. Yet greater short-term insecurity seems inevitable as geographic diversity of supply is reduced and reliance on vulnerable supply routes grows.

Longer-term energy security risks are also set to grow. With more and more of the world's remaining oil reserves in a small group of countries, their market dominance may threaten the pace of investment. The greater the demand for oil and gas from these regions, the more likely those regions are to seek higher prices, and to maintain them by deferring investment and limiting production.

Unfettered growth in energy demand is clearly going to have serious consequences for the climate. The IEA's Reference Scenario points to continuing growth in CO₂ and other greenhouse gas emissions; CO₂ emissions are projected to be up 45% by 2030, with other greenhouse gases contributing to an eventual average temperature increase of up to 6°C.

COMMENTARY

By David Buchan

Yes, but it'll be hard to shake off the oil and gas shackles

Implausible Trotskyist though he is, Fatih Birol is of course right to urge world revolution in energy. But getting us to arise and shake off the shackles of fossil fuels will be quite another matter.

To many people, fossil fuels feel less like shackles than a warm comfort blanket to which we have grown pleasantly accustomed. "The good news", says Mr Birol, "is that we already know many of the policies and technologies that can deliver substantial savings in energy consumption and CO₂ emissions". Yes, we do know them, and unfortunately these policies and technologies, at least at the present stage of their development, often produce more expensive and less reliable or continuous energy than our old hydrocarbon standbys.

We can only grasp the magnitude of the challenge of Mr Birol's world revolution by reminding ourselves of the fantastic convenience of the established fossil fuel order that we tend to take for granted. Though to slightly varying degrees, oil, gas and coal are excellent stores of energy, flexible to use and relatively easy to transport when compared to wind and solar power (intermittent) and nuclear (expensive and inflexible) which must be converted into electricity that, for all its wonderful versatility, loses power in long-distant transmission and is hard to store.

Three-quarters of the extra CO₂ will come from China, India and the Middle East, and as much as 97% from non-OECD countries as a whole – although on average non-OECD per-capita emissions will still be far lower than in the OECD. Bucking the global trend, only the EU and Japan see lower emissions in 2030 than today, in the Reference Scenario.

A new course of action, taking strong and co-ordinated action to curb greenhouse gas emissions, is an imperative. December's Copenhagen conference must provide an international framework for a post-2012 global climate-change policy. The target that Copenhagen sets for the long-term stabilisation of greenhouse-gases

will determine how stringent our policy responses need to be. The energy sector has a relatively slow rate of capital replacement because of the long lifetimes of much of its infrastructure. More efficient technologies normally take many years to spread through the energy sector, so now both public and private sectors must accept the need for additional investments, as well as potentially the costs of early capital retirement, to speed up this process and deliver deep cuts in emissions.

Two IEA climate-policy scenarios show how we could stabilise the concentration of greenhouse gases at 550 and 450 parts per million of CO₂ equivalent; the 550 scenario equates to an increase in global temperature of approximately 3°C and the

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450 scenario to one of around 2°C. In the 550 scenario, energy demand up to 2030 rises by about 32%, with the share of fossil fuels falling markedly, and average demand up 1.2% yearly, compared to 1.6% in the Reference Scenario. Energy-related CO₂ emissions would peak in 2025 and have declined slightly by 2030.

The 450 scenario presents an immense challenge. The 2030 emissions level for the entire world would be less than the emissions projected for non-OECD countries alone in the Reference Scenario. In other words, even if OECD countries were to reduce their emissions to zero, they alone could not put the world onto the 450-ppm trajectory. And it would mean a technology shift that in both scale and speed of deployment would be unprecedented.

The good news is that we already know many of the policies and technologies that can deliver substantial savings in energy consumption and CO₂ emissions. But decisions and their implementation have to begin now.

We're talking about significant changes in the pattern of investment across the supply and demand chains, as well as huge additional spending on new capital stock, especially in power plants and in more energy-efficient equipment and appliances. And although the sheer scale of the transformation means placing a substantial burden on both private and public sectors, the current financial crisis should be used as an opportunity rather than a barrier for launching it.

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Yet escape from fossil fuels we must. This is not only because hydrocarbons are fouling the atmosphere, and at a rate that may now have destroyed any plausibility of the IEA's scenario of keeping CO₂ in the air to 450 parts per million and the rise in temperature to 2°C. As one would expect from the IEA, an organisation founded to provide its members with energy security, Mr Birol reminds us that reliance on oil and gas carries increasing short-term risks of supply interruption, and long-term risks of scarcity leading to higher prices.

But Fatih Birol's most important point is his call for the economic crisis to be "used as an opportunity rather than a barrier for launching" the necessary replacement of polluting and inefficient energy equipment. He says the energy sector has "a relatively slow rate of capital replacement". Studies by his own agency show "relatively slow" to be an understatement.

According to the IEA, housing stock lasts anywhere between 40 to 400 years, industrial buildings 10-150 years, large hydropower plants 60-120 years, coal-fired plants 40-60 years, nuclear reactors over 40 years, power grids and gas pipelines around 40 years, and so on. Apart from children's lost iPods, the only electrical item we replace very frequently is Thomas Edison's incandescent (and energy inefficient) light bulb.

The "opportunity" Mr Birol speaks of is to respond to the current need for fiscal stimulus by replacing now some of the energy or energy-using plants that we know we will anyway have to replace in the future.

Renewable energy will have a major role. Even in the Reference Scenario, global renewables-based electricity generation (mainly hydro and wind but also solar and biomass) is set to double between 2006 and 2030. In the EU, wind's share in total power generation is set to rise to 14% by 2030 from 2% today, and would account for well over half the total increase in the EU's power generation. In the 450 scenario, with its goal of limiting to around 2°C the increase in global temperature, renewables make up 30% of the EU's power generation mix in 2030, a sharp increase from 10% today.

It's up to governments to galvanise the transformation. Clear price signals, including carbon pricing, are crucial, and many of the non-OECD countries, in addition to needing some financial support to help reduce their greenhouse gas emissions, can benefit from the removal of their fuel price subsidies. But clear price signals are not enough as a low-carbon future requires major breakthroughs in technology development and deployment. Governments can create incentives to innovate, encourage research and break down international barriers. Much of the additional spending will have to be made by households, with a step-change in social attitudes to energy efficiency. Through information campaigns, regulation and targeted fiscal incentives, governments have a key role to play. □

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Accelerated replacement investment would not be anticipating the future by very much in some sectors. In the power sector, a major emitter of carbon greenhouse gases, 40% of the generating plants – and 50% of coal-burning plants – in OECD countries are already over 30 years old. Most iron, steel and cement plants are of a younger vintage, and according to the IEA, plants less than 10 years old will by next year account for 59% of capacity in iron and steel, and 68 % in cement. But so far the only "scrappage" subsidy for energy-using capital equipment that governments have come up with is for cars. We need to be bolder in embracing the inevitable; that's what world revolution is about. □

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