



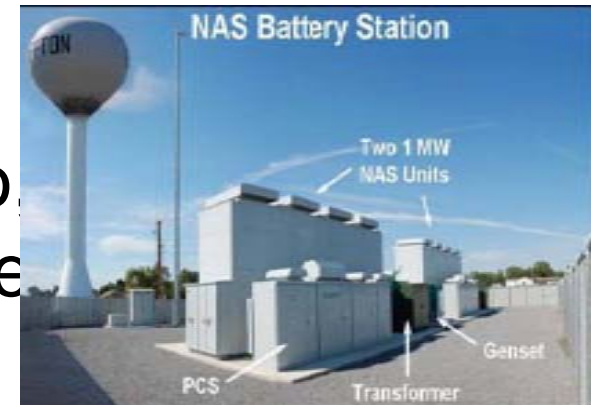
# Keeping the Lights On

Safe, Reliable, Clean and Affordable



# Smart Storage for a Smart Grid

- Many applications: frequency regulation, renewable energy integration, black start, diurnal storage, T&D deferrals etc
- Many technologies: Pumped Hydro, Compressed Air, Batteries, Flywheels, Ultra-Capacitors



# The Case for Lithium-Ion

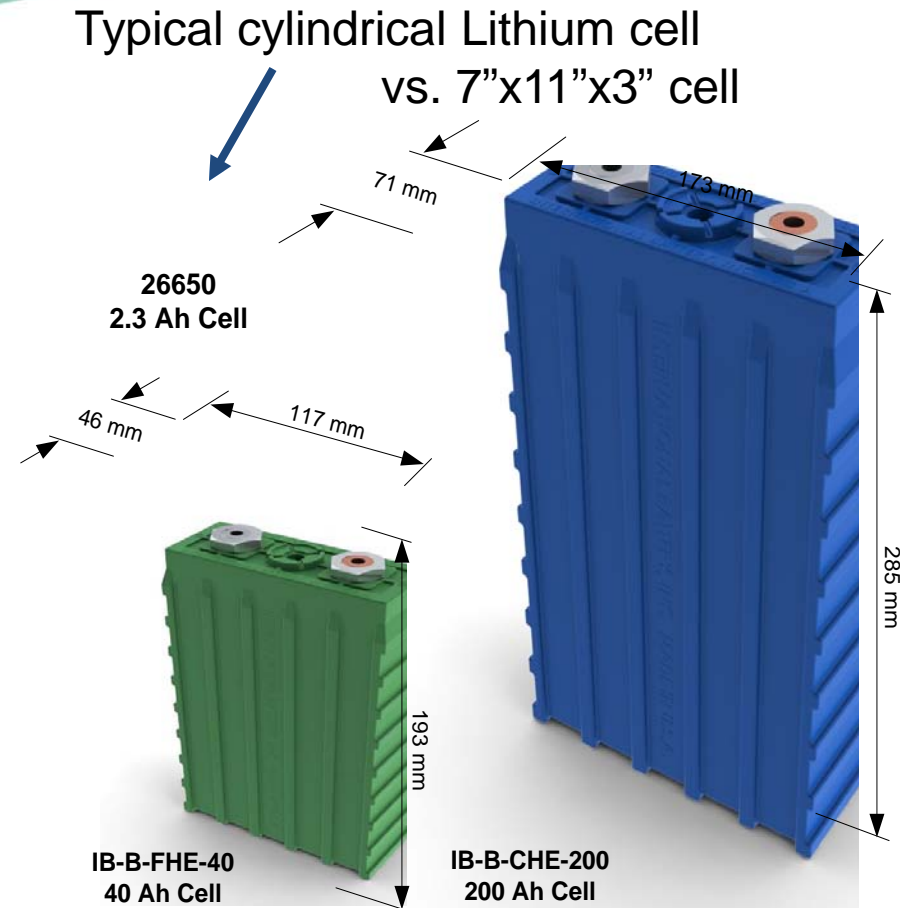
- Efficiency .... >> 95%
- Energy Density.... 50% reduction in weight & volume
- Response time.... 50 msec
- Depth of Discharge.... > 80%
- Cycle Life.... >> 3000 cycles
- Charge time.... 15 minutes to 2 hrs
- Low self-discharge.... << 3% per month
- No maintenance
- Cost Reduction & Innovation Roadmap
  - + Adoption by other industries
  - + Continuous Investment and innovation



# Economy of Scale

## Large Format Prismatic Cells

- ❑ 70x more energy in one large prismatic cell than in one 26650 cylindrical cell
- ❑ Monitoring and control of each individual cell enables a more efficient and reliable system
- ❑ Integrated pressure release protection for added safety
- ❑ Passed UN 3480 certification testing and other rugged abuse and safety tests





# Distributed Storage Systems

## Utility Grade

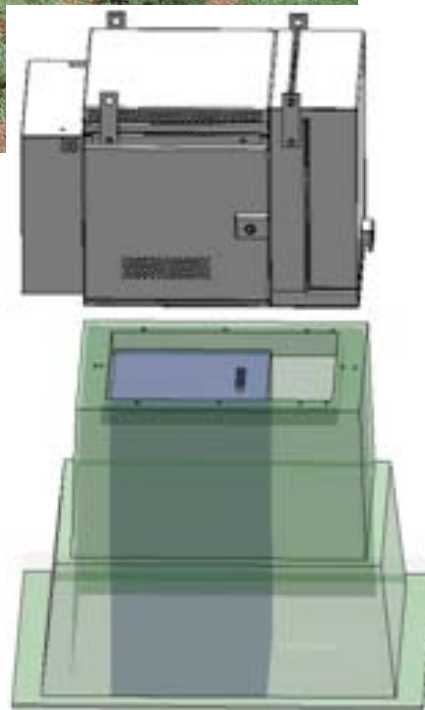


Operating temperature: - 30 C  
to +50 C

Humidity: 10 % - 100 %

Building Code: Zone 4

No maintenance first 5 years



AEP Community Energy Storage  
(CES)

28 kWh

< 500 kg

No liquid cooling

