A NATIONAL TOWN MEETING ON
demand response + smart grid
presented by ADS
MAY 26-28 2015

ICE ENERGY®

Distributed Energy Resources: Energy Storage and What's Happening in California



Introduction to Ice Energy

- Thermal energy storage company founded in 2003
- Headquartered in Santa Barbara California
  - distribution center in Costa Mesa California
  - new R&D facility being set up in Riverside California
  - manufacturing located in Hammondsport New York
- Our systems eliminate the electrical load of AC for up to 6 hours a day with no impact on building temperature by delivering stored cooling from ice. Although sited behind the utility customer meter, our systems are designed for the utility, which gets the ability to decide when electricity is used for AC.
- 10 MWs installed over the last 8 years
- 30 MWs contracted over the last 5 months

The Ice Bear®

Video



http://www.ice-energy.com/product-overview-video

In simple terms, the Ice Bear® consists of a large thermal storage tank that attaches directly to a building's existing air-conditioning system. Once installed, the Ice Bear® energy storage unit operates in two basic modes, Ice Cooling and Ice Charging.

The Ice Bear® transfers the job of cooling back to the building's AC unit once the ice has fully melted. Later, during the cool of the evening, the Ice Charge mode is activated and the entire cycle begins anew.

Ice Charging mode (during off peak)

- Self-contained charging system
- Circulating refrigerant
- Copper coils freeze an insulated tank filled with 450 gallons of water
- Water turns to ice, condensing unit turns off
- Ice is stored until its cooling energy is needed

Ice Cooling mode (during peak demand)

- Ice Bear® switches to cooling
- Up to six hours of operation
- Ice (rather than AC compressor) cools hot refrigerant, slowly melting ice in the process.
- Efficient pump pushes ice-cold refrigerant through modified Ice Energy LiquidDX® evaporator coil in conventional AC unit.

- Onboard CoolData controller and online CoolData Dashboard enables remote monitoring and control, including full dispatchability of each unit or fleet.
- Ice Energy often leverages CoolData infrastructure to do demand response on other, nearby AC systems not receiving the thermal energy storage, as another value-add.

Storage prior to the California mandate

- In California, and the rest of the US, energy storage for the grid consisted of few and far between pumped hydro projects and pilots of various distributed energy storage technologies
- Energy storage was not really a factor in resource planning
- In fairness to utilities, most distributed energy storage technologies were not really ready for prime time in terms of cost or reliability, but a few were and were stuck like the rest in pilots
- Ice Energy, which back then had over 10 million operating hours and 98% plus availability did 40 pilots

California Mandate

- In 2013 California mandated that the IOUs procure not less than 1325 MWs of storage over the next 5 years to support the continued adoption of renewables
- While a surprise to most, this was foreshadowed by the CPUC approving a So Cal Edison LCR with the condition that they include a minimum of 50 MWs of storage

SCE LCR

- Most expected SCE to procure exactly the mandated amount of storage and not a kW more
- Most expected SCE to spread the procurement over a large number of major storage (Battery) companies so that even the 50 MWs would end up looking more like a bundle of pilots rather than any grid scale storage project
- Most were wrong
- SCE procured 5X the mandate, making storage more than 10% of the total capacity purchased under their all resources RFO
- Only 4 storage companies were selected and 3 of us had major grid scale awards
- Most of the MWs awarded were for behind the meter storage
- The big names were noticeably absent

Current California Market for Storage

- The mandate, SCE and storage vendors have established a clear and large market for distributed energy storage in California
- Based on SCE, storage for the grid will far exceed the mandate
- SDG&E and PG&E both have issued storage RFOs
- The PPA contracts offered/required by the IOUs give storage companies the financeable vehicles traditional and renewable generation have enjoyed and that will enable scaling
- Municipal utilities in California are setting their own storage targets, including some very aggressive targets like LADWP.
- Additionally, California's Self-Generation Incentive Program provides rebates to investor owned utility customers that cover most of the cost of qualifying advanced energy storage systems.

Implications for the Future

- In California, distributed energy storage will quickly fill the new market. Competition will increase, existing storage technologies will continue to improve in cost and reliability, new technologies will emerge and the end result with be a diversity of low cost, high reliability, high value distributed energy storage on the grid
- Storage will dramatically flatten the load profile, making grid infrastructure much more efficient and reliable, reducing the need for capacity, and enabling a new wave of renewables displacing fossil fuels
- Outside California in the US, there are potential markets for distributed energy storage for the grid developing but none yet that are clear and economic

Thank you!