

EU Energy [R]evolution: moving towards 100% renewables in 2050

Forty years ago, climate change was unheard of, fossil fuels were plentiful and renewable energy from wind, water, sun and heat was little more than a dream. Since then, Europe has developed green energy technologies and adopted strong targets for the growth of the sector over coming years. The *EU Energy [R]evolution* roadmap, commissioned by Greenpeace and the European Renewable Energy Council (EREC), looks at the potential for the next forty years. It demonstrates how Europe can move towards an efficient and fully renewable energy system to ensure security of energy supply, create green jobs, cut CO₂ emissions and rising energy prices, and encourage innovation.

The *EU Energy [R]evolution* achieves the 95% cut in emissions by 2050 called for by climate scientists to avoid the worst impacts of climate change. It also phases out expensive and risky nuclear electricity and ends Europe's dependence on fossil fuels. These are replaced by a flexible mix of available and cost-effective renewables for electricity, heat generation and transport.

The *Energy [R]evolution* demonstrates how renewable energy can cover 92% of the EU's total energy use and 97% of electricity by 2050, moving Europe towards a 100% renewable energy supply.¹ This requires substantial energy savings through efficiency technologies, improved public transport systems and a shift of freight transport from road to rail. Smart building design, the use of renewable heating technologies and the use of electricity from renewables for industrial processes can replace the use of fossil fuels in the heating sector. The swift phase-out of nuclear and coal power production, the uptake of electric vehicles and the implementation of smart and super grids to allow flexible and localised electricity output and consumption allows for the smooth integration of up to 100% renewable electricity.

Costs and savings

Investment in green energy will nudge up the cost of electricity in the short to medium term. But this is an investment that pays off: the *Energy [R]evolution* will save a total of €2.65 trillions in fuel costs and represents and immediate investment in jobs and energy security. It denotes a revolution that will give Europe a global competitive advantage on technology and act as a beacon for other regions looking to steer a course away from dangerous climate change. By 2050, the annual cost of electricity supply will be €132 billion per year below what it would be under a business as usual scenario. Even taking into account the cost of investment, cutting the use of fossil fuels would save European economies an average of €19 billion every year up to 2050.

EU Energy [R]evolution facts and figures

97% renewable electricity in 2050

Total EU energy use in 2050: 92% renewables

95% emission cuts in 2050 (compared to 1990)

€2.65 trillion in fuel cost savings by 2050

€1.85 trillion extra investment between 2007 and 2050, compared to business as usual

€19 billion average annual savings between 2007-2050 (including fuel cost savings and price of investment)

€132 billion in annual electricity supply cost savings in 2050

940,000 new green jobs in 2020, 1.2 million in 2030

¹ A gap towards a complete 100% renewable energy supply remains especially in the transport sector, where truly sustainable and credible solutions have yet to be found for aviation and shipping.

Thanks to higher efficiency and a shift to electrified transportation, fuel cost savings in the heating and transport sectors are expected to slash energy prices even faster than is the case for electricity.² Other savings are expected to benefit the economy, such as avoided environmental and health costs.³

Finally, the *Energy [R]evolution* predicts the creation of hundreds of thousands of additional jobs in Europe. By 2020, the scenario forecasts about 940,000 jobs in the renewable power industry, increasing to 1.2 million jobs in 2030. Job losses in the fossil fuel sector due to a reduced coal generation capacity are overcompensated by growing renewable power generation.

"The renovation means my flat is now worth more and I'm also saving money on heating bills. And it's had a great effect on the area too: several of my neighbours are now modernising their homes."



Julia Kappell/Greenpeace

Barbara Skrionya

Budapest: The village house ('Faluház') in the Óbuda-Békásmegyer district of Budapest is Europe's biggest block of flats. It was built in 1970 and is the biggest apartment building in Hungary. It has 886 flats, 15 staircases and had nine different heating systems. Inefficient heating combined with bad insulation and poor windows meant people had to endure spiralling heating bills for decades.

But in 2003 and 2009 the building was refurbished to become a model of energy efficiency, after 82% of households voted for the extensive modernisation of the block. The heating systems were revamped, the insulation was renovated, 1,800 old windows were replaced and a solar collector system to produce hot water was installed on the roof, covering 1,500 square metres. Today, CO₂ emissions have dropped significantly, maintenance and heating bills are significantly lower and the value of the apartments has increased.



Camille Gira, mayor of Beckerich,

"Green energy has brought new jobs to our community, saved us money on fuel and is now even part of our town's identity."

Beckerich: In 1997, the commune of Beckerich, in Luxembourg, developed an energy plan to invest in sustainable solutions. The first bio-methane project was developed in 1998 and by 1999 electricity consumption had already decreased by 7% per citizen, compared to 1994.

Today, 15% of local households have invested in solar energy, a subsidy for building insulation has cut energy demand for heating, and additional biomass capacity has been installed and connected to a new district heating network. 90% of electricity for households and 40% of heating now come from renewable energy sources. By 2020, the town aims to run on 100% renewable energy.

Comparisons with other scenarios

When compared to other EU energy roadmaps for 2050, the *Energy [R]evolution* is politically ambitious, but based on realistic assumptions that can deliver flexible energy production and consumption closer to local businesses and communities. A secure and balanced mix of energy sources for Europe's energy system makes the *Energy [R]evolution* the most sustainable and credible blueprint for a genuine energy revolution.

The *Energy [R]evolution* achieves substantial emission reductions while phasing out nuclear power and without the use of carbon capture and storage technology, which are risky, expensive and unable to deliver in time to avoid runaway climate change. It combines significant energy savings with a mix of largely decentralised renewable energy production and the sensible use of large-scale offshore wind and concentrated solar thermal power production. The use of biomass in the *Energy [R]evolution* only relies on residues from agriculture and forestry.

² A detailed cost calculation has not been made for the heating and transport sectors.

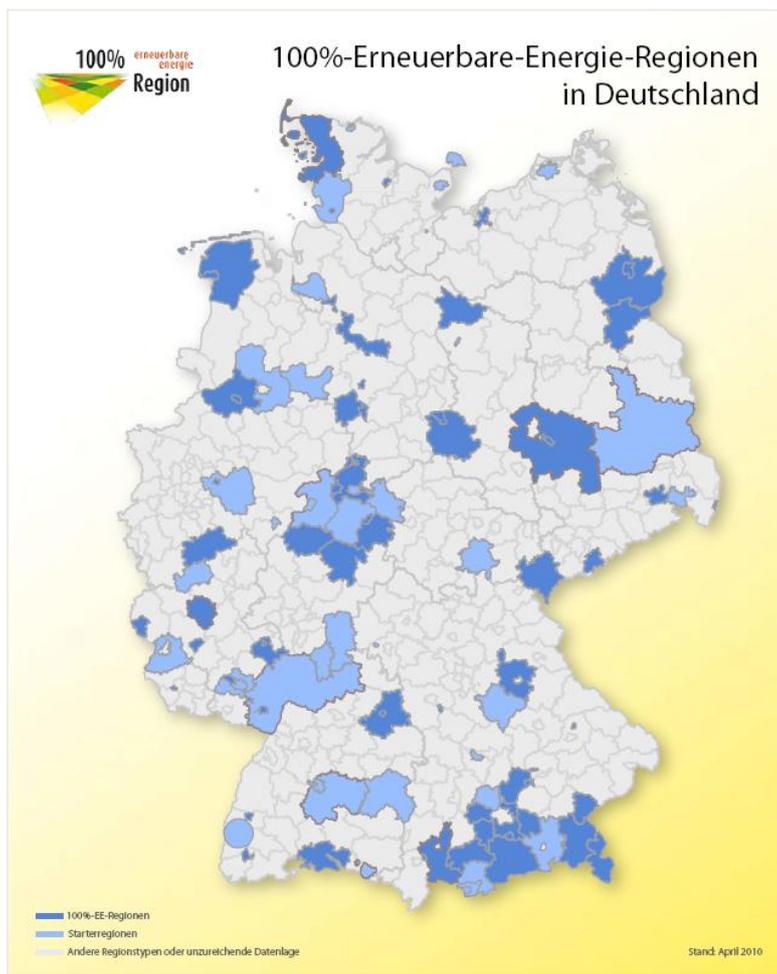
³ See for example: APPA, *Study of the Macroeconomic Impact of Renewable Energies in Spain*, November 2009; Sensfuß, F. and Ragwitz, M. (Fraunhofer ISI), *Analyse des Preiseffektes der Stromerzeugung aus erneuerbaren Energien auf die Börsenpreise im deutschen Stromhandel; Analyse für das Jahr 2006. Gutachten im Rahmen von Beratungsleistungen für das Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU)*, 2007; EWEA, *Wind Energy and Electricity Prices Exploring the 'merit order effect'*, A literature review by Pöyry for the European Wind Energy Association, 2010.

Policy recommendations

The central challenge to achieving the *Energy [R]evolution* is implementation. Today, three quarters of primary energy supply comes from fossil fuels. To achieve large-scale and cost-effective growth of renewable energy and resource-efficient technologies, a balanced and timely mobilisation of private and public investment is needed. These will largely rely on policy incentives to ensure that conventional power sources are replaced by clean ones.

Greenpeace urges the European Union and its member states to make rapid progress in five areas:

1. **A truly sustainable energy economy vision for 2050 that guides European climate and energy policy.** This should explore the benefits and feasibility of a fully renewable energy system and the development of a credible emission reduction pathway.
2. **Ambitious targets for emission reductions, energy savings and renewable energy.** Legally binding domestic EU emission reductions of at least 30% by 2020, mandatory energy savings targets and the implementation of the 20% renewable energy target.
3. **Removal of barriers for renewables.** The electricity market and network management practices should be subject to a thorough reform. All subsidies and support measures for nuclear power, fossil fuels and inefficient plants, appliances, vehicles and buildings should be removed. Energy prices should reflect the genuine costs of fossil fuels and nuclear energy use.
4. **Effective policies to promote a clean economy.** An update of the European Emissions Trading Scheme that removes loopholes, the effective implementation of the renewable energy directive and ambitious energy efficiency standards for vehicles, consumer appliances, buildings and power production.
5. **Redirecting public finance.** EU structural and cohesion funds should be redirected towards renewable energy and energy savings, and targeted support for innovation and research in energy saving technologies.



German regions heading for 100% renewables in dark blue
Source: 100% renewables regions initiative

**The *EU Energy [R]evolution* and its accompanying
press release can be downloaded at
www.greenpeace.eu**

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