SUSTAINABLE ENERGY NEWS

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Computer Tools for NGO Energy Plans

NGO Views on CSD9 & CDM

PV-Wind Hybrid

Canadian Green Energy Versus Nuclear

The Canadian Nuclear Awareness Campaign and Greenpeace Canada have launched a campaign to keep the oldest Canadian reactors closed, the A series reactors at the Pickering A and Bruce A nuclear power plants. These 8 reactors are now closed for repair and it will cost an estimated CAN$ 5 billion to start them again. The campaign has a number of proposals:

- promote renewable energy with minimum quotas for renewable energy plus mandatory labelling of electricity specifying where it comes from
- promote efficient cogeneration of heat and electricity
- funding for electricity conservation
- phase out coal-fired power plants
- do not allow the power company "Ontario Power Generation" to avoid the payment of its debt of CAN$ 23 billion for its power plants via a bailout.

Source: Nuclear Awareness Project, Ontario, Canada. e-mail:nucaware@web.net, Ph/fax:+1-905-8520571.

303 US NGOs & Businesses for Sustainable Energy

On April 15 1999, a large group of environmental organizations, consumer groups and businesses released a statement for a US national energy strategy. Its proposed goals for 2020 are:

- to decrease energy use by 10% from today's level;
- to use renewable energy to meet at least 25% of the nation's energy demand;
- to reduce reliance on fossil fuels by at least 30%; and
- to phase out the use of nuclear power.

The statement was delivered to all members of US Congress and key officials in the Clinton Administration.

Source: Sunday Campaign and Sustainable Energy Coalition, http://www.ecomall.com/activism/sec26.htm, sec27.htm, sec28.htm and e-mail list *(See page no.14.)*

Stand Alone Mobile Hybrid PV-Wind Plant at Folkecenter, Denmark

By Lars Yde, Folkecenter for Renewable Energy, Denmark

A mobile hybrid PV-Wind plant was developed at the Folkecenter for Renewable Energy in Denmark.

It can be easily packed and transported in a container, which then serves as an office.

Mobile Power Plant

A mobile PV-Wind hybrid system has been designed and installed at the test field at the Folkecenter for Renewable Energy in Denmark. The plant consists of a 1.5-kW wind turbine, 1.0-kW solar panels and a battery bank with an accessible capacity of 20 kWh.

The hybrid system can be easily transported and erected anywhere in the world that is accessible by a lorry with a 20-foot container. The batteries, solar panels, frames and wind turbine with tower foundation and blade can all be easily packed inside the container for transportation. After arrival at the site, the transport container serves as a very fine and secure office for the power plant.

Presently, the PV panels are attached so that they function as a shelter at the southern side and the wind turbine is erected just 5 meters away.

What are the advantages of a combined system?

A photovoltaic plant has, under Danish climate conditions, a relatively high production in summer and a relatively low production in winter. A wind power supply has serious problems in summer, as periods of up to 2 weeks with very low wind may occur. A combination of solar and wind energy supply reduces the demand for storage capacity considerably.

Results of Computer Simulation and Analysis

In the spring of 1998, a data acquisition system was applied and the necessary data for investigation of the plants performance by computer simulation was collected. The simulations are carried out by the program "Hybrid2 Simulation Model" which was developed by NREL, National Renewable Energy Laboratory, Golden, Colorado, USA. It is a very strong tool for detailed analysis of hybrid systems.

The Danish Design Reference Year (DRY) is used for climate data for the simulations in order to investigate the plant's sensitivity to :

- Size and age of the battery bank
- Different consumption patterns
- Different size and ratio between wind turbine, solar panel and battery bank.

The analysis confirms the assumptions made in the design phase that optimum performance (that is, the maximum coverage of the wanted consumption), under Danish climate conditions, is obtained when the ratio between rotor area and area of the solar cells is one to one.

Another assumption made in the design phase was that the battery bank should have a capacity to cover 2 days' consumption. The simulations have shown that with an accessible capacity of 3 days the percentage of coverage of the wanted consumption is 85.9%. However, if the battery is decreased to a capacity of 1.5 days, the coverage would only be reduced to 80.7%.

The plant proved to be insensitive to the pattern of consumption. Shifting the load from constant 300W (7.2 kWh/day) to a pattern with peaks at 7 a.m., 12 a.m. and 7 p.m. only decreased the load coverage from 85.9% to 84.5%, a reduction of 2%. If the consumption mainly takes place during the daytime, the load coverage increases to 87.2%, also 2%.

Surprisingly, the simulations showed that the optimum number of batteries is somewhat lower than assumed in the design phase. The mistake was to use the MPP (Maximum Power Point) at 15 volts because it corresponds to the standard conditions at 25°C. At least 85% of the solar energy that radiates the solar panels is changed into heat. Therefore, it is more likely that the average temperature is 65% when the panels produce electricity.

Economy

The final and most important question is what is the price per covered kWh? The economic analysis for the optimum system solution shows an average kWh price of 5.95 DKK. (0.9 US$).
The lifetime of the plant is assumed to be 20 years and the battery bank shall be replaced every 5 years.
Using a battery of half the size would reduce the kWh price to 5.14 DKK (0.8 US$) and the load coverage from 85.9% to 80.7 (6%) if the lifetime of the battery is still considered to be 5 years.

Real Life Experience, Lesson Learned

The PV panels have a V_{OC} (open circuit voltage) of 20 volts. That makes 500 volt for the 22 batteries and 22.7 volts for each. However, the dump load in the inverter will start operating at 405 volts and will thus protect the batteries. 405 volts, 18.4 volts per battery, is still a bit too much. It will not damage the batteries, but it may cause extra water consumption. That is exactly what was the experienced. Another experience is that it is important to have easy access to the batteries for refilling water, which is unfortunately not the case in this plant.

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