

Efficiency and innovation could slash energy demand growth

Rising costs and improving technology will be the driving forces behind future energy

THE future of energy is all about efficiency. That is efficiency in transport, buildings, industry, as well as commercial and residential sectors. Taken together, the potential to cut energy demand growth over the coming decades is tremendous.

Even the international energy agency (IEA) says that efficiency is the world's most important fuel – describing it as a “hidden fuel yet hiding in plain sight”.

The Paris-based adviser to the 28 OECD nations says “the scale of recent investment in energy efficiency worldwide makes it as significant in its contribution to energy demand as investment in renewable energy or fossil fuel generation”.

Indeed, oil, which dominated the 20th century, seems to be living on borrowed time as ever-higher costs to extract increasingly hard-to-get crude bite both governments' budgets and consumers' pockets – not to mention the majors' bottom line.

Falling demand

The developed world is already using much less oil as its price has soared. Consumption in the OECD is in long-term decline thanks to efficiency gains.

Between 2005 and 2010, the IEA calculated that energy efficiency measures across 11 of its member countries saved the energy equivalent of \$420 billion worth of oil. Even with rising consumption in the developing world, oil's share of the global fuel mix will decline, in part thanks to rising transport efficiency and to the expansion of gas-fired power generation.

But a sustained period of higher oil prices – averaging over \$110 per barrel in real terms since 2011 – that is without parallel in oil market history has given consumers and industry extra incentive to improve energy efficiency and push ahead with technical innovations.

This has also boosted interest in replacing oil, for example with natural gas and electrification in road transport. But also with the development of new and disruptive technologies, from more advanced renewable fuels to more efficient, lower-cost solar cells, as well as batteries.

Greater energy efficiency offers

huge potential to cut rising carbon emissions, which threaten the ecological and economic welfare of the planet.

But the financial savings of cutting energy use can be equally monumental, to the tune of trillions of dollars globally – in 2012, the equivalent of about 9% of global GDP was spent on energy costs.

Rocketing demand for energy, as middle-class consumption rises across the world, will force the world's economies to find ways to lower these energy costs.

Those gains could come through increasing reliance on non-fossil-fuel energy sources, or through improved efficiency, particularly in buildings – responsible for 40% of total energy consumed globally and one-third of the world's carbon emissions.

Residential and commercial buildings can use far less energy for heating, cooling and ventilation. Low- or zero-carbon and net-positive energy houses – built with more, and more efficient, insulation and matched with the expansion of heat pumps and solar roofs – will further reduce reliance on oil and gas as single heat providers.

Large cities can cut their energy loads through better urban design and using the heat exhaust from power generation for warming buildings.

Many industrial energy processes can cut energy demand substantially and save on energy use through the shift to new, energy-efficient materials in manufactured goods.

Electrification and advances in internal combustion engine technology should transform fuel use in the transport sector, which makes up about one-fifth of global final energy use and will account for nearly all future expansion in oil use, particularly for road vehicles.

Better cars could save the oil equivalent of Saudi Arabia's output in 20 years, according to the IEA's efficient world scenario. In shipping, there are at least 50 technologies that could be applied to vessels today that would reduce the industry's fuel bill by \$70 billion a year, says Peter Boyd, chief

operating officer of think tank Carbon War Room.

In the power sector, emerging technologies and distribution structures will be much more transformative than expected. Grid developments, particularly smart grids, which pool supply, demand and storage, allowing for highly sophisticated load management across regions and borders, will boost efficient and cost-effective electricity supply from weather-dependent variable sources, such as wind and solar, even from remote locations.

Efficiency is the key

In dynamic power systems – where significant short-term investments are needed to meet expanding power demand or replace old assets – such as India, China, Brazil and other emerging economies, wind and solar can be cost-effective solutions to meet incremental demand.

“Emerging economies really have an opportunity here. They can leap-frog to a 21st-century power system – and they should reap the benefits,” the IEA's executive director Maria Van der Hoeven said at the launch of the agency's latest report *The Power of Transformation – Wind, Sun and the Economics of Flexible Power Systems*.

If history is any guide, the efficiency gains will come. Were it not for the technological advances of the past 40 years, energy use would be as much as 60% higher than it is today. This makes the IEA's optimistic efficient world scenario – which sees total primary energy demand cut by 17% to 14,908 million tonnes of oil equivalent by 2035 compared to its baseline outlook – perhaps more realistic than it at first appears.

Indeed, “the general rule of thumb is that for every dollar you invest in energy efficiency, you achieve \$2-4 in terms of long-term cost savings”, Sarbjit Nahal, head of thematic investment strategy at Bank of America Merrill Lynch, said in an interview with the bank's *Advisor* magazine.

“You may or may not believe in climate change, but energy efficiency is all about reducing costs. And it's hard to argue against economics.” **DE** ●

