

# Fuel Requirements for Black Start Resources Cost / Benefit Analysis Results

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OC/MIC Special Session  
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## Stage 1 FRBSR Work

2019 – 2020

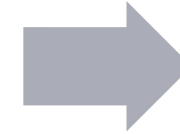
- Level of Fuel Assurance
- Universal Fuel Assurance Requirements
- Fuel Assurance Solutions by Primary Fuel Type
- Testing & Verification Requirements
- Compensation Mechanism
- Implementation Plan
- Solution Packages



## Stage 2 Hiatus Work

2020 – 2021

- Enhanced Restoration Time Analysis
- **Cost / Benefit Analysis Methodology**
- Gas Supply Risk Assessment



## Stage 3 FRBSR Considerations

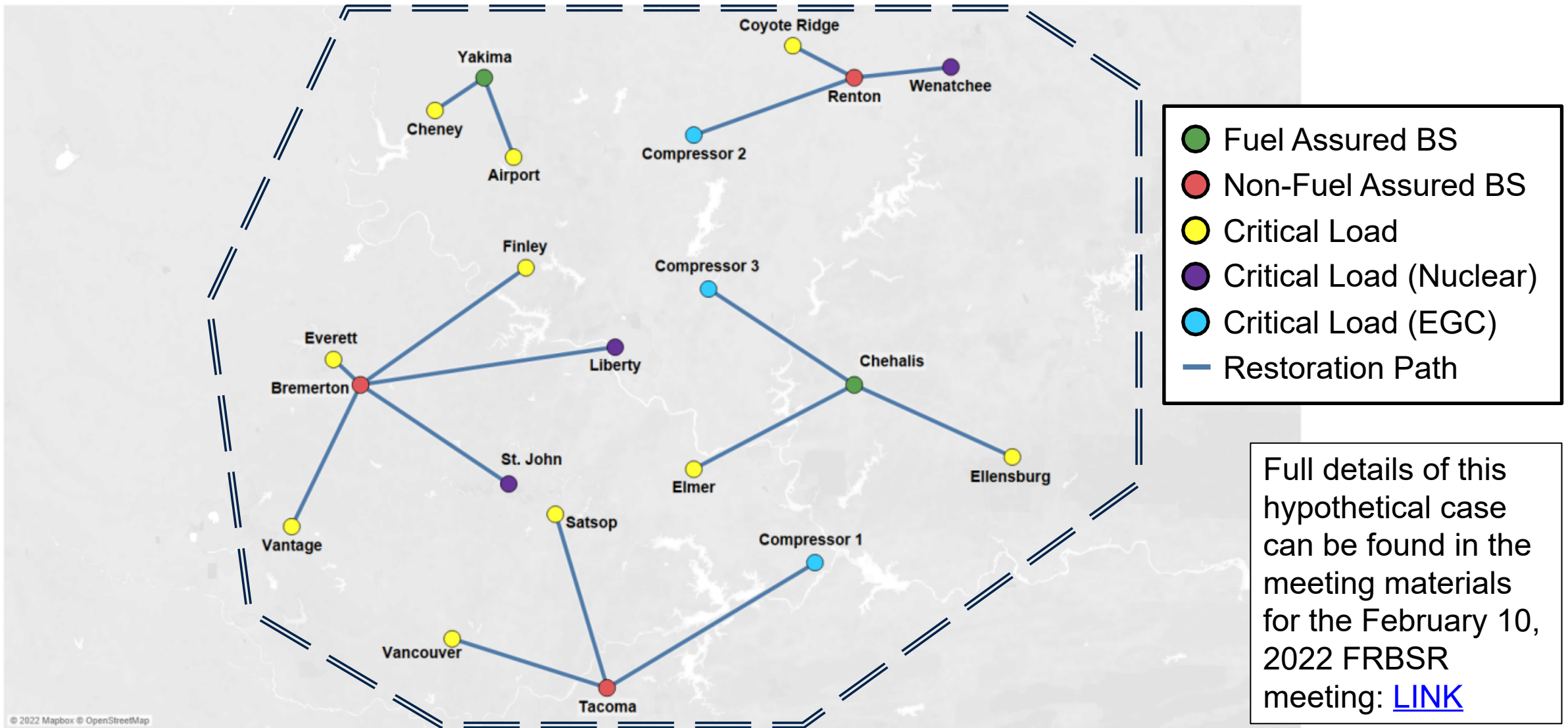
2022

- Updated Design Component Details and Solution Packages
- Enhanced Definitions of Fuel Assurance
- Hydro Packages to align with ELCC
- Inputs from FERC/NERC ERCOT Report

**Incremental Restoration Time Increase**: Additional time required to restore a TO zone due to the loss of one or more BS sites above and beyond the theoretical zonal restoration time with all BS sites available.

**High Impact Black Start Site**: A BS site which, when unavailable during a restoration scenario, results in an incremental restoration time increase of ten hours or more. This ten hour cutoff is a PJM suggestion and not tied directly to any standards.

# Hypothetical Case: Standard Restoration



The **occurrence frequency** is the frequency of an event (simultaneous blackout and fuel failure) required to financially justify the conversion investment and is represented as once every **X** Years.

If **X** is large  
(e.g. 100 Yrs.)



Event can be rare to make the conversion cost a financially justifiable investment  
**HIGH FINANCIAL MERIT**

If **X** is small  
(e.g. 3 Yrs.)

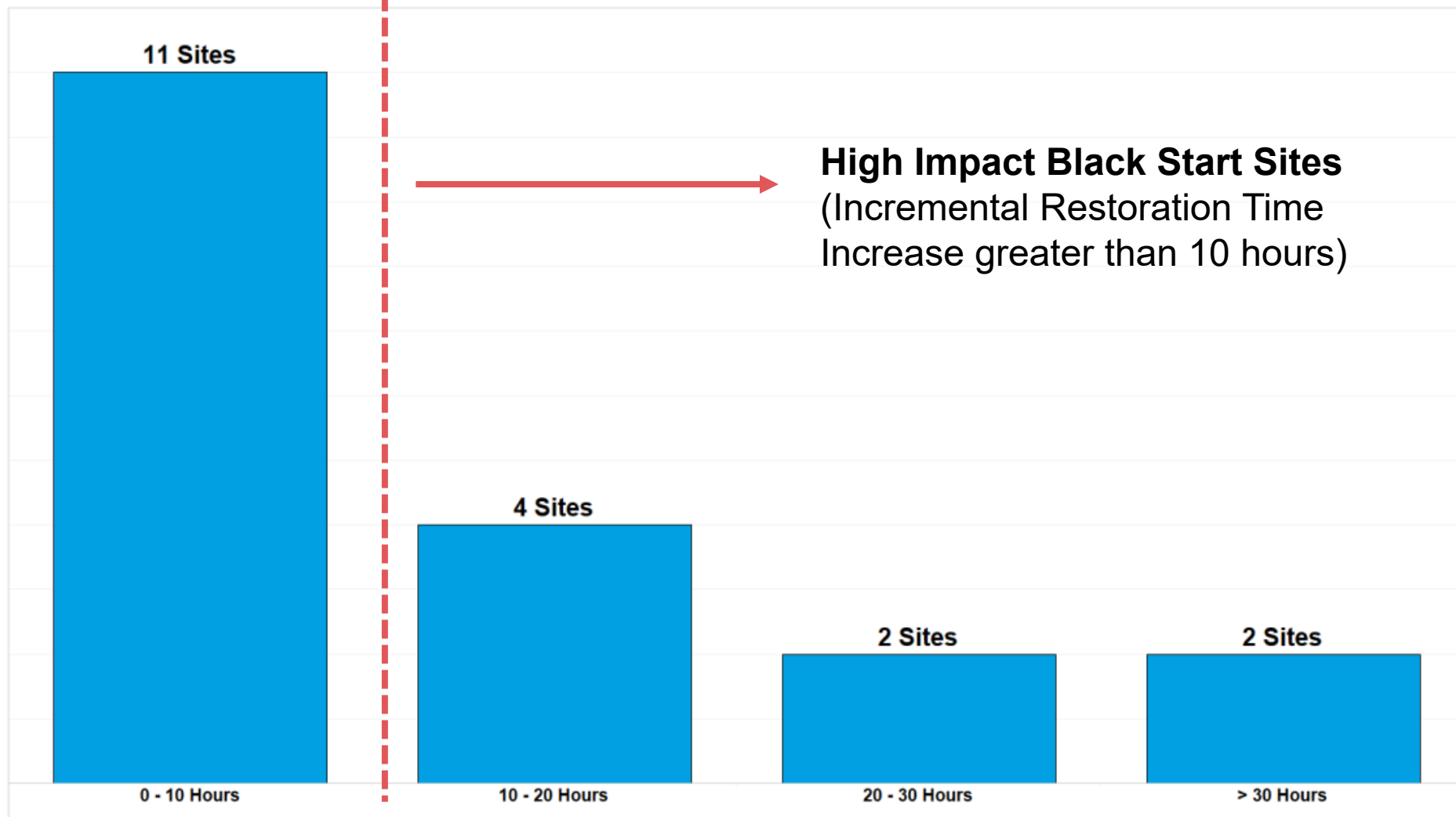


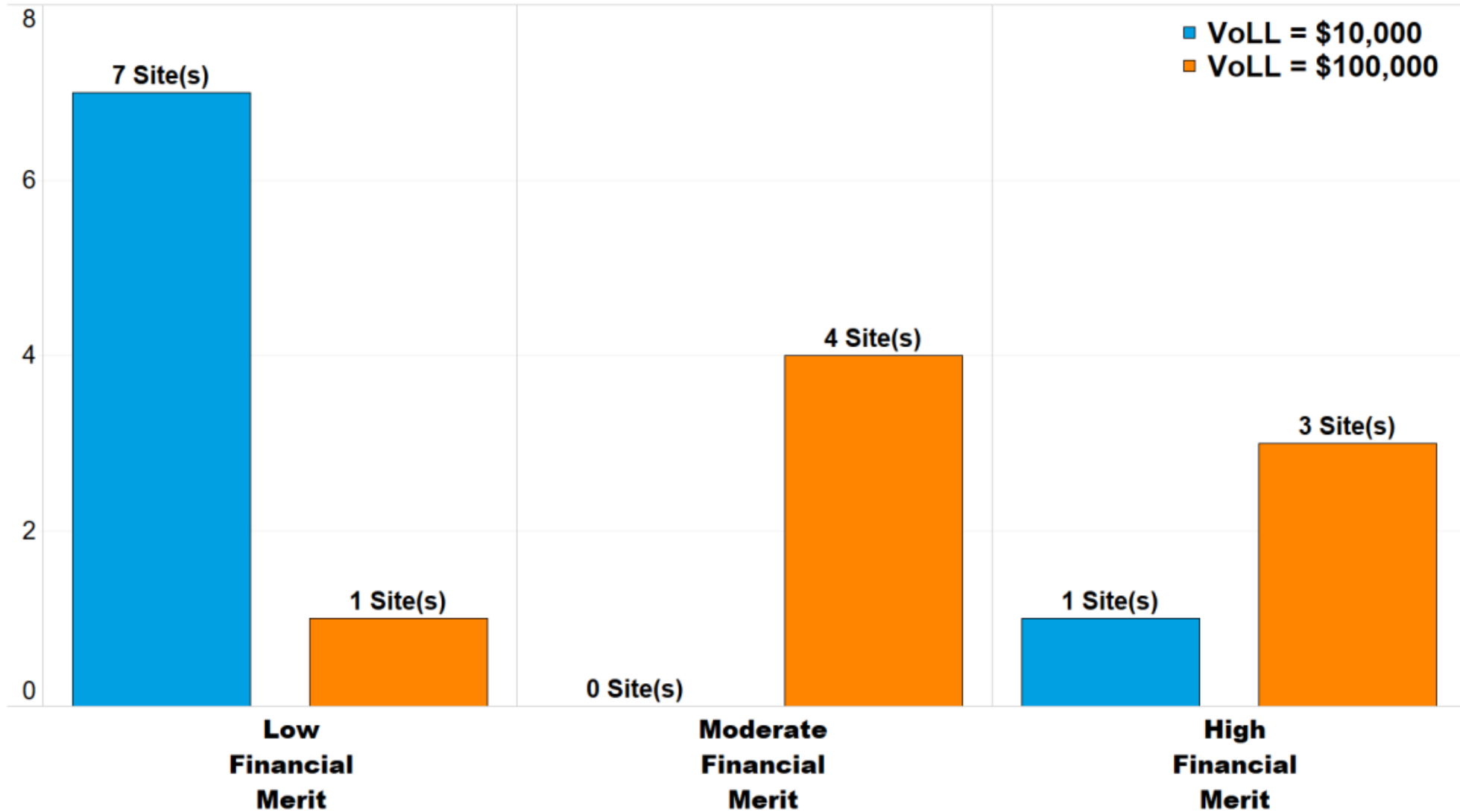
Event must be common to make the conversion cost a financially justifiable investment  
**LOW FINANCIAL MERIT**

Scenario	Fuel Assurance Conversion	Annual Conversion Cost	Financial Merit (VoLL = \$10k)	Financial Merit (VoLL = \$100k)
Scenario 1	Renton	\$100,000	Low	High
Scenario 2	Bremerton	\$3,000,000	Low	Low
Scenario 3	Tacoma	\$2,000,000	Low	Low
Scenario 4	Bremerton & Tacoma	\$5,000,000	Low	Moderate

Occurrence Frequency	Financial Merit
0 – 10 Years	Low
10 – 25 Years	Moderate
More Than 25 Years	High

# PJM Non-Fuel Assured Black Start Site Incremental Restoration Time Increase Results







- This methodology is a purely financial cost/benefit analysis of fuel assurance conversions of Black Start sites
  - Factors in a probabilistic assessment of risk
  - Integrates variables:
    - Zonal Load, Value of Lost Load, Incremental Restoration Time Increase, Probability of Event, Fuel Assurance Conversion Cost
- Methodology could be used in the future if needed as a financial cost/benefit analysis
- Results indicate that a higher VOLL value needs to be used in order to demonstrate a higher financial merit for fuel assurance investments
- PJM believes a reliability criteria based on identification of high impact black start sites should govern in justification of additional fuel assurance investments

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## Fuel Requirements for Black Start

## Resources



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