

T@W Good Practice Form

Setting

Title: Tuzla 7.5 MW Geothermal Power Plant
 Country: Turkey
 Location: Izmir region
 Start date: 2008
 End date:
 Technology keyword(s): Geothermal Electricity Generation
 Host sector: Energy Industry

General description

Summary:

The purpose of the project activity is to generate electricity and heat from geothermal energy and feed the electricity into the Turkish grid. The use of geothermal power for electricity generation saves greenhouse gas emissions compared to the conventional generation mix in Turkey.

Aims:

- Environmental friendly electricity generation
- Decreasing high import dependency of Turkey

Summary of Results:

The plant shall go into operation end of 2008. The project is realised with the help of carbon credits, certified under the Gold Standard for voluntary emission reductions.

Planning Time: Licence in 2004 - Commissioning in 2008

Planning issues:

Operation Time:

Feasibility Study:

Technical details

Technical details:

The project activity includes the drilling of one production and one re-injection well and the installation of a closed circuit system with heat exchanger, steam turbine and electricity generator. The temperature of the geothermal fluid is expected to be around 174°C. The plant shall produce some 51,000 MWh per year.

Energy data

Energy data: 7.5 MW installed electric capacity
 Energy saved/generated: Generation of some 51,000 MWh per year, saving of some 32,000 tCO₂ per year compared to Turkish electricity generation mix.
 Monitoring: Electricity Meter

Environmental data

Environmental data: The project contributes to lower GHG-emissions and to foster the spread of environmentally friendly technology in Turkey.

Project GHG-emissions: 0 tCO₂ p.a.

GHG-emission reductions: 32,000 tCO₂e/y
 "EUA, CER, ERU, AAU": Gold Standard VERs
 Methodology: CDM small scale methodology AMS I.D.

Baseline

The reference scenario ("Baseline") is defined as electricity generation by the operation of grid-connected power plants and the addition of new generation sources in Turkey.

Monitoring:

Monitoring is carried out by multiplying the annual electricity generation by the Turkish grid emission factor.

Contribution to Sustainable Development:

The Tuzla Geothermal Power Plant contributes to sustainable development in Turkey by

- reduction of overall CO₂ emissions from power generation in Turkey,
- stimulation of geothermal power application in Turkey,
- creation of local employment during the construction and operation phases of the plant,
- demonstration of viability of privately financed geothermal power projects,
- promotion of Kyoto-Protocol in the political discussions and
- contribution to a more differentiated and independent power generation in Turkey.

Economic data:

Economic data:

Financing:

Capital cost:

Operational Costs:

Payback:

Energy Production costs:

Other savings:

Additional Information

Printed or electronic reports or other literature available:

Project Web site: http://www.future-camp.de/english/subwebs/2klima/26_andere.html

Photo Library

Pictures:

Contact information (to be duplicated for each contact for this project):

Type of Organisation: Service provider

(e.g. technology supplier, service provider, host company, financing body, project management)

Technology keyword(s) specific to this organisation: Emissions Trading, Kyoto Protocol, JI/CDM projects, Gold Standard VER projects

Organisation / Agency: FutureCamp GmbH
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Description of the Organisation for inclusion in the database of Technology and Service Providers:

FutureCamp GmbH offers consulting, functional support and development of strategic concepts in the domains of emissions trading (EU emissions trading, JI&CDM, as well as other climate protection projects) and innovation management. In addition to providing consulting services, FutureCamp is also active in the development of new, innovative business fields in several domains (ecology/water monitoring, mobile health / tele-monitoring, decentral and regenerative power systems).

Other contacts:

Please email filled out form (including pictures) to: GP@setatwork.eu

For each picture provided, please provide a caption including any acknowledgement or source and confirm that you own the copyright and/or permission is given for it to be published by T@W on the website and in T@W publications.

If possible please provide pictures at 300dpi so that they can be used in printed versions of the Good Practice.

T@W Good Practice Technology Keywords

TECHNOLOGY KEYWORD	DESCRIPTION
Advanced technologies	The introduction of IT into the workplace and the spread of home working as a result is one example of how advanced technologies can save energy and resources. Others include neural networking, robotics, artificial intelligence and advanced control networks. Applied properly, these can reduce energy usage and improve industrial performance.
Agricultural Waste	Organic wastes are produced as a result of a wide range of agricultural activities, for example crop residues, animal manure, poultry litter, etc. These can be converted to energy by a range of technologies, including direct combustion, gasification, anaerobic digestion (to produce biogas), etc.
Agriculture	There is a vast opportunity to save energy and reduce emissions through more efficient processes in Agriculture. This ranges from reducing the use of nitrogen fertiliser by using more manure through to re-forestation.
Air monitoring	Air monitors can contain materials that have a deleterious effect on the environment. Monitoring systems are now available which can reduce these effects.
Buildings	There are very few parts of the world where buildings require either no heating or cooling to sustain adequate living or working conditions. As such energy in buildings uses about 30% of the total world's energy resources. All aspects of the building can be examined and improved to reduce energy consumption and this area offers a major opportunity for reducing greenhouse gases into the atmosphere.
Coal combustion	This is a traditional source of heat for industrial and power generation processes. There are a large number of developments around the world to increase combustion efficiencies and to reduce Greenhouse Gas emissions during combustion.
Coal mining technology	The extraction of coal can be energy intensive. There are now a number of technologies that can help optimise this process and hence help to reduce Greenhouse gas emissions. These include pre-mining gasification and the integrated recovery of both coal and methane.
Combined cycle	This is a generic term used to describe a two or multistage process of generating electricity through different types of turbines. It can produce efficiencies in excess of 60%.
Combined heat & power	Gas turbines and internal combustion engines can be utilised to generate both electricity and heat. Both of these energy types can be used within a business to make best use of the fossil fuel input. CHP can be found in many industry sectors such as paper and chemicals. Smaller units can be found in hospitals, hotels and leisure centres.
Combined renewable energy technologies	Due to the intermittency of some renewable energy sources, it is often beneficial to combine two or more technologies to achieve a firm power supply (sometimes with a form of energy storage). These can be used to supply energy to remote communities that are not connected to a larger grid system.
Electrical	There is a wide range of domestic and commercial appliances that consume large amounts of the world's electricity resources. These range from the humble office fan to the multilevel commercial refrigeration system. All can be improved to run on less electricity through better control, improved internal components or development of a better appreciation of waste.
Electrical transmission & storage	Most transmission networks lose about 3-6% of the power being transmitted. However in some parts of the developing world this can be as high as 20%. There are a number of technologies available that can help reduce these losses.
Energy distribution	Energy is distributed in many forms: as compressed air and liquids, steam, hot water, hot gases, electricity and hot oils. Distribution losses can be reduced through insulation, leak detection and repair, better transformers in electricity distribution and overall improved maintenance.
Energy management	Industry and Commerce are, in general, poor at managing their energy resource. Effective management of energy can save up to 20% of energy costs in a business. It can be applied through developing a management champion and teams, setting targets to achieve, careful measurement and reporting of performance.

Engines & transmissions <input type="text"/>	<p>The internal combustion engine has been with us for almost a century and in that time it has been constantly improved through better combustion efficiencies and power to size ratios. There is still further work to do on these devices as well as exploiting new types of engine such as the wankel engine or direct diesel injection.</p>
Forestry & energy crops <input type="text"/>	<p>Wood can be used as a fuel both as a by-product from forestry operations and as a crop grown in its own right. Other crops can also be grown for energy purposes (e.g. Oil seeds, sweet sorghum, etc). Combustion is the most common technology used to extract the energy but there is also a range of other technologies that can be used depending on the end use energy requirement (gasification, pyrolysis, anaerobic digestion, fermentation, etc).</p>
Fuel cells <input type="text"/>	<p>When certain chemicals are mixed across a membrane then electricity is generated. This generation can be highly efficient and devices, in principle, can be made with high power to weight ratios. Most fuel cells are at the development stage although some are being installed in vehicles and are being used for electricity storage.</p>
Gas cleaning systems <input type="text"/>	<p>Industrial processes often need to filter gas streams to remove particulates or to filter liquids to separate types of fluid. These processes can be energy intensive and there a number of developments that are available to reduce this process energy.</p>
Geothermal energy <input type="text"/>	<p>Geothermal energy is the name given to energy extracted from the earth, either near the surface or by drilling to higher temperatures at greater depth. At lower temperatures the energy is usually extracted as heat, sometimes with the aid of a mechanical heat pump. At high temperature the heat can be used for power generation.</p>
Heat recovery & storage <input type="text"/>	<p>All high temperature processes generate some waste heat. Sometimes it is cost effective to utilise this heat either at the point of generation for example in recuperative type burners or remotely to heat other parts of an industrial site. In some instances there is no immediate use for waste heat and it can be stored. Heat storage, however, is not practised much in industry and it has its main use for space heating applications where electricity is the main energy source.</p>
High temperature technologies <input type="text"/>	<p>High temperature is here referred to as above 300 deg C. There is a steady stream of new burner, insulation and control technologies being introduced into the market place. These reduce waste gas emissions, shorten heating times save energy and improve industrial competitiveness.</p>
Hydroelectricity <input type="text"/>	<p>Hydroelectricity (or hydropower) is one of the oldest and most widely used forms of renewable energy. It exploits the mechanical energy of falling water to drive a turbine, of which there is a wide variety of designs. Systems range from low-head (<3m) to high head (>20m). This database is limited to small-scale hydropower systems (<10MW).</p>
Hydrogen <input type="text"/>	<p>Hydrogen is emerging as a major component of clean, sustainable energy systems, relevant to all energy sectors (transportation, buildings, utilities and industry). Ultimately it is hoped to produce hydrogen from renewable energy sources.</p>
Industrial technologies <input type="text"/>	<p>This covers a vast range of technologies and processes from gentle drying of fabrics to paper pulping and cement clinker grinding. One of its principal technologies is the electric motor which consumes about 60% of the electrical energy used by industry.</p>
Industrial waste <input type="text"/>	<p>Organic wastes are produced by a wide range of commercial and industrial processes for example industrial wood waste, hospital wastes, tyres, chemical wastes, food processing, etc. These can be converted into useful energy by a range of technologies: combustion, gasification, anaerobic digestion, etc.</p>
Landfill gas <input type="text"/>	<p>Landfill gas is produced as a result of organic wastes decomposing in landfill sites. It can be recovered for direct use as a boiler fuel, converted into electricity or upgraded to a higher value fuel gas.</p>
Lighting <input type="text"/>	<p>Around the world the provision of lighting is one of the single largest influences on the emission of greenhouse gases. There is a vast range of lighting types available and most currently installed are of relatively low efficiency. The introduction of technology such as compact fluorescents and low energy Tungsten lighting can revolutionise the power consumption of whole societies.</p>

Municipal waste Municipal solid waste (MSW) contains a significant amount of organic matter that can be used for energy purposes. MSW can be combusted untreated, processed into a higher-value “refuse derived fuel” or converted using other technologies (e.g. gasification, pyrolysis, fermentation, etc). Sewage sludge also can be digested to produce biogas.

Nuclear technology Electricity generation through the use of nuclear power is widespread around the world. There are a number of designs of reactor and for each there is a possibility of improving energy efficiencies. These devices produce virtually no greenhouse gases.

Ocean energy Energy in the oceans and seas can be extracted in a number of ways. Tidal barrages capture water at high tide, and tidal-stream devices used tide-induced currents to generate power. Devices to capture the energy in waves can be located on the shoreline or some distance offshore. It is also possible to generate power from the thermal gradients in seawater at appropriate locations - this technology is known as OTEC (Ocean Thermal Energy Conversion).

Oil & natural gas technology In the extraction of oil and gas there are a growing range of technologies that can make these processes more efficient such as working with more efficient compressors and improving leak detection.

Other Technologies This section deals with any other technologies that have not been classified elsewhere.

Solar energy (heat) Energy from sunlight in the form of heat can be captured by devices that circulate a fluid for delivery elsewhere. Solar water heaters range from systems supplying a single house or swimming pool to those supplying multiple dwellings or commercial/industrial premises. Solar energy can also be used to provide process heat for industrial/agricultural processes. Solar cooling technologies have also been developed. Through the use of climate-sensitive building design, solar energy can be used for space heating, natural day lighting and even ventilation. Buildings that exploit these range from individual dwellings to large commercial/industrial ones.

Solar power When certain materials are subjected to sunlight they develop an electric potential that can be used to generate electricity. These photovoltaic (or PV) systems can be used for large scale centralised power generation, for decentralised grid-connected power supply and as a remote power source when there is no grid-supplied electricity available. The energy in sunlight can also be concentrated sufficiently to achieve temperatures suitable for thermal power generation. A variety of designs have been used in areas of high incident sunshine.

Transport This subject covers a wide range of transport types on land, sea and in the air. Indeed transport contributes some 30% (at least) to the amount of Greenhouse gases in the atmosphere. There a wide range of technologies either available or under test which can help improve efficiencies and reduce emissions. These include electric vehicles, improved tyres, transport use optimisation and better turbine design.

Wind Modern wind turbines generate electricity through the action of the wind on aerofoil blades. Most of these are land-based and can either be connected to an electricity grid or be non-grid connected, with some form of back up or storage. More recently the potential to site turbines offshore is being investigated and developed. Wind energy can also be used to generate heat and mechanical power.