

Demonstration of Modular Energy Storage in the Northwest

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OE Energy Storage Systems Program Review

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Energy storage for local demand management

Project objective: Analyze and demonstrate the benefits of electrical energy storage on the distribution grid

Situation



- 25MVA transformers at radial substations at Murden Cove and Winslow operate at or above target load

Requirements

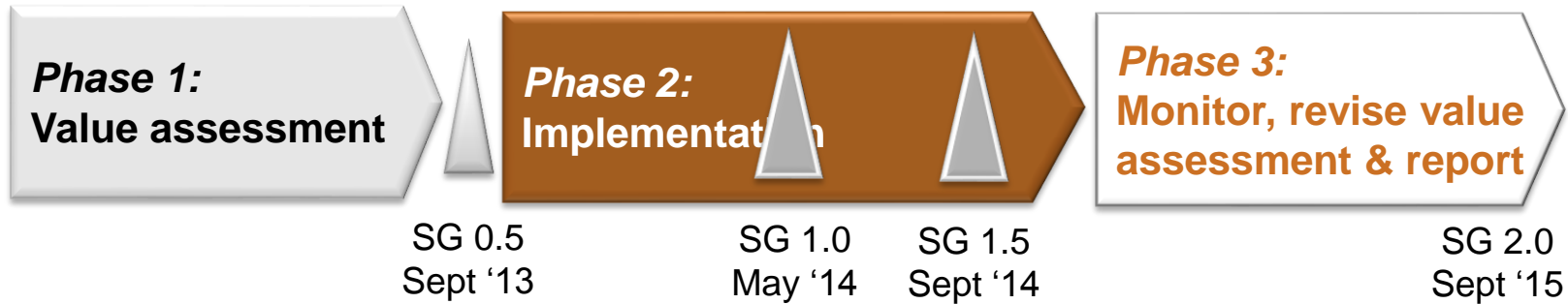
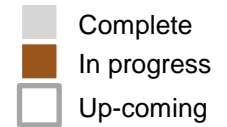
- ❑ Multiple hours of capacity required
- ❑ Small footprint to fit within a substation
- ❑ Year-round operation capabilities
- ❑ Flexibility to perform multiple applications (e.g., balancing svcs., islanding)

Novel technical solution



- Containerized, electrochemical energy storage with a 2nd generation flow battery technology

Project schedule



Core tasks

- Vet control strategy
- Make economic case
- Develop pilot plan
- Build and commission
- Project development
- Test planning
- Operate and test
- Assess value creation
- Share lessons

Deliverable

- ✓ Final Phase 1 report
- ✓ 3rd party test report
- ✓ "Go/ no-go"
- ✓ Permits
- ✓ Purchase Order
- ✓ Site plans & specifications
- ✓ Test plans
- Training materials & guides
- Test reports
- Test program
- Monitoring reports
- Final report

✓ indicates deliverable is complete

Meaningful accomplishments to date

Complete
 In progress

Key elements

Milestones

1 Stage gates
0.5 & 1.0

- ✓ Positive economic case
- ✓ Successful 3rd party test
- ✓ Final report & EESAT presentation

- ✓ Sandia test

2 Control
strategy

- ✓ Created storage evaluation tool
- ✓ Vetted control strategy with experts

3 PSE internal
buy-in

- ✓ Approval at C-level

- ✓ Budget approval
- ✓ Purchase Order

4 Inter-
connection

- ✓ System specifications
 - Complete
 - ✓ System impact study
 - Facilities study

- ✓ Application submission
- Study completion

5 Community
outreach

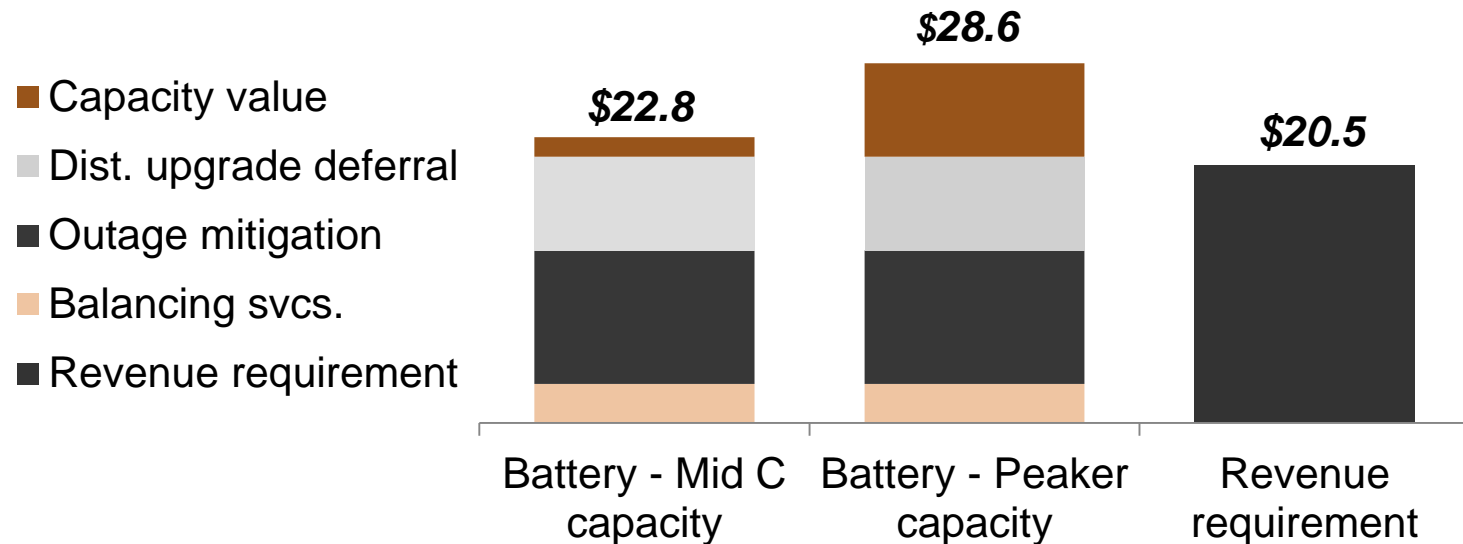
- ✓ City Planning and permitting
- ✓ Support of Fire Department
 - City council support
- ✓ Local stakeholder engagement

- ✓ Planning meeting
- ✓ FD and Fire council meetings
 - City council meeting

Positive economics and additional benefits

Present value of storage benefits/costs

\$M, USD



- Regardless of capacity assumption economics “pencil out”
- Additional “difficult to quantify” value in
 - Knowledge transfer
 - Institutional know-how
 - Public awareness

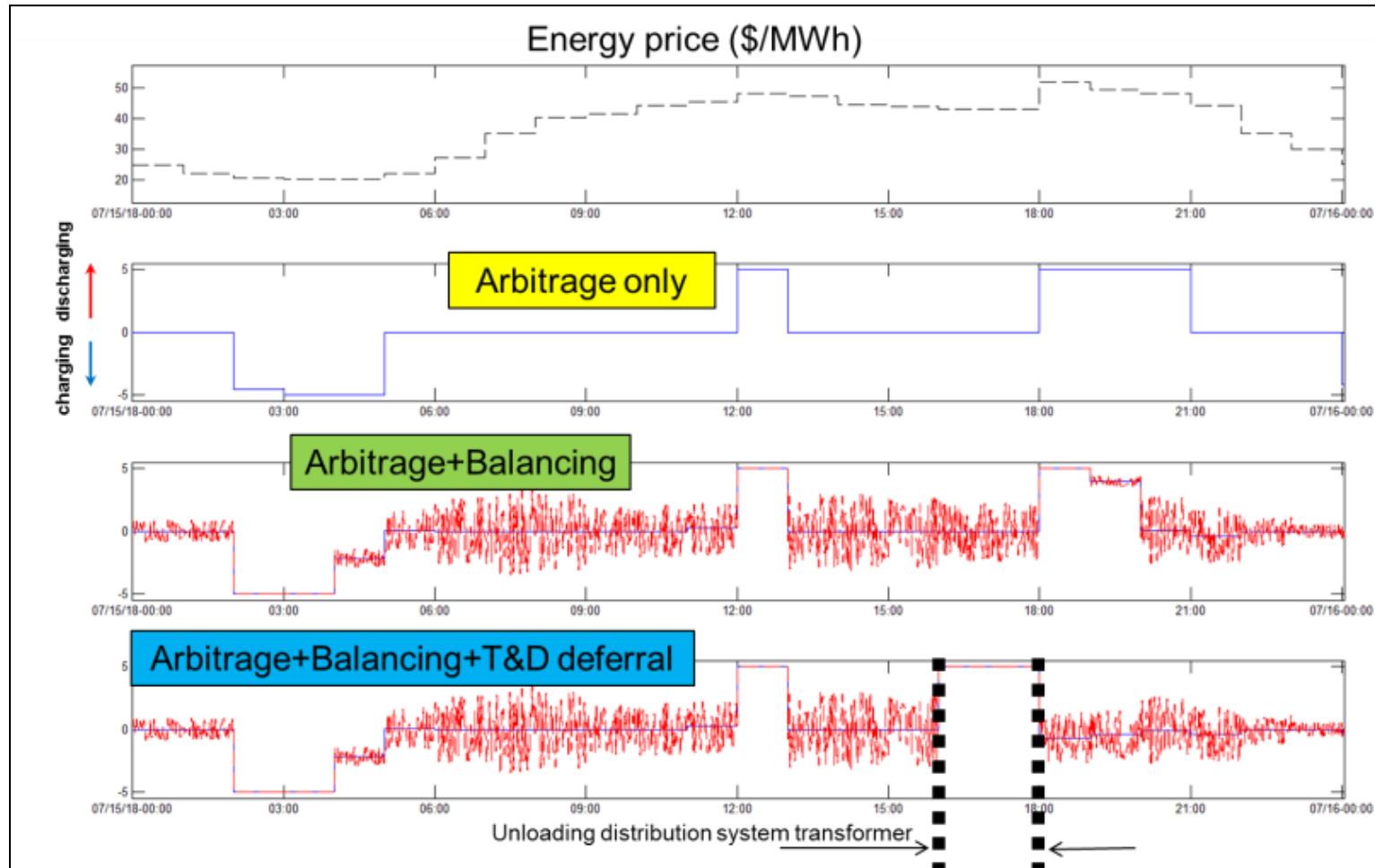
Storage evaluation tool can be applied broadly

The screenshot displays the BattEvaluation software interface, which is used for battery storage evaluation. The window has a title bar with the name 'BattEvaluation' and standard Windows window controls. Below the title bar, there are two tabs: 'Input' and 'Result', with 'Input' currently selected.

The interface is divided into several sections:

- Location:** Two radio buttons are present: 'Bainbridge Island' (selected) and 'Baker River 24'.
- Services:** A list of services with checkboxes: 'Arbitrage' (checked), 'Balancing' (checked), 'Capacity value' (checked), 'Distribution deferral' (checked), 'Outage w/o foresight' (checked), and 'Outage w/ foresight' (unchecked).
- Battery parameters:** A section with input fields for 'Discharging efficiency' (0.80654), 'Charging efficiency' (0.83594), 'Energy capacity' (16 MWh), 'Power capacity' (4 MW), and 'Initial SOC' (0.5). A 'Default' button is also present.
- Input files:** A section with input fields for 'Prices' (.\Input\price.xlsx), 'Balancing sig.' (.\Input\PSE_Reserve_2020_W_1.), 'Capacity value' (.\Input\BI\CapacityValue.xlsx), 'Deferral' (.\Input\BI\TDdeferral.xlsx), 'Outage' (.\Input\BI\Outage.xlsx), and 'Outage power' (.\Input\BI\OutagePower.xlsx). Each field has a 'Browse ...' button.
- Output:** A section with a checkbox for 'Output' (checked) and an input field for the output path (.\Output\BI), with a 'Browse ...' button.
- Price select:** A section with two radio buttons: 'All 50 prices' (unchecked) and 'Single price' (checked). Below the radio buttons is a list box showing a range of prices from 24 to 32, with 24 selected.
- Buttons:** At the bottom right, there are three buttons: 'Run' (highlighted with a red rectangle), 'Cancel', and 'Plot'.

24-hour energy storage schedule for Bainbridge Island



Team has made marked progress toward completion of several near-term deliverables

Category	Accomplishments for review criteria at SG2.0
1 Manufacturing	<ul style="list-style-type: none">• Build of EnergyPod® 1 and PowerBox containers• End-of-line test of EnergyCells• EnergyPod® operation and installation manual outline drafted
2 Interconnection	<ul style="list-style-type: none">• System impact study complete• Facilities study in progress
3 Siting and Civil	<ul style="list-style-type: none">• Final site and civil designs• Contractor(s) selected• Work on site scheduled or started
4 Testing	<ul style="list-style-type: none">• Completed Factory, Site, Field testing plans• Site selected and test plan prepared for 3rd party off-site EnergyPod® 1 & PowerBox test
5 Controls and Communication	<ul style="list-style-type: none">• Demonstration of remote EnergyCell hardware control with 1Energy communications infrastructure

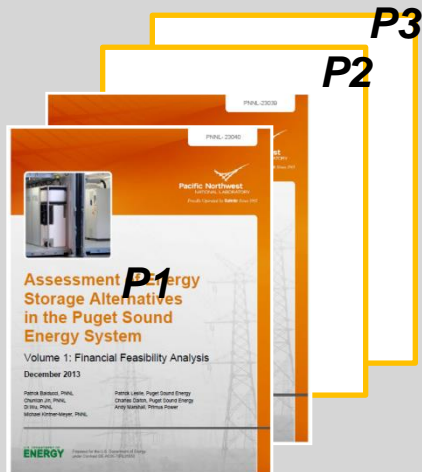
The first turnkey EnergyPod® container has arrived at Primus



Deliverables support holistic tech transfer

Project team goal: Enable reproducibility and continuous process of improvement in energy storage deployment through effective tech transfer

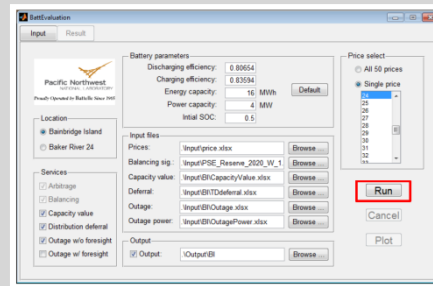
Reports



transfer to ...

- BPA
- DOE
- Other utilities
- Public

Tools

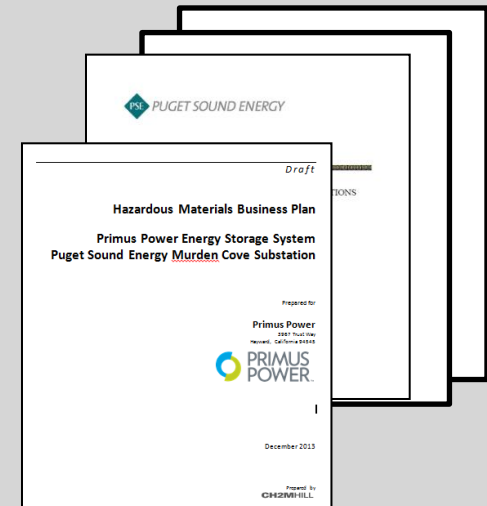


*PNNL storage
evaluation tool*

transfer to ...

- BPA
- DOE
- Other utilities
- Storage community

Manuals & “Playbooks”



transfer to ...

- Primus / PSE
- As appropriate
 - BPA
 - DOE
 - Other utilities

Tasks completed / next steps

Task or milestone

Owner(s)

Complete

- ☐ Complete system impact study
- ☐ Complete stakeholder outreach
- ☐ Complete test protocols drafts
- ☐ Draft construction plans



Sandia
National
Laboratories



In Progress

- ☐ Execute interconnection agreement
- ☐ Select contractors; begin site preparation
- ☐ Build and test EnergyPod® 1



Upcoming

- ☐ Complete stage gate 2.0
- ☐ Install EnergyPod® #1
- ☐ Begin data acquisition and analysis
- ☐ Install EnergyPod® #2



Q&A

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