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Intro:

This analysis explores the question of whether this residential solar installation proposal is cost-effective by examining its economic viability. To assess the economic viability, the study analyzes the initial costs, loan payments, maintenance expenses, and potential savings associated with residential solar systems. Government incentives are also considered to determine their impact on the overall cost-effectiveness.

Battery Storage vs Wholesale

The residential solar panel installation proposition, based on the provided assumptions, offers a compelling case at first glance for homeowners in the context of Entergy Gulf States Louisiana LLC's Residential - RS-G rate schedule. It allows for substantial savings on utility bills and a reduced environmental impact. However, it may not be worth the potential years of headache for what ends up being a relatively small amount of savings. It all depends on what your goal is, whether it be financial benefit, environmental health, or autonomy from the grid. Let's compare the effectiveness of these scenarios:

. Wholesale back to grid:

When considering a residential solar panel installation without battery storage, several key advantages and disadvantages come into play. On the positive side, homeowners can anticipate reduced utility bills, thanks to the substantial 27.200 kW solar panel system's ability to generate their electricity. This reduction helps offset the impact of annual utility rate increases, which can be significant at 2.02% (forecast). Additionally, a Federal Tax Credit (ITC) of $29,561 presents a valuable financial incentive that lowers the overall cost of the solar installation. Moreover, the environmental benefits of solar panels contribute to sustainability and align with eco-conscious values. However, there are notable cons to this proposition, including the requirement of a 25-year contract term, signifying a significant long-term commitment that homeowners must carefully consider in relation to their future plans and potential property changes. Additionally, the total financed amount of $98,536, including interest over the 25-year term, can lead to substantial overall costs that necessitate thorough assessment within the context of the homeowner's financial goals. Lastly, with an efficiency depreciation of 0.7% annually, it’s important to consider the cost of maintaining/ upgrading your panels in the future.

. With Battery Storage:

On the other hand, opting for a residential solar panel installation with battery storage introduces a new set of considerations. The addition of a battery system brings advantages like enhanced energy self-reliance, allowing homeowners to store excess energy generated during the day for evening use or power outages, thus reducing dependence on the grid. Furthermore, a battery system facilitates greater grid independence, as it enables the household to operate autonomously during peak hours or grid disturbances. Additionally, homeowners can engage in energy arbitrage by selling excess energy back to the grid during peak rate periods, potentially improving the overall financial return on their investment. However, it's crucial to acknowledge the cons of this configuration, including the added cost involved in integrating a battery storage system, impacting the initial investment and overall financial outlay for the solar installation. Batteries also require maintenance and have a finite lifespan, potentially incurring replacement costs over time. Lastly, the system's complexity increases with the addition of a battery, which may need more maintenance and technical expertise to operate effectively.

The addition of a battery storage system to the residential solar panel installation enhances energy self-reliance and grid independence but comes with additional costs and complexities. The choice between these two scenarios will depend on individual homeowner preferences, energy goals, and budget considerations. It's essential to conduct a comprehensive financial analysis and consult with solar energy providers to make an informed decision.

How much battery storage do you need?

To determine the appropriate size for your battery storage system in conjunction with your solar setup, various factors need to be considered, such as your energy consumption patterns and objectives. A simplified approach for sizing the battery storage can be outlined as follows (can play with figures in the attached Excel file):

First, you need to assess your daily energy usage. If your annual energy consumption stands at 52,400 kWh, dividing this by 365 days gives an approximate daily average consumption of 143.56 kWh.

Next, consider your solar generation capacity. While the system's nameplate capacity is 27.200 kW, this value signifies the maximum output achievable under ideal conditions. In practice, energy generation fluctuates due to variables like weather, time of day, and other factors. Therefore, it's essential to calculate your actual daily solar generation, which is dependent on your location and the efficiency of your solar panels.

The degree of autonomy you desire is also a critical factor. Autonomy just means how many days you wish for your battery storage to provide power without relying on the grid or solar panels. This autonomy period is dependent on your unique requirements. As an example, let's assume you aim for two days of autonomy, meaning the battery should supply power for a two-day duration without recharging. The calculation for determining the required battery capacity is found through the following formula:

Required battery capacity (kWh) = (Daily average consumption - Daily solar generation) \* Autonomy days

Assuming, for example, an average daily solar generation amounting to 60% of your daily consumption (a figure that may fluctuate depending on your location and panel efficiency), the daily solar generation would be approximately 86.14 kWh. Consequently, the required battery capacity is evaluated as (143.56 kWh - 86.14 kWh) \* 2 days, leading to an estimated capacity of 115.84 kWh.

To attain two days of autonomy, you would need a battery storage system with a capacity of roughly 115.84 kWh. It's important to remember that this is a simplified calculation, and actual requirements can vary due to weather patterns, fluctuations in energy consumption, and the efficiency of your specific system. For precise sizing, it's advisable to engage the expertise of a solar energy professional who can tailor the battery storage to meet your specific needs. To get an approximate cost estimate you need to consider battery type, brand, installation costs, incentives and rebates, and market conditions. This large capacity would be costly, but you must consider the fact that your Federal Tax Credit will be 30% of your total costs.

Proposal details

Assumptions:

. Utility Company: Entergy Gulf States Louisiana LLC

. Rate Schedule: [Residential - RS-G](https://lpsc.louisiana.gov/docs/utilities/Comparisons/Electric/Residential%20Electric%20Bill%20Comparison%20March%202023.pdf)

. Post-Solar Rate Schedule: Residential - RS-G

. Current Average Utility Bill: $499

. Annual Consumption: 52,400 kWh

. Utility Rate Increase: 2.02%

Equipment:

. Panels: [68 x Aptos Solar Technology DNA-108-MF10-400W](https://www.aptossolar.com/wp-content/uploads/2022/10/DNA_108_MF10_400W.pdf)

. Inverters: [68 x Enphase Energy IQ8PLUS-72-2-US [240V]](https://www.energysage.com/solar-inverters/enphase-energy/4647/IQ8PLUS-72-2-US/)

. System Nameplate: 27.200 kW

. Annual Production Degradation: 0.7%

Cost Overview:

. Total Financed Amount: $98,536

. Contract Term: 25 years

. APR: 3.99%

. Initial Payment: $0

. [Federal Tax Credit](https://www.energy.gov/eere/solar/homeowners-guide-federal-tax-credit-solar-photovoltaics) (ITC): $29,561 (30% of total costs)