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Future Trends Series - GR:REEN Project

Title of the report

RE-Thinking 2050: A 100% Renewable Energy Vision for the European Union

Area

Energy and Environment

Reporter

European Renewable Energy Council (EREC)

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<http://www.erec.org/>

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Short summary

In this report, the EREC provides a comprehensive estimate of the economic, environmental, and social benefits associated with a transition to a 100 per cent renewable energy system for the European Union. It also particularly focuses on the policy recommendations considered necessary to tackle the non-technical barriers to achieving this goal, and explores the issues associated with a major expansion in the contribution from renewable energy.

Key trends

Wind Vision up to 2050 Technology Outlook

- Over the medium term, it is estimated that €6 billion of investment in wind energy research is needed in Europe over the next 10 years.
- According to the European Commission, "The return would be fully competitive wind power generation capable of contributing up to 20% of EU electricity by 2020 and as much as 33% by 2030."
- Meeting the European Commission's ambitions for wind energy would require 265 GW of wind power capacity, including 55 GW of offshore wind by 2020.
- A total of 600 GW of wind energy would be needed in 2050 to meet 50 per cent of the EU's electricity

demand: 250 GW would be onshore and 350 GW offshore. With a higher proportion of offshore wind energy, wind energy could produce more than the 2,015 TWh.

Hydropower Vision up to 2050

Technology Outlook

Hydropower is predicted to play a key role in 2030 and 2050 through:

- Development of hybrid systems combining several technologies to guarantee the maximum energy production in the most efficient way.
- Development of multipurpose hydro plants with applications in the fields of drinking water supply systems, irrigation channels, flood control and protection, the creation of adjoining environmental areas, waste water treatment plants and recreational purposes.
- Adding security and stability to the European grid thanks to the pump storage.
- Supporting the development of rural areas by the installation on economically advantage conditions of SHP off-grid units.

Photovoltaics (PV)

Technology Outlook

- It can reasonably be assumed that photovoltaic electricity will become a mainstream power source in Europe by 2020 and a major power source in 2050.
- The potential of photovoltaic electricity in Europe could be at least 50 per cent higher by 2050.
- All assumptions are based on current knowledge of technological evolution to be expected in the coming years. With the expected evolution of technologies such as concentrated PV and nanotechnologies, even higher efficiency and output performances can be expected.

Solar Thermal Electricity (STE)

Technology Outlook

- The installed capacity in Europe is expected to be of 2 GW by 2012, 30 GW by 2020, 60 GW by 2030 and 125 GW by 2050. The technical potential in Europe can be estimated 20 times that figure within reasonable generation costs.
- For long-term renewable supply in the EU, regional approaches are of paramount importance. Focusing on STE, the EU and its Member States should take advantage of the fact that the largest potential of the world is in Southern Europe and the Union's neighbouring countries of the Mediterranean, partners in the Union for the Mediterranean. North African countries should develop clean technologies to face the increasing domestic energy demand.
- In the medium-term targets of 20 GW by 2020, 85 GW by 2030 and 430 GW by 2050 are feasible taking into account the grid infrastructure to be developed in the region.

Solar Thermal

Technology Outlook

- The importance of the heating and cooling sector has now been clearly recognized, as it currently meets roughly half of the entire final energy demand (49%) and will continue to be a major player in the energy supply.
- The overall energy demand will decline with the implementation of energy efficiency measures. Therefore, the deployment of renewable heating and cooling technologies (RES-H&C) must go hand in hand with major energy efficiency improvements in buildings to ensure a widespread take-up of renewable energy systems (RES).
- In the medium-term (2030), the solar fraction would be 15 per cent, based on a 20 per cent reduction in demand compared with the 2006 level.
- In the long-term (2050), the solar fraction would be 47 per cent, based on a 31 per cent reduction in demand compared with the 2006 level.

Geothermal Technology Outlook

- Geothermal energy can substantially contribute to heating and electricity production, with ca. 20 per cent of the total EU consumption, or 70 Mtoe for electricity and ca. 30 per cent of the total EU consumption, or 150 Mtoe for heating and cooling.
- The availability of the resource, all day and all night, throughout the year, provides a back-up to the electricity grid anywhere.
- By 2030: Towards a competitive source of energy by bringing down EGS plant cost, starting the implementation of massive construction programs, and transferring EGS technology outside Europe. Geothermal heat pumps and direct uses will be firmly established and further developed, notably in view of agricultural applications (e.g. heating greenhouses), new applications for pre-heating in industrial processes (high temperature) and new district heating systems for dense urban areas.
- By 2050: Powering Europe and the world from geothermal with EGS developed everywhere at a competitive cost, replacing conventional base-load power plants (coal, nuclear, fuel, etc.) and geothermal heating and cooling systems being available and economic for both individual buildings and urban areas.

Bioenergy Technology Outlook

- Future development depends to a large extent on the economic framework created by the European Member States. The leading principles for the further development of bioenergy in future energy systems are sustainability criteria, efficiency and competitiveness.
- Bioenergy has to bring to commercial maturity the most promising technologies that fit these principles. Developing a longer term R&D programme to support the bioenergy industry beyond 2020 and looking towards 2050 is a key parameter for the success of the sector.
- The topics that will affect R&D in the area in the coming years are the integration of bioenergy into supply structures with new conversion technologies, monitoring conversion technologies, monitoring biogas plants, modelling of the whole biogas chain, the development of digestion technologies and the development of both consulting and training programmes.

Suggestions

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Methodology

Research from primary and secondary sources

Reference to other trends reports? If yes, which reports?

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