

BRIGHT Battery Pilot Update

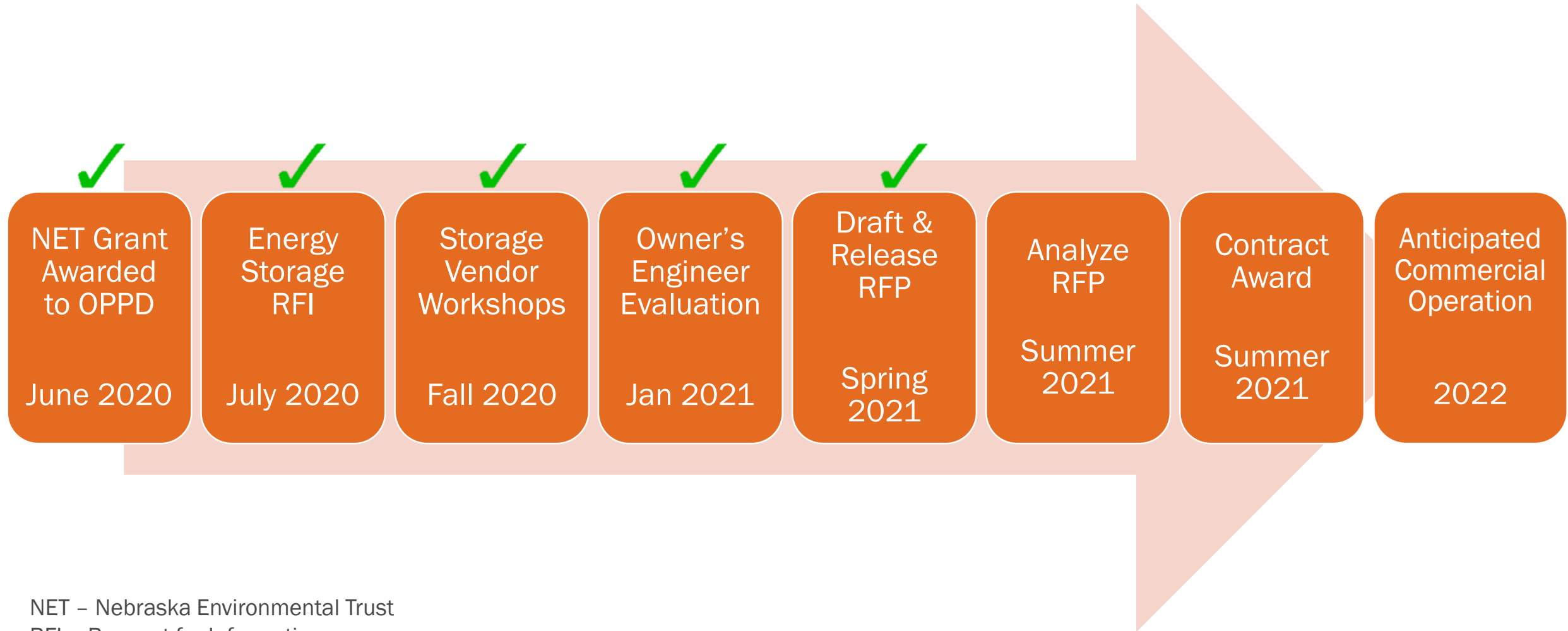
Board of Directors Committee Meeting
June 15, 2021



Agenda

- Project Milestones
- Use Case Analysis
- Project Cycles & Sizing Selection
- State Regulatory Approval
- Next Steps

BRIGHT Milestones



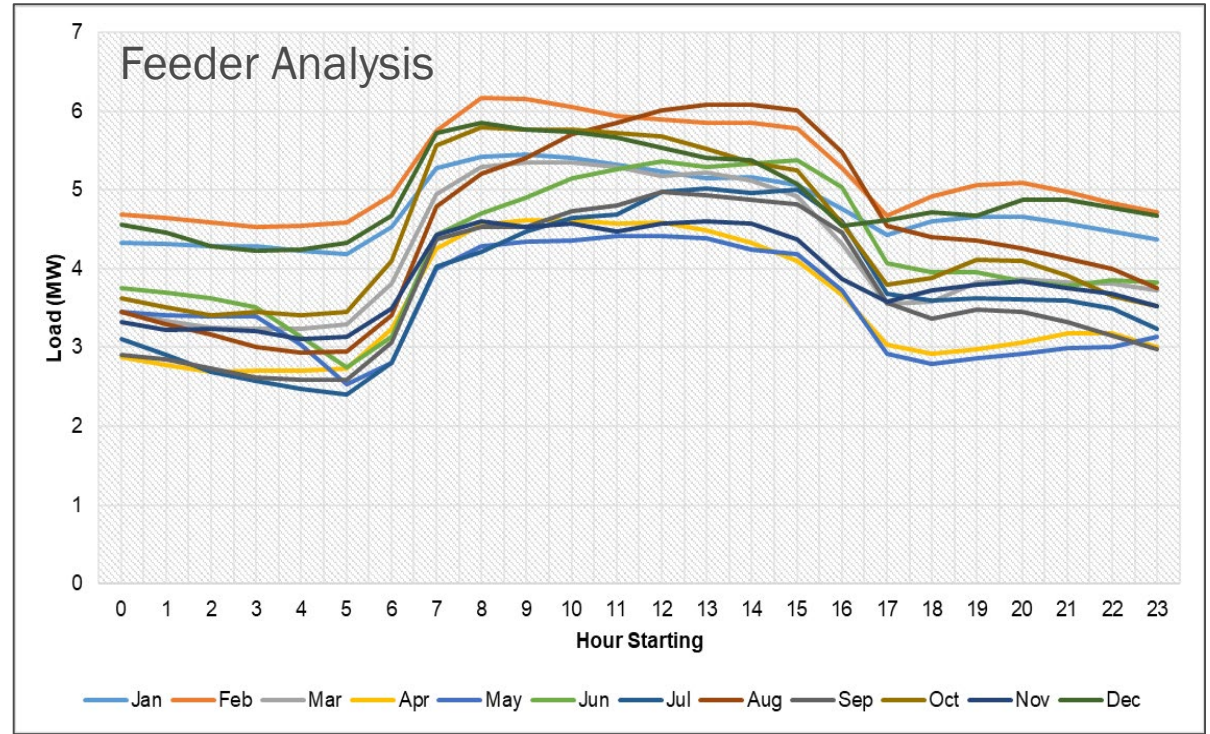
NET – Nebraska Environmental Trust
RFI – Request for Information
RFP – Request for Proposals

Use Case Analysis



Project Analysis

- Evaluation conducted
 - Site analysis
 - Substation feeder analysis
 - Technoeconomic analysis
- Key lessons learned:
 - Batteries provide a range of applications, but they cannot do everything at once
 - Certain use cases must be prioritized over others
 - Successful projects align on scope and sizing up front, then build RFP accordingly
 - Certain applications require extra cost and planning up front (i.e. equipment, design)



Use Cases Evaluated for BRIGHT Project

Potential use cases consider cost, grant requirements, timeline, location, and organizational learning

Use Case	Description
Energy Shifting	Charging/discharging to move electricity consumption from one time period to another
-Peak Load Reduction	Defer or eliminate future system upgrade costs
-Energy Arbitrage	Provides value by charging during off-peak hours, discharging during peak hours
Voltage Support	Provides reactive power through the inverter
Southwest Power Pool Market Participation	Participates in SPP's energy and ancillary services market (current services: Real-Time & Day-Ahead Energy, Spinning and Supplemental Reserves, Regulation)
Microgrid	Used as a dispatchable distributed generator to temporarily reduce loading
Blackstart	Provides electricity to the grid without first utilizing outside power from the grid
N-1 Reliability	Provides grid support in event of the loss of another component (transformer, breaker, circuit, etc.)

Out of Scope for BRIGHT Pilot: Microgrid, Blackstart, N-1 Reliability due to significant additional cost and project scope for added equipment and substation redesign; requires prioritization over other applications

Selected Use Cases & Other Project Benefits

Use Cases

- Energy Shifting
 - Peak Load Reduction
 - Energy Arbitrage
- Voltage Support

Inherent Benefits

- Increased Reliability
- Organizational Learning
- Stakeholder Outreach
- Safety

Future Testing Opportunities

- Market Participation
 - 10-minute Spinning Reserve
 - Regulation
- Energy Shifting
 - Intra-Hour Arbitrage

Battery Cycling & Sizing



Battery Design: Capacity, Duration & Cycling

Capacity – the measure of the energy stored in the battery in megawatts (MW)

- Grant application defines 1MW capacity

Duration – the run time of the battery on a full charge measured in hours (hrs)

- 2-hr and 4-hr evaluated based on supporting project use cases; defined in RFP

Cycle – a full charge/discharge, or the equivalent, of the rated capacity

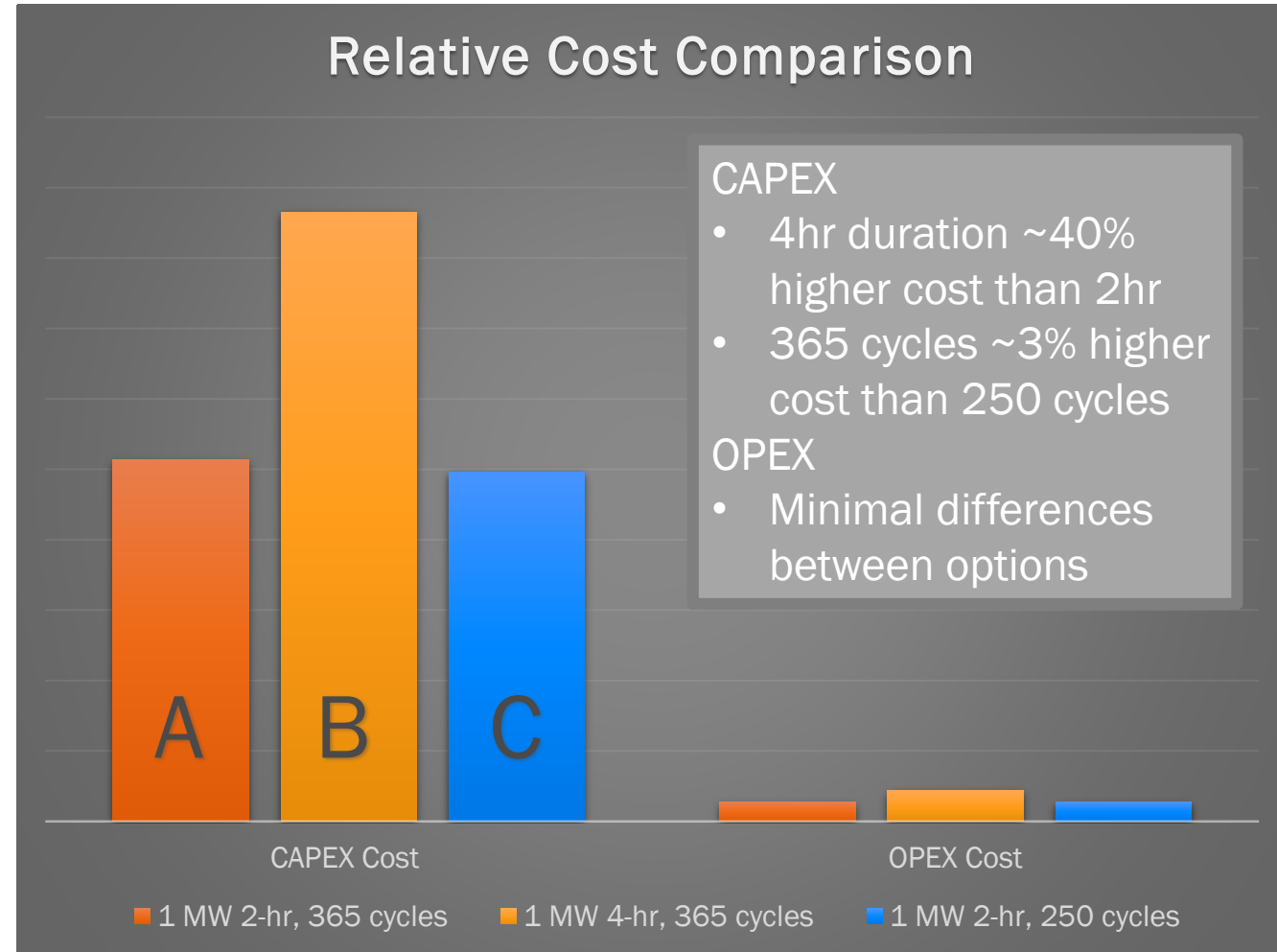
- Number of cycles defined in the RFP; does not affect the selection of use cases
- More cycles require larger capital cost to oversize the battery; increased flexibility for testing

Size & Cycling Options

- ✓ **Option A: 1 MW 2-hr, 365 cycles:**
- ~40% lower cost than 4 hour duration
 - Increased testing flexibility
 - Similar learning opportunities

- Option B: 1 MW 4-hr, 365 cycles:**
- Significant cost increase for longer duration (~40%)
 - Increased testing flexibility
 - Similar learning opportunities

- Option C: 1 MW 2-hr, 250 cycles:**
- Lowest cost given short duration and lower cycles
 - Reduced testing flexibility
 - Similar learning opportunities

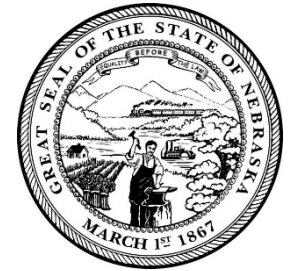


State Regulatory Approval



State Regulatory Approval

- Generation Application
- Timeline
 - June 15: Submit PRB application
 - July 12: PRB hearing/approval
- Uncertainties
 - Battery storage is not expressly addressed in Nebraska statutes



Next Steps



**RFP responses will clarify timing of Commercial Operation Date*