



The Energy Report

Media summary

The Energy Report is a WWF collaboration with energy consultancy Ecofys that explores powering the world entirely by renewable energy by the middle of this century. The result is the most ambitious, science-based examination yet of a renewable and clean energy future on a global scale. It covers all energy needs and the challenge of providing reliable and safe energy to all. Importantly, it uses deliberately conservative assumptions: fossil fuel price increases of no more than two per cent annually, deployment of technologies available today and continuous but not disruptive renewable energy expansion. It is an ambitious but achievable vision that outlines the key changes required to achieve a fully clean energy future and avoid catastrophic climate change.

Why an energy report?

The current fossil fuel energy paradigm is not sustainable. A “business-as-usual” approach to our energy future will mean substantially higher and more volatile energy costs, driven by increasing scarcity and fossil fuel supplies from more physically and politically challenging areas. Energy security would continue to be challenged by disruptions of supply, accidents and disputes over energy resources.

Moreover, 1.4 billion people have no access to reliable electricity. Some 2.7 billion depend on traditional fuels such as wood, charcoal or manure for cooking and heating – often harvested in ways highly damaging to the environment and used in ways highly damaging to health.

Most seriously, fossil fuel use is by far the most serious single contributor to climate change, accounting for about two thirds of all greenhouse gas emissions. “Business-as-usual” scenarios are for both absolute emissions and the energy share of emissions to increase, adding to the cost and incidence of already occurring climate change impacts and offering no chance for the world to stay below unacceptable risk levels for runaway climate change.

A fully sustainable renewable power supply is the only way we can secure energy for all and avoid environmental catastrophe.

Is a 100 per cent renewable energy supply possible globally by 2050?

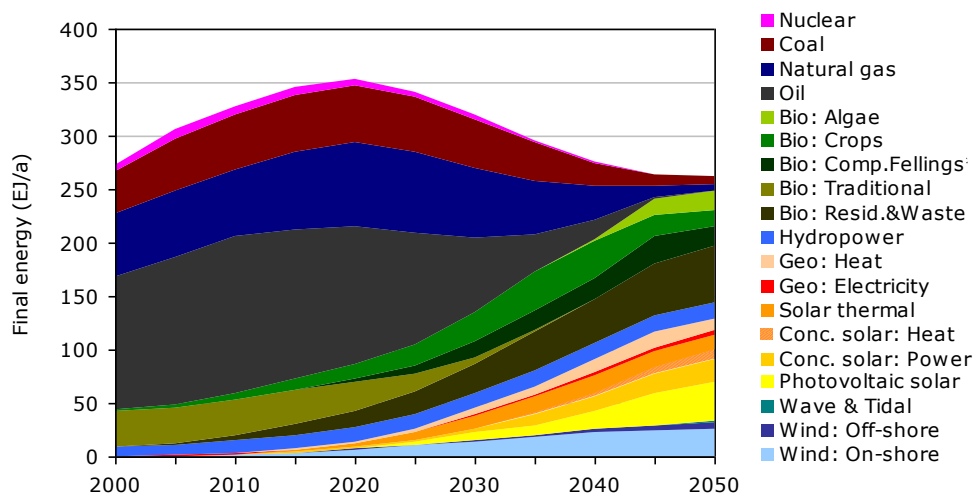
The Ecofys scenario, contained within *The Energy Report*, concludes that it is technically feasible to supply everyone on Earth with the energy they need by 2050, with 95 per cent of this energy coming from renewable sources utilizing technologies current or in development today. In its report, WWF indicates how its vision of a 100 per cent renewable and sustainable energy supply could be realized.

The Ecofys scenario

In 2050, ambitious energy saving measures result in total energy demand being 15 per cent lower than in 2005 – despite population, industrial output, passenger travel and freight transport rising as projected.

Industry uses more recycled and energy efficient materials, buildings are constructed or upgraded to need minimal energy for heating and cooling and there is a shift to more efficient means of transport. As far as possible electrical energy is used instead of solid or liquid fuels. Wind, solar, geothermal and hydropower are the main sources of electricity, with solar and geothermal sources, as well as heat pumps providing a large share of heat for buildings and industry. “Smart” electricity grids store and deliver energy more efficiently. Bioenergy (liquid biofuels and solid biomass) is used as a last resort where other renewable energy sources are not viable – for aircraft, ships and truck haulage and industrial processes requiring very high temperatures.

World energy supply by source under the Ecofys scenario



What is the investment needed and what is the economic benefit?

By 2050, we save nearly €4 trillion (\$US 5.4 trillion) annually through energy efficiency and reduced fuel costs over a “business-as-usual” scenario. However, big increases in capital expenditure are needed first – to install renewable energy generating capacity on a massive scale, modernize electricity grids, transform goods and public transport and improve the energy efficiency of existing buildings. These will grow over the next 25 years from about €1 trillion to about €3.5 trillion a year (\$US 1.4-4.7 trillion). Our investments begin to pay off around 2040, when the savings start to outweigh the costs. If oil prices rise faster than predicted and we factor in the costs of climate change and the impact of fossil and traditional fuels on public health, the payoff occurs much earlier.

Are there enough renewable energy sources to meet the energy needs of all?

Currently, more than 80 percent of our global energy comes from fossil fuels. Under the Ecofys scenario, fossil fuels, nuclear power and traditional biomass are almost entirely phased out by 2050. Realistically, can a more varied mix of renewable fuels make up the shortfall?

Taking into account factors such as overall potential, current growth rates, and appropriate selected sustainability constraints, the Ecofys scenario builds up a picture of the “realizable potential” of available renewable energy resources. In most cases, the realizable potential greatly exceeds the projected 2050 energy demands on the resource – by many orders of magnitude in the case of all uses of solar power; more than double in the case of offshore wind, wave and tidal power, high temperature and geothermally generated electricity; and substantially in the case of onshore wind and low temperature geothermal energy. The exception is hydropower, where realizable potential is constrained by concerns over the

environmental and human costs of large dams and thus the 2050 contribution of hydropower is close to its realizable potential. To limit impacts on food supplies and biodiversity, bioenergy production is constrained.

Efficiency and electrification – two key pathways of *The Energy Report*

The Ecofys scenario of 15 percent lower global energy demand by 2050 is in marked contrast to “business-as-usual” projections similar population and economic activity assumptions, which predict a doubling in energy demand. Energy conservation is the most important element in achieving a sustainable, renewable energy future – but in every sector, solutions already exist that can deliver the massive energy savings required. The challenge is rolling them out on a global scale as soon as possible.

Buildings are major users of energy, yet these can be made virtually energy neutral (or even energy positive) with current technologies. Heating needs can be reduced by at least 60 per cent by insulating walls, roofs and ground floors; replacing old windows; and installing ventilation systems that recover heat. Local solar thermal systems, low temperature geothermal heat, and heat pumps and other efficient technologies would fulfill the remaining heating and hot water needs. New buildings need to be regulated to meet these high efficiency standards as soon as possible. For all buildings to meet these standards by 2050, 2-3 per cent of existing floor area would need to be retrofitted every year. This is ambitious but achievable: Germany has already reached annual retrofit rates in this range.

The Ecofys scenario for a renewable energy future depends upon using electrical power from clean, renewable sources in place of fossil fuels and nuclear wherever possible. This would bring electricity from less than one fifth of total final energy demand to almost half.

Moving from fossil fuels to renewable electricity presents challenges. The first priority should be to upgrade current electricity grids to mix and distribute more and more variable sources of electrical energy. Efficient international networks will also help balance variable renewable sources from different regions. Within Europe, for example, wind and ocean power from the North Sea area could complement Alpine hydropower and solar power from the Mediterranean and even North Africa. Smart grids will help transmission operators, power companies, businesses and consumers manage load and demand with supply. Excess power would be used to top-up storage (notably in car batteries) and to generate hydrogen fuel. Electrification would also make major inroads into transport.

Why is bioenergy hedged with safeguards?

The use of biomass fuels is recognized as among the most contentious issues raised by *The Energy Report*, but there are some transport and industrial needs that under current and feasible technologies are unlikely to be met without liquid and solid fuels. Biomass is the only renewable option. Part of this demand can be met from waste products, but, under the Ecofys scenario, it would still be necessary to grow sustainable biofuel crops and take more wood from well managed forests to meet demand. Careful land use planning and effective international cooperation and regulatory arrangements will be needed to ensure that energy demands are met without threatening food or water supplies, or threatening biodiversity through direct or indirect incentives for land clearing. Bioenergy from algae is likely to ease some land use pressures as 2050 approaches.

Bringing energy to everyone

A sustainable energy future must be a fair one, in which the equal right of every person to benefit from the world’s energy resources is recognized. Around one fifth of humanity lacks access to reliable electricity and two fifths are in need of clean cooking and heating fuels and technologies. Renewable and efficiency based solutions are generally already available, extending from large scale renewable power generation (solar power in Africa, geothermal in Indonesia) through to community level power installations based on solar, wind turbines, micro-hydro or biogas; and down to solar, biogas or fuel efficient cookstoves.

Will moving to a renewable energy future affect lifestyles?

The Ecofys scenario shows that we can supply almost all of our energy needs from renewable sources by 2050 while maintaining rates of economic growth and leading prosperous, healthy lifestyles. Indeed, quality of life for many will improve immeasurably with access to electricity and clean energy.

We will, however, need to make wiser choices about the way we use energy. Some lifestyle changes will allow us to reach a renewable energy future while reducing our impact on the planet. Key will be growing enough food to nourish a growing global population and limiting bioenergy demand from pushing our forests, agricultural land and freshwater ecosystems to the limit. To achieve such a balance, the Ecofys scenario assumes meat consumption is more equitable, and growth in overall meat consumption is limited. This would mean a halving of meat consumption per person by 2050 in OECD countries and an increase by a quarter elsewhere – with significant dietary benefits for all. Food wastage and food transport would also be reduced.

Personal mobility will also rise by 2050, with the overall distances people travel increasing by half in OECD countries and trebling in the rest of the world. The Ecofys scenario suggests we can manage those increases by moving towards more efficient forms of transport, walking and cycling over short distances, and making more use of public transport including replacing a proportion of plane travel with train travel – and making use of improved communications technology to make some travel unnecessary. Cuts beyond the Ecofys projections, particularly in air travel, would substantially reduce the needs for biofuels.

Making lifestyle changes will take time, but history shows that people will change their behaviours when they understand the benefits, and when policies steer them in the right direction. Recycling is now second nature in many countries, while smoking rates have fallen with growing knowledge of the health risks. A better understanding of the impacts of our own choices will help us move toward a fair and fully renewable future.

Getting from here to there

Although public investment will be important, business, community and even individual investment will play a key role. Financial incentives for renewable energy, such as feed-in tariffs, are a key means of creating a more favourable climate for renewable energy, guaranteeing payments to households, businesses, communities and other organizations generating their own electricity. Feed-in tariffs are now available in more than 50 countries, including parts of China, India and the US.

What now?

Achieving a sustainable renewable energy future will take determined action at the international, national, community and individual levels – and the sooner such action is taken the earlier the benefits will be realized. At the international level, the clearest priorities are strong international agreement on climate change action, including viable levels of assistance to help developing countries to a sustainable energy future. Regional, national and local governments need to cut perverse subsidies and commit to targets and pathways to energy efficiency and renewable power. Business needs to begin following some of their own leaders into a green economy future. And individuals need to consider the implications of their energy use and lend their support to moving to a sustainable rather than an anxious and threatened future.