Distributed Generation Proposal

PREPARED FOR:
Self Appraisal, -
Residential PV/BESS Leighton Buzzard, UK

PREPARED BY:
James Hoare CEng FIET FEI, Energy Engineer
LHW Partnership LLP,
james.hoare@lhwpartnership.co.uk
07715 576666

This proposal has been generated using HOMER Grid, a dynamic software engine that runs complex simulations and sensitivity analyses with your energy data. It evaluates thousands of variables to compare value streams, assess system options, and provide risk-mitigation and cost reduction strategies. Originally developed at the US Department of Energy's National Renewable Energy Laboratory, the HOMER software is a risk-mitigation tool trusted by over 200,000 project developers and financial institutions to produce informed economic feasibility studies, system design and engineering insight, as well as energy cost savings.

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Energy Engineer, LHW Partnership LLP,
james.hoare@lhwpartnership.co.uk,
07715 576666

Project Summary

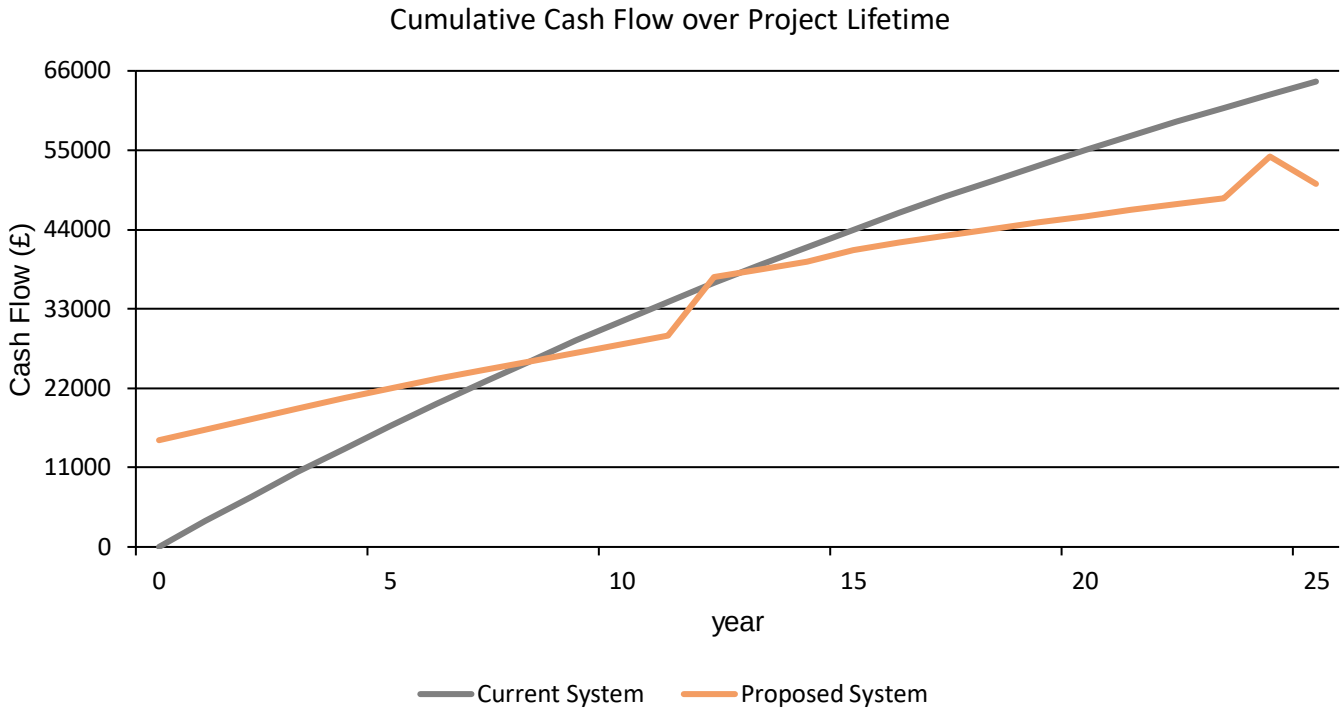
CURRENT SYSTEM

The electric needs of Residential PV/BESS Leighton Buzzard, UK are met with a grid connection. You currently spend £3,646 on your utility bill per year. 0% of your utility bill is demand charges.

PROPOSED SYSTEM

We propose adding 6.5 kW of PV and 32 kWh of battery capacity. We also recommend switching your utility billing rate from 'Simple Tariff' to 'Flux'. This would reduce your annual utility bill to £1,352. Your investment has a payback of 7.07 years and an IRR of 10.70%.

Simple payback:	7.07 yr	Net Present Value:	£14,230
Return on Investment:	7.10 %	Capital Investment:	£14,800
Internal Rate of Return:	10.7 %	Annualized Savings:	£1,641



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ABOUT LHW PARTNERSHIP LLP

LHW Partnership is a specialist engineering consultancy, established to provide high quality engineering expertise with the aim of accelerating the adoption of quality, low carbon energy projects.

LHW Engineers have been involved in the energy industry since the 1980s and with renewable energy since 1991, working with some of the UK's first wind farms. We hold many years project engineering experience in renewable and energy efficiency (heat and power), including technical and financial feasibility, project planning, design and installation management. A particular facet is the early adoption of innovative but proven technologies, both within and from outside the sector, and to find new ways of solving challenges presented.

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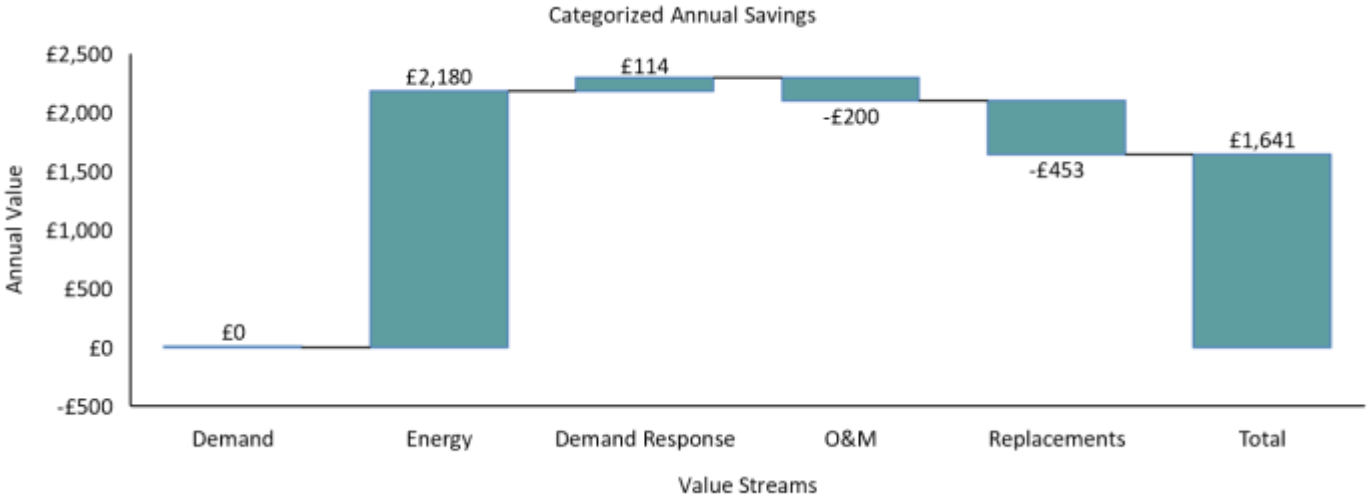
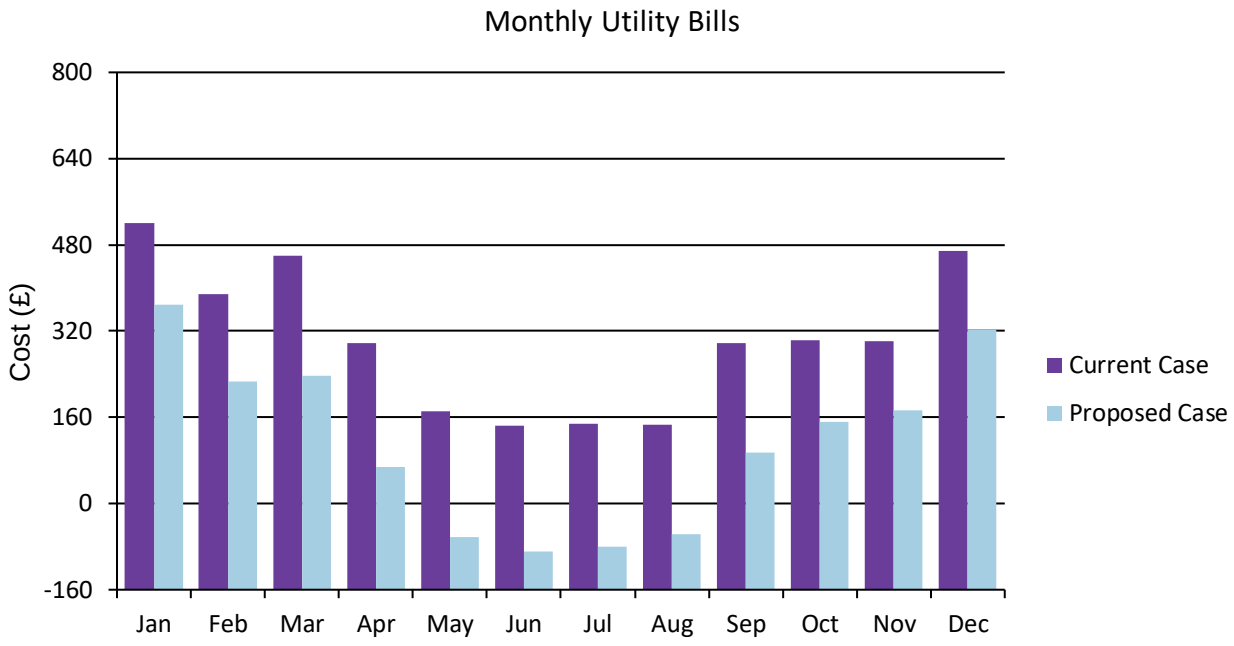
Savings Summary

The chart summarizes down your estimated annual savings in the following categories:

1. Demand: Savings from demand charge reduction
2. Energy: Consumption reduction and self-consumption
3. Demand Response: Programs incentivize reduced consumption at specific dates and times
4. O&M: Operating and maintenance costs of the proposed components
5. Replacements: Cost to replace proposed system components over the project lifetime
6. Total: The total savings (annualized) of the proposed system



Your monthly utility bill savings by month:



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Savings Details

1. Utility Bill Savings

The facility at Residential PV/BESS Leighton Buzzard, UK is served by Octopus. The electricity tariff plan you are currently on is the Flux.

Your monthly electricity bill has two main parts:

1) Energy charges for the total amount of electricity you consume.

2) Demand charges—for "peak usage." If your facility tends to use a lot of power over short periods, your demand charges will comprise a larger part of your bill. If you use power at a more consistent rate throughout the month, your demand charges will generally comprise a smaller part of your bill. Demand charges make up a significant portion of commercial and industrial customers' total electricity costs: typically, between 30 and 70 %.

Your annual utility bills and savings by category:

	Consumption Charge	Demand Response	Fixed Rate	Total
Base Case	£3,493	£0.00	£153.34	£3,646
Proposed Case	£1,313	-£113.88	£153.34	£1,352
Annual Savings	**£2,180**	**£113.88**	**£0.00**	**£2,294**

Current System: Grid-Connection
Proposed System: Grid-Connection, Solar, and Storage

2. Demand Response Programs

Demand Response Programs are incentives offered by utilities in exchange for lowering your consumption at certain times during the year. If your facility has managed to successfully reduce its demand during the event, then the utility would pay you a pre-approved amount for every kW reduced. This is known as the demand reduction incentive.

Demand Response Program: Generic Demand Response

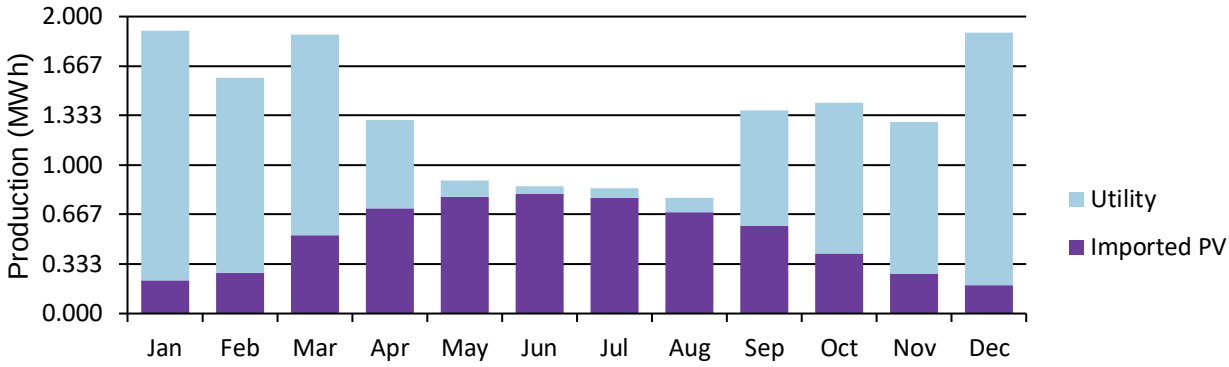
Octopus offers an incentive of **£3.00 for every kW** reduced. You are required to reduce your consumption for a period of 3.0 hours when notified by the utility. Signing up for this program leads to a total revenue of **£113.88**. Below are the demand response events that occur in a year, and the revenue incurred by reducing your facility's peak during each one of them.

Event Date	Reduction (kW)	Revenue (£)
Thu 02 Nov 05:00 PM	1.23	£3.70
Thu 23 Nov 05:00 PM	1.48	£4.44
Thu 30 Nov 06:00 PM	2.00	£5.99
Mon 11 Dec 07:00 PM	5.07	£15.22
Wed 13 Dec 05:00 PM	0.439	£1.32
Tue 19 Dec 07:00 PM	1.71	£5.13
Thu 12 Jan 04:00 PM	2.76	£8.28
Sun 29 Jan 06:00 PM	4.75	£14.24
Wed 01 Feb 05:00 PM	3.43	£10.29
Mon 06 Feb 05:00 PM	2.30	£6.91
Tue 07 Feb 06:00 PM	1.79	£5.36
Sun 19 Feb 06:00 PM	0.267	£0.802
Thu 23 Feb 06:00 PM	0.105	£0.315
Tue 28 Feb 07:00 PM	3.79	£11.38
Tue 07 Mar 07:00 PM	2.24	£6.71
Wed 15 Mar 06:00 PM	1.81	£5.42
Sat 18 Mar 05:00 PM	0.248	£0.745
Mon 27 Mar 05:00 PM	0.831	£2.49
Tue 28 Mar 04:00 PM	0.191	£0.573
Wed 29 Mar 04:00 PM	1.53	£4.58

Consumption Summary

Electric Consumption

This facility uses 29 kWh/day and has a peak of 6.581 kW. In the proposed system, the following generation sources serve the electrical load.



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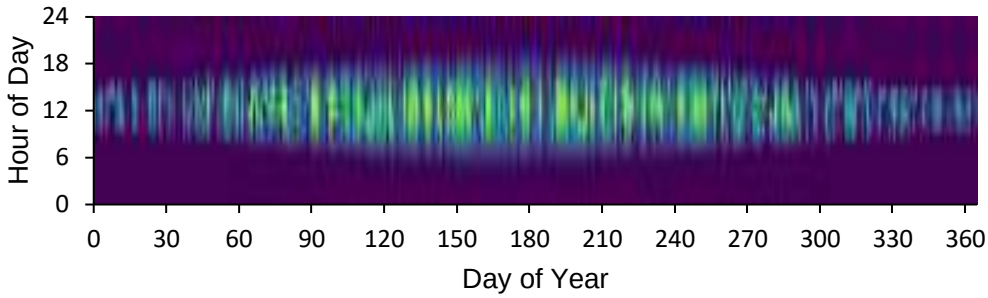
Engineering Details

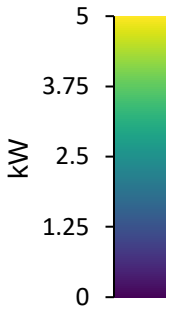
PV: Imported PV Production

The Generic PV system has a nominal capacity of 6.50 kW. The annual production is 6,241 kWh/yr.

Rated Capacity	6.50 kW
Capital Cost	£4,000
Specific Yield	960 kWh/kW
PV Penetration	59.0 %

Total Production	6,241 kW
Maintenance Cost	50.0 £/yr
LCOE	0.0442 £/kWh



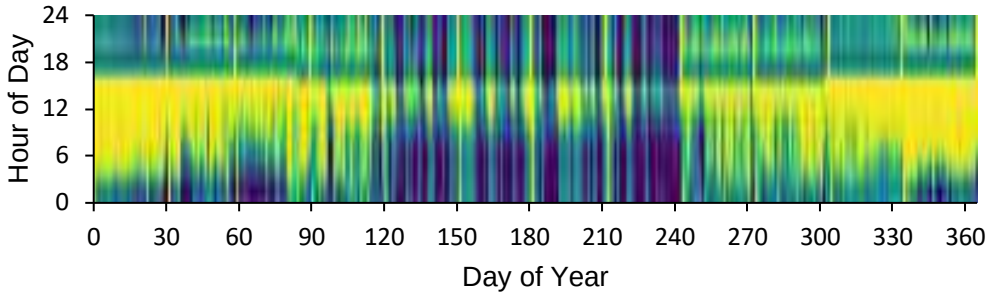


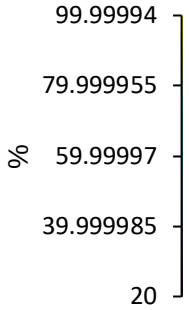
Storage: BYD 15.4kWh LVL 48V

The Fortress Power storage system's nominal capacity is 31.7 kWh. The annual throughput is 7,270 kWh/yr.

Rated Capacity	31.7 kWh
Annual Throughput	7,270 kWh/yr
Maintenance Cost	100 £/yr
Autonomy	21.0 hr

Expected Life	12.0 yr
Capital Costs	£9,800
Losses	341 kWh/yr


Hour of Day
24
18
12
6
0
0
30
60
90
120
150
180
210
240
270
300
330
360
Day of Year

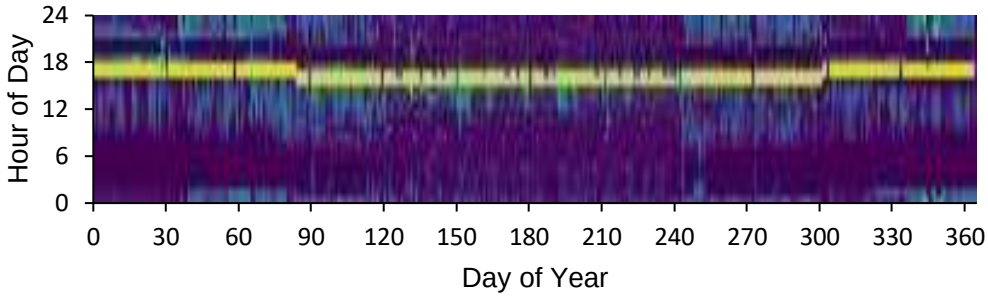

99.99994
79.999955
%
59.99997
39.999985
20

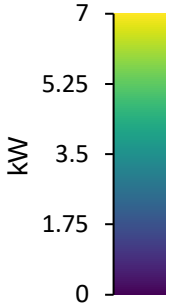
Engineering Details

Converter: System Converter

Capacity	6.50 kW
Mean Output	1.16 kW
Minimum Output	0 kW
Maximum Output	6.50 kW
Capacity Factor	17.8 %

Hours of Operation	6,389 hrs/yr
Energy Out	10,123 kWh/yr
Energy In	10,656 kWh/yr
Losses	533 kWh/yr





Cash Flows

Project Lifetime	25 years	Expected Inflation Rate	5.0%
Nominal Discount Rate	8.0%	Real Interest Rate	2.9%

Year	1	2	3	4	5	6	7	8	9	10
BYD 15.4kWh LVL 48V	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)
Flux	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)
Imported PV Production	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)
System Converter	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)

Year	11	12	13	14	15	16	17	18	19	20
BYD 15.4kWh LVL 48V	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)
Flux	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)
Imported PV Production	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)
System Converter	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)

Year	21	22	23	24	25
BYD 15.4kWh LVL 48V	(£100.00)	(£100.00)	(£100.00)	(£100.00)	(£100.00)
Flux	(£1,352)	(£1,352)	(£1,352)	(£1,352)	(£1,352)
Imported PV Production	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)
System Converter	(£50.00)	(£50.00)	(£50.00)	(£50.00)	(£50.00)

Utility Bill Details

Utility Monthly Summary - Current System

Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Energy Purchased (kWh)	Peak Load (kW)	Energy Charge	Demand Charge	Demand Response	Fixed Charge	Minimum Charge	Taxes	Total
January	1,539	0	1,539	6.36	£507.92	£0.0	£0.0	£13.02	£0.0	£0.0	£520.95
February	1,140	0	1,140	4.82	£376.13	£0.0	£0.0	£11.76	£0.0	£0.0	£387.89
March	1,358	0	1,358	4.46	£447.32	£0.0	£0.0	£13.02	£0.0	£0.0	£460.35
April	862	0	862	4.35	£284.48	£0.0	£0.0	£12.60	£0.0	£0.0	£297.09
May	479	0	479	6.48	£158.46	£0.0	£0.0	£13.02	£0.0	£0.0	£171.48
June	399	0	399	3.17	£131.79	£0.0	£0.0	£12.60	£0.0	£0.0	£144.39
July	406	0	406	3.17	£134.07	£0.0	£0.0	£13.02	£0.0	£0.0	£147.10
August	404	0	404	3.17	£133.08	£0.0	£0.0	£13.02	£0.0	£0.0	£146.10
September	865	0	865	4.35	£285.62	£0.0	£0.0	£12.60	£0.0	£0.0	£298.22
October	878	0	878	4.35	£289.75	£0.0	£0.0	£13.02	£0.0	£0.0	£302.77
November	873	0	873	3.52	£287.99	£0.0	£0.0	£12.60	£0.0	£0.0	£300.59
December	1,383	0	1,383	6.58	£456.43	£0.0	£0.0	£13.02	£0.0	£0.0	£469.46
Annual	10,585	0	10,585	6.58	£3,493	£0.0	£0.0	£153.34	£0.0	£0.0	£3,646

Utility Monthly Summary - Proposed System

Month	Energy Purchased (kWh)	Energy Sold (kWh)	Net Energy Purchased (kWh)	Peak Load (kW)	Energy Charge	Demand Charge	Demand Response	Fixed Charge	Minimum Charge	Taxes	Total
January	1,678	248	1,430	6.36	£378.63	£0.0	-£22.52	£13.02	£0.0	£0.0	£369.13
February	1,314	337	977	4.82	£250.02	£0.0	-£35.05	£11.76	£0.0	£0.0	£226.74
March	1,350	389	960	4.46	£244.74	£0.0	-£20.52	£13.02	£0.0	£0.0	£237.25
April	599	340	259	4.35	£54.68	£0.0	£0.0	£12.60	£0.0	£0.0	£67.29
May	112	348	-236	6.48	-£75.95	£0.0	£0.0	£13.02	£0.0	£0.0	-£62.93
June	49.1	393	-344	3.17	-£101.12	£0.0	£0.0	£12.60	£0.0	£0.0	-£88.52
July	65.7	374	-308	3.17	-£93.37	£0.0	£0.0	£13.02	£0.0	£0.0	-£80.35
August	98.6	319	-220	3.17	-£70.82	£0.0	£0.0	£13.02	£0.0	£0.0	-£57.79
September	774	398	376	4.35	£82.10	£0.0	£0.0	£12.60	£0.0	£0.0	£94.71
October	1,016	431	584	4.35	£138.50	£0.0	£0.0	£13.02	£0.0	£0.0	£151.52
November	1,023	328	695	3.52	£174.51	£0.0	-£14.13	£12.60	£0.0	£0.0	£172.98
December	1,699	371	1,329	6.58	£330.91	£0.0	-£21.66	£13.02	£0.0	£0.0	£322.27
Annual	9,778	4,277	5,501	6.58	£1,313	£0.0	-£113.88	£153.34	£0.0	£0.0	£1,352

Glossary Section

Annualized Savings
The difference in annualized cost between the base case system and the proposed system. The annualized cost is the cost that, if it were to repeat in every year of the project lifetime, would give the same net present cost as the actual cash flow sequence.

Capital Investment
The capital investment is the additional installed cost of the proposed system relative to the base case system at the start of the project.

Internal rate of return
Internal rate of return (IRR) is the discount rate at which the base case and proposed system have the same net present cost. HOMER calculates the IRR by determining the discount rate that makes the present value of the difference of the two cash flow sequences equal to zero.

Net Present Cost
The total net present cost (NPC) of a system is the present value of all the costs the system incurs over its lifetime, minus the present value of all the revenue it earns over its lifetime. Costs include capital costs, replacement costs, O & M costs, fuel costs, emissions penalties, and the costs of buying power from the grid. Revenues include salvage value and grid sales revenue. HOMER calculates the total NPC by summing the total discounted cash flows in each year of the project lifetime.

Net Present Value
Net Present Value (NPV), also referred to as net present worth, is the difference between the net present costs of the base case system and the proposed system.

Return on Investment
Return on Investment (ROI) is the yearly cost savings relative to the initial investment. The ROI is the average yearly difference in nominal cash flows over the project lifetime, divided by the difference in capital cost.

Simple payback
Simple payback is the number of years at which the cumulative cash flow of the difference between the proposed system and base case system switches from negative to positive. The payback is an indication of how long it would take to recover the difference in investment costs between the proposed system and the base case system.

Total Annualized Cost
Total Annualized Cost is the annualized value of the total net present cost. The annualized cost of a component is the cost that, if it were to occur equally in every year of the project lifetime, would give the same net present cost as the actual cash flow sequence associated with that component. HOMER calculates annualized cost by first calculating the net present cost, then multiplying it by the capital recovery factor.

HOMER Energy

ABOUT HOMER ENERGY

HOMER software is used by more than 200,000 users in 193 different countries.

HOMER Energy is the world's leading microgrid modeling software company. The Hybrid Optimization of Multiple Energy Resources (HOMER) software helps engineers and project developers navigate the complexities of designing cost-effective and reliable microgrids that combine traditional and renewable generation sources.

HOMER evaluates thousands of variables to compare value streams, assess system options, and provide risk-mitigation and cost reduction strategies. The software includes hundreds of preconfigured components to offer detailed insight, while addressing the modeling requirements of all major microgrid segments.

HOMER software is utilized by over 200,000 users in 193 countries and is trusted by governments, financial institutions, military agencies, utilities, energy systems integrators, and NGOs to design hybrid power systems. In the last decade, HOMER has demonstrated its effectiveness for analyzing complex distributed energy systems, including grid-tied hybrid renewable microgrids and situations where the grid is insufficiently reliable, such as islands and remote communities.

ABOUT HOMER GRID

HOMER Grid is a powerful software solution for modeling hybrid energy systems and evaluating options to reduce electricity expenditures. It is a robust tool that combines engineering and economics information in one comprehensive model while rapidly performing complex calculations to determine the value of self-consumption, demand charge reduction, and energy arbitrage.

HOMER Grid allows users to compare multiple components and design outcomes, identify points at which different technologies become cost-competitive, and consider options for minimizing project risk and determining the most economic design. With integrated access to more than 20k tariffs in the US, Canada, and Mexico, and the ability to model any tariff, HOMER Grid simulates real-world performance to deliver informed choices for system design and optimization.