

Lessons Learned from the Grid Bridging System (GBS) Project

Jeremy VanderMeer

Research Assistant Professor

Alaska Center for Energy and Power

University of Alaska Fairbanks

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ACEP
Alaska Center for Energy and Power

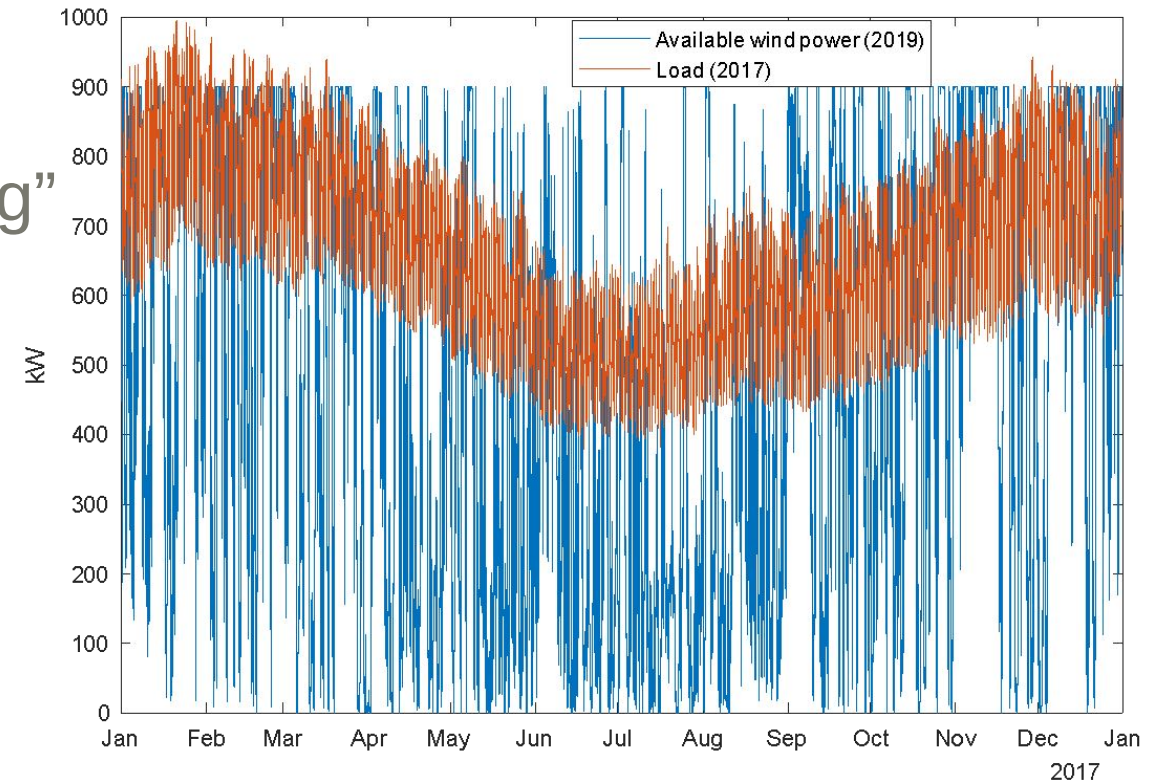
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What is the Grid Bridging Project?

With high RE penetration systems, turning diesel generators off results in much higher savings than “time-shifting” wind.

- Achieved by providing spinning reserves and grid forming services
- A power application, with only minutes of duration required

Identify, procure, test, and install appropriate cost-effective technology



GBS Timeline

- 2018-2019
 - 900 kW EWT wind turbine installed
 - Intertie connecting St. Mary's and Mountain Village
 - Creation of MiGRIDS and techno-economic studies
 - First RFP - LTO and ultra-capacitors
- 2021
 - Second RFP - LTO and LFP
 - Supply chain and shipping delays - missed 2022 barge season
- 2023
 - ACEP lab test
 - Barge and install in St. Mary's



GBS Technology Overview

	ultra-capacitors	LTO	LFP
Power/Energy ratio	too high	just right	too low
Existing field experience	yes	no	no
Fire hazard	lowest	medium	highest
Cycle life	highest	medium	lowest
Ambient temperature range	largest	medium	smallest
Ease of disposal	highest	lowest	lowest
Cost	highest	medium	lowest



GBS Final Selection

- 1 MW/1 MWh LFP system from FREQCON
 - LFP on paper made the most economic sense
 - 4-wire inverter does not require an isolation transformer
 - FREQCON makes inverters for the EWT turbine in St. Mary's, allowing a shared service contract
- Operational experience will help determine technology and sizing optimizations for future systems



ACEP Lab Acceptance Testing

- Good products, but originally designed for grid-connected applications
 - Grid forming was not fully functional
- Several weeks of testing and development led to full functionality
- ACEP lab played a critical role - in the field would have been challenging



St. Mary's Install!



Lessons Learned

- End goal is to not need a lab acceptance test
- The RFP should clearly specify
 - Required performance
 - And required tests to validate performance
- Measured results from either the factory or a field deployment should be shown before shipping



Looking Forward

- It would be ideal to have a certification standard to define grid forming performance and testing protocols
 - Should encompass remote use cases
- ACEP is part of the UNIFI consortium working towards this
 - GBS experience is informing UNIFI progress and UNIFI helped inform GBS test plan
- End of year GBS report, example RFP, test plan and results
- Operational experience will inform future technology and sizing selections - stay tuned!



Thank you!

Jeremy VanderMeer

Research Assistant Professor

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University of Alaska Fairbanks

jbvandermeer@alaska.edu

<http://acep.uaf.edu>

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