

# Generation Replacement Strategies: Siting Study

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# Update on Replacement Generation

- Staff research on potential technologies
- Staff discussions with SPP on Generation Replacement Process
- Filed Generation Replacement request with SPP, June 2021
- Filed waiver request with FERC, June 2021
- **Siting study to determine limitations, locations and suitable technologies for replacement generation**
- RFP development planned for release Fall 2021



# Siting Study: Purpose

- The purpose of this study is to find the most appropriate technologies and locations for replacement of up to 108 MW of existing and/or recently retired electrical generating capabilities at locations within the existing IPL infrastructure.



# Siting Study: Considerations

- Improve efficiency and cost effectiveness of IPL assets
- Maintain reliability and system resilience (Winter Storm)
- Previous studies indicate a need for over \$30M in IPL system improvements if all on-system generation is eliminated
- Use of the SPP Replacement Generation process avoids the multi-year backlog for New Generation and avoids cost of sharing other utilities system upgrade requirements



# Siting Study: Constraints

- Electrical Capacity and Dispatch capability
- High Availability and Reliability including extreme weather
- Multiple fuel sources
- Adaptability for conversion to green fuels such as Hydrogen
- Support future Decarbonization and Renewables



## Siting Study: Other factors

- Social/Aesthetic goals – noise, visual impact
- Capital and O&M Costs – fuel/lube oil consumption, complexity and frequency of maintenance
- Environmental Permitting
- Water/Wastewater requirements



<b>GENERATOR TYPE</b>	<b>APPROXIMATE GENERATOR SIZE</b>	<b>TOTAL FOOTPRINT REQUIRED</b>	<b>SITE FOR 108MW</b>
INDUSTRIAL COMBUSTION TURBINE	5 MW	0.25 ACRES	5.5 ACRES
SMALL AERODERIVATIVE COMBUSTION TURBINE	22 – 33 MW	0.35 ACRES	2 ACRES
LARGE AERODERIVATIVE COMBUSTION TURBINE	45 – 55 MW	0.65 ACRES	2 ACRES
SMALL RECIPROCATING ENGINE	4 – 5 MW	0.15 ACRES	4 – 5 ACRES
MEDIUM RECIPROCATING ENGINE	9 – 11 MW	0.35 ACRES	2 ACRES
LARGE RECIPROCATING ENGINE	18 MW	1 ACRES	6 ACRES
HORIZONTAL AXIS WIND TURBINE	2-3 MW	50 ACRES	5400 ACRES
VERTICAL AXIS WIND TURBINE	10 KW	0.05 ACRES	540 ACRES
PHOTOVOLTAIC SOLAR	1 MW	6 ACRES	648 ACRES
SOLAR THERMAL	100 MW	500 ACRES	540 ACRES
BATTERY ENERGY STORAGE SYSTEM	1 MW / 4 MW-HR	0.03 ACRES	3 – 4 ACRES

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# Sub H



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# Sub I



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# Sub A



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# Site Analysis

- Sub J – no access to natural gas for fuel
- Sub I – Gas pipeline extension required, approx. 0.64 acres of space, nearby residential and Drumm Farm
- Sub H – Gas already in place, approx. 0.63 acres of space, highway access, some residential
- Sub A – Gas already in place, existing large industrial site, over 4 acres of space available



# Technology Considerations

- Aeroderivative Combustion Turbines fit within the available space and have the capacity factor and operating profile suitable to the expected SPP market conditions
- Reciprocating engines have a slightly better efficiency but can cost 25-30% more to install and have higher O&M costs
- Wind and Solar are not suitable technologies due to space limitations
- Battery Storage technology is not currently suitable for dispatchable power but could be added as technology evolves.



# Study Conclusion

- The Blue Valley Power Station/Substation A is the recommended location for the installation of new generation equipment.
- Sub I and/or Sub H are secondary locations for potential replacements. A transmission study is needed to determine reliability impacts.
- Aeroderivative turbines are the recommended technology. Reciprocating engines are an acceptable alternate technology.



# Next Steps

- Development of RFP with appropriate evaluation criteria to facilitate a total life-cycle Cost-Benefit Analysis for comparison
- Transmission Study to identify reliability impacts of generation options at Sub I and Sub H
- Pending decision on FERC waiver and SPP review process.
- PUAB Public Hearing



Questions ?



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