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

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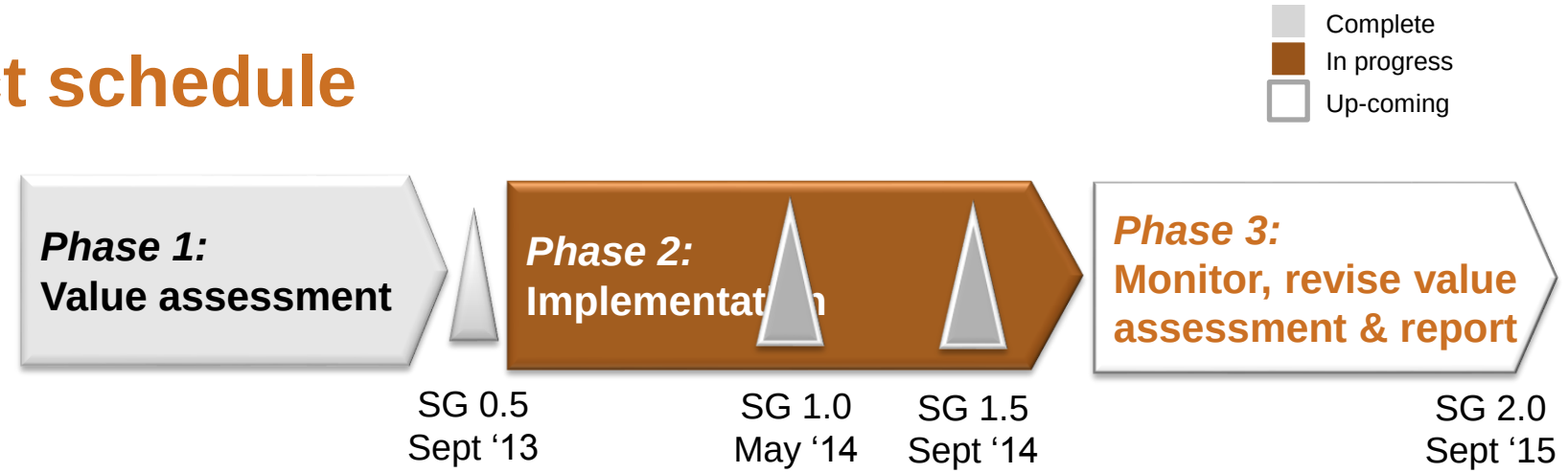
Project schedule



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

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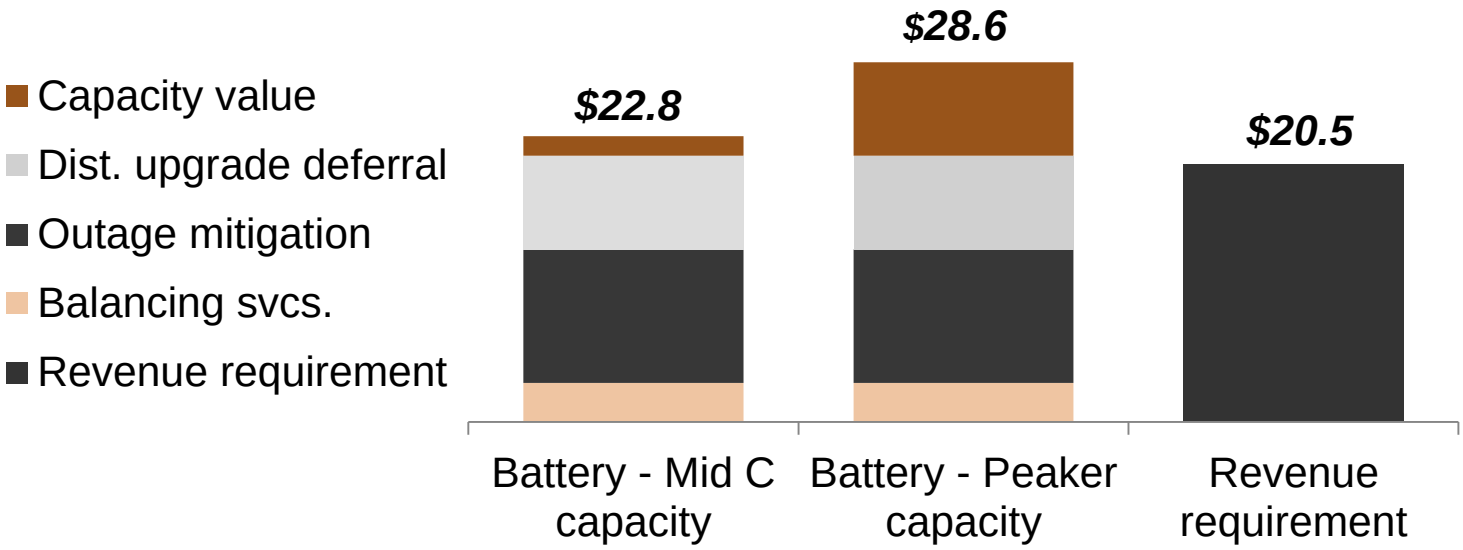
Meaningful accomplishments to date

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

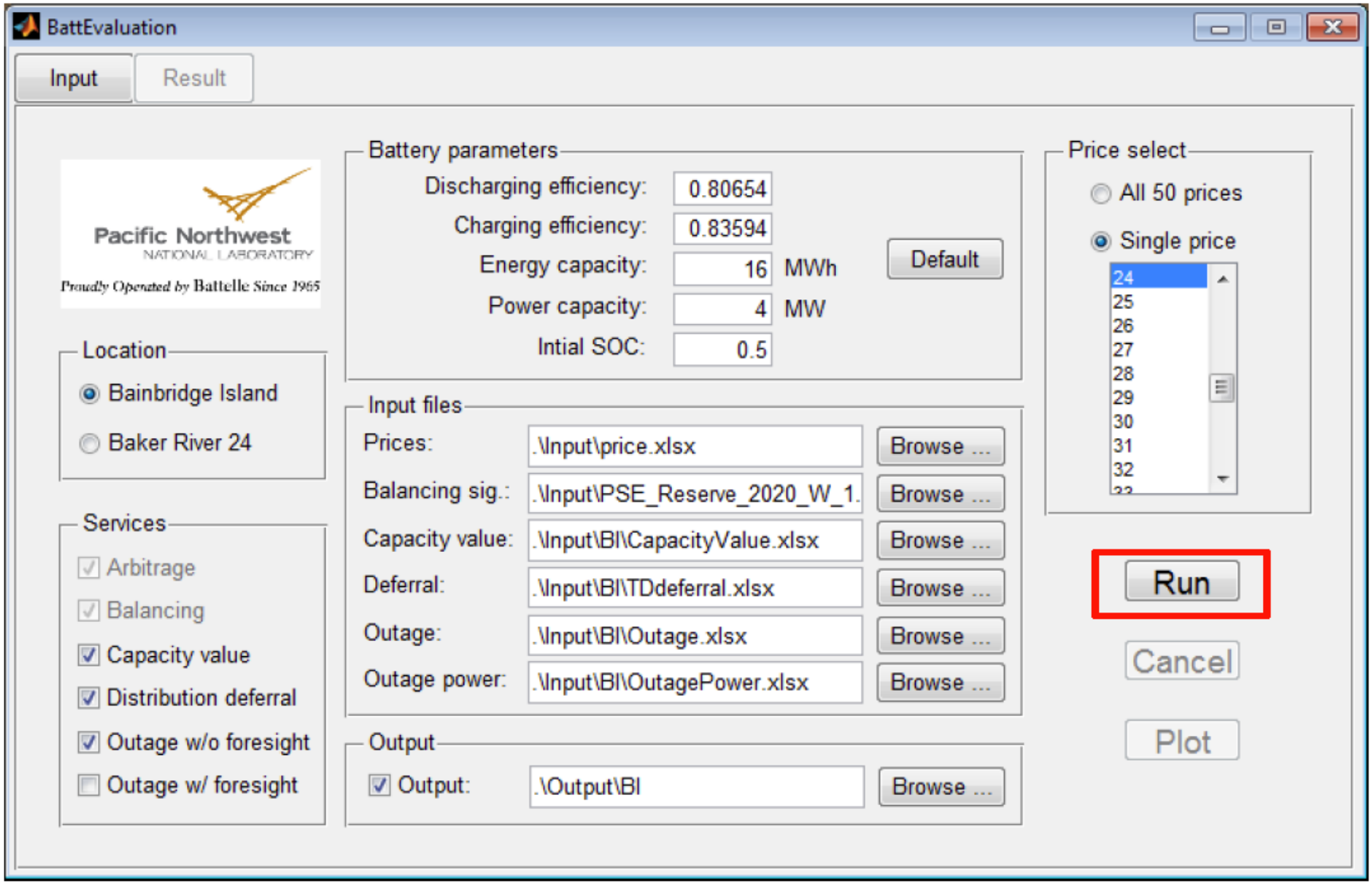
Positive economics and additional benefits

Present value of storage benefits/costs
$M, USD

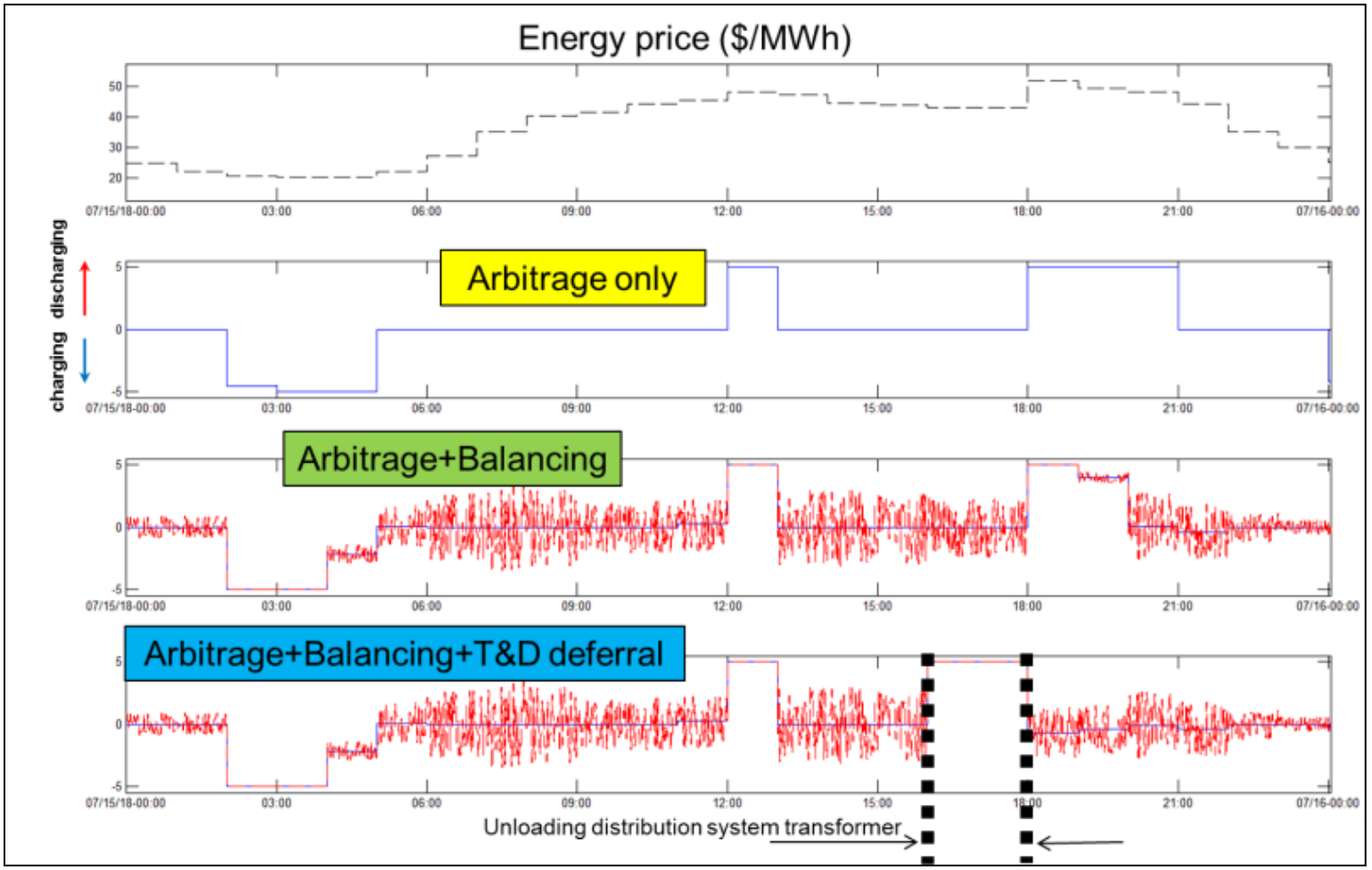


- Regardless of capacity assumption economics “pencil out”
- Additional “difficult to quantify” value in
  - Knowledge transfer
  - Institutional know-how
  - Public awareness

Storage evaluation tool can be applied broadly



24-hour energy storage schedule for Bainbridge Island



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

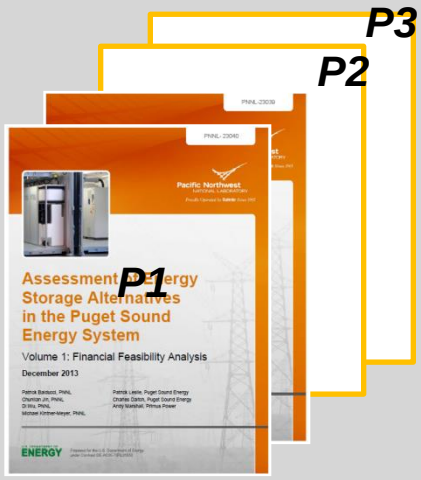
	Category	Accomplishments for review criteria at SG2.0
1	Manufacturing	• Build of EnergyPod® 1 and PowerBox containers • End-of-line test of EnergyCells • EnergyPod® operation and installation manual outline drafted
2	Interconnection	• System impact study complete • Facilities study in progress
3	Siting and Civil	• Final site and civil designs • Contractor(s) selected • Work on site scheduled or started
4	Testing	• 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	• 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

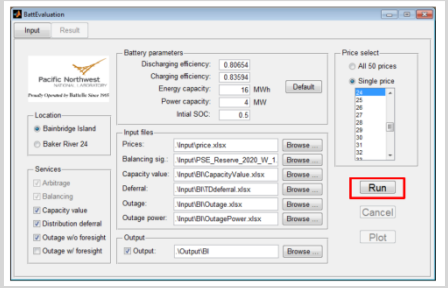
Reports



transfer to …

- BPA
- DOE
- Other utilities
- Public

Tools

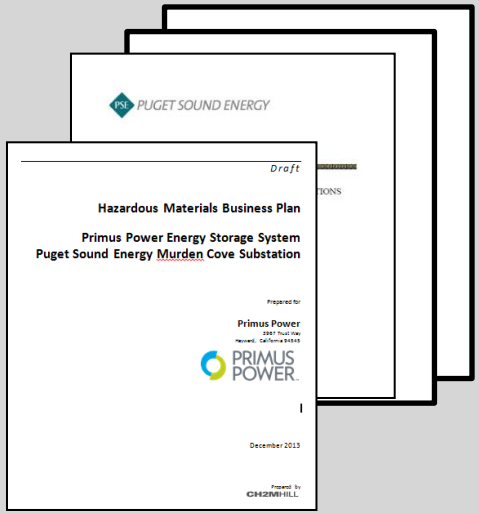


PNNL storage evaluation tool

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	PSE
	☐ Complete stakeholder outreach	PSE, Primus Power
	☐ Complete test protocols drafts	Sandia National Laboratories, Pacific Northwest National Laboratory, PSE, Primus Power
	☐ Draft construction plans	PSE
In Progress	☐ Execute interconnection agreement	PSE, Primus Power
	☐ Select contractors; begin site preparation	PSE, Primus Power
	☐ Build and test EnergyPod® 1	Primus Power
Upcoming	☐ Complete stage gate 2.0	Pacific Northwest National Laboratory, PSE, Primus Power
	☐ Install EnergyPod® #1	Primus Power
	☐ Begin data acquisition and analysis	Pacific Northwest National Laboratory, PSE, Primus Power
	☐ Install EnergyPod® #2	Primus Power, Pacific Northwest National Laboratory

Q&A

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