

Overview

Alpine X Inc. (Alpine-X) is committed to developing and operating sustainable, low carbon-footprint resorts to deliver on the mission of making snowsports more inclusive and accessible to everyone, all year long. Alpine-X retained Setty & Associates (SETTY) to evaluate energy production and sourcing alternatives for the planned Fairfax Peak Resort to be built on a reclaimed landfill in Lorton, VA. SETTY assessed ten alternative approaches to meeting the energy demands of the resort against Alpine-X's energy goals. The alternative that best meets Alpine-X's objectives is a 3 MW on-site solar installation combined with net metering and guaranteed solar/wind electricity purchases from the local utility, Dominion Energy.

Alpine-X Energy Objectives

- Optimize the use of renewable energy to meet energy demand and manage carbon-footprint
- Secure energy and capacity at lower cost and risk
- Achieve price stability and predictability
- Provide for long-term resource adequacy, resiliency, and reliability
- Use modern and proven technologies
- Achieve LEED certification for resort hotels
- Incorporate sustainability, site characteristics, environmental impact, and community concerns into energy decisions

Fairfax Peak Resort

The Alpine-X Fairfax Peak Resort will include an indoor snowdome, 300-room hotel, multiple food and beverage and retail amenities, a family entertainment center, meeting rooms, support areas, and other amenities located on the closed Lorton landfill.

Fairfax Peak Energy Strategy Assessment

SETTY assembled a team of certified Professional Engineers, energy modelers, and researchers to, in collaboration with Alpine-X: 1) translate the Alpine-X energy objectives into evaluation criteria, 2) develop an initial energy demand profile, 3) create a list of possible energy supply strategies, and 4) assess and prioritize the strategies. Opportunities to decrease or shift the timing of demand, incorporate storage technologies, reuse waste energy, or apply control and other innovations were evaluated in parallel with the supply study. Design, equipment, operation, and energy re-use decisions may reduce overall energy demand but will not affect the recommendation of this study.

For each potential energy production and sourcing strategy, SETTY evaluated seven criteria aligned to the Alpine-X energy objectives. Strategies were scored on their ability to: 1) showcase clean, responsible Dark Green solutions to the community, 2) use on-site renewable energy, 3) avoid fossil fuels, 4) minimize carbon-footprint, 5) be implemented, 6) provide reasonable payback, and 7) offset a high percentage of energy demand. Strategies were scored "green" if a criterion is fully met, "yellow" if partially met, and "red" if not met.

Ten strategies were developed and scored (Table 1-1). A summary of significant observations and conclusions follows:

- On-site wind turbines, renewable natural gas (RNG) using landfill gases, RNG-fired steam turbines, geothermal exchange, thermal energy storage, and thermal energy recovery were unable to

demonstrate favorable economics or provide enough output to offset a significant portion of demand.

- On-site photovoltaic solar combined with net metering met most criteria but was limited to 3 MW by rule.
- Adding storage to on-site PV solar could create a 100% solar solution but the cost was prohibitive and land requirement too great.
- The Dominion Energy Green Power® program offers guaranteed solar or wind generated electricity for a per kWh surcharge. The Green Power® program can meet all requirements other than on-site production and demonstrating deep green technology.
- Combining a 3MW on-site PV solar installation with net metering and the Dominion Energy Green Power® program offers the best overall solution with the least risk and manageable capital and operating costs.

Table 1-1: Summary of Evaluation Results for the Strategies Explored

	Wind Turbines	Renewable Natural Gas (RNG)	RNG-Fired Steam Turbines	Geothermal Exchange	Thermal Energy Storage	Thermal Energy Recovery	Solar PV – Net Metering	Solar PV - Storage	Dominion Green Energy Program	Solar PV + Dominion Green Power®
	1	2	3	4	5	6	7	8	9	10
Outward-Facing Dark Green	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Onsite Renewable	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓
Fossil Fuel Free	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
Limited / Zero Carbon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Implementable	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
Realistic Capital \$/ Possible Payback	✗	✗	✗	✗	✗	✗	✓	✗	✓	✓
High Demand Offset %	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓

Recommendation: Solar PV + Net Metering + Dominion Energy Green Power®

SETTY recommended Solar PV + Net Metering + Dominion Energy Green Power® to Alpine-X to best help meet Alpine-X’s sustainability and economic goals. By deploying this strategy, all energy used at Fairfax Peak would come from renewable sources, although a portion of the energy would be generated off-site. The off-site renewable energy would be provided by Dominion Energy as part of the Net Metering agreement and under the Dominion Energy Green Power® program.

Dominion Energy is the electricity provider for the Lorton area and has a distribution monopoly under the Virginia State Corporation Commission rules. Dominion’s Net Metering terms and conditions limit the power that a participating facility can generate to 3 MW AC. This 3 MW limit was the basis for sizing the on-site solar PV array recommended for Fairfax Peak. Table 1-2 shows the characteristics of the recommended PV array.

Table 1-2: Recommended 3 MW AC PV Array Characteristics

CAPACITY	SOLAR PANEL ORIENTATION	INVERTER	LAND AREA	PHOTOVOLTAIC PANELS
3.00 MW AC 3.75 MW DC	Tracking mode = One axis Slope = 39°	Efficiency: 95% Capacity 3.0 MW AC Misc. losses: 1%	14 acres	Type: mono-Si Efficiency: 18.55% Number of units: 10,417 Solar collector area: 20,216 m ²

Under the Net Metering agreement, Dominion Energy will credit Alpine-X for any electricity produced more than immediately consumed by Fairfax Peak. These credits will be applied against the electricity provided to Alpine-X under Dominion Energy’s GS-3 (Large General Service Secondary Voltage) tariff adjusted for additional charges for participating in the Dominion Energy Green Power® program. The Dominion Energy Green Power® program applies incremental per kWh charges to purchase Renewable Energy Certificates (RECs) from wind and solar facilities in Virginia and the surrounding region. The combination of on-site PV Solar and the Green Power® program will provide 100% renewable electricity.

About SETTY

SETTY is a family-owned and managed, multi-disciplinary design engineering firm offering Mechanical, Electrical, Plumbing, Fire Protection, Commissioning and Energy Services with nine offices across the U.S., and has been headquartered in Fairfax, Virginia since 1984. SETTY assembled a team of energy and planning professionals with diverse skill sets including partner company FVB for this study. FVB Energy, Inc. specializes in sustainable energy infrastructure design and business analysis. FVB has offices in the U.S., Canada, and Europe.