Virtual Batteries Overview
- Growing need for more flexible grid assets due to increasing wind/solar deployments.

- Current grid-scale energy storage requires high capital investment.

- Commercial and residential buildings can provide distributed “virtual” storage capacity complementing physical storage, but it needs to be identified, quantified, and controlled.

- A cost-benefit analysis must be performed to determine potential return on investment and support investment decisions.
**Scope:** Tools are being developed that allow building owners and utilities/grid operators to identify, quantify, and control virtual storage assets.

**Audience:** Commercial and residential building operators, energy service providers and control system vendors who provide transactive grid services.

**National lab partners:** PNNL, Oak Ridge National Laboratory.

**Industry.academia partners:** University of Florida, United Technologies Research Center, Tennessee Valley Authority Bonneville Power Administration.

**Project duration:** April 1, 2016 – March 31, 2019.

**Funding:** $4.5M.
Results: Why it Matters

Objectives:

- Perform national opportunity assessment to quantify potential (GW/GWh) of virtual storage resources
- Develop flexibility screening tool to quantify regional potential of virtual storage resources
- Perform cost-benefit assessment for using virtual storage to provide grid services complementary to physical storage
- Develop controls for virtual storage assets to provide grid services using VOLTTRON™
- Test and validate virtual battery performance using realistic scenarios based on input from utilities and building owners

Timeline:

- Performed national opportunity assessment (Sept 2016)
- Developed first version of flexibility screening tool that enables users to assess regional power and energy limits from virtual storage assets (Feb 2017)
- Completed preliminary benefit assessment study for California, including revenue assessment and physical storage requirements (March 2017)
- Develop control apps in VOLTTRON and deploy in at least one test site (Dec 2017)
- Complete techno-economic assessment of virtual building and dedicated grid storage systems (Feb 2018)