D4 Describe and discuss the societal and environmental implications of the use of electrical energy

D4.1 identify and evaluate sources of electrical energy, including oil, gas, coal, biomass, wind and solar (e.g., identify and evaluate renewable and nonrenewable sources for generating electricity; evaluate the use of batteries as an alternative to internal combustion engines)

Energy Sources

Much of the world's electricity is generated from coal and uranium. These energy sources are slowly becoming depleted. Consequently, the search is on to find alternative forms of energy. Wind, tides, and steam (geothermal energy) are now being harnessed to produce electricity. Scientists are investigating how to produce electricity from solar panels and fuel cells.

Whatever energy form is used, caution must be exercised to ensure that the environment is not seriously affected and that natural resources are being used sustainably.

D4.2 describe the by-products of electrical generation and their impacts on the environment (e.g., identify by-products and potential impacts of coal-fired electricity generation)

Electricity and the Environment

Fossil fuels, such as gas and coal, which are used to generate electricity have an impact on the environment. Byproducts of coal-generated power cause pollution and global warming. The carbon dioxide, sulfur dioxide, and nitrogen oxide emitted into the atmosphere cause the greenhouse effect and produce acid rain. While there are environmental costs to the production of more "green" sources of energy, such as the land that must be available for wind harnessing or the fish that may be affected by dams for tidal energy, these sources of energy are much less harmful to the environment than the burning of fossil fuels.

D4.3 identify example uses of electrical technologies, and evaluate technologies in terms of benefits and impacts (e.g., identify benefits and issues related to the use of electrical technologies for storing and transmitting personal information)

Electrical Technologies

Cellphones, computers, MP3 players, dishwashers, and televisions are just some of the electrical technologies people use every day. While these devices have many benefits to society, there are some costs associated with them. To assess the environmental impact of a specific technology, the impact of the manufacturing, daily usage, and disposal of the technology need to be considered.

Manufacturing computer, for example, requires a lot of energy. Most of this energy is produced by burning fossil fuels, which contributes to the greenhouse effect and climate change. Along with the energy required, the manufacturing process uses a lot of materials and chemicals. Because computer technology changes so quickly, computers quickly become outdated. These outdated machines are thrown out, resulting in large piles of computer equipment in landfills. New recycling facilities reduce the amount of electronic materials that end up in landfills, but the recycling process also requires energy from fossil fuels.

D4.4 identify concerns regarding conservation of energy resources, and evaluate means for improving the sustainability of energy use

Energy Conservation and Sustainability

Fossil fuels are a non-renewable energy source. This means that people need to conserve these resources to prevent them from being depleted too quickly. There are many things to consider when deciding how to conserve energy. For example, an electric car does not burn gasoline; however, the electricity that it uses may been generated by burning fossil fuels.

When resources are replenished at the same rate as they are used, they are said to be **sustainable**. This concept may include conserving the current non-renewable resources so they are available for long periods of time. It could also mean that non-renewable resources such as fossil fuels are not used at all because they cannot be replenished. Some sustainable choices people are making include riding bikes to work instead of driving, pruchasing high-efficiency appliances, and turning lights off when they leave a room.