INFORSE Sustainable Energy Visions

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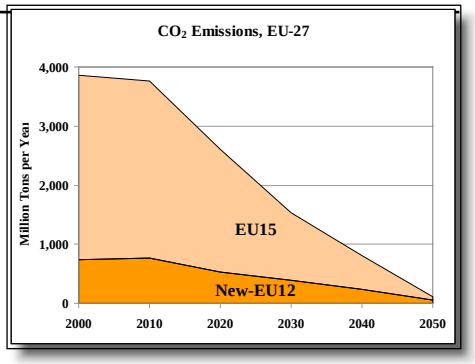


It is becoming increasingly evident that there is a need for rapid transitions to energy systems with efficient use of renewable energy.

The present technical solutions were primarily made for cheap oil, gas, and coal, without caring about external factors such as climate change. Neither our economies nor our environment can afford our continuing use of fossil fuels much longer.

Nuclear power has its own set of problems of radioactive waste, safety and, recently, long-term prospects of fuel shortages. Therefore, the nuclear option is not viable in a future fuelled by sustainable energy.

We are left to consider whether and how to change to efficient use of renewable energy. To find the answers, INFORSE is promoting a series of sustainable energy visions that show how the world, the 27 EU countries, and individual countries *can change* from the present unsustainable energy sources to sustainable energy systems based 100% on renewable energy. The visions show decade by decade how such a transition can be made in 25-50 years. They include increases in energy efficiency, renewable energy, and sectors such as housing and service, as well as stability in sectors such as industry and agriculture, and, in the transport sector, conversion to more sustainable transport solutions. The global vision also includes local energy solutions for eradication of poverty.

For many people in the traditional energy sectors, it is a mantra that renewable energy cannot supply the power and energy that we need. ***INFORSE's visions show that it is indeed possible***. It is in fact possible with the welfare that we have today, and with costs that are absolutely manageable. ***It is purely a political decision*** *whether a country will change to sustainable energy or continue its unsustainable path; and the sooner the transition is started, the cheaper it will be.*

Energy Efficiency is the Key to Success

Energy is used very inefficiently and for a large number of end-uses the same service of the energy (such as light, heated or cooled rooms, industrial production etc.) can be made with ¼ of the energy that is used today. In the visions we assume that this can be realised until 2050 for use of electricity, industrial production, and transportation. For use of electricity use there are many examples: a new compact fluorescent lamp or a LED lamp uses only ¼ of the energy of an incandescent lamp, a laptop computer uses only about ¼ of the energy of an old PC, and the best new fridges and freezers use only ¼ of the average stock in the households. For industrial production, a new generation of equipment is typically 20-30% more efficient than the one it replaces, and with a new generation every 5-10 years, the increase in efficiency until 2050 will equal about a factor 4.

For space heating, houses can be built as super low-energy houses with almost no net heat consumption. Since we cannot and will not replace all houses until 2050, the efficiency increase has to be more modest, and we have estimated that a factor-2.5 increase of energy efficiency is feasible from the average housing stock in 2000 to the average in 2050. Such an increase in energy efficiency by 2050 is equal to an efficiency increase of 2%/year, a rate that is certainly possible with a combination of energy renovation and high standards for new houses.

For transport, the main efficiency gain is the conversion from fossil fuel, which is used in cars with an efficiency of 15-20%, to electric vehicles, in which energy efficiency is 60-80%, along with more efficient trains with recovery of energy from braking. With old, wasteful power supplies, the high efficiency of cars is lost in the power production; but with an increasing part of the power production from renewable energy sources and with highly efficient co-generation of heat and power (CHP), this is no longer the case. Battery-driven cars can also act as flexible loads when charged, matching variations in renewable energy production. They can even serve as small electricity storages at need.

Efficient Supply

The traditional fossil- or nuclear power plants, which waste 2/3 of their respective energy potentials, are not part of a sustainable energy supply. They should be replaced with ever-more-efficient CHP plants, fuelled with solid biomass and biogas. The INFORSE visions assume that power plants are replaced with best available technology (BAT) in CHP plants and that this BAT is gradually improved.

Moderate Growth

The growth that drives energy consumption is the physical growth of housing, transport etc. rather than the economic growth, at least in industrialised countries. Therefore, the visions use forecasts of physical growth, based on trends, plans, and the visions of the participating NGOs. This combination presents scenarios of growth in housing and service sectors, starting with current trends and gradually ramping down, in a decade or two for the richest countries and within four to five decades in countries with less housing area per capita. It also predicts stable industrial production in most countries, because increased value in industrial production derives from increased quality, not from increased quantity. Finally, it points to convergence of transport to a level about 20% below the current Western European level, as the current transport patterns are clearly unsustainable with far too much commuting and underpriced transport of goods without inclusion of environmental costs. Measures to reduce commuting and to include the real cost of transport will not only save energy, but in many other ways as well, will lead to more sustainable transport systems.

Renewable Energy Development

While renewable energy is more expensive than energy efficiency, it is available in all countries for which we have developed visions, in sufficient amounts to supply the country with the energy needed for the visions. Typically all forms of renewable energies are included, within environmental and practical limits: solar heating, solar electricity (mainly PV), windpower, hydro power, wood, straw and other agricultural residues for combustion, energy forest/plantations mainly on abandoned land, biogas, and geothermal energy. In a few cases we have also included smaller amounts of wave power even though the technology is not commercial yet. For each country we publish a publicly available paper stating the assumptions used.

Sustainable Energy Vision for the EU

For the EU-27, we have developed a vision using the above-mentioned estimates of energy efficiency, development of energy-using sectors, and renewable energy potentials from Windforce10/12 (for windpower), German Advisory Council on Global Change 2003 (for biomass) and other sources. We have combined this in one scenario with phase-out of fossil fuels by 2050 and of nuclear power by 2025, leading to 33% reductions of greenhouse gases by 2020 and 100% by 2050. The current large imports of fossil and nuclear fuels are replaced by a small import of electricity. With this development most energy installations will be phased out as they come to the end of their lifetimes, to be replaced by more efficient ones. Thus, the costs are small. Faster reductions are both possible and indeed desirable from a climate perspective; but will require a larger number of early retirements of installations and will therefore be more expensive.

National Sustainable Energy Visions

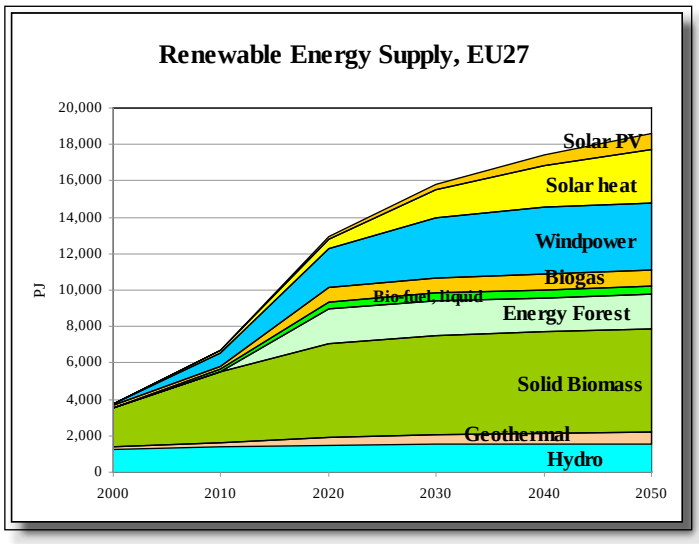
Sustainable energy visions are made for a number of countries: Lithuania, Latvia, Slovakia, Romania, Belarus, and Denmark. New vision are under development for Bulgaria and Russia. The ZeroCarbonBritain plan, that covers the UK, is in many ways similar to the visions. Most of the visions follow the EU-27 vision of phase out of fossil fuels until 2050, but the Danish vision and ZeroCarbonBritain includes a fossil fuel phase out until 2030.

Sustainability of Biomass

A crucial issue for a transition to sustainable energy is that fossil fuel must be replaced with real sustainable solutions. The biomass included in the visions is therefore from within the EU to avoid unsustainable imports, and the potentials for biomass conform to estimates from the German Advisory Council on Global Change 2003 for the 15 ”old” EU countries. In addition, the vision includes the use of 7% of agricultural land to produce solid biomass and 7% for liquid biomass. The total biomass energy, 6600 PJ, is 30% lower than the sustainable level of biomass indicated by the European Environmental Agency in its estimation of sustainable biomass potentials in 2006. If the use of agricultural land becomes problematic, e.g. because of increased need for food production, the production of liquid biofuel can be stopped, as it can be replaced with other options without extra costs. Currently there is still abandoned agricultural land that can be used for energy plants/forests in many EU countries.

“It is purely a political decision”

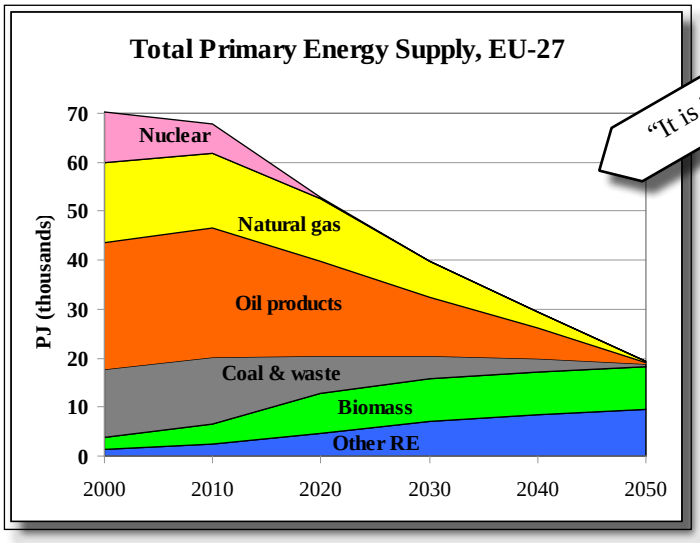
Read more about the visions at www.inforse.org/europe/Vision2050.htm



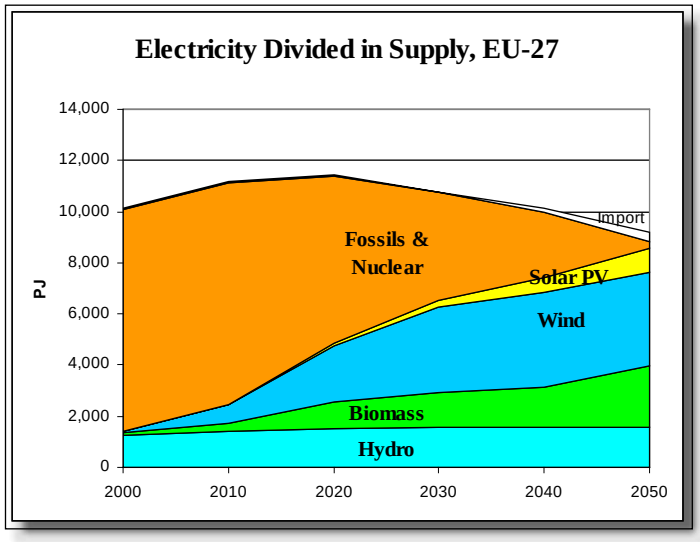
Graph: CO_2 Emissions in EU-27 by 2050 is close to zero according to the vision of INFORSE

Graph: All forms of renewable energy increase in the vision, with biomass, windpower and solar heating predominating.

“It is in fact possible”



Graph: With the large increase in energy efficiency, primary energy demand is reduced to less than 1/3 of its current level, even as the energy service levels are maintained. The strong focus on energy efficiency is the most cost-effective and the most environmentally benign mechanism involved in the vision.



Graph: Electricity production is not reduced much in the vision, but it is increasingly used for transport.