Heavy use of the electric grid can result in congestion – a condition in which the lowest-priced electricity can't flow freely to a specific area, and higher-priced power is needed to keep the lights on.

Limits on the Delivery of Least-Cost Power

Power moves from generation plants to the high-voltage transmission system, then to local utility distribution systems. PJM oversees the high-voltage transmission system, dispatching the least-cost power available across the grid.

However, some conditions can limit the high-voltage transmission system, which can raise the price of providing electricity to some consumers.

At a Glance

- Congestion occurs when the lowest-cost electricity cannot reach some consumers.
- Changes in generation, transmission or demand can impact congestion.
- Because the grid must remain balanced at all times, PJM will dispatch higher-cost electricity to the areas experiencing congestion.
- PJM and stakeholders work together to plan for improvements to relieve congestion.

Congestion at the County Fair

Let's picture the grid as a large fairground, with many different vendors available to serve and entertain customers. Before the fair begins, the event managers select and hire vendors to serve the anticipated crowds at the lowest cost.

On the day of the fair, the weather is sunny and perfectly comfortable for spending the day outdoors, so turnout is on the high end of the managers' estimates. Unfortunately, the bus for the children's music act booked for the afternoon got a flat tire. Suddenly, the lines for the balloon twister and face painter start to get very long. There's an imbalance between the demand for entertainment and the supply.

Calling for Reinforcements

The fair managers recognize the problem, so they call a local bounce house operator and ask them to provide additional entertainment. The bounce house is available, but it's going to be more expensive than the other attractions.

The fair managers agree to pay the higher rate. The bounce house operator arrives and sets up quickly. The lines become manageable again. For today, the fair managers are able to absorb the cost of bringing in the bounce house, but if the congestion around popular vendors persists, they'll need to plan for a more permanent, cost-effective solution.

So How Does This Work in the Power Grid?

One of PJM's primary jobs as a regional transmission organization (RTO) is to manage congestion. One way is by re-dispatching generation around transmission constraints.

As an RTO, PJM plans to dispatch the lowest-cost available power first and adds higher-cost electricity as needed to serve the total consumer demand. And, remember, the RTO must also keep the supply and demand of the entire grid perfectly balanced at all times, so it's not an option to wait for that low-cost power to catch up when demand is high.

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What Causes Congestion on the Power Grid?

On a hot day when demand increases and transmission lines become heavily loaded, some lines may begin to reach the limits of their capacity. This could restrict PJM's ability to deliver the lowest-priced power to all or part of the areas served by the constrained lines.

Similarly, if some lines malfunction and trip out of service, PJM's ability to deliver the lowest-priced power could be limited.

Congestion Is an Economic Effect

Congestion is an economic issue, not necessarily a reliability issue. Sufficient generation is available to maintain an uninterrupted supply of electricity. It's just that, sometimes, more expensive generation is all that's available in a given area to meet the demand.

Over the long term, if these kinds of transmission constraints persist, the higher costs could be passed on to consumers' monthly electric bills.

Market-Based Solutions for Congestion

Another way for PJM to manage congestion is by administering a market for Financial Transmission Rights (FTRs), which are the equivalent of insurance policies for electric distribution companies to protect themselves against congestion costs.

The economic value of FTRs is determined by day-ahead hourly congestion prices. The FTR serves as a benefit, or credit, to the holder if it represents a flow of energy in the same direction as the congested flow. The FTR serves as a liability, or charge, to the holder if it represents a flow of energy in the opposite direction as the congested flow.

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