Dispatchable Energy Resources

Throughout any given day, customer electricity usage is always changing. This happens as lights turn on and off, washing machines run through a wash cycle, air conditioners kick on or off and from many other everyday life occurrences. One of the roles of the Electric Reliability Council of Texas (ERCOT) is to match energy to those fluctuations. Electric utilities provide the energy resources to do so. Energy resources that are available to ramp up or down are called dispatchable. Dispatchable energy resources are controllable and can adapt in response to changes in electricity demand. With an evolving electric industry — older, traditional power plants retiring and the rapid addition of renewable resources on the ERCOT grid — dispatchable energy resources are an important consideration.

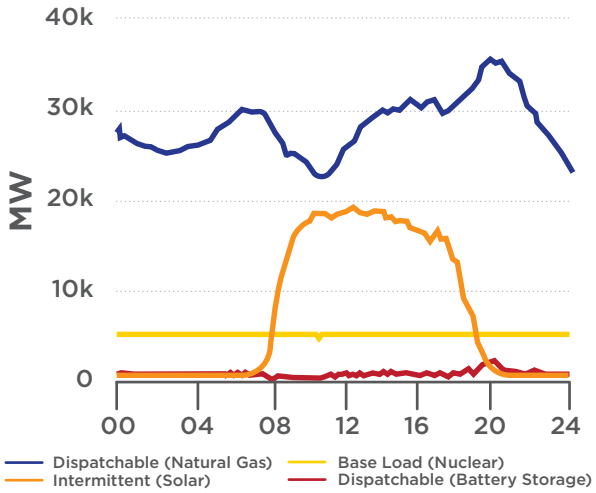
In general, power generation is commonly grouped into three categories: base load power, intermittent power, and dispatchable power. Each of these categories has a part to play in helping to keep the utility grid operating reliably and efficiently, and a key distinction between the three types of generation is their ability to be called upon when needed.

Base Load Power

Base load power plants — such as nuclear plants — provide a continuous and stable output of electricity. They are generally more efficient when they run 24/7 and are typically run as constant, scheduled output. They are often not capable of significantly ramping up or down based on changing electricity demand. Most base load power plants are large, rated at hundreds of megawatts of capacity. This type of generation is considered the backbone of the power supply. When there is sufficient base load power, utilities can have higher confidence that their basic customer demand can be met.

Intermittent Power

Intermittent power plants — such as wind and solar photovoltaic (PV) farms — are more variable in nature than base load power. Intermittent power sources are dependent on weather, so there is less control over when they produce power or how much they produce. Though this type of power has more variability, it is not necessarily dispatchable. For example, even though Texas solar regularly ramps up alongside the increased customer demand for air conditioning in the summer, solar generation naturally ramps down early into the long summer evenings, when customers are still using a significant amount of power. While the electricity solar generates can often be timely and beneficial, it is not considered a dispatchable resource because it cannot be controlled. This is also true for wind power.



Source: Grid and Market Conditions (ercot.com)

The graph above shows various types of resources supplying the ERCOT market on Sept. 17, 2024. It shows an example of each category of resource described here including baseload (nuclear), intermittent (solar PV) and dispatchable (natural gas and battery storage). For simplicity, other resources, including coal and lignite, wind, hydro and others, are not shown.

Dispatchable Power

Dispatchable power plants — such as natural gas peakers and natural gas combined cycle plants — are able to be turned on or off and ramp up or down as needed in response to electricity demand.

Peakers are designed to be infrequently used generation resources that can be dispatched for short durations when the power is needed. Most peaker plants run for 1,500 or fewer hours a year. For reference, there are 8,760 hours in a calendar year. These plants often consist of multiple individual units that are usually around 50 MW each. It is useful to think of a peaker plant like a jet engine that can be turned on and off as needed. The process is very quick, making them highly dispatchable.

Combined cycle power plants are an example of a resource that can fit into more than one category. True to its name, a combined cycle plant is a combination of two types of resources: a peaker plant and another type, known as a steam turbine. Any heat source and water can be used to create steam to drive the steam turbine, and in a combined cycle power plant, the steam is produced from the excess heat of the peaker plant. In this way, a combined cycle power plant recycles that heat and is more efficient than a peaker plant alone. That is, it generates more power for the same amount of fuel than a peaker plant. In exchange for this efficiency, these power plants are often not fully dispatchable. A certain amount of their output is constant and scheduled while the rest can ramp up and down in response to electricity demand.

What about Demand Response and Battery Storage?

On the other side of the power equation, demand can also be considered a somewhat dispatchable resource. That's where demand response comes in. Demand response programs call on customers to reduce their energy usage for short durations during peak times. Customers who choose to participate can lower the need for peaking generation. This works by shifting customer energy use to before or after the peak period.

Large-scale batteries and aggregate residential batteries can also be used to shift load by charging or discharging for a specific duration — often 1-, 2-, or 4-hours, depending on how much energy capacity the battery has. How battery storage systems charge or discharge is highly controllable, with very quick response times. It is useful to think about the ability of an electric vehicle to accelerate "from 0 to 60" in seconds. That speed and flexibility is also available in battery storage systems. The limited duration, however, can be a negative when dispatchable energy resources are needed for long duration events.

The Benefits of Dispatchable Energy Resources

When dispatchable energy resources are sited locally — within the Austin Energy service area — they can offer direct support to Austin Energy customers. Local dispatchable energy resources can strengthen reliability by reducing the amount of power we need to bring in to serve customers at peak use times. By providing power close to where it is needed, they are available to quickly respond to changes in customer electricity usage without the risk of congestion or high pricing that comes with power that has to travel long distances across transmission lines. Local dispatchable energy resources that are able to provide power for long periods of time also provide financial protection against load zone price separation and liquidity risks.

Dispatchable energy resources can also provide ancillary services that make our grid more reliable and affordable to operate. Ancillary services describe the capability of an energy resource to provide electricity in a way that maintains a stable, reliable and efficient power grid. Examples of ancillary services required by ERCOT are:

- Quick start — able to start up and produce power within a very short period of time
- Frequency response — able to ramp up and down in response to instructions sent every four seconds to help keep supply and demand in constant balance.

Some dispatchable energy resources are also able to provide black start services, which is the ability for a power plant to start up and begin to restore power to an electric grid that is completely without power. Below is a table of Austin Energy resources and their characteristics:

Austin Energy Resource Type	Local	Power Type	Available for Ancillary Services
Peaker Plant	Yes	Dispatchable	Yes
Battery Energy Storage System	Yes	Dispatchable	No
Demand Response	Yes	Dispatchable	No
Combined Cycle Power Plant	Yes	Part Dispatchable Part Baseload	Yes
Biomass Power Plant	No	Part Dispatchable Part Baseload	Yes (some)
Coal Power Plant	No*	Part Dispatchable Part Baseload	Yes
Nuclear Power Plant	No*	Baseload	No
Solar PV Plant	Yes and No	Intermittent	No
Wind Plant	No	Intermittent	No

*While not physically located within the Austin Energy service territory, the nuclear and coal power plants partially owned by Austin Energy function as if they were local from a financial perspective. Historical ERCOT rules provide "pre-assigned congestion revenue rights" to these resources which essentially causes them to be priced in the ERCOT market as if they were within the service territory and not subject to congestion pricing.

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