Solar + Storage

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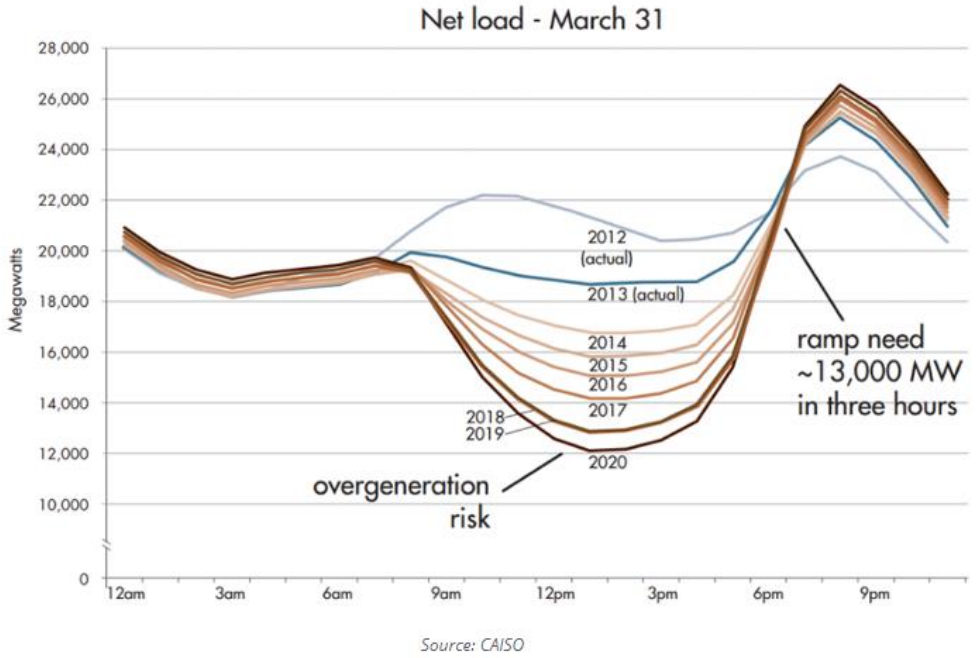
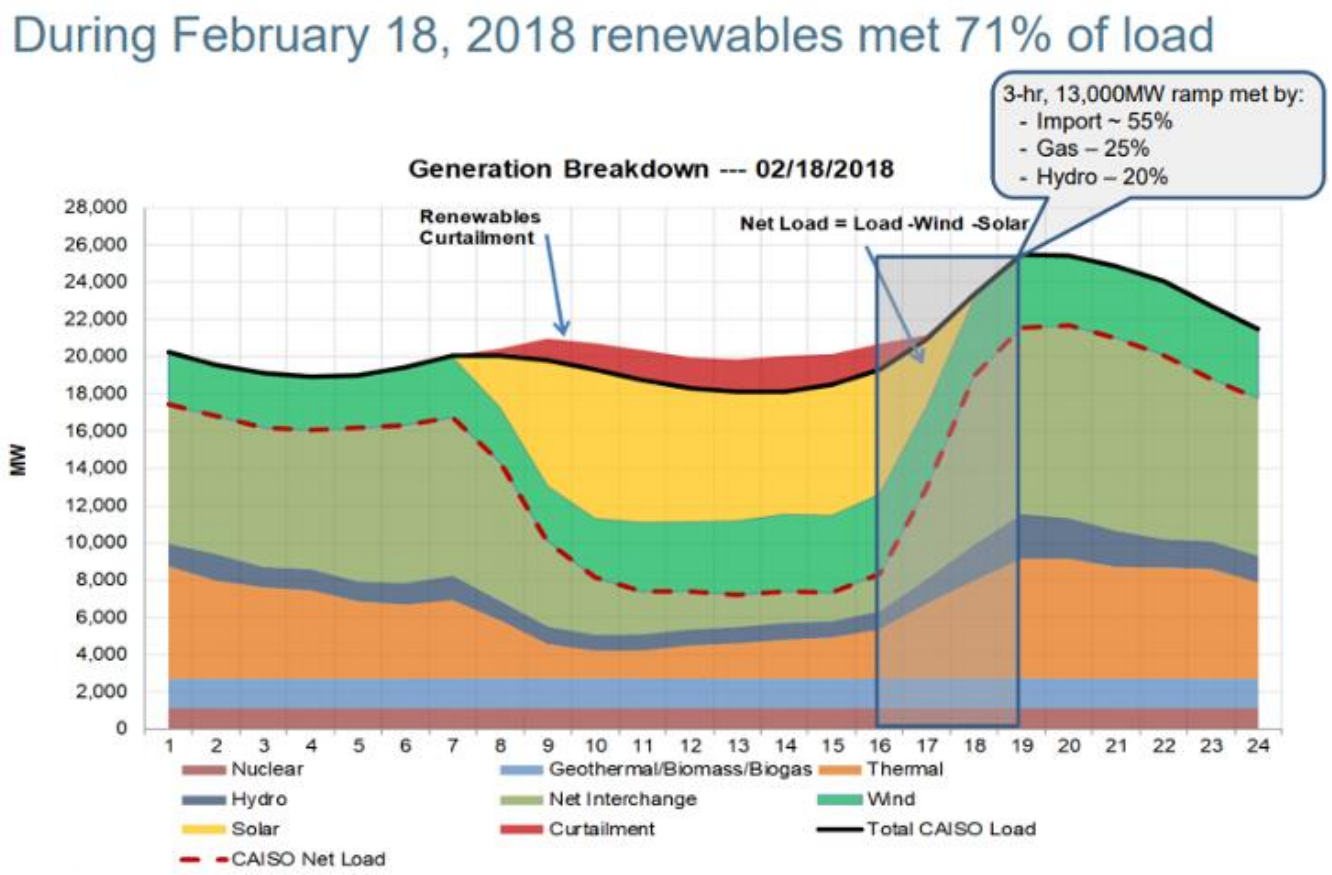
A Siemens and AES Company

Why is everyone talking about solar + storage?

Reason #1: Unless we solve solar value deflation, solar growth will stagnate

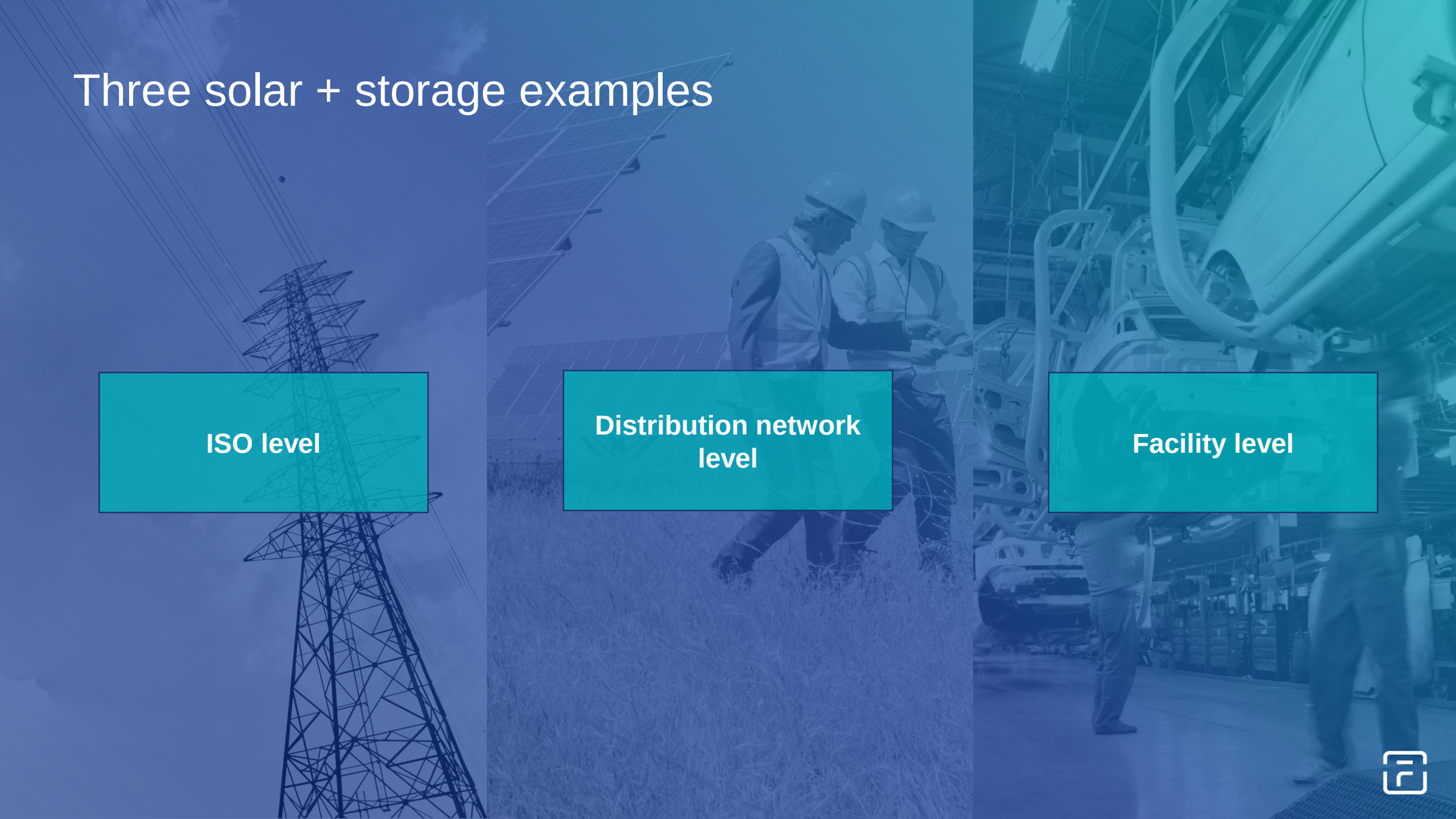




Why is everyone talking about solar + storage?

Reason #2: Resilience from climate shocks and cyber attacks

Three solar + storage examples



ISO level

Distribution network level

Facility level

1) Solar + storage helps grids with renewable energy targets procure clean capacity rather than building gas peakers

Case Study 1:
Renewable firm energy

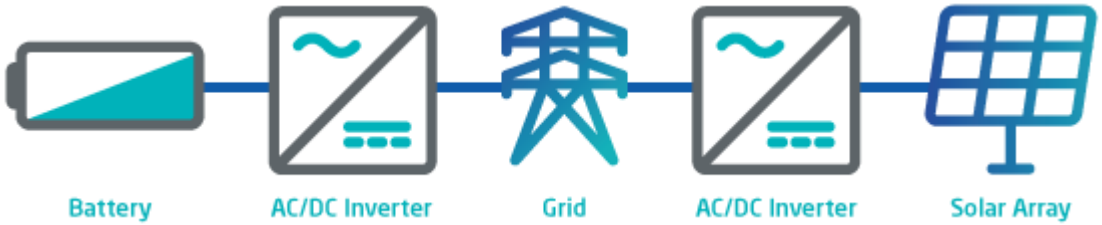
Background:
Southwest US utility looking to purchase solar and storage to time shift solar energy

Problem:
Utility seeking affordable, flexible renewable energy for rate payers

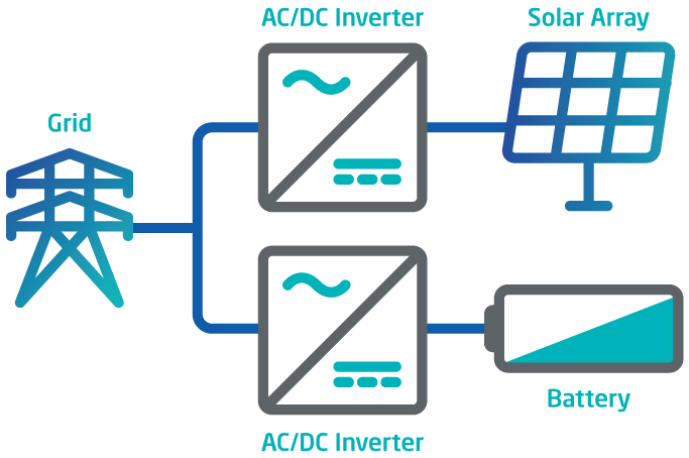
Solution:
Solar + storage DC-coupled solution shares inverters, land, interconnection to reduce total system. Increases capacity value of solar production for higher PPA rates for developer, and helps grids ensure reliability as solar penetration increases (duck curve).

Solar + storage system configurations

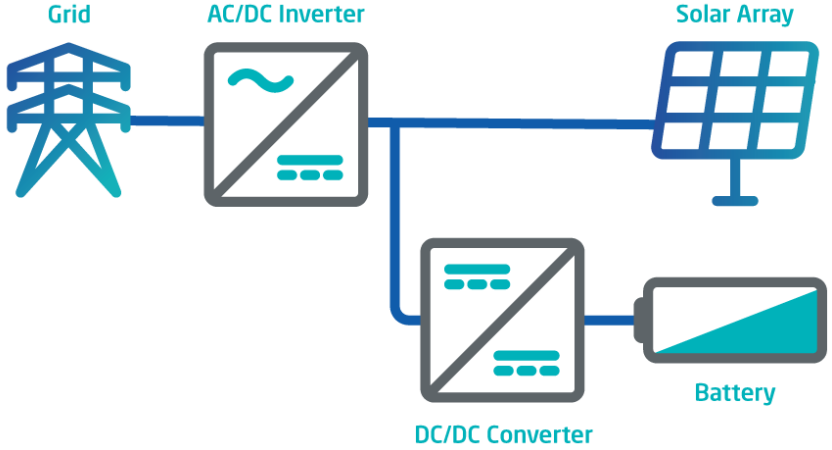
AC-coupled, standalone



AC-coupled, colocated



DC-coupled, colocated



To DC or not to DC, that is the question

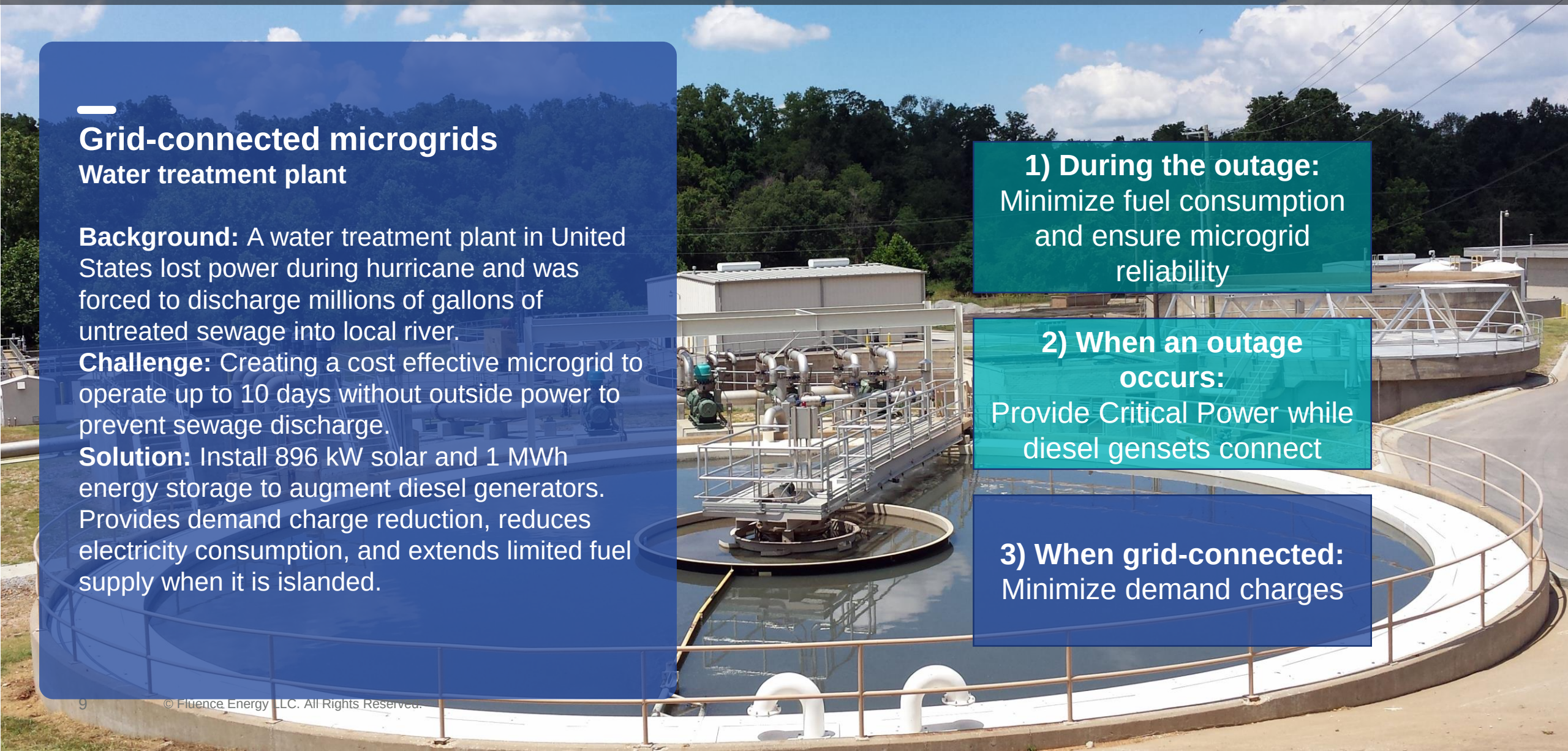
	AC	DC
Separate dedicated inverters for solar elements and energy storage elements of the project	X	
Increased amount of PV energy that can be delivered through same interconnection		X
Eliminates one set of MV switch gear, transformers, and inverters for interconnection		X
Can store energy generated by the solar project or from the grid	X	X
Simplified interconnection process due to single inverter		X
Eligible for ITC (must demonstrate battery is mainly charged is from PV for first 5 years)	X	X
Takes advantage of solar project DC / AC ratio oversize to charge storage system		X
Use cases 1. Grid Stability 2. T&D deferral 3. Renewable Plant Stability 4. Renewable Firm Energy 5. Ancillary Services 6. Energy Cost Control 7. Critical Power	All	All

2) Defer distribution system upgrades triggered by increased residential solar uptake

3) Grid-connected microgrid with solar + storage to provide adequate resilience to a facility or campus, while also being cost effective

Grid-connected microgrids
Water treatment plant

Background: A water treatment plant in United States lost power during hurricane and was forced to discharge millions of gallons of untreated sewage into local river.
Challenge: Creating a cost effective microgrid to operate up to 10 days without outside power to prevent sewage discharge.
Solution: Install 896 kW solar and 1 MWh energy storage to augment diesel generators. Provides demand charge reduction, reduces electricity consumption, and extends limited fuel supply when it is islanded.



1) During the outage:
Minimize fuel consumption and ensure microgrid reliability

2) When an outage occurs:
Provide Critical Power while diesel gensets connect

3) When grid-connected:
Minimize demand charges

Thank you

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