Presentation of the Power Supply Plan

Grand Haven Board of Light & Power

November 2018
Agenda

► Power Supply Plan Highlights
► Industry Overview and Trends
► Utility Planning Requirements
► Planning Efforts from 2012 to Present
► Power Supply Options
► Economic Analysis
► Conclusions & Recommendations
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Primary goal of a power supply plan is to provide an economic evaluation of a utility’s power supply portfolio over both short-term and long-term planning horizons.

**Need to focus on short-term decisions that position utility for long-term success.**
Power Supply Plan Highlights

- GHBLP has evaluated its power supply comprehensively since 2012.
- Within the electric utility industry, older, less efficient steam plants are now higher cost. This is true for J.B. Sims Unit 3. There are less expensive resources available.
- Having Network Integrated Transmission Service (NITS, full service transmission rights), the GHBLP electrical system will be more reliable and also provide the opportunity to access low cost capacity and energy.
- Maintaining appropriate level of on-system generation allows GHBLP to retain local generating capacity while taking advantage of low MISO power prices.
- Snowmelt system can be operated in a “decoupled” configuration with a new natural gas-fired heat generator and electric pumps.

A combination of local on-system resources, market capacity, and renewables would provide GHBLP a well diversified power portfolio.
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Industry Overview and Trends

- Many coal-fired power plants have retired due to economics, more are expected
- Natural gas prices are low, expected to stay low
- Relatively low overall load growth across the U.S.
- Increasing amounts of renewable power, especially wind in the Midwest
- Wholesale electricity prices remain low
Municipal Utility Trends

► Municipal utilities are retiring uneconomic generation
  • Mainly small-scale coal plants
► Membership in municipal joint action agencies provides economies of scale and additional reliability for small communities
► Low wholesale electricity prices support “relying on the market” for capacity
► Low load growth along with increases in energy efficiency reduce need for new on-system generation
► Municipal utilities are increasingly installing reciprocating engines as a source of new-build capacity in cooperation with renewable energy purchases

- Prior to 2009, market energy prices significantly higher than today
  - Recession reduced demand
  - Natural gas fracking lowered fuel price
  - Increased energy efficiency
  - Increased renewables
- Post 2009, market prices have been lower
- J.B. Sims Unit 3 is unprofitable at current market prices
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Pillars of Utility Mission Statement

- Low cost energy
- Reliable energy
- Safe energy
- Environmentally compliant energy
**GHBLP Key Considerations**

- Previous studies recommended the following actions:
  - Retire Sims Unit 3 on an economic basis
  - Invest in transmission and distribution to prepare for increase reliance on market imports
  - Most economical option for on-system generation is a small, quick-start natural gas resource such as reciprocating engines

- Community and policy drivers:
  - Maintain some form of on-system generation
  - Move away from coal-fired generation
  - Shift toward a more sustainable power supply and increase usage of renewable resources
  - Continue operation of snowmelt system regardless of J.B. Sims retirement

**Ideal power supply plan for Grand Haven balances economics and community drivers**
GHBLP’s Obligations

► Provide sufficient capacity (MW) to meet demand
  • Based on NERC rules, MISO sets capacity requirement based on GHBLP’s load forecast
  • Capacity comes from units that GHBLP builds, contracts through bilateral agreement, or demand side management
  • Capacity typically has to be dispatchable, renewables are intermittent and don’t provide significant capacity

► Provide sufficient energy (MWh) to meet customers’ needs
  • Electrical energy comes from units that GHBLP builds, contracts, net metering, conservation, or MISO market

► Energy must be compliant with regulations
  • Renewable and solar mandates
  • Environmental regulations
Balance of Loads & Resources (BLR)

- MISO requires utilities to maintain **capacity** reserves of 7.8% in excess of demand.

- GHBLP must secure “firm” capacity to meet its demand plus reserve requirements.

- Renewables do not get full credit due to intermittency (i.e. non-firm):
  - Wind receives 15.6%.
  - Solar receives 50%.
  - Dependent on actual generation.
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Power Supply Planning Efforts

GHBLP has completed numerous comprehensive studies over the past several years assessing its power supply plan.
Power Supply Planning Efforts
Initial Planning Efforts

► Since 2012, GHBLP has been gathering information to address the need to replace aging power supply resources

► Sargent & Lundy (S&L) Integrated Resource Plan (April 2012)
  • Formulated a long-term plan to meet GHBLP’s future power supply requirements
  • Performed condition assessment and environmental compliance evaluation of J.B Sims Unit 3 and Diesel Plant
  • Identified that Unit 3 and the diesel plant would retire in 2020
  • Extensive evaluation of power supply options

Identified that Sims Unit 3 and the diesel plant would retire in 2020
S&L 2012 IRP Resource Options

S&L evaluated the following resource options in the 2012 Integrated Resource Plan:

- Continued operation of J.B. Sims Unit 3
- Combined Cycle Gas Turbine
- Nuclear Plant
  - Dual-unit, AP1000
  - Small Modular Reactor
- Circulating Fluidized Bed Boiler
- Advanced pulverized coal
  - Single-unit and dual-unit options
- Steam power plant
  - Dual-fueled coil and biomass boiler
  - Biomass-fueled boiler
  - Gas fired boiler
- Geothermal
  - Dual Flash and binary
- Natural Gas Plants
  - Aeroderivative combustion turbine
  - Reciprocating internal combustion engines
- Wind Farms
  - Onshore
  - Offshore
- Landfill gas
- Solar thermal
  - With and without storage
- Solar photovoltaic
  - Small-scale solar
  - Large-scale solar
- Hydroelectric
  - Conventional
  - Pumped storage
- Compressed air energy storage
Initial Planning Efforts Continued

► S&L 2012 IRP Conclusions
  • Recommended obtaining Network Integrated Transmission Service (NITS) to increase wholesale market purchases
  • Recommended retirement of Sims 3 and Diesel Unit 1 in 2020
  • Most economic option would be combination of 80 percent power from market and quick start generation installed as self-build option
  • Consider installation of a quick start generation facility or purchase a share in a natural gas facility

► Black & Veatch (B&V) Natural Gas Generation Siting Study (April 2013)
  • Recommended replacing Sims with a natural gas peaking plant placed at the Sims site
  • Supplemental study evaluated conversion of Unit 3 to natural gas, but determined that it was uneconomical
Power Supply Planning Efforts
Continued Planning Efforts

► Key Policy Statement (October 2014)
  • GHBLP stated intention to reduce reliance on coal and transition to alternative sources of fuel

► Key Policy Statement (August 2015)
  • Continue to evaluate alternative generation options to Sims
  • Complete transmission and interconnection studies to prepare for increased reliance on wholesale imports
  • Avoid “overbuilding” or market speculation to meet customer needs

► Organization Check Up (January 2016)
  • Determined Sims is no longer an economical power supply option
  • Recommended capital transmission investments and network membership in MISO to prepare for Sims retirement
  • Sims debt retirement provides GHBLP with additional capital for investment in transmission and distribution systems
  • GHBLP has little power supply ownership diversification and therefore has higher risk than most utilities of similar size
Recent Planning Efforts

- B&V Natural Gas Generation Siting Study (2013)
- B&V Natural Gas Generation Siting Study Supplement (2014)
- Board Approved Policy Statements (2015)
- Key Policy Statements (2015)
- Organization Check Up (2016)
- GHBLF Strategic Plan (2016)
- IRP Considerations (2017)
- Sims Internal Condition Assessment (2017)
- Snowmelt Study (2017)
Recent Planning Efforts

► IRP Considerations (February 2018)
  • Emphasized importance of supply diversification and future adaptability and flexibility of GHBLP’s power supply

► MISO Transmission Report (February 2018)
  • Recommended GHBLP obtains NITS status to enhance reliability of supply imports, as recommended in previous power supply studies
  • Increased transmission and distribution capacity will increase reliability

► Sims Internal Condition Assessment (February 2018)
  • Conducted condition assessment as recommended in previous power supply studies
  • Results indicated that capital expenditures exceeded benefits of continued long-term operation of Unit 3
  • Recommended avoiding any additional capital expenditures on Sims plant, reducing position in coal markets, prepare a staff succession plan, and working with MPPA to develop reduced run-time plan for Sims
Recent Planning Efforts Continued

► Sims Staffing Report (March/June 2018)
  • Normal staffing level at Sims is 39 employees
  • New power facility will need approximately 13 to 15 employees
  • Staffing levels can be reduced through attrition with no terminations of steam plant employees
  • Replacing Sims with smaller plant estimated to save $2.7M on labor expenses annually

► Sims Power Plant Closure Report (April 2018)
  • Determined Sims operation does not impact GHBLP customer reliability
  • Sims cannot operate beyond 2020 in a safe, reliable, economic manner without substantial capital expenditure
  • Ancillary benefits of Sims operation cannot be justified
Recent Planning Efforts Continued

► B&V Sims Life Assessment Report (June 2018)
  • The assessment found that Unit 3 has reached the end of useful life
  • Capital expenditures of $35M are required to keep Sims safe and reliable, but the costs exceed the benefits of long-term operation
  • B&V recommended the retirement of Sims by June 2020 and to conduct production cost modeling to identify the most economical power supply portfolio to optimize internally owned generation options.

► City Council resolution stating local generation and snow melt system is important to the community
Snowmelt System

- Current system is coupled to Sims plant using heat energy supplied from the boiler
- Two independent studies were performed to evaluate alternatives after Sims retirement
  - First study determined amount of heat and energy required to operate the snowmelt system
  - Second study determined what would be required to “decouple” the snowmelt system from Sims
- New system would likely require natural gas-fired heat generators and electric pumps
  - Costs are largely dependent on system location

Snowmelt should not be the driver in deciding power supply path for the electric customers
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Key Components of the Power Supply Plan

► Review of completed studies
► Combine previous studies into a singular plan
► Identify power supply options available to GHBLP
► Economic cost-benefit evaluation

Objective: Determine the “best” mix of resources that provides safe, reliable, environmentally compliant, low cost capacity and energy to GHBLP’s customers.
Power Supply Options

► Keep Sims 3 operational
  • Requires full staffing level and $35M in capital expenditure to maintain safe and reliable operation
  • While option is not economical, nor has it been recommended in previous studies, it was provided as a method of comparison

► Build replacement generation
  • Previous studies recommended quick start, natural gas plants as an alternative to Sims located at Harbor Island.
  • Burns & McDonnell agrees with previous study results indicating quick start generation would be the preferred replacement of Sims Unit 3.

► Purchase capacity from the market
  • NITS provides clear economic benefits of lower cost energy and capacity
  • Transmission and distribution upgrades in-progress enhance reliability
Power Supply Paths

Based on previous studies and technical evaluation, four power supply paths were determined and modeled for further evaluation:

- **Path 1** - Business-as-usual with continued Sims operation
- **Path 2** - Retire Sims and replace with 4x9 MW (36 MW total) reciprocating engines
- **Path 3** - Retire Sims and replace with 6x9 MW (54 MW total) reciprocating engines
- **Path 4** - Retire Sims and replace with market capacity

All paths, specifically Paths 2, 3, and 4, include snow melt alternatives. Costs have been included for “decoupling” the snowmelt system from Sims and operational expenses associated with a new system.

All paths interact with the wholesale energy market by selling and purchasing from MISO.
Path 1 BLR - Continue to Operate Sims
Path 4 – Retire Sims Unit 3

Path 4 - MISO Market

Capacity Surplus / (Deficit)

Path 4 – Retire Sims Unit 3

J B Sims:3
MPPA Landfill Gas Project
MPPA Solar Project
Beebe 1B Wind Project
Pegasus Wind Project
CMS Energy Contract
System Peak + Reserve
System Peak
Path 4 – Retire Sim & Build Nothing
Path 2 BLR – Retire Sims & Build 36 MW of Recips
Path 3 BLR – Retire Sims & Build 54 MW of Recips
GHBLP must have enough capacity to meet peak demand. But a majority of the energy need is much lower.
GHBLP Load Duration Curve

Sims Unit 3 is 70 MW.

It is too big for GHBLP load requirements.
Distribution of GHBLP Electrical Demand
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Economic Evaluation

Objective: Assess the cost-benefits of individual resources to determine how GHBLP’s overall power supply portfolio can meet customers’ needs both short-term and long-term.

Utilize costs for resources as described previously.

Develop forecasts for fuel and market energy prices.

Economic evaluation includes:
- Fixed expenses
- Variable expenses
- Fuel costs
- Debt service expenses
- Credit for market revenue
- Snowmelt system costs
Economic Evaluation – Methodology

► Utilized pre-screed alternatives and existing resources to determine optimized portfolio

► Sophisticated software that simulates power generation resources’ interaction with the MISO market over a 20-year horizon
  • Software dispatches resources every hour of the year

► Forecasts an “all-in” cost to GHBLP for serving customer’s needs over the 20-year horizon

► Sensitivities evaluate portfolios across different natural gas and market capacity price forecasts
Flexible Dispatch Provides Value in the Market

Coal units are not flexible. Sims energy cost is more expensive than the market. It is difficult to turn off the unit.

Recip engines are extremely flexible. If prices are low, they turn off. If prices are high, they dispatch and “cherry pick.”
Financial Assumptions

- 20-year planning horizon: 2019 through 2038
- Interest rate: 4%
- Financing term: 20 years
- General inflation: 2.5%
- Discount rate: 4%
- Demolition costs have been included
- Snowmelt costs included in all paths
Numerous Scenarios Considered

- Sensitivity analysis was completed as part of the economic evaluation
  - Aimed to evaluate the robustness of power supply paths across uncertain variables
- Sensitivities on natural gas price and market capacity price
- Four scenarios were considered within the economic evaluation
  - Low Natural Gas & Low Capacity
  - Low Natural Gas & High Capacity
  - High Natural Gas & Low Capacity
  - High Natural Gas & High Capacity
# Economic Evaluation – Portfolio Analysis Results

## Grand Haven Board of Light & Power

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<th>Path 1 J.B. Sims Unit 3</th>
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<th>Path 3 6x 9 MW Recips</th>
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Economic Evaluation – Net Present Value Results

Sims locks in high costs

Provides opportunity to lower costs, and provides local resource.

Opportunity for lower costs, but lacks local resource

How large should the local resource be?

<table>
<thead>
<tr>
<th>Path 1</th>
<th>Path 2</th>
<th>Path 3</th>
<th>Path 4</th>
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<tr>
<td>J.B. Sims Unit 3</td>
<td>4x 9 MW Recips</td>
<td>6x 9 MW Recips</td>
<td>MISO Market</td>
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</table>

BURNS MCDONNELL
Why Not Replace All of Sims with a Large Plant?

Building smaller enhances flexibility, allows for future expansion, covers approximately 50% of load.

Very rarely is load above 50MW. Building too big reduces long-term flexibility.
Agenda

- Power Supply Plan Highlights
- Industry Overview and Trends
- Utility Planning Requirements
- Planning Efforts from 2012 to Present
- Power Supply Options
- Economic Analysis
- **Conclusions & Recommendations**
Conclusions

► Continued operation of Sims provides the most expensive power supply path with the least amount of flexibility.
  • Burns & McDonnell does not recommend this option, which is consistent with both Sargent & Lundy’s and Black & Veatch’s previous results and recommendations as well.
  • Burns & McDonnell agrees with the Board’s decision to cease operations in June 2020

► Relying only on market capacity and energy provides the lowest cost option in all scenarios
  • While this is the lowest cost option, it does expose GHBLP to potential rising prices in energy and capacity
  • This is a viable path for GHBLP

► New on-system generation provides lower cost than continued operation of Sims, but higher cost than relying only on the market
  • This is a higher cost option than relying solely on the market based on current forecasts for both energy and capacity
  • This is a viable path for GHBLP

► Either of the viable paths provides flexibility to allow for the use of emerging technologies such as local solar and energy storage
Conclusions & Recommendations

Based on the combination of economics, public feedback to date, and Board & Council policy statements, Burns & McDonnell concludes the following:

- Ongoing operation of Sims Unit 3 is higher cost than other options; Sims Unit 3 should be retired by June 2020.
- The installation of a 35 to 40 MW reciprocating engine plant on Harbor Island will provide a local generation resource while allowing increased flexibility and should be pursued.
- GHBLP should meet additional capacity requirements through market purchases or agreements.
- This path provides GHBLP enhanced flexibility to be both proactive and reactive to changes within the power industry regarding advances in technology and power prices.
- If market conditions change in the future, additional generating units can be added to the Harbor Island plant while avoiding the risk of overbuilding today.
Action Plan

1. Address public input/feedback and present to the Board for review.
2. Finalize the power supply plan report
3. Move from planning to engineering phase
   a. Conduct a Project Definition Report (PDR) for the new plant: includes demolition plan of existing site, preliminary engineering, site layout, cost estimates, interconnection studies, permitting, execution schedules
   b. Engineer replacement for snow melt system both during the transition and permanently
   c. The PDR will be needed to meet the requirements of the City Council’s Resolution passed on September 4, 2018.
   d. Develop remediation plans for Sims facility and coordinate with PDR execution schedules.
4. Secure short-term capacity and energy during the transition from Sims Unit 3 to the new plant
5. Begin building a long-term diversified portfolio, through the joint action agency, that will complement and supplement the new generating facility on Harbor Island that offers cost competitive power supply for electric customers.
Opportunity for Feedback

- Open the floor to the public for questions and feedback.
- Each speaker needs to provide their name and address for the record.
- Each speaker will be limited to approximately 3 minutes to provide ample time for everyone to have the opportunity to speak or ask questions.
- Questions will either be addressed 1) verbally during the meeting or 2) with written responses within the final report.
CREATE AMAZING.