Sample Report

Renewable Energy Feasibility Study

foresight

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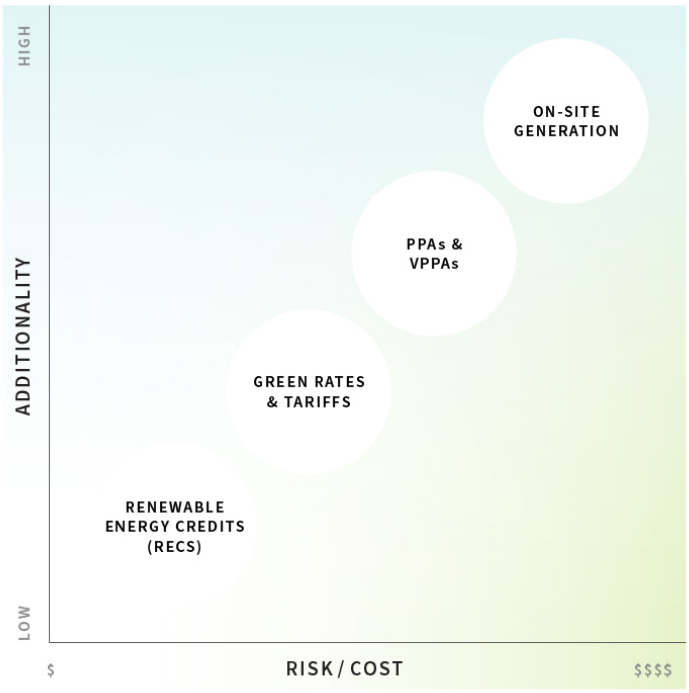
Introduction

The goal of this study is to provide ABC Company with renewable energy recommendations for Facility 1.

Foresight's team of energy engineers, procurement specialists, and data analysts conducted research, evaluated the Renewable Energy Hierarchy, and researched options at each level with an emphasis on on-site generation.

Renewable Energy Hierarchy



The Renewable Energy Hierarchy shows renewable energy options via Additionality vs. Risk/Cost.

As the scale suggests, increased additionality often involves greater risk and cost. Our team has compiled recommendations that account for a healthy balance between the two, accounting for the unique goals and opportunities for ABC Company's Facility 1.

Additionality: Adding renewable assets (electricity) to the grid.

Risk/Cost: Initial set up cost, and risk involved based on length of commitment.

EMISSIONS OFFSETS

By transitioning to 100% renewable electricity at Facility 1, ABC Company could prevent the emission of nearly 600 metric tons of CO_2e (tCO_2e).

By transitioning to 100% de-carbonized natural gas at Facility 1, ABC Company could prevent the emission of nearly 680 tCO_2e.

Transitioning to 100% renewable electric and de-carbonized natural gas energy sources at Facility 1 would offset ABC Company's entire organizational emissions by a total of 38%.

Even though the Facility 1 has a larger electrical footprint than natural gas, the emissions are lower due to how clean the electric grid in the region is. The EPA ranks the electric grid in the Facility 1 region 5th in the nation. These calculations are based on July 2022 to June 2023 consumption levels.

ABC Company Sustainability Goals

ABC Company desires to strengthen its renewable energy strategy to support its Corporate Social Responsibility commitments. Pursuing renewable energy options at Facility 1 supports ABC Company's core values of being protective of natural resources and mindful of their environmental footprint. This feasibility study is a key step toward ABC Company's commitment to the protection of our environment.

Current ABC Company Energy Landscape

Facility 1 is serviced by *Energy Company A*, the largest electricity provider in the state.

CURRENT COMMODITY PRICE

$0.08727 per kWh

CURRENT BLENDED PRICE

$0.10674 per kWh

Facility 1 is in a state with a regulated electricity market, meaning ABC Company is unable to seek alternative electricity suppliers for this load. In 2021, Energy Company A's electricity portfolio supplied 30.7% of electricity from renewable sources. With one of the most diverse renewable energy portfolios in the nation, it leverages solar and geothermal projects, alongside a mix of wind, biomass, hydro, and waste-to-energy projects.

Facility 1 Energy Usage

MONTH & YEAR	USAGE (KWH)	COST (USD)
Jul 2022	197,371	$23,881
Aug 2022	207,443	$21,985
Sep 2022	190,983	$19,831
Oct 2022	173,195	$19,921
Nov 2022	170,865	$19,664
Dec 2022	149,150	$17,957
Jan 2023	148,190	$19,993
Feb 2023	156,148	$21,010
Mar 2023	157,430	$21,107
Apr 2023	154,868	$22,279
May 2023	167,426	$24,095
Jun 2023	189,215	$26,449
Total	**2,062,284**	**$258,171**

Recommendations

To support ABC Company's interest in exploring innovative on-site generation technologies that tell a story of sustainability and efficiency, Foresight recommends the following for the Facility 1.

Renewable Energy Recommendation

SOLAR ENERGY

Solar energy is an advanced renewable technology that is highly feasible in Facility 1's location. Through research of site and available technologies, solar is the most viable option for Facility 1. ABC Company would have to invest approximately $1.5 to $3 million in upfront cost, with an ROI of about 10 years.
Details for this option can be found on page 6 >

Next Step

Consult with local solar contractors, such as Intermountain Electric (IME), to obtain cost estimates for the facility's solar system installation.

Wastewater Treatment Recommendation

HYDROTHERMAL CARBONIZATION (HTC)

Implementing HTC technology at the wastewater treatment plant would benefit the facility considering the short processing time and small land requirement. Most notably, the byproducts possess energy potential that can serve as a substitute for fossil fuels, propelling a circular solution for on-site wastewater treatment combined with on-site de-carbonized energy.
Details for this option can be found on page 9 >

Next Step

Set up an introductory meeting with SoMax to further explore this technology.

Alternative Recommendation

GREEN RATES & TARIFFS

If ABC Company chooses not to implement an on-site technology, participation in the NGR Program through the local utility, Energy Company A, allows ABC Company to purchase locally generated renewable energy at a reasonable price, although it will not contribute any additionality to the electric grid. ABC Company has the option to purchase either 50% or 100% renewable energy from local sources.
Details on this option can be found on page 13.

Next Step

Receive formal pricing options from Energy Company A for further review.

RENEWABLE ENERGY RECOMMENDATION

Solar

Due to abundant sunlight and vast open spaces, Facility 1 is an ideal location for solar generation. Policies and incentives that promote solar energy adoption, including net metering programs, tax credits, and renewable portfolio standards, have made Facility 1's state a leader in solar energy, accounting for 24% of the state's electric grid.

Additionality	*ROI*	*Cost*
High	10 Years	$1.5 – $3 million

CONSIDERATIONS SPECIFIC TO FACILITY 1

Foresight utilized HelioScope, a solar design software, to create a 3D solar array model for ABC Company's Facility 1 facility, using GPS data for precise measurements. The program includes the industry standard PVSyst database, enabling simulation calculations for energy production, considering various factors like weather, shading, wiring, and aging, along with recommendations for electrical layouts and equipment.

For precise design and costs, ABC Company must consult with a specialized contractor. All values presented here are high-level estimates.

FINANCIAL COST CALCULATIONS

Gross investment accounts for the annual offset of a fully commissioned solar array in energy (kWh) and cost (USD), using the estimated install cost of $3.00 per installed Watt in Facility 1's state (this should be considered an estimated average install cost in Facility 1's state; it will vary depending on the solar contractor chosen and the final system size).

Other financials variables considered in cost calculations:

- Linear charge in utility electricity rates
- System operation and maintenance
- Federal credits

State and utility incentives were not included in revenues due to their performance-based nature.

The net investment combined the gross investment, described variables, and federal credits. The estimated ROI compared the net investment to the annual savings generated by the designed solar energy system. ABC Company's tax team ultimately makes the decision on what incentives they believe fit ABC Company's tax and financial goals. Further, the presented tax credits are not guaranteed in full. The chosen renewable system will have to be approved and granted by the relevant entities for any credits or incentives listed here.

OPTION 1: ROOF-MOUNT, RECOMMENDED

Opting for a roof-mounted solar array is the ideal choice for the Facility 1. While designing, Foresight faced constraints such as roof boundaries and obstructions like HVAC units when sizing the array. Selecting appropriate module types can increase production in a confined space, with 395-watt modules offsetting almost 60% of the existing facility's annual electricity consumption.

Roof-Mount Solar Financial Breakdown

Facility Actual Annual Consumption (kWh)		2,000,000
Array Estimated Annual Production (kWh)		1,156,000
Percent Offset		58%
Investment	**Net Investment**	**$ 1,045,000.00**
	Gross Investment	$ 2,004,000.00
Federal Credits	Solar Investment Tax Credit (ITC)	$ 600,000.00
	Federal Tax Depreciation	$ 360,000.00
Revenues	Annual Energy Savings	$ 100,000.00
Payback	**Estimated ROI**	**10 Years**

Further, utilizing the warehouse roof in addition to the existing building will maximize electrical production of the chosen array, increasing offset potential at each. Before installation, the chosen contractor must assess factors like the roof's age and structural integrity, among other factors, for both roofs.

Facility 1 has already received a solar array proposal from Intermountain Electrical (IME). The facility has an existing relationship with this contractor and can consider them in the solar proposal process.

OPTION 2: GROUND-MOUNT

A ground-mount array was also designed to be considered at the facility. Ground-mounted solar offers the most flexibility in sizing, optimizing the potential energy offset and in turn, increasing cost savings. The system was designed with the same 395-watt modules, covering about 2.5 acres and offsetting almost 90% of the facility's annual electricity consumption.

Foresight understands a warehouse is to be built on the newly acquired lot adjacent to the facility, and potentially a wastewater treatment plant as well. Considering this, limitations may exist surrounding available space for a ground-mounted solar array.

Ground-Mount Solar Financial Breakdown

Facility Actual Annual Consumption (kWh)		2,000,000
Array Estimated Annual Consumption (kWh)		1,785,000
Percent Offset		89%
Investment	**Net Investment**	**$ 1,565,000.00**
	Gross Investment	$ 3,000,000.00
Federal Credits	Solar Investment Tax Credit (ITC)	$ 900,000.00
	Federal Tax Depreciation	$ 535,000.00
Revenues	Annual Energy Savings	$ 155,000.00
Payback	**Estimated ROI**	**10 Years**

OPTION 3: ROOF-MOUNT + CARPORT

Solar-capped carport structures were considered to complement the existing building's designed roof-mounted solar array. The combination offsets about 70% of the facility's energy. Carports are adaptable and can be sized to suit the parking lot area of Facility 1.

Carport structure costs were not accounted for in calculations seen here, as prices range greatly depending on size, having hefty price tags. The structure cost is eligible for the solar tax credit as it is integral to the array. Further, utilizing the warehouse roof over solar-capped carports may be seen as a better investment.

Roof-Mount + Carport Solar Financial Breakdown

Facility Actual Annual Consumption (kWh)		2,000,000
Array Estimated Annual Consumption (kWh)		1,420,000
Percent Offset		71%
Investment	**Net Investment**	**$ 1,285,000.00**
	Gross Investment	$ 2,460,000.00
Federal Credits	Solar Investment Tax Credit (ITC)	$ 740,000.00
	Federal Tax Depreciation	$ 440,000.00
Revenues	Annual Energy Savings	$ 125,000.00
Payback	**Estimated ROI**	**10 Years**

COMMUNITY SOLAR

Community solar refers to a solar farm where the generated electricity is shared among members instead of the owner using it all. This setup allows electric consumers to invest in an offsite solar farm if they want to access renewable energy without installing solar panels on their own property. A key aspect of commercial community solar is having an anchor tenant, which is a single, creditworthy, non-residential customer. Project developers seek out an anchor tenant who commits to using a significant portion of the solar farm's capacity.

Energy Company A's new Expanded Solar Access Program (ESAP) will let a number of residential and business customers derive their electricity mix from a utility-scale and community based solar resource. For a commercial user such as ABC Company, Facility 1 has the potential to become a host, or anchor tenant, in the ESAP program.

Benefits of Community Solar

- Host site compensation
- Company name/logo on Energy Company A CBSR webpage
- Option for press and media announcements
- Public demonstration of a commitment to clean energy
- Potential 10% adder through the ITC

WASTEWATER TREATMENT RECOMMENDATION

Hydrothermal Carbonization

Hydrothermal carbonization (HTC) is the dehydration of carbohydrates in water under mild temperatures and pressures, which mimics natural geological processes that form fossil fuels (coal, natural gas, oil) which occur over hundreds of millions of years.

SoMax Circular Solutions is a renewable technology company creating green solutions for the treatment of organic waste. Their process accomplishes the same formation as the natural process, but in 4–8 hours.

For precise design and costs, ABC Company must consult with SoMax. All values presented here are high-level estimates.

Additionality	***ROI***	***Cost***
High	5 – 15 years	$1 - $4 million (see Cost Research section below)

HYDROTHERMAL CARBONIZATION TECHNOLOGY

SoMax technology fits within standard shipping container sizes and is completely customizable. Within the HTC reactor, there are four core processes.

1. Pressurization: the pump pressurizes and pushes the feedstock through the HTC system.
2. Heating: the feedstock temperature is raised to a level where chemical reactions can occur.
3. Conversion: during the designed retention time, the thick feedstock transforms into a carbonaceous slurry.
4. Separation: after the slurry leaves the heat exchanger, it is depressurized, stored, dewatered, and separated into solid hydrochar and process water.

Two main byproducts come from the HTC process: hydrochar and process water.

Hydrochar, named *BioCoal* by SoMax, has equivalent energy density to coal and can be burned to produce energy. Use of hydrochar in place of fossil fuels in power generation allows customers to achieve net carbon energy, aligning with ABC Company's sustainability goals. Another use of the hydrochar is using it as a soil amendment, increasing porosity, reducing erosion and runoff, and offering a sustainable source of nutrients for crop growth. Hydrochar is rich in carbon and can absorb CO_2 by gathering it on the surface, making it an effective material for carbon sequestration. Facilities that produce the hydrochar can go through the process of getting it verified, and once verified, bury it in the ground to receive carbon credits[1].

Process water, named *BioSolution* by SoMax, is derived from the original biomass feedstock and potentially contains beneficial compounds including nitrogen, phosphorus, and potassium. This liquid can be used directly as a liquid fertilizer, possibly benefiting agriculture if sold to local farmers. Alternatively, phosphorous and nitrogen can be extracted to provide both a concentrated nutrients source and clean water.

[1] Carbon credits, also known as carbon offsets, are a market-based mechanism used to mitigate greenhouse gas (GHG) emissions and combat climate change. The concept is based on the idea of assigning a financial value to the reduction, removal, or avoidance of a certain amount of greenhouse gases from the atmosphere. These credits can then be bought and sold in the carbon market.

The ability to produce BioCoal and the makeup of the BioSolution directly depends on feedstock makeup. A feasibility study of ABC Company's wastewater components is crucial to figuring out if creating the two byproducts would be viable. It is possible to make amendments to the feedstock material to optimize it for HTC.

ADVANTAGES

- Minimal Space Requirement: Baseline HTC technology through SoMax fits within traditional shipping containers.
- Rapid Processing Time: HTC has a 4– 8 hour processing time, in comparison with other traditional wastewater treatment processes.
- Enhanced Safety with Eliminated Hazards: HTC eliminates the danger of explosions associated with biogas production.
- Energy & Cost Efficiencies:
    - HTC is well-suited for Facility 1 due to its ability to treat wet waste without requiring feedstock pre-drying, saving both energy and cost.
    - HTC uses less water compared to other process options which usually require water addition for processing and byproduct washing.
- Additional Benefits: HTC destroys select contaminants and there is easy storage of the hydrochar.

Traditional Process Comparison: Anaerobic digestion, in comparison, takes up to 40 days for a typical treatment process, requires a larger area for the process, and poses danger for explosions due to the large amounts of biogas being produced in the process.

DISADVANTAGES

- Concentration of BioSolution Components: BioSolution, or process water, has potential concentration of certain materials or compounds that could become hazardous at higher levels.
- Ancillary Technologies for Water Byproduct:
    - The liquid byproduct generated through HTC may require additional processing to meet local standards for repurposing and reuse.
    - Ancillary equipment such as dewatering solutions and pumps take up additional space.
- Economic and Environmental Considerations: The handling and disposal of this liquid byproduct might outweigh the advantages of the HTC process, both in economic terms and environmental impact.
- Challenges with Makeup of ABC Company's Wastewater: The composition of ABC Company's wastewater, along with issues mentioned here, could present obstacles to the practical application of hydrothermal carbonization for wastewater treatment.

COST RESEARCH

The cost listed above is approximated with market-based averages and currently deployed systems. To determine exact costs, ABC Company will need to work with SoMax, who would require an on-site preliminary visit and consider factors such as makeup of feedstock, characteristics of wastewater outflow, and more.

Other Renewable Energy Options

To inform our recommendations, Foresight's team of energy engineers, procurement specialists, and data analysts conducted research for the following renewable energy options for Facility 1.

Renewable Energy Credits (RECs)

WHAT ARE RENEWABLE ENERGY CREDITS?

Unbundled renewable energy offsets are distinct and measurable attributes generated by an energy source that differs from the one directly supplying electricity to a facility. Renewable Energy Credits are also referred to as Renewable Energy Certificates (RECs), Guarantee of Origins (GOs), Green Energy Certificate (GECs), and International-RECs (I-RECs), depending on the territories that the customer is operating in.

For example, purchasing renewable energy offsets in quantities that match the electricity usage for ABC Company's facility from a wind farm in Oklahoma, which is not owned by Energy Company A, would classify as an unbundled offset.

HOW AND WHEN TO PURCHASE RECS

Offsets (and the assets that generate them) have two types of vintages:

Asset Vintage
Year the asset is constructed

Generation Vintage
Year the REC is issued

Organizations should focus on the Generation Vintage when purchasing offsets, i.e. if ABC Company wishes to offset Facility 1's 2023 electricity consumption, it should purchase RECs that have a 2023 Generation Vintage.

The window for buying specific vintage RECs is generally greater than a year. In most cases, companies purchase offsets in the first quarter of the following year. If ABC Company wishes to purchase 2023 vintage RECs, they're available until the completion of Q1 2024.

This strategy is beneficial for both the selling and buying parties. The purchaser has certainty in how many RECs are needed because electricity consumption can be totaled for the prior year. Similarly, the seller knows exactly how many RECs were produced by the asset(s) in the prior year and can build firm contracts.

Reputable REC Firms: 3Degrees, Anew Climate, Constellation New Energy

ADDITIONALITY & RISK/COST

RECs don't offer much additionality since you're purchasing or 'investing' in green infrastructure that *already* exists. However, they are a low-risk avenue that requires significantly less capital compared to other options.

Wind, solar, geothermal, certain hydroelectric and certain biomass technologies can be used for a Green-e Energy Certified product. Products marked as "any" employ a mix of these technologies.

North American RECs – 2023 Vintage

PRODUCT TYPE	PRICE PER MWH	ANNUAL COST
Green-e Any	$2.24	$4,619
Green-e Solar	$2.29	$4,722
Green-e Wind	$2.29	$4,722

Green Rates & Tariffs

WHAT ARE GREEN RATES & TARIFFS?

Green rates and tariffs are optional programs offered by utilities in regulated markets, which require approval by state public utility commissions. These programs allow customers to purchase renewable electricity through their local utility, supporting local renewable assets. Green tariffs are typically billed either as a special fee per kWh, or as a separate rate entirely, on monthly utility bills.

AVAILABLE PROGRAMS WITH ENERGY COMPANY A

Energy Company A currently offers a program allowing customers to offset either 50% or 100% of their usage using already existing renewable resources within their portfolio or new renewable resources. At a higher price, customers can request a specific renewable energy source if they are looking at new resources.

JOINING THE PROGRAM

The program would add a new line item to ABC Company's current electricity invoices called the Renewable Resource Rate (RRR).

For existing resources in 2023, the RRR was $1.03 per kPC (thousand Portfolio Credits) retired on the customer's behalf. Energy Company A anticipates similar pricing in 2024 for existing resources. Pricing for the program is currently unavailable for 2024 and depends on available resources. Using last year's pricing, Foresight estimates an annual cost of $2,500 for 100% renewable energy.

If ABC Company is interested in joining the program, it must submit a request during the enrollment period the year prior. The 2024 enrollment period is expected to be launched in Fall 2023.

ADDITIONALITY & RISK/COST

Like RECs, Green Rates & Tariffs do not offer much additionality as you are purchasing or 'investing' in green infrastructure that *already* exists. However, they are still a low-risk, low-cost avenue for pursuing renewable energy.

The program is unique in that it does allow customers to pursue new assets, thus offering more additionality than typical green tariffs. This does come at a higher price than the already existing assets.

Power Purchase Agreements (PPAs)

Currently, Facility 1 is not eligible for a PPA, as the state has a regulated electricity market.

WHAT ARE PPAS?

PPAs are arrangements where third-party suppliers install, own, and operate renewable energy resources on a customer's property. PPAs allow customers to receive stable, low-cost renewable electricity with no up-front cost and no responsibility for installation or maintenance. The customer agrees to purchase assets directly from the supplier, instead of through its local utility.

PPA CONSIDERATIONS

A typical PPA agreement spans 10–20 years and includes committing to a monthly volume and price of electricity — increasing the risk. However, the supplier (in conjunction with the developer) assumes the risk and responsibilities of the asset and, in most cases, provides for load shaping.

ADDITIONALITY & RISK/COST

PPAs add assets to the grid, therefore increasing additionality. The added risk is due to the nature of long-term contracts.

Virtual Power Purchase Agreements (VPPAs)

A VPPA is not a viable option for Facility 1 due to the small electricity load. It may be an option if ABC Company bundled all its sites into one agreement — but it is possible ABC Company's nationwide load is still too small for a VPPA.

WHAT ARE VPPAS?

VPPAs are long-term financial instruments that provide renewable energy credits (RECs) directly to a customer from a specific renewable energy project located off-site of a customer's property. The electricity generated by these resources is not delivered directly to your facility; instead, it is delivered to the grid and the customer receives the RECs.

These contracts are considered "virtual" because they are not tied to a specific location (like a PPA is). VPPAs are very large-scale renewable procurement tools, typically utilized by large data centers, large manufacturing plants, cities, etc. VPPAs allow for bundling, with one VPPA providing renewable energy for multiple sites and locations.

COMPLEXITIES OF VPPAS

VPPAs are financial derivatives where settlements between the developer and electricity consumer are made each month of the contract and are based on the difference between the contracted price for electricity and the market rate. These agreements require an intimate knowledge of electricity markets, regulatory reporting, and finance and legal approvals and oversight.

ADDITIONALITY & RISK/COST

Out of all the above renewable energy options, VPPAs offer high additionality, as new assets are created once the contract is put in place. They are the highest risk option, with long terms and requiring large energy loads over the entire contract.

On-site Generation Considerations

All on-site energy generation technologies come with specific incentives, regulations, risks, and liabilities. The following section outlines factors that apply to companies that deploy qualified renewable energy technology.

TECHNOLOGY PRICING

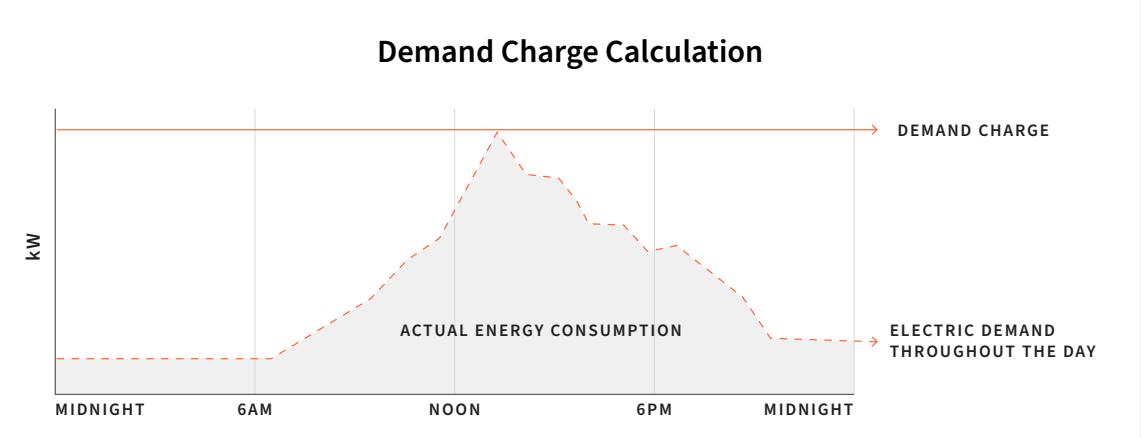
All costs provided in this report are estimates and should be regarded as approximate figures. It will be necessary to consult with specialized contractors for each technology, who can provide precise quotations, accurate implementation timelines, and granular engineering designs once an on-site visit has been completed. Additionally, it is crucial to thoroughly assess and comply with the local city and county regulations, given the area's restrictions aimed at safeguarding the local landscape.

ELECTRICITY DEMAND

When considering on-site renewable energy generation, it is important to understand that renewable technologies will lower energy *consumption* charges but may not always alleviate *demand* charges. When reviewing a utility bill, commercial consumers have two varying charges, energy consumption and demand. Consumption is a straightforward pay-what-you-use figure, but the demand charge can be more complex.

Understanding Demand Charges

The energy grid is dynamic, sending energy at different sizes and voltages from a generation facility to the end-user. Utilities measure your demand (kilowatts – kW) in intervals, typically 15 minutes, and will charge you a fee based on the specific interval in which the facility was drawing the most power from the grid during the billing cycle. For example, the chart below shows a company that consistently pulls a marginal amount of power from the grid from late evening into the early morning hours. As the day passes, more electricity is used, increasing the energy needed to power the facility and subsequently raising the demand. The highest demand of the day determines your demand charge.



ELECTRICITY STORAGE

Battery storage systems provide critical backup during outages and load shifting and are often a consideration alongside renewable energy systems. However, battery storage is extremely expensive and complex, both in purchasing and maintenance. ABC Company should consider chemistry and configuration, power and performance, warranty, and price, depending on which renewable energy technology is implemented.

INCENTIVES & REGULATIONS

Federal: Investment Tax Credit (ITC)

The ITC is applicable from 2022–2035, set at 30% of the installation cost of a qualifying renewable energy project. The Inflation Reduction Act adds three additional options for increasing the tax credit:

- +10% for purchasing domestically produced hardware
- +10% for locating the project in a former energy community
- +10% for selling electricity to low-income communities through community solar adds

PROJECT SIZE	BASE INCENTIVE	ENERGY COMMUNITY BONUS	DOMESTIC BONUS CONTENT	TOTAL POSSIBLE
< 1 MW	30%	10%	10%	50%
> 1 MW	6%	2%	2%	10%
> 1 MW that meets prevailing wage and apprenticeship requirements	30%	10%	10%	50%

Federal: Production Tax Credits (PTC)

The PTC is an incentive in the Inflation Reduction Act that reimburses the amount of electricity a renewable energy system generates for systems greater than 25 kW. The current base PTC value is $5.50/MWh for systems less than 1 MW. The Inflation Reduction Act adds two additional options for increasing the tax credit:

- +10% for purchasing domestically produced hardware
- +10% for locating the project in a former energy community

PTC details continued on next page

PROJECT SIZE	BASE INCENTIVE	ENERGY COMMUNITY BONUS	DOMESTIC CONTENT BONUS	TOTAL POSSIBLE
< 1 MW	$27.50/MWh	$2.75/MWh	$2.75/MWh	$33.00/MWh
> 1 MW	$5.50/MWh	$0.55/MWh	$0.55/MWh	$6.6/MWh
> 1 MW that meets prevailing wage and apprenticeship requirements	$27.50/MWh	$2.75/MWh	$2.75/MWh	$33.00/MWh

A project can qualify for either the ITC or PTCs, but not both. Project owners/developers choose which is more advantageous for their project.

Federal: Modified Accelerated Cost Recovery Systems (MACRS)

MACRS allow businesses who purchase renewable energy systems to depreciate the cost of the equipment over a 5-year recovery period. By utilizing MACRS, businesses can benefit from significant depreciation deductions, which ultimately provide cost savings and make renewable energy more financially attractive.

Combining MACRS with other incentives like the ITC can maximize the savings and accelerate the payback period of a renewable energy system.

State Tax Incentives

Facility 1's state offers partial sales and use tax exemptions on biomass, geothermal, solar, wind, and waterpower energies. Renewable energy systems with generating capacity up to 1MW or 100% of the customer's annual requirements qualify for net-metering. This allows system owners to offset their utility power usage and receive credits for any surplus electricity they generate on a kWh basis.

Regional Ordinances

The regional Code of Ordinances includes regulations for solar, wind, and geothermal energy systems, each with unique rules and requirements. Regulations cover obtaining permits, adhering to size and height limitations, and complying with setback requirements for the installation and operation of renewable energy systems within the city.

Utility: Energy Company A Incentives

Energy Company A provides net metering in four tiers based on application date, determining the energy credit rate. Tiers 1 to 3 are currently full, but applications are still being accepted for Tier 4 (75% credit on retail electricity rate) as of July 2023. They also offer the Energy Storage Incentives Program for customers with battery systems charged by qualifying renewable energy systems. Capacity range is limited to 4 kW to 1,000 kW for commercial customers, and incentives vary from $0.32 to $0.50 per kW, up to $3,000 on a time-of-use rate. At present, the energy storage program is not open for new applications but may reopen in the future.

Durion, Inc., Renewable Heat & Power

Durion empowers commercial consumers to decarbonize their energy loads with fully renewable power and heat technology while providing a 24/7 energy supply.

Durion Heat collects concentrated electricity, storing it in Durion's proprietary hot water thermal storage system as thermal energy. Durion Power uses the same process but converts energy to electricity using an Organic Rankine Cycle (ORC) generator. A combined system of Durion Heat and Power maximizes overall system efficiency at lower total energy rates.

For precise design and costs, ABC Company must consult with Durion. All values presented here are high-level estimates.

Additionality	*ROI*	*Cost*
High	Instant	PPA - $0.10/kWh and HPA - $0.9/therm Approximate annual savings of $55,000 – $66,000

BENEFITS

- 24/7 electric and thermal energy generation
- Resiliency to grid fluctuation, power outages, or energy provider disruption
- Multiple configurations for a tailored system (heat, power, or both combined)
- System configurations provide a carbon-free solution close to 100% of a customer's energy needs

CONSIDERATIONS SPECIFIC TO FACILITY 1

Durion aims to design systems that effectively remove natural gas dependency at the facility. To verify system sizing Durion would need to conduct preliminary and other site investigations. The designed system, consisting of multiple, modular components, would account for the vast majority of ABC Company's daytime and nighttime thermal and electrical loads.

Size	*Electricity Production*	*Heat Production*
7 acres	1,500 MWh	85,000 therms

DETERMINING COSTS

In partnership with other entities, generated heat and electricity would be sold through a 25-year-term Heat and Power Purchase agreements (HPA & PPA). Payback period would be almost instant, considering no up-front costs and immediate savings on natural gas bills. This type of PPA is different than that describe above and is eligible in regulated states such as Facility 1's state.

During the most recent 12 months, Facility 1 spent about $110,000 on natural gas. The heat & power system designed for Facility 1 will allow for an **approximate annual savings of $55,000 – $66,000 on natural gas.**

PPA (Power Purchase Agreement) Pricing

Year one price: Approximately $0.10/kWh electricity
Annual Escalator 1.9%

HPA (Heat Purchase Agreement) Pricing

Year one price: Approximately $0.03/kWh ($0.9/therm) thermal energy
Annual Escalator: 1.9%

APPROACH DUE DILIGENCE

- Availability of Land (9-acre lot)
- Heat, Power, Heat & Power (possible scaling approach)
- Starting with Heat (where decarbonizing opportunities are rare)
- Cutting Edge Technology
- Possible Grants for Emerging Technologies

Solar Thermal Collectors

Solar thermal collectors act as a renewable and sustainable source of heat energy, often heating water. These collectors absorb sunlight and transfer heat to water flowing through the collector's pipes or tubes at low-, medium-, or high-temperatures.

Concentrating solar power (CSP) systems use mirrors or lenses to concentrate sunlight onto a small area to increase solar radiation intensity. This concentrated light is focused onto a receiver, which contains a heat transfer fluid, such as oil or molten salt. The heat transfer fluid absorbs the concentrated solar energy and reaches high temperatures. Alternatively, high-temperature solar thermal collectors can be integrated into a specific industrial process to supply heat where it is needed.

For precise design and costs, ABC Company must consult with a specialized contractor. All values presented here are high-level estimates.

Additionality	***ROI***	***Cost***
High	5 – 15 years	$1.5 - $2 million (see Cost Research section below)

CONSIDERATIONS SPECIFIC TO FACILITY 1

With boilers at Facility 1 operating around 300°F, the high-temperature application would be required. However, many additional variables must be considered before choosing it as an alternative option to fossil-fuel based heat sources for the facility.

- Challenges exist to maintain the high temperatures for production. This renewable option is more sensitive to fluctuations in weather conditions, as they depend on direct sunlight and require precise tracking systems to optimize solar radiation capture.
- To combat natural fluctuations, incorporating a thermal storage system would likely be necessary to ensure a continuous heat supply.

Even further, a stand-alone system would not increase pressure and would require a separate pump or pressure-boosting system to meet pressure demands of production. Implementing such a system would require additional engineering with careful design to ensure system efficiency, reliability, and safety.

COST RESEARCH

The cost listed above is a high-level estimate from a renewable energy contractor. To determine the exact cost of a solar thermal collector system, ABC Company will need to work with a specialized contractor, who would require an on-site preliminary visit and consider the following factors:

- Nature and characteristics of the water source
- Electrical and thermal energy patterns of the facility
- Mechanics of the boiler system, including the condensate return rate
- Available land and its characteristics
- And other variables

Wind

Wind energy is a growing renewable resource in Facility 1's state, contributing to the state's clean energy goals and diversifying its power generation portfolio. Currently, wind makes up about 1% of the state's electric grid.

Wind turbines are tall structures that are equipped with large blades that rotate, converting kinetic energy of moving air into mechanical energy. This mechanical energy is transferred to a generator within the turbine's housing and converted into electrical energy, typically in the form of alternating current (AC), through electromagnetic induction. It is then transmitted to the end user (homes, businesses, or the electrical grid).

For precise design and costs, ABC Company must consult with a specialized contractor. All values presented here are high-level estimates.

Additionality	***ROI***	***Cost***
High	5 – 15 years	$2 - $5 million (see Cost Research section below)

CONSIDERATIONS SPECIFIC TO FACILITY 1

While the state possesses regions with high wind potential, the irregular and forceful gusts often exert excessive strain on turbine blades. Wind energy technology is not a smart investment at Facility 1 due to this natural constraint.

COST RESEARCH

The cost listed above is approximated with market-based averages. To determine the exact cost of a wind energy system, ABC Company will need to work with a specialized contractor, who would require an on-site preliminary visit and consider the following factors:

- Scale of the project
- Capacity factor and efficiency of chosen wind turbines
- Average wind speeds of the region
- Available land and its characteristics
- And other variables

Hydropower & Pumped Storage Hydropower

Currently, hydropower makes up under 4% of the state's electric grid and represents a promising renewable energy option for decentralized electricity generation.

Hydropower is generated by using a dam or diversion structure to alter the natural flow of a body of water. Pumped storage hydropower (PSH) is a configuration of two water reservoirs at different elevations, which are connected to a solar or wind energy system, or both. When sunlight and/or wind are in high supply, water is pumped to the high elevation reservoirs. At times, when these two elements are not fully available, water is released back to the lower reservoir to generate the needed electricity and respond to various demands. It's akin to a large, natural battery.

For precise design and costs, ABC Company must consult with a specialized contractor. All values presented here are high-level estimates.

Additionality	***ROI***	***Cost***
High	5 – 15 years	$1 – $3 million (see Cost Research section below)

CONSIDERATIONS SPECIFIC TO FACILITY 1

Facility 1 has a wastewater outflow of approximately 30,000 US gallons/day. While there is great potential for energy generation, wastewater effluent will need to be treated before entering any hydropower technology. Like the solar thermal collector technology, a backup power source may be necessary for consistent power. An assessment on how seamlessly hydropower can be integrated into the existing electrical systems and infrastructure must be performed.

Further local city and county ordinances and regulations would have to be considered, as the area has high restrictions to protect the local landscape.

COST RESEARCH

The cost listed above is approximated with market-based averages. To determine the exact cost of a hydropower or PSH system, ABC Company will need to work with a specialized contractor, who would require an on-site preliminary visit and consider the following (and more) factors:

- The nature of onsite wastewater treatment
- Where the treated water is intended to be used
- How treated water will be transported to the end location
- Nature and characteristics of the water source
- Available land and its characteristics
- And other variables

Meet Your Team

LINKEDIN PROFILE

Vicki L. Scott, CEP, Senior Energy Advisor

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Vicki is a Certified Energy Procurement Professional (CEP) and has been procuring natural gas and electricity nationally for over 14 years. She has served as a lead project manager in both the energy and Information Technology space for 20+ years. Vicki is process driven with a proven track record in moving projects forward and meeting deadlines.

LINKEDIN PROFILE

Haylee Lewis, EIT, Energy Advisor

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Haylee holds a Bachelor of Science degree in Environmental Engineering from Michigan State University. After entering the workforce as a Quality Superintendent for a solar energy company, she found Foresight through her passion for holistic energy, sustainability, and engineering solutions. Her position as an Energy Advisor on our Rate & Procurement team allows her to lean into her desire for continuous learning and improvement for her clients.

LINKEDIN PROFILE

Stephanie Workman, Energy Analyst

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Stephanie earned a Bachelor of Arts degree from Aquinas College. She's been with Foresight since 2018, performing in-depth analysis on utility rate schedules to optimize clients' energy spend. She also helps companies procure energy that best suits their needs and risk tolerance, with a focus on renewable energy feasibility studies. Stephanie serves as volunteer for nonprofit, American Model United Nations (a collegiate level Model UN) and has been in a leadership position for the past three years in both training and administration positions.

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