



SSAFE General Committee Presentation

Electrical Grid Basics

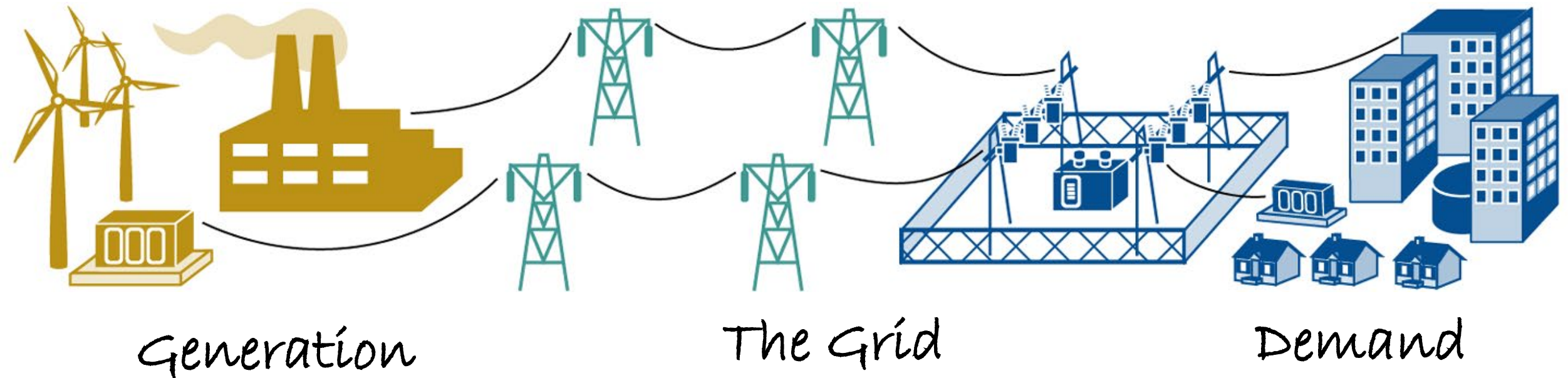
What it is, how it is regulated, and why we care!

By: George Alexander, Kendal at Longwood

Recorded on March 17th, 2022 as part the SSAFE Greening our Campuses Meeting

What's the role of the grid?

It delivers electricity from a variety of generating sources to diverse users of electricity. To operate reliably, it has to be carefully regulated.



The grid provides a specific, narrow range of voltages

If the voltage goes too high, appliances can get fried or even catch on fire.

If the voltage goes too low, you get a “brown out” and some devices won’t even work.

Power plants (“generation”) and users of electricity (“demand”) can’t manage these variables on their own.

They depend on grid regulators.

These are non-profit regulatory agencies, generally known as “independent system operators” (ISOs).

Each region of the country has its own ISO

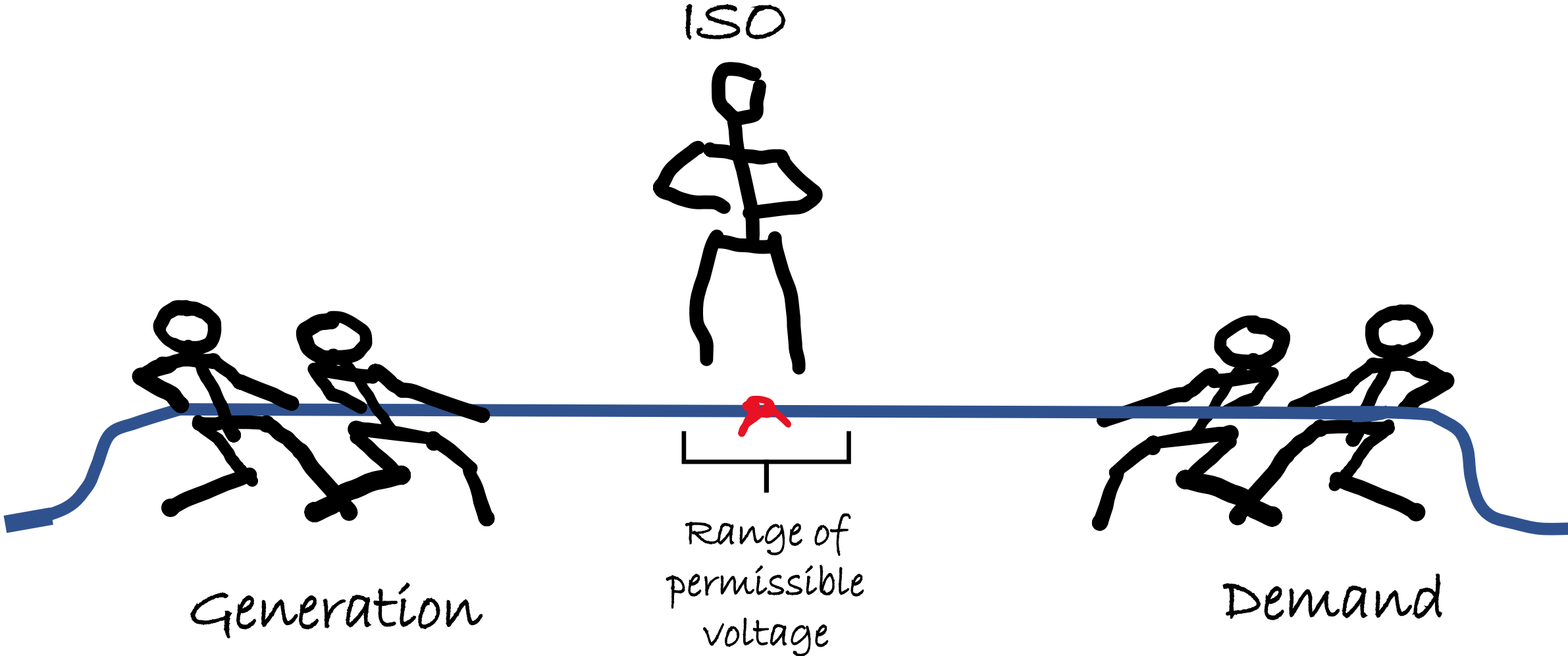


Two important tasks of the ISO:

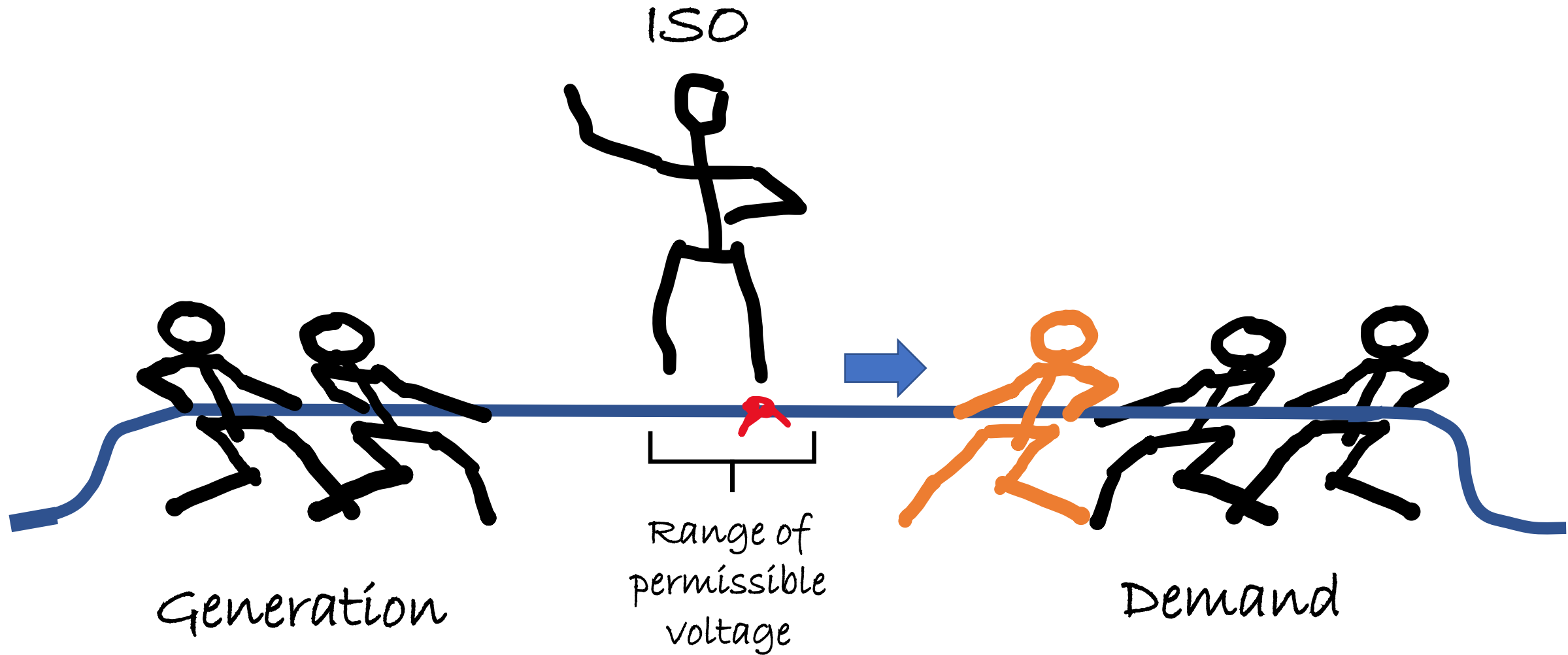
- It makes sure there is the right balance between electricity supply and demand to maintain the right voltage
- It ensures that future peaks in demand can be met adequately

First, let's take a look at the voltage piece

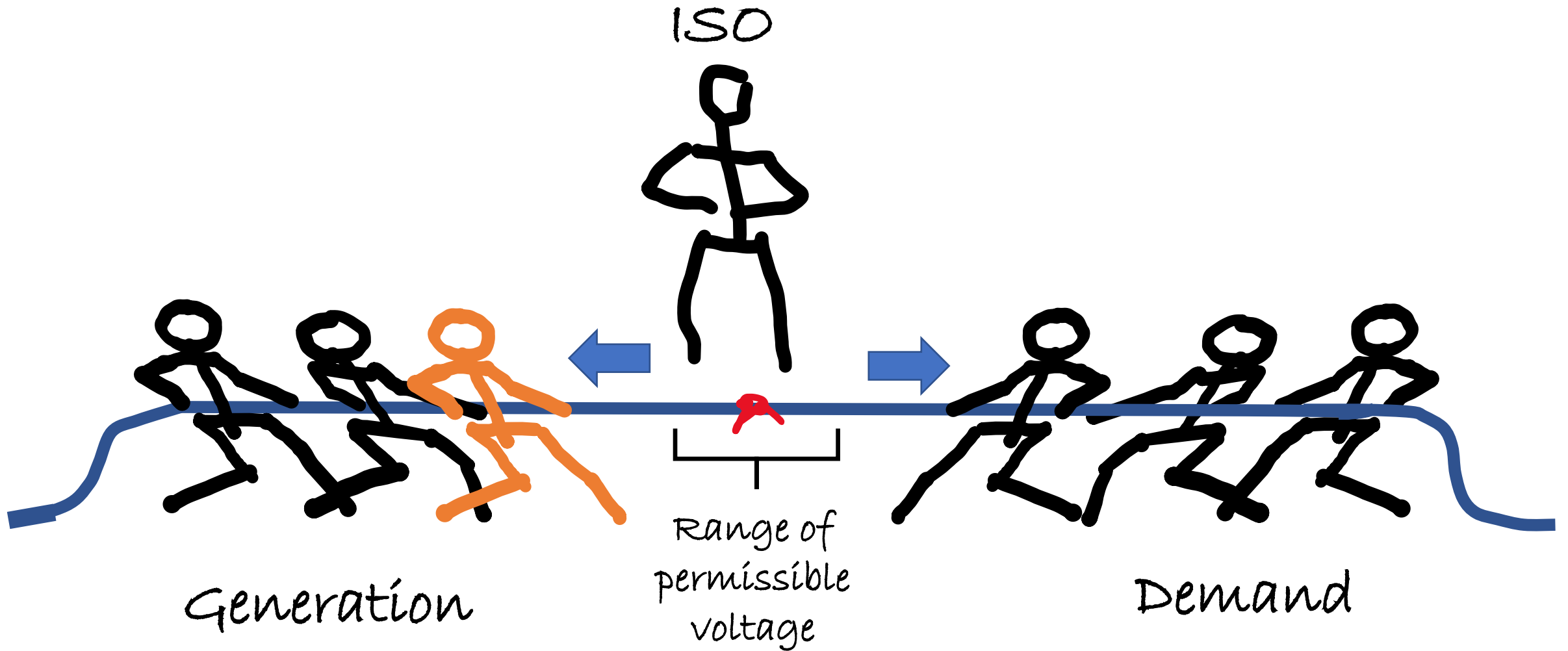
The ISO monitors the voltage to make sure the generation and the demand are balanced



If there is too much demand and the voltage drops, the ISO calls for more generation



The ISO has agreements with the generators and can add or remove generation as needed



The power balancing process is constant

- Generation has to be added
 - When an aluminum smelter starts up
 - When clouds pass over a solar field
 - When everyone's A/C kicks in on a hot day
- Generation has to be reduced
 - At the end of the evening
 - When an assembly line shuts down
 - On the weekend

The ISO also has some ability to reduce demand (“demand management”)

- They can levy a surcharge for power use during peak periods (so customers are encouraged to use less electricity at those times).
- They can pay organizations with backup generators to turn them on during peaks.
- In some cases, they can call for thermostats or hot water heaters to be adjusted, and for reduced EV charging during peaks.
- These are all activities that some retirement communities can get involved in.

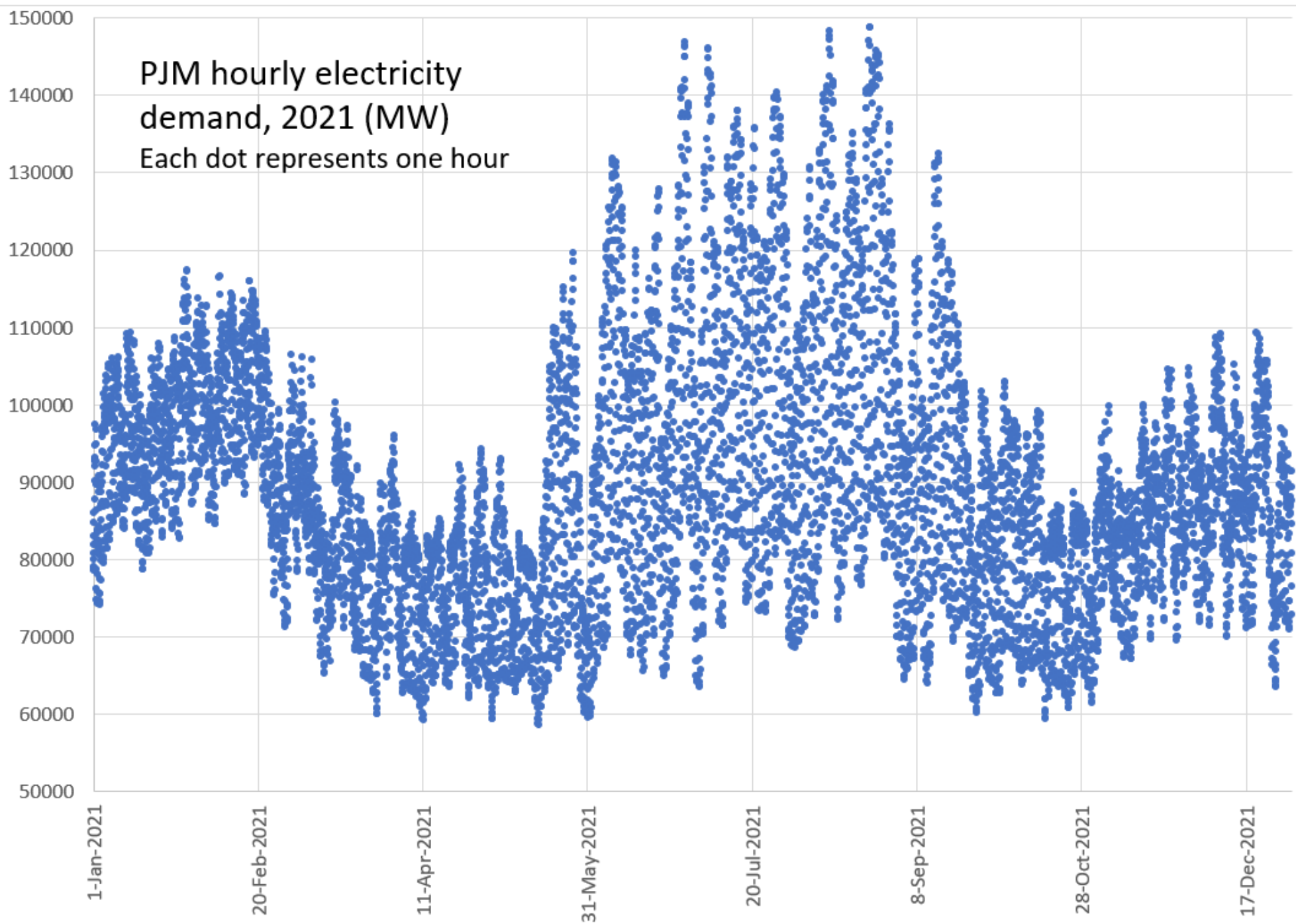
The daily task of ISOs is balancing supply and demand, as we just saw.

The long-term task of ISOs is making sure there is enough electricity for annual peaks.

If enough generation capacity is not available during a peak, the ISO won't be able to balance supply and demand and maintain the right voltage.

For most ISOs, including PJM, the biggest peaks are due to summer A/C loads.

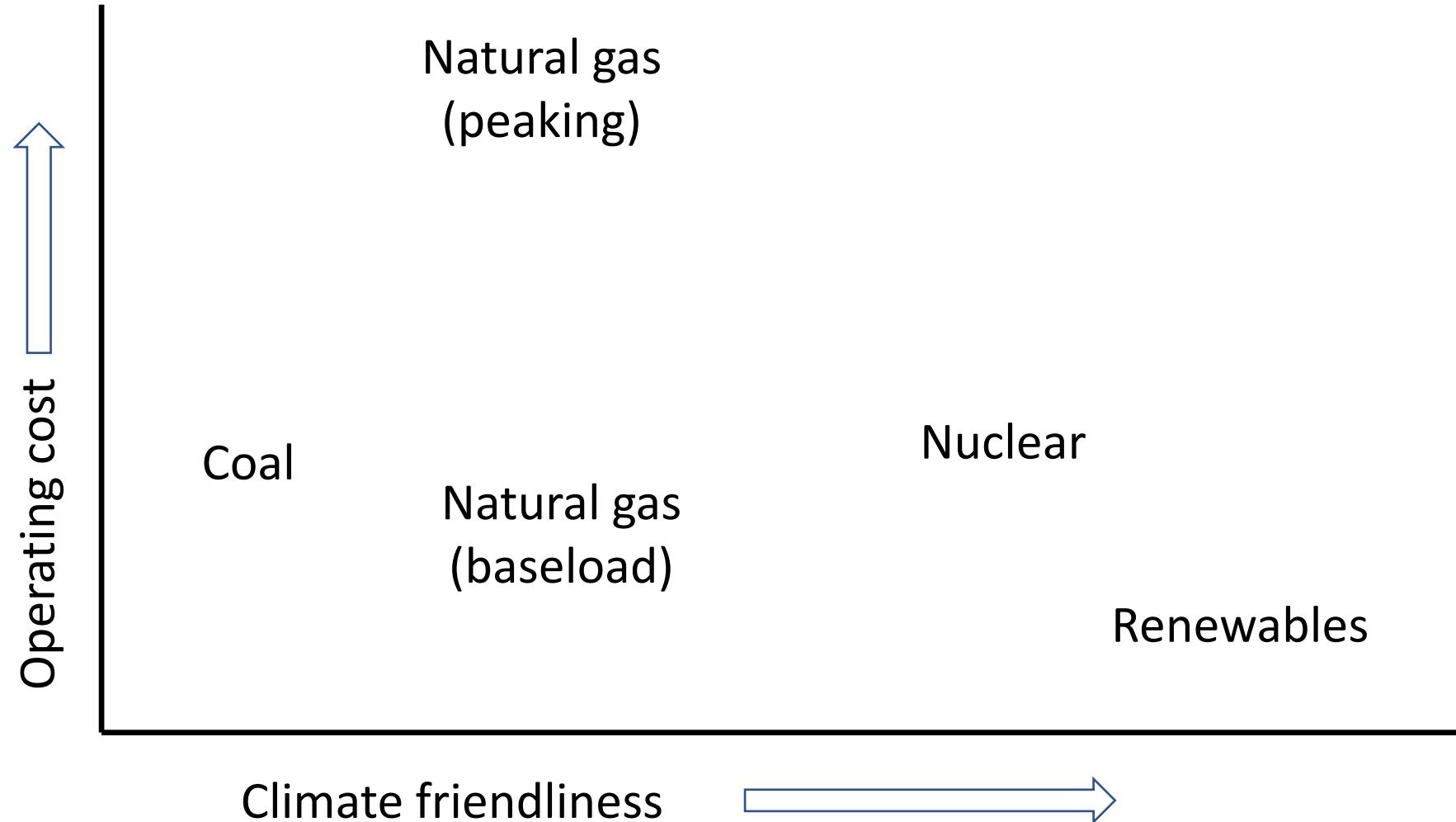
Peak capacity is only needed for a few hours on a few days in July and August.



The ISOs contract for generation to meet future needs

- Most ISOs run “capacity auctions” to get commitments from generators to be on standby for peak periods up to three years in the future
- The generators get paid to keep their “capacity” on standby, whether or not they actually generate any electricity
- This is the reason for “capacity charges”, the surcharges we pay the ISO

Renewables are cleaner and cheaper.
But are they available when they are needed?

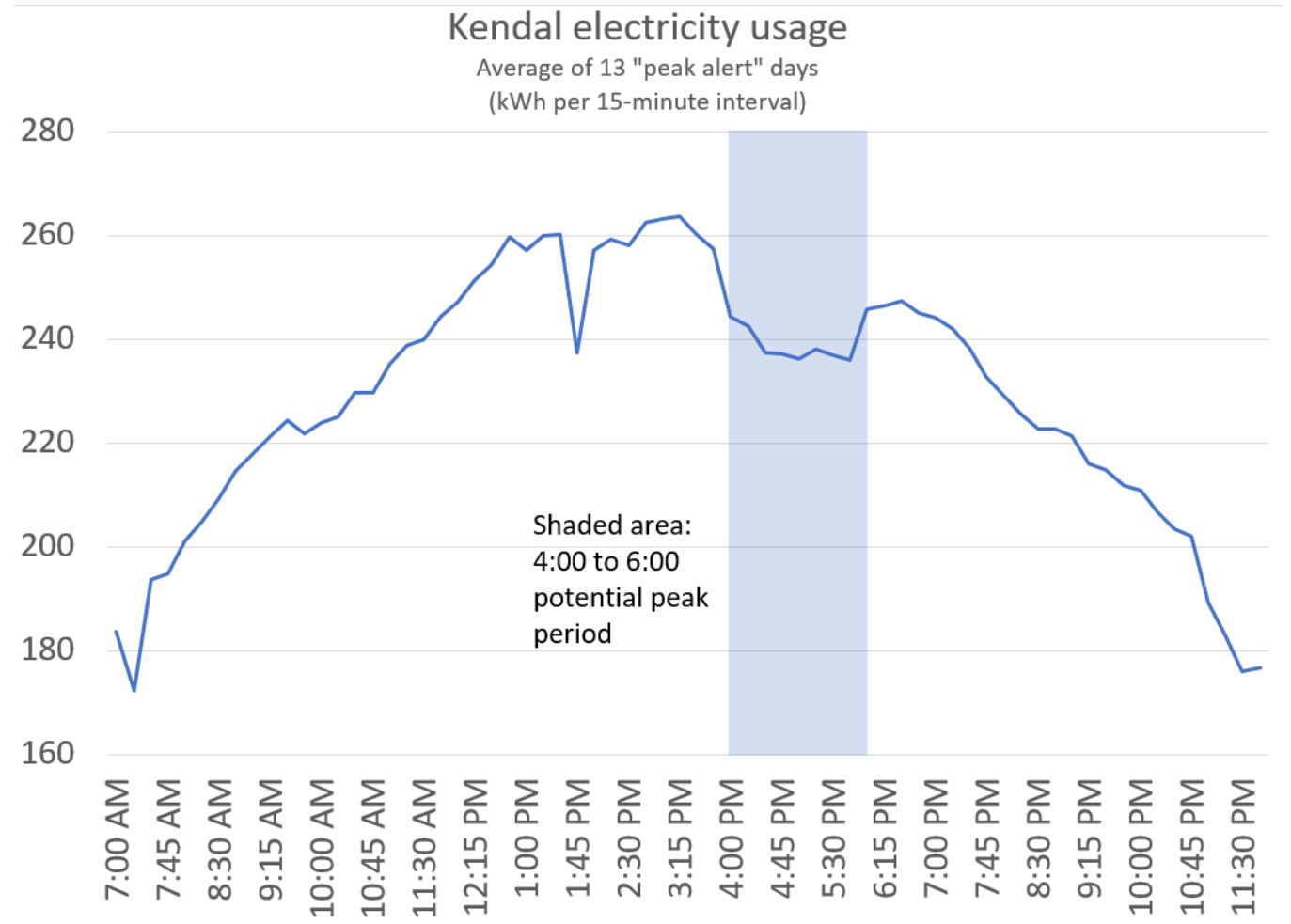


Someday, batteries will fill the role of peaker plants

- But some natural-gas peaker plants are still being built
- To replace them all, a massive build-out of battery capacity will be needed, which will take years
- In the meantime, other methods of reducing peak demand can help

In most regions, we pay capacity charges according our electricity usage during peaks

- The Longwood & Crosslands “peak alert” program
- We helped minimize the use of the dirtiest power plants
- We were able to save about \$24,000 on our capacity charge—and plan to do even better next summer



How we can bring value to the grid, reduce air pollution, and get paid for it

- Reducing annual peaks
- Daily peak shaving (requires “smart meters” and time-of-use billing)
- Batteries (and EVs?)
- Backup generators & islanding
- Microgrids

Each of these steps reduces the use of inefficient, highly polluting generators

The ISOs play a critical role in keep the grid stable, and their role may become even more complicated in the future.

Retirement communities are well positioned to become important grid resources.



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