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North American Grid Infrastructure

AGING GRID

Grid components have been grafted on the system over 120 years. The American Society of Civil Engineers gives our energy infrastructure a D+. North American utilities identify aging infrastructure as the #1 pressing challenge for their industry.

STORMS

Severe weather events are becoming more frequent, and more damaging. Hurricane Sandy affected 8.7 million power customers, some hundreds of miles away from the coast. 1.4 million of these customers were still without power six days after the storm.

MAN-MADE INTERRUPTIONS

"The centralized distribution system [in the US] presents an array of vulnerabilities from a cyber and physical security standpoint."

— *Jon Wellinghoff, former Commissioner of the U.S. Federal Energy Regulatory Commission (FERC)*

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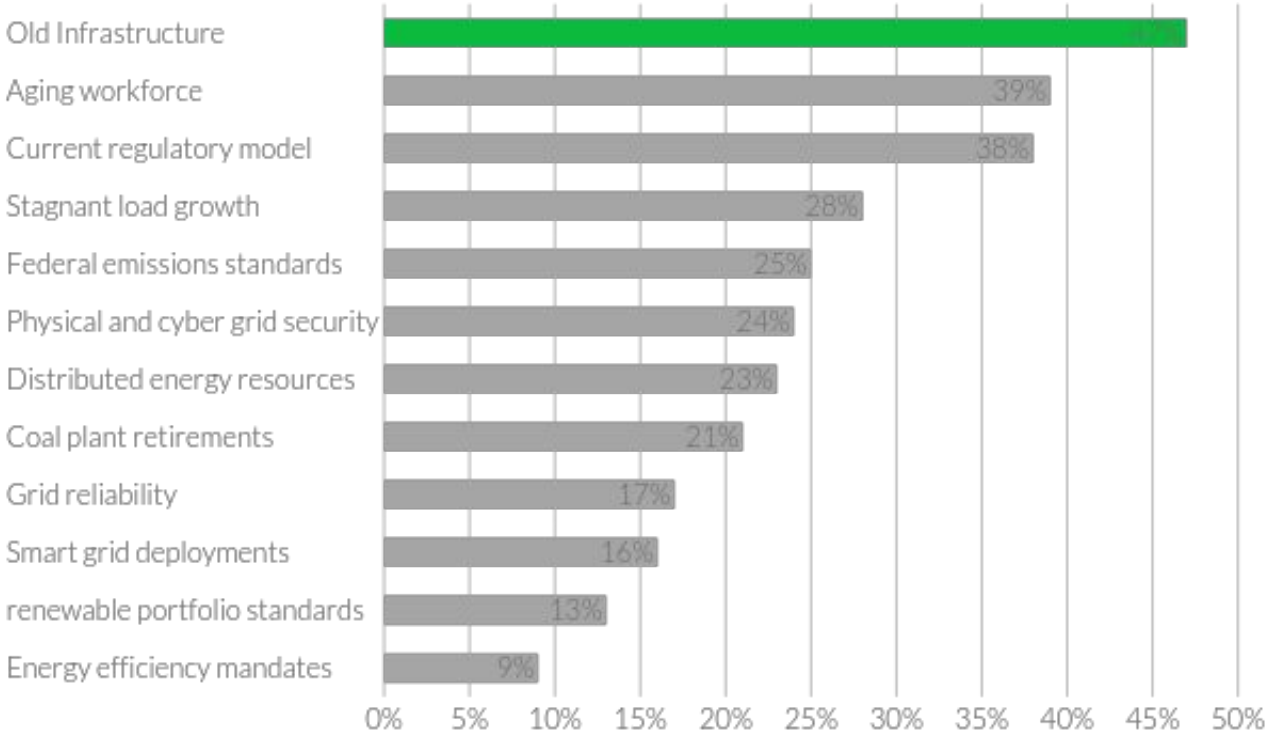
North American Grid Infrastructure

Q. What are the three most pressing challenges for your utility?



Survey of 400 Utility Executives

Source:
2015 Utility Dive Survey

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Why Microgrids

California Warns of a Second Energy Crisis

“The central decision making that we use for keeping the grid reliable, safe and affordable is splintering,” Picker said in the state report issued Thursday. “In the last deregulation, we had a plan, however flawed. Now, we are deregulating electric markets through dozens of different decisions and legislative actions, but we do not have a plan.” - California Public Utilities Commission President Michael Picker

Heat wave sparks major power outages around Los Angeles

Skyrocketing electricity demand due to Friday’s triple-digit temperatures triggered power outages around Los Angeles that are still affecting about 34,500 residences and businesses, officials said.

Customers should plan for 12 to 24 hours without power and possibly even longer due to the high number of small localized outages

Consumers were urged to reduce their electricity usage from 2 to 9 p.m. Saturday, the hours when high use is typical. (Air conditioners pull much of that power but other appliances such as washing machines, dryers and dishwashers also contribute, Ramallo said.

Here is a link to a interactive map of live outages in SCE territory

Power now fully restored to DWP customers after plant explosion in San Fernando Valley

94,000 Los Angeles Department of Water and Power customers in the San Fernando Valley who lost their electricity after an explosion crippled an electrical receiving station in Northridge

The loss of power came at the peak of a heat wave that pushed temperatures to 100 degrees causing mechanical failure related to cooling equipment might have caused the explosion

PG&E cuts power to 60,000 to prevent wildfires during wind storm

Pacific Gas & Electric cut off electricity service to nearly 60,000 people on Sunday in a new attempt to prevent wildfires across Northern California service area during high winds and dry conditions.

PG&E lines were found responsible for 16 fires last year and California lawmakers passed wildfire liability protections for utilities this summer after PG&E warned that fire costs could force it into bankruptcy or reorganization.

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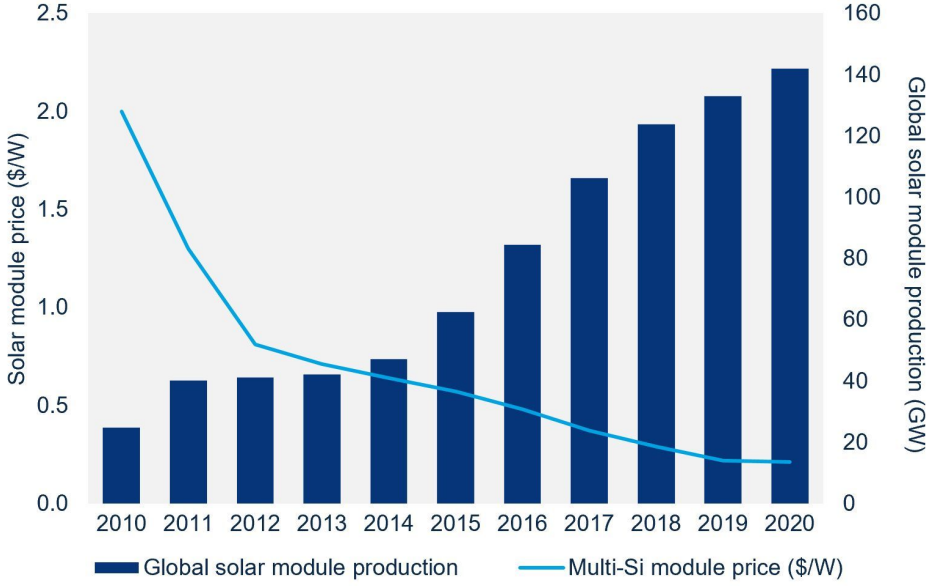
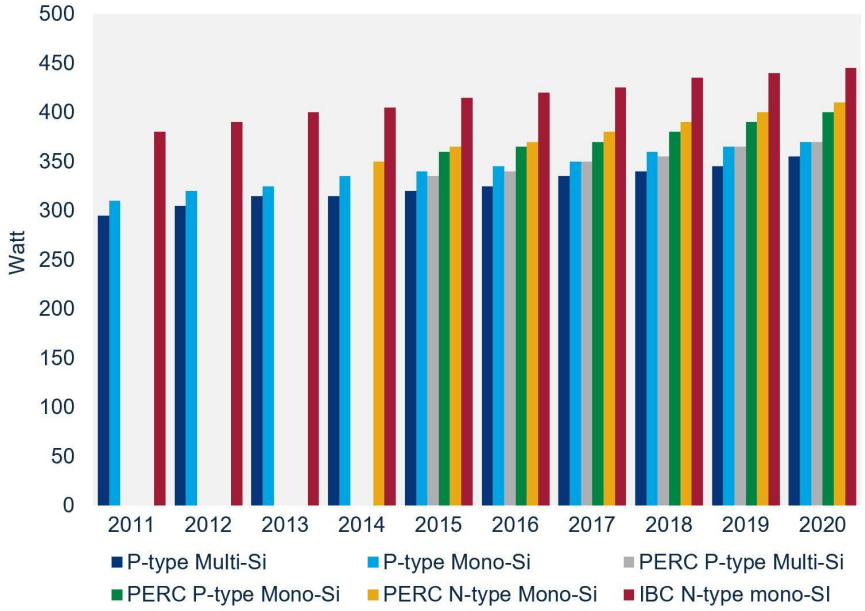
Cost of Solar and Advancement





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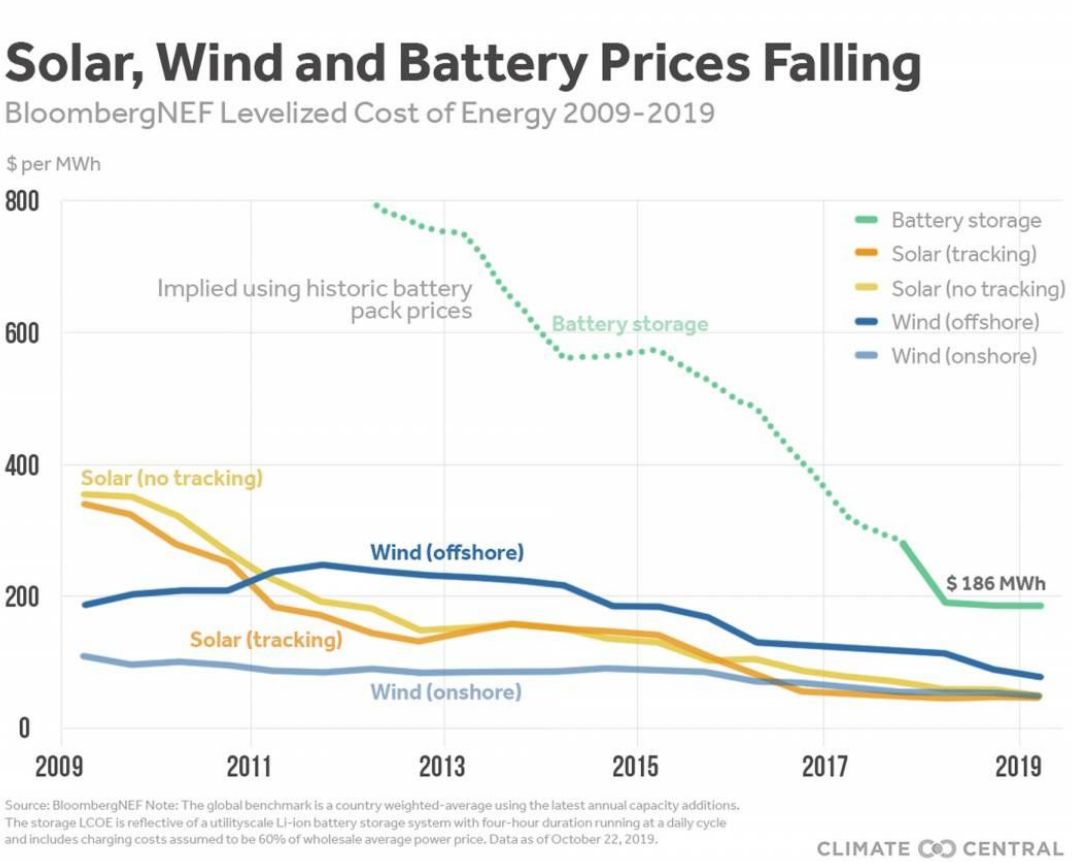
Cost of Technology



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Policy Difference

Oregon

- **SB 1547**: increases Oregon's Renewable Portfolio Standard (RPS) requirement to 50 percent renewables by 2040
- **EO 17-20**: requires new homes built after September 2020 and new commercial buildings built after October 2022 to be equipped for solar panel installation
- **EO 17-21:** sets a goal of at least 50,000 registered electric vehicles in the state by 2020
- **Oregon Clean Jobs Bill**: limits and sets price on climate pollution from large polluters. It will secure greenhouse gas reductions and reinvestment into communities and projects to create clean energy jobs and a thriving economy, especially in disadvantaged communities.
- **Solar development initiative (SDI):** provides cash incentives to owners of solar energy systems with a nameplate capacity of between 2 and 10 megawatts.

California

- **SB 100**: calls for 60 percent renewable energy by 2030 and 100% carbon neutrality by 2045.
- **2019 Energy Efficiency Standard**: Requires residential battery systems to be 5 kWh minimum & accessible by utility if home's current energy needs are met.
- **SB 1339**: requires publicly owned electric utilities to provide a standardized process for the interconnection of a customer-supported microgrid, including separate electrical rates and tariffs.
- **CPUC ruling - R.04-03-017**: provides solar rebates to existing homes from utility companies.
- **Energy Commission's New Solar Homes Partnership**: a $400 million program, offers incentives to encourage solar installations, with high levels of energy efficiency, in the residential new construction market for investor-owned electric utility service areas.
- **CA code Section 218(b)**: considering revisions to allow non utilities to distribute power across property lines when doing so as part of a clearly defined microgrid
- **California Rule No. 2**: clarifies "cost of ownership" and assure microgrids are treated fairly.
- **California Public Utilities Commission:** to create a microgrid tariff to outline clear interconnection process and recognizes the value of microgrids.

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Lessons Learned

Lessons Learned

- Permitting and interconnection still take far too long
- Absent grant funding; and microgrids often require long-term third-party service agreements to support O&M.
- Microgrid controllers and communication protocols need further standardization, and some other technical product and microgrid configuration challenges still exist
- Costs have continued to decrease, but must further come down for an attractive ROI in the absence of grants
- Analyzing data from operating microgrids will be increasingly important as the market grows and matures
- The EPIC-funded projects significantly improved the understanding of microgrid best practices in CA

What needs to happen

- Create standardization of interconnect agreements and requirements
- Create technology neutral microgrid tariffs or standards for sharing costs and benefits of the services microgrids can provide.
- Policy to allow multi-customer microgrids
- Support private developers and 3d party financing
- Allow private development projects to support grid with ancillary services which reduces infrastructure cost to utility and creates greater grid stability.
- Stronger policy to support distributed generation is key
- Create Microgrid incentive programs for for developers, utilities, end users, integrators,etc.

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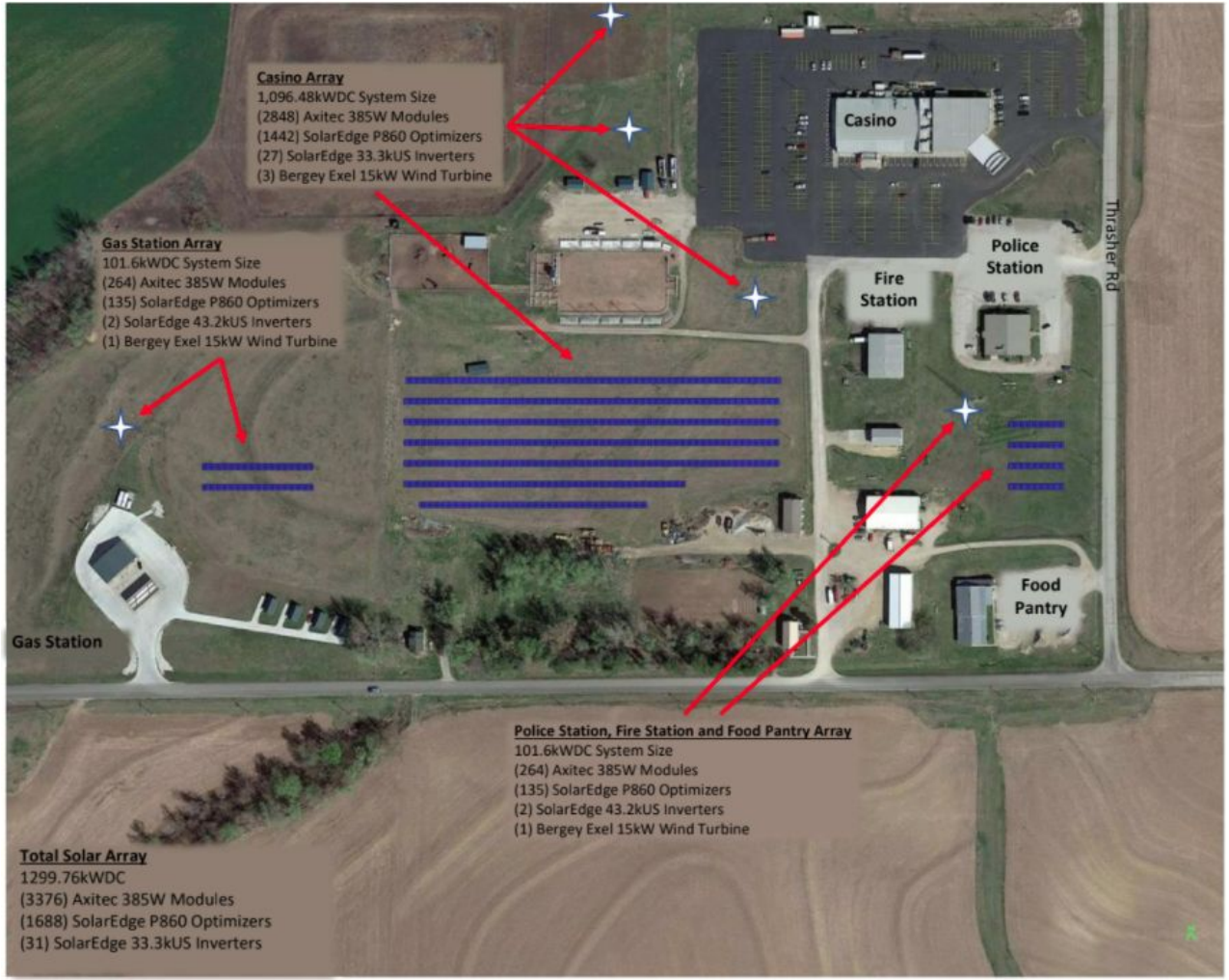

- ***Resiliency***: Improve short-term and long-term reliability of power supply.
- ***Clean Power***: Maximize renewable energy supply and minimize dependence on fossil fuels.
- ***Self-Sufficiency***: Eliminate the Tribe's dependence on external power supply from the local Utility.
- ***Cost Savings***: Reduce the cost of energy for the short-term and eliminate unpredictable cost increases over the long-term.
- ***Security***: Own and operate the energy generation and delivery capabilities for critical tribal facilities -- enabling long-term energy security.
- ***Economic Development***: Provide training, employment and entrepreneurial opportunity for tribal members.
- ***Flexibility and Expandability***: Enable the expansion and enhancement of Tribal owned energy supply capabilities in the future in concert with the above defined objectives.
- ***Supportability***: Ensure the system is well supported in the commercial market

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