What does baseload power mean

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We acknowledge Aboriginal and Torres Strait Islander peoples as the First Australians and Traditional Custodians of the lands where we live, learn, and work.

Some sources of renewable power are available 24/7 (e.g., hydropower, assuming water availability, or geothermal power) and are well suited to serve as baseload units. Both wind and solar are intermittent sources of energy and only generate when the wind is blowing, or the sun is shining.

The U.S. has set an overall goal of decarbonizing the generation of electricity by 2035, as part of the effort to reach net-zero emissions for the entire U.S. economy by 2050.8 With coal and natural gas plants currently generating 60% of the power (or 1,675 billion kWh), the transition to a decarbonized grid, while clearly challenging, will create an enormous market opportunity for zero-carbon solutions that create clean, firm, baseload power.9

Globally, the needs are the same - moving from uncontrolled fossil fuel generation to zero-carbon sources. For instance, the International Energy Agency (IEA) found that:

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Base load power sources are the plants that operate continuously to meet the minimum level of power demand 24/7. Base load plants are usually large-scale and are key components of an efficient electric grid. Base load plants produce power at a constant rate and are not designed to respond to peak demands or emergencies. The base load power generation can rely on both renewable or non-renewable resources.

Non-renewable resources (fossil fuels) include: coal, nuclear fuels. Renewable resources include: hydropower, geothermal heat, biomass, biogas, and also a solar thermal resource with associated energy storage.

Typically, the power demand varies cyclically from day to day, reaching maximum during day business hours and dropping to minimum during late night and early morning, but never dropping below a certain base. (Figure 9.1) This base load is typically at 30-40% of the maximum load, so the amount of load assigned to base load plants is tuned to that level. The above-base power demand (above the base) is handled by intermediate and peak power plants, which are also included to the grid. The main advantages of the base load power plants are cost efficiency and reliability at the optimal power levels. The main disadvantages are slow response time, lack of fuel flexibility, and low efficiency when operated below full capacity.

Base load plants (as well as other energy converting facilities) are characterized by a nominal capacity rating.

For example, if a plant rated at 1000 MW, it means it can generate 1000 MWh of electricity per hour when working at full capacity. The actual generation can be less, depending on the demand or operating conditions, and can be characterized by the capacity factor (CF):

CF = [actual generated output] / [maximum possible output]

For example, let us calculate the capacity factor for a 1000 MW base load power plant that generated 512,000 MWh of electricity over the month of January.

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