



29 June 2018

J.B. Sims Generating Station, Unit 3 Life Assessment

Bradley R. Saad, P.E.
Senior Operations & Maintenance Consultant)

BUILDING A WORLD OF DIFFERENCE®



BLACK & VEATCH

Agenda



- **B&V Introduction**
- **Sims Unit 3 Overview**
- **Purpose of Assessment**
- **Assessment Findings**
- **Black & Veatch Recommendation**
- **Generation Alternatives**
- **Next Steps**
- **Discussion**



Black & Veatch Introduction

Bradley R. Saad, P.E.

Over 10,000 Professionals in Over
100 Offices Worldwide

Major Markets:

Power

Mining

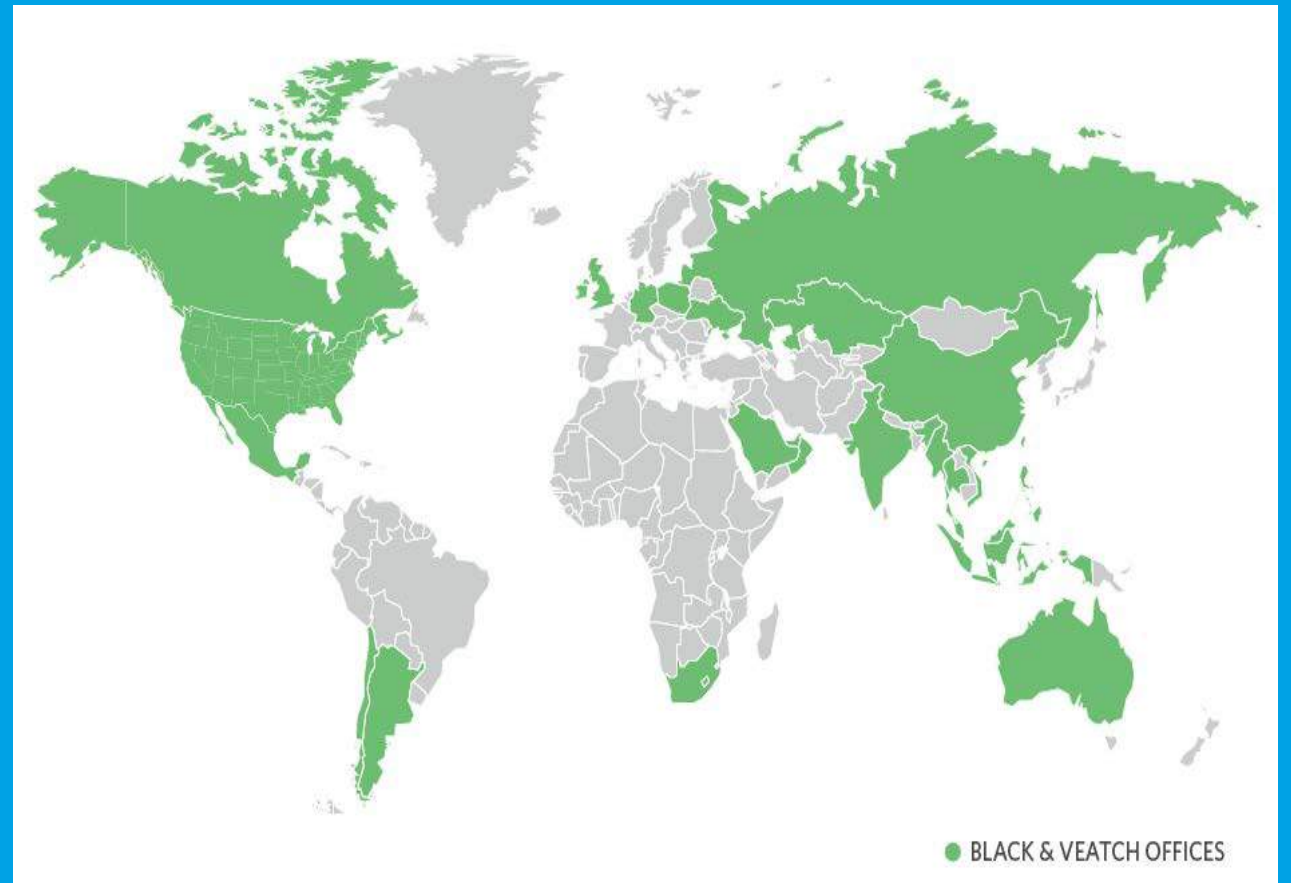
Oil & Gas

Water

Banking

Data Centers

Telecommunications





Black & Veatch History with GHBLP & Unit 3

- 1983, Black & Veatch Design Engineer for GHBLP Sims Unit 3
- 2013, Natural Gas Generation Siting Study
- 2016-Present, Continuous Monitoring & Diagnostic (M&D) Services
- 2017, On-Site Heat Rate Testing, Evaluation and Improvement Recommendations
- 2018, Sims Unit 3 Life Assessment
- 2018, Sims Unit 3 Snow Melt Analysis

Building a Strong Relationship with Grand Haven Board of Light & Power



Black & Veatch Life Assessment Team

Bradley Saad, P.E. – Project Lead

40 Years Power Plant O&M

- Director Engineering Services
- Outage Manager
- Boiler Specialist

Tom Hudson, P.E. – Pipe Stress Lead

14 Years Pipe Stress Experience

- Stress Analysis of Power Systems
- Support Design
- Piping & Support Inspections

Bruce King, P.E. – Electrical Lead

14 Years Electrical Engineering

- Office Electrical Section Head
- Power System Studies
- Experience as Electrician

Kyle Lucas – Environmental Lead

21 Years Environmental Management

- Pollutant Legislation Impacts
- Air Quality Control Studies
- Clean Air Act/New Source Review

Carrie McCoy, P.E. – Environmental Engineer

16 Years Environmental Engineering

- Soil & Groundwater Remediation
- Geotechnical Investigations
- Asbestos and Mold Abatement

Maureen Muller, P.E. – Material Applications Engineer

1 Year Materials Applications

- Materials-Related Code Compliance
- Weld-Related Code Compliance
- Materials Selection

Brendan O'Reilly – Outage Consultant

20 Years Outage Management

- Outage Process Improvement
- Field Walkdowns
- Construction Support

Mike Preston, P.E. – Industrial Water Treatment

30 Years Industrial Wastewater Engineering

- Wastewater Treatment Upgrades
- Effluent Limitation Guideline Design
- Screening and Technology Selection

Brian Reinhart, P.E. – Technology Assessment Lead

13 Years Technology Assessment

- System Planning
- Technical Due Diligence
- Cost and Performance Estimates

Tom Salt, P.E. – Operations Specialist

11 Years Power Plant O&M

- Operator Training
- Plant Monitoring & Diagnostics
- Performance Test Procedures

Tom Trimble, P.E. – Boiler Specialist

33 Years Steam Generator Technologies

- System Analyses and Specifications
- Life Extension Evaluations
- ASME Regulations & Compliance





Sims Unit 3 Overview





Sims Unit 3 Overview

- Located in Grand Haven Harbor Island Area
- Commercial Operation since 1983 (35 years old)
- 70 Net Megawatt Output – Pulverized Coal Fired
 - Babcock & Wilcox Boiler
 - Fuji Electric Turbine and Generator
 - Electrostatic Precipitator
 - Wet Flue Gas Desulfurization
 - Once-Through Cooling from Grand River



Purpose of Assessment

- Independent Life Assessment
- Develop Action List for Continued Operation
- Make Recommendation Based on Plant Condition





Black & Veatch Assessment Findings and Recommendations





Black & Veatch Key Findings

- Many critical components have reached the end of useful life.
- 4160V and 480V Switchgear and Motor Control Centers have a high potential for failure.
- Boiler High Temperature materials condition is unknown. Requires testing and analysis to determine current condition.
- High Energy Piping material condition is unknown. Requires testing and analysis to determine current condition.
- Environmental compliance requirements are required by October 2018 for ash ponds, but can be avoided.
- Additional environmental controls will likely be required after 2020 for Effluent Limitation Guidelines.

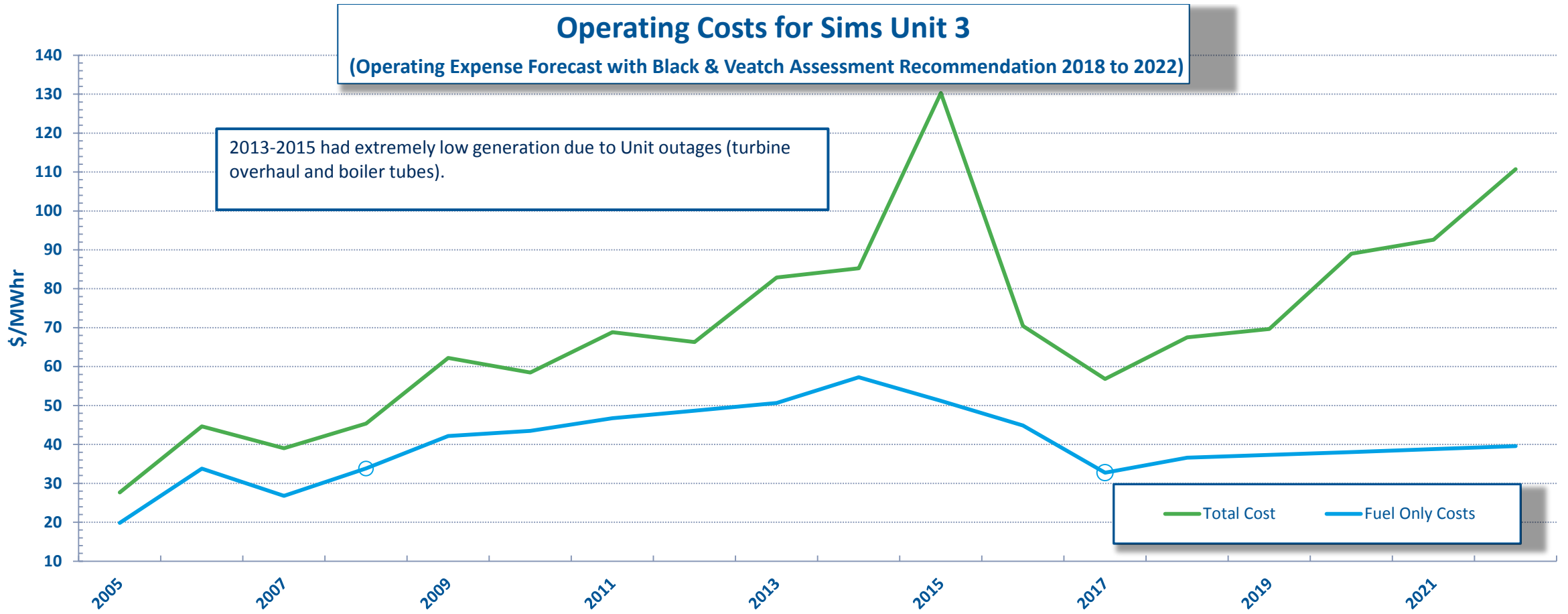




Black & Veatch Key Findings -Continued

- Forecasted Safety and Reliability Costs until 2020 is \$4.4 Million Dollars
- Forecasted refurbishment cost for next 5 plus years is \$35.0 Million Dollars
- Unit 3 current average Generation cost including fuel cost is \$56/MWh
- Expected Generation cost for next 5 years including refurbishment and fuel cost is \$85/MWh
- Grand Haven past 5 year average Local Marginal Pricing (LMP) is \$35/MWh





Operating Expense



Black & Veatch Recommends Retirement of Unit 3

Justification

- Unit 3 has reached the end of useful life, requiring significant investments to continue safe and reliable operation.
- Cost of \$35 million have exceeded any benefits of life extension.
- More economical power supply options exist that would improve electric prices and improve reliability.
- Given the magnitude of investments necessary, New Source Review would likely be triggered.
- GHBLP will be able to take advantage of lower staffing levels through attrition to minimize any adverse effects on steam plant employees.
- Continued operation of Sims Unit 3 does not make economic sense.





Justification for 2020 Recommendation

- Next turbine overhaul scheduled for 2020 can be avoided.
- Boiler control upgrades can be avoided.
- Costs for active ash pond compliance in accordance with the Coal Combustion Residual Rule can be avoided.
- Costs associated with the Effluent Limitations Guidelines can be avoided.
- Full Integrated Network Transmission Service will be available to provide firm power to serve Grand Haven electrical load.
- Electrical switchgear replacements can be avoided.
- Limit investments in plant and avoid purchasing any more fuel to minimize stranded costs risk.



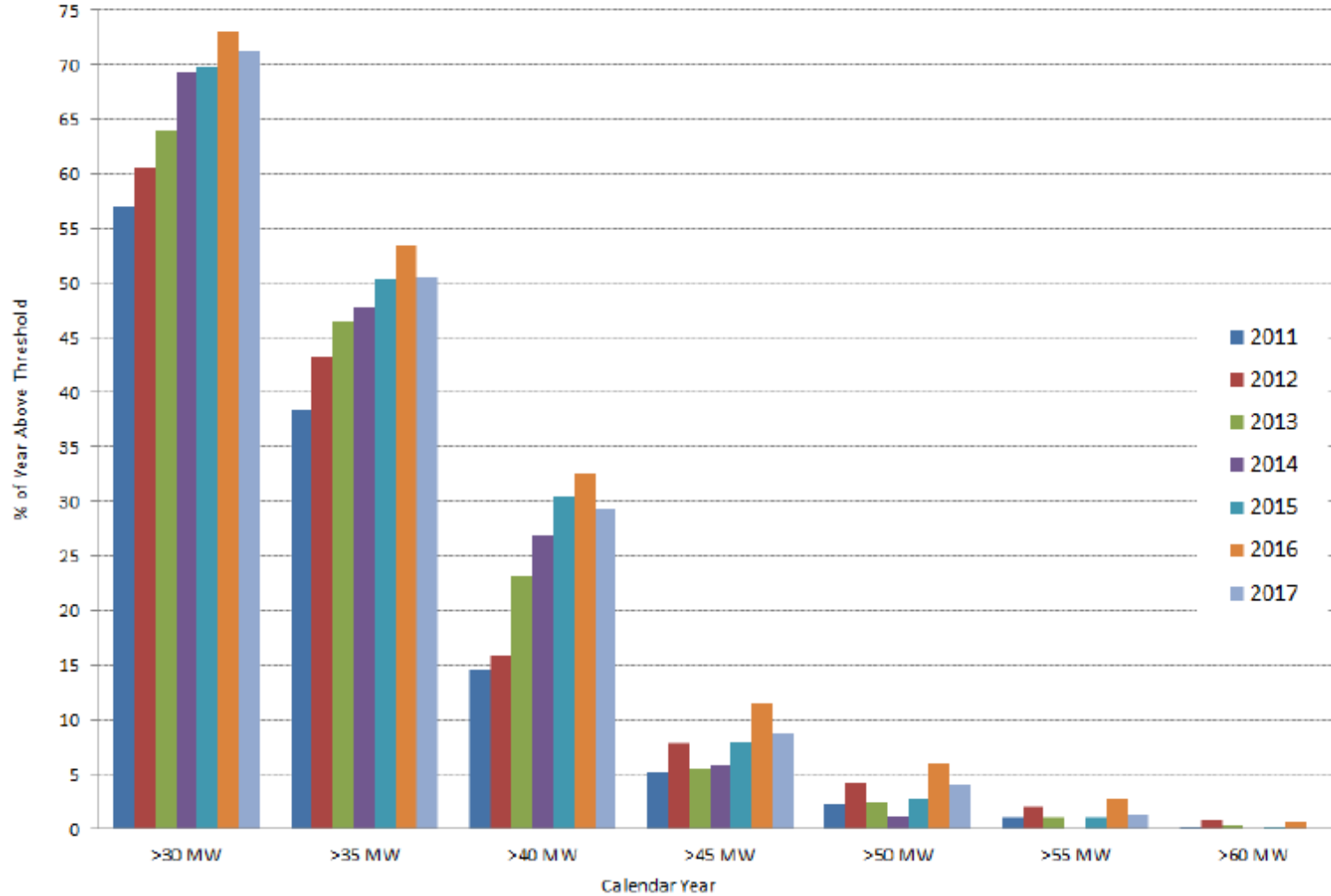


Generation Alternatives



Historical Electrical Demand

Distribution of Historical Grand Haven Electrical Demand



Load MW	% of Year
60	0.36
55	1.33
50	3.34
45	7.52
40	24.68
35	47.21
30	66.42

Dispatchable Generation Alternatives

DESCRIPTION	AERODERIVATIVE GAS TURBINES	RECIPROCATING ENGINES
Representative Make	GE	Wärtsilä
Representative Model	LM2500+G4	20V34SG
Number of Units	1 – 2	3 – 6
Total Investment Cost	\$41,250,000 - \$76,250,000	\$40,500,000 – 72,215,000

All Dispatchable Alternatives Generation to be considered to Optimize Grand Haven Needs



Resource Plan – Next Steps

- **Production Cost Modeling**
 - Identify the most economical power supply portfolio.
 - Optimize internally owned generation options.
- **Project Development**
 - If a local generation component is desired, begin design and engineering.
 - Harbor Island was identified as best site in 2013.
- **Decommissioning and Demolition Study**
 - Land use plan.
 - Site Environmental Mitigation.



Action Plan

- 1. Invest in all safety related items identified in the report and determine what reliability items to address by 2020.**
- 2. Prepare and secure energy and capacity purchases during decommissioning and demolition of Sims.**
- 3. Model and identify optimum size and type of internally owned generation.**
- 4. Allow time for public input and comment.**
- 5. Developed long term generation mix (hedge plan for renewables, market portfolio, capacity arrangements, partnering projects, etc.) outside of internal generation.**
- 6. Develop site abatement, demolition, and mitigation plan.**
- 7. Identify best land use options for Harbor Island with new generation facility.**
- 8. Allow time for public input and comment on final land use.**



Discussion



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28 June 2018

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