Blackout Prevention

Public Utilities, Energy, Technology Committee

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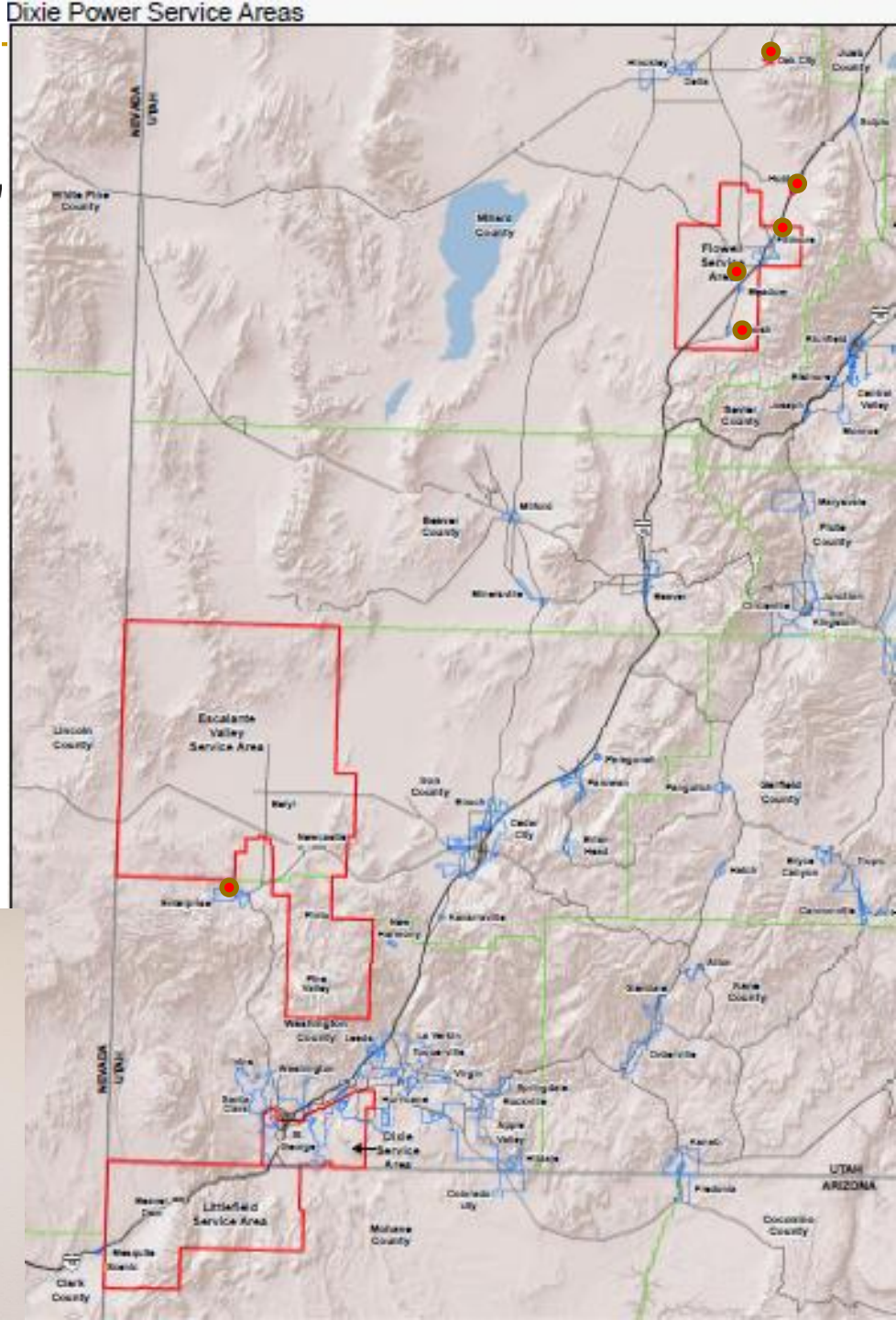

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Power Supply 101

- Energy: the capacity to do work; price based on fuel
- Demand: the ability to have energy when you need it; price based on physical infrastructure
- Frequency: spinning generators in the USA all rotate 60 times/second = 60Hz
- Energy Storage:
  - No meaningful capacity to store electricity
  - Electricity is created in same instant it's used
  - No meaningful capacity to store natural gas

What Did We Learn About Grid Resilience From The Blackouts That Occurred In California 2020 And Texas 2021?

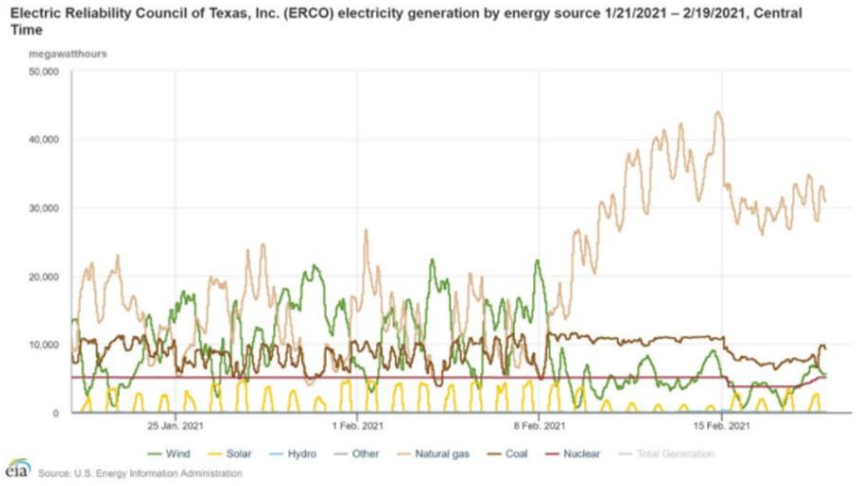
- California August 14-15, 2020: What happened?
  - Peak demands were only 90% of 2006 peaks
  - California had shut down:
    - 2,250 MW San Onofre nuclear power plant,
    - 8,500 MW from several natural gas-fired power plants,
    - at least that much more capacity in several large coal-fired power plants around the southwest
  - 1,000 MW of wind generation was off-line due to still air (in the heat)
  - Solar panels producing 25% less than normal due to smoke from fires
  - California scrambled to buy 25% of its power from out of state, and energy market spot prices shot up from $30 to $1,600/MWh
  - Rolling blackouts shut off 1,000 MW affecting 3.3 million people
  - UCal-Berkeley professor, Dr. Severin Borenstein, said: “We have less gas and less nuclear capacity and we have more solar and more wind... How is that solar and wind going to perform and how do we maintain reliability on these really rough heat spells?”

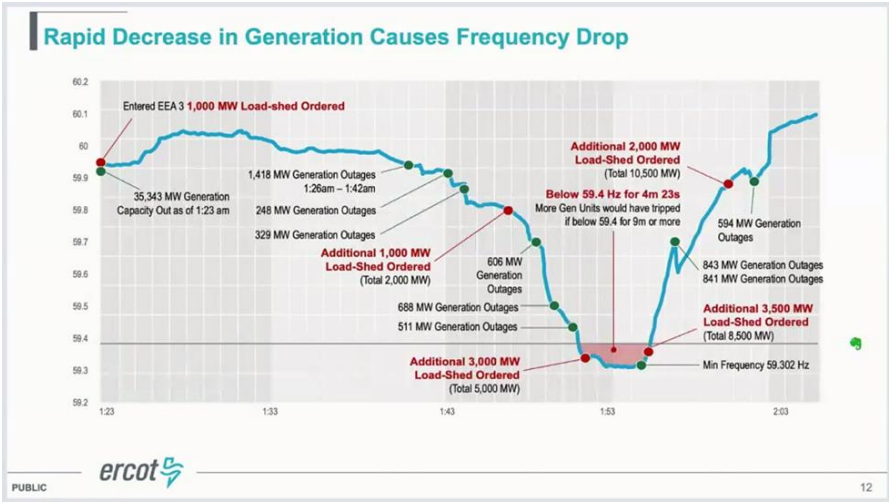
What Did We Learn About Grid Resilience From The Blackouts That Occurred In California 2020 And Texas 2021?

- California August 14-15, 2020: What did we learn?
  - Spinning reserve margins had dropped to 3% vs required 10%
  - Wind generation is always off-line in still air due to heat (or cold)
  - Solar panels always produce less when it's smoky or cloudy and nothing when the sun is low – even when it's still hot and demand is still high
  - California panic buying energy on the open market drove prices up over 50x which created shortages in Utah
  - Retail wheelers in AZ declined to provide energy during the crisis

What Did We Learn About Grid Resilience From The Blackouts That Occurred In California 2020 And Texas 2021?

- Texas, February 10-20, 2021: What happened?
  - Texas relies heavily on natural gas generation chasing wind generation, with some nuclear and coal baseload generation.
  - When it got very cold, the wind dropped off, hitting zero twice.
  - When it snowed the solar dropped off.
  - Natural gas picked up the slack until some of the gas wells froze up.
  - Frequency dropped (creating instability) and 10,500MW ordered shed





What Did We Learn About Grid Resilience From The Blackouts That Occurred In California 2020 And Texas 2021?

- Texas, February 10-20, 2021: What did we learn?
  - Spinning reserve margins also below 10%
  - Just in time delivery of fuel, like natural gas, causes huge risk in the energy business, because the gas wells in Texas all froze over just when they were needed the most.
  - “Green Energy” like wind and solar are overpriced, under-performing, create lots of instability and fluctuations in the voltage and frequency, and have no place in the interconnected grid.
    - They are made for and are barely adequate to serve small, remote loads, like satellites in space or grass huts on islands, or intermittent loads like water pumping.
  - Going it alone, like Texas in ERCOT, can leave you short of capacity when there might be capacity available in neighboring states.
  - Conversely, leaning on the interconnected grid too heavily, like California last summer who was into the market for at least 25% of their demand, can also leave you short of supply if your neighbors are all experiencing the same weather.
  - “Deregulation” doesn’t work. In this case, monthly power bills on deregulated services in Texas spiked to $17,000 for the month during the big freeze.

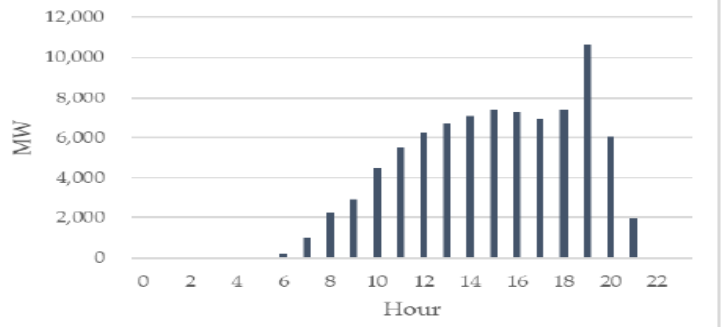
What Did We Learn About Grid Resilience From The Blackouts That Occurred In California 2020 And Texas 2021?

- Western Electricity Coordinating Council (WECC) performed an assessment of our western area interconnected grid.
- On February 26, 2021 WECC published their study: “Western Assessment of Resource Adequacy.”
- Four Key Findings, in their words:
  - 1. “…all subregions show some risk of unserved demand…”
  - 2. “Under the most optimistic assumptions about future loads, resources, and imports, there are still hours in which the interconnection does not meet the” projected demand.
  - 3. “While load variability affects resource adequacy, increasing levels of variable resources, like wind and solar, primarily drive the results of this analysis.”
  - 4. “Reduced availability of excess generation coupled with an increase in the demand for imports can result in multiple entities relying on the availability of the same imported resource.”

Table 1: Peak Demand Hour Availability by Type

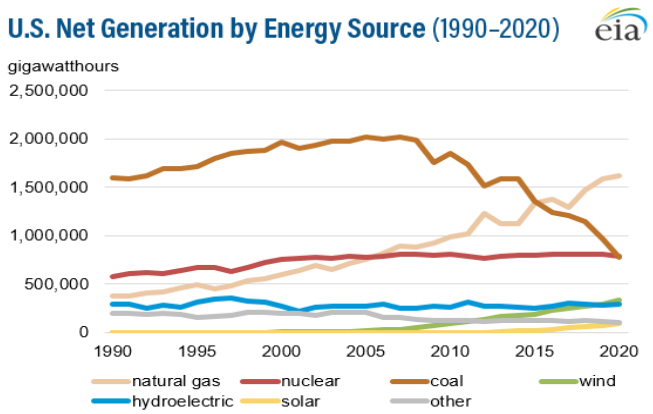
	2021	2022	2023	2024	2025
Baseload	27,512	27,159	27,180	26,994	26,798
Hydro	4,955	4,870	4,955	4,955	4,955
Solar	3,747	4,356	5,143	5,225	5,225
Wind	1,439	1,315	1,439	1,439	1,439

Figure 16: Peak Day Potential Demand at Risk — 2021



Is Utah Equipped To Prevent Large-scale Blackouts Like Those?

- Yes – today; not going forward
  - Baseload plant retirements outside Utah create price pressures in Utah
- Are there recommendations for how to become prepared?
  - "First, do no harm" attributed to the ancient Greek physician Hippocrates
  - Spinning reserves: Utah net exporter of electricity
  - Maintain fleet of dispatchable, baseload generation with on-site fuel supply: coal (nuclear)
  - Limit interconnection of intermittent energy supplies: 15% of peak load
    - Require standards of voltage and frequency fluctuations
  - Avoid trap of "climate politics," including CO2 taxes & dividends, renewable energy mandates & subsidies



How Can We Firm Up The Grid In Southern Gateway Communities To Prevent Blackouts?

- All of Washington County (550MW) fed from Central to St George on 2 x 345kV and 2 x 138kV lines, all within the same corridor, and all from same Central Substation
- Washington County vulnerable to transformer failures in Central Sub or wildland fires
- Washington County should have redundant 345kV feed from 3-Peaks Sub in Iron County down separate corridor
- Washington County is also redundant feed for Kane County

End of Report

- “Blackouts are unacceptable. We don’t accept blackouts in America. We want power 24/7/365 and anything less than that is not meeting the standard that we want.” Honorable Mark Christie, FERC
- “Electricity is no longer a luxury; it has risen in importance to be behind only air and water in sustaining life” Texas Senate Bill 1606