

FRANKLIN**WH**



Power Price Protection Franklin**WH** Net Present Value in Time of Use Tariffs

Franklin**WH**

Whole **H**ome Energy Storage

INTRODUCTION

A high capacity multi-feature Energy Storage System (ESS), such as the Franklin Home Power (FHP) system, brings consumers power price protection savings relative to historically high and increasing utility peak pricing. The FHP enables grid electricity consumption avoidance during daily peak rate periods which adds approximately between \$5,200 and \$13,800 in net present value (NPV)² to a home's value.

Historically, homeowners were able to save money simply by adding a solar photovoltaic system to their homes but recent rule changes in California have changed the calculation by ending Net Metering and moving to a Net Net Billing Tariff (NBT). This means that with the addition of a FranklinWH ESS to the home, the homeowner may use the FHP to automatically precisely deploy power during peak rate periods to reduce utility bills and enhance the net present value of a home's electrical system.

When used in Time of Use (TOU) mode, the FranklinWH high capacity residential ESS allows homeowners to defer electrical usage from times of day when electrical utility rates are high to times of day when rates are lower. When coupled with a modestly sized solar photovoltaic (PV) system, the return on a homeowner's investment for an FWH system exceeds that of lower priced, lower capacity options.

The FranklinWH system includes the aGate intelligent panel to manage the use of each energy source, grid, solar, generators and batteries, and the aPower batteries to provide energy storage. Each FranklinWH aPower X battery has 13.6 kWh usable capacity which can be used to maximize avoidance of electrical usage during peak periods.

Power Price Protection concept introduction

Inflated electrical prices coupled with recent decreases in ESS appliance prices have resulted in attractive homeowner ROI² rates of approximately 31% when adding a FranklinWH ESS to a home solar photovoltaic (PV) system. Homeowners protect themselves from high variable utility costs by installing a FranklinWH ESS. The homeowner in a California TOU utility area adds at least \$5,200 of NPV to their home by installing a FranklinWH home battery. These ROI and NPV values are for PG&E utility territory and are more conservative than analyzing SCE and SDGE utility territories.

Household savings comes **from consistent daily avoidance** of electricity purchase during peak rate hours. The next section reviews economics of consistent daily peak rate period avoidance.

Lower upfront cost of TOU only product still results in lower NPV to household than FranklinWH system

The following series of tables analyzes the NPV to a homeowner of the FranklinWH home battery system. The analysis period is set to the warranty duration and battery throughput over the warranty period. Annual utility inflation and discount rates are conservatively assumed as 3.0% and 5.0% respectively to align more closely with typical historical rates. Higher utility inflation rates accelerate payback period and would result in a higher NPV to the homeowner. Installers across California were blindly cold call surveyed for accurate installed system costs. It was assumed all homeowners are eligible for the Federal 30% Investment Tax Credit.

1. Net Present Value (NPV) is the value of an asset's cash flow over its life, calculated for the present time.

2. Return on Investment (ROI) is the NPV of an asset divided by its cost.

As expected, the FranklinWH system’s higher warranted energy throughput and 12-year warranty offer superior net value to the homeowner. Table 1 calculates an example of savings through the warranty period.

Installed System Cost (1+1)	(\$ 16,999)												
Investment Tax Credit @ 30%	\$ 5,100												
Net Homeowner Cost	(\$ 11,899)												
	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12
On-Peak kWh Rate (Annual Average)		\$ 0.46	\$ 0.48	\$ 0.49	\$ 0.51	\$ 0.52	\$ 0.54	\$ 0.55	\$ 0.57	\$ 0.59	\$ 0.60	\$ 0.62	\$ 0.64
Warranted Energy (MWh) Total		43	43	43	43	43	43	43	43	43	43	43	43
Warranted Energy (MWh) Annual		3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
Annual Electricity Cost Savings		\$ 1,660	\$ 1,710	\$ 1,761	\$ 1,814	\$ 1,869	\$ 1,925	\$ 1,982	\$ 2,042	\$ 2,103	\$ 2,166	\$ 2,231	\$ 2,298
Homeowner Cash Flow	(\$ 11,899)	(\$ 10,239)	(\$ 8,529)	(\$ 6,768)	(\$ 4,953)	(\$ 3,085)	(\$ 1,160)	\$ 823	\$ 2,864	\$ 4,968	\$ 7,134	\$ 9,365	\$ 11,663
Homeowner NPV	\$ 17,108	** Assumptions Battery is only used for self consumption during peak hours Consumer has sufficient onsite PV to charge the battery (s) for \$0/w Consumer has sufficient electrical demand during On-Peak Rates to fully consume the battery capacity Discount Rate 5.0% Utility Annual Inflation 3.0%											
Homeowner Net Value of FWH Battery	\$ 5,208												
Payback Period	7												
Return on Investment (ROI)	31%												

Table 1. FranklinWH aPower X economic analysis over system warranty period in PG&E utility territory

The FranklinWH system brings an NPV of \$5,208 to the homeowner over the warranty term. This NPV to Homeowners is better than the competition because of the longer warranty term and higher warranted energy throughput. The FWH 12-year warranty beyond the industry standard 10-year warranty coupled with class leading energy throughput result in more household electricity consumption deferred from peak periods.

While inflation may or may not abate in the future, utility bills are certain to continue to rise. On-peak rates for PG&E's popular EV2-A TOU PG&E rate plan are \$0.56/kWh during the 4PM to 9PM weekday window when most homeowner activity occurs. The financial analysis above centers on PG&E's utility rates for the most conservative analysis. PG&E rates are the lowest relative to Southern California Edison (SCE) and San Diego Gas & Electric (SDGE) which yields the most conservative ROIs and NPVs to homeowners. Please see Appendix 1 for SCE and SDGE specific rate analysis. Analysis summary table from Appendix 1 is shown below for reference.

For more details on FranklinWH systems and net present value, refer to <Power Price Protection: FranklinWH vs. Competitors white paper>

Utility	Tariff Name	Peak Rate	ROI	NPV
SDGE	TOU-DR-2	\$ 0.69565	81%	\$ 13,786
SCE	TOU-D-PRIME	\$ 0.6231	59%	\$ 10,008
PGE	EV2-A TOU	\$ 0.46	31%	\$ 5,208

Table A.1 Summary of SDGE and SCE Power Price Protection analysis

SCE rates for the popular TOU-D-PRIME rate payers are charged up to \$0.62 per kWh during the peak window. SDGE rate payers are charged up to \$0.82 per kWh, the highest rate in the nation, which further improves FHP ROI and payback period. In order to save money during a time when inflation is raising costs in all aspects of life, homeowners may elect to reduce their activity when they get home from work; but this is not a practical choice for many people.

Switching to natural gas appliances does not provide a relief from inflation or peak period electrical rates, as that fuel has also seen significant price increases.

Offset utility usage during peak electrical rate periods using FranklinWH

A higher capacity ESS, such as the FranklinWH system, has the capacity to completely offset residential electrical usage during the weekday peak 4PM to 9PM window. Weekend rates during the 4PM to 9PM peak window typically remain identical.

The FranklinWH's aPower X AC-coupled, class leading 43 MWatt-hours (43,000 kWh equivalent) throughput battery with a 12-year warranty ensures the homeowner is guaranteed to substantially lower peak period electrical grid consumption more than competitors' home battery products. Table 2 shows the calculation from warranty to daily displaced grid energy.

Warranty terms	43 Megawatt-hours or 12 years, whichever comes first
Warranty equivalent	43 Megawatt-hours equals 43,000 kWh
Straight-line annual performance equivalent	43,000 over 12 years = 3,583 kWh annually
Straight-line daily performance equivalent	9.82 kWh daily displaced

Table 2. FranklinWH warrantied performance equivalent to daily usage

9.82 kWh daily consumption during the 5 hour peak rate window is about 2 kWh per hour which is easy to achieve with the average household. Common post-work day and early evening activities include using air conditioners or heat pumps, electric ovens and stoves, and electric hot water heaters. It is impractical to imagine modern life without these large electric appliances and hard to sell electrical usage behavioral changes after a long work day. By purchasing and installing a FranklinWH aPower home battery, homeowners purchase 9.8 kWh of daily power pricing protection for their household.

Appendix A – Utility rates and additional comparisons for SCE and SDGE

Utility bill rate peaks are more acute in Southern California Edison (SCE) and San Diego Gas & Electric (SDGE) utility territories, as can be seen from the rate tables below.

Utility	Tariff Name	Peak Rate	ROI	NPV
SDGE	TOU-DR-2	\$ 0.69565	81%	\$ 13,786
SCE	TOU-D-PRIME	\$ 0.6231	59%	\$ 10,008
PGE	EV2-A TOU	\$ 0.46	31%	\$ 5,208

Table A.1 Summary of SDGE and SCE Power Price Protection analysis

San Diego Gas & Electric

SDGE has the highest residential peak electrical prices in the country. This analysis is performed using the TOU-DR-2 rate schedule for SDG&E. Weekday Schedule Table A.2.1 makes it easy to see how drastically peak rates differ from normal rates. Normal off-peak rates for Period 2 are already considered elevated relative to national average utility rates.

Weekday Schedule																								
	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 am	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4
Feb	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4
Mar	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4
Apr	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4
May	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4
Jun	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2
Jul	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2
Aug	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2
Sep	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2
Oct	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2	2
Nov	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4
Dec	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	4	4

Figure A.2.1 – SDGE Weekday rate schedule

Period 1	\$ 0.69565 per kWh
Period 2	\$ 0.40502 per kWh
Period 3	\$ 0.54425 per kWh
Period 4	\$ 0.47235 per kWh

Table A.2.1 SDG&E utility territory - rate schedule TOU-DR-2

Homeowners obtain higher NPV and ROIs than shown in the baseline PGE analysis above when they utilize a FranklinWH home battery to avoid peak electrical prices in SDGE because SDGE peak period utility rates are substantially higher than PGE.

Installed System Cost (1+1)	(\$ 16,999)												
Investment Tax Credit @ 30%	\$ 5,100												
Net Homeowner Cost	(\$ 11,899)												
	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12
On-Peak kWh Rate (Annual Average)		\$ 0.70	\$ 0.72	\$ 0.74	\$ 0.76	\$ 0.78	\$ 0.81	\$ 0.83	\$ 0.86	\$ 0.88	\$ 0.91	\$ 0.93	\$ 0.96
Warranted Energy (MWh) Total		43	43	43	43	43	43	43	43	43	43	43	43
Warranted Energy (MWh) Annual		3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
Annual Electricity Cost Savings		\$ 2,493	\$ 2,568	\$ 2,654	\$ 2,724	\$ 2,806	\$ 2,890	\$ 2,976	\$ 3,066	\$ 3,158	\$ 3,252	\$ 3,350	\$ 3,451
Homeowner Cash Flow	(\$ 11,899)	(\$ 9,407)	(\$ 6,839)	(\$ 4,194)	(\$ 1,471)	\$ 1,335	\$ 4,225	\$ 7,201	\$ 10,267	\$ 13,425	\$ 16,677	\$ 20,027	\$ 23,478
Homeowner NPV	\$ 25,686	** Assumptions											
Homeowner Net Value of FWH Battery	\$ 13,786	Battery is only used for self consumption during peak hours Consumer has sufficient onsite PV to charge the battery (s) for \$0/W											
Payback Period	5	Consumer has sufficient electrical demand during On-Peak Rates to fully consume the battery capacity Discount Rate 5.0%											
Return on Investment (ROI)	81%	Utility Annual Inflation 3.0%											

Table A.2.2 FranklinWH aPower X economic analysis over system warranty period in SDG&E utility rate territory. Rate schedule TOU-DR-2

NPV analysis in SDGE territory for adding a FranklinWH battery to a home yields NPV of \$13,786 or \$13,800 and ROIs of 81%. In the analysis, only the utility rate is updated for SDGE territory, all other variables are held constant.

Southern California Edison

SCE rates are incrementally higher than PGE rates. While SCE rates are not as high as neighboring SDGE rates, they are still some of the highest in the nation.

Weekday Schedule

	12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 am	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm
Jan	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
Feb	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
Mar	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
Apr	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
May	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
Jun	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1
Jul	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1
Aug	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1
Sep	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	1	1	1
Oct	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
Nov	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4
Dec	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	3	3	3	3	3	4	4	4

Period 1	\$ 0.24304 per kWh
Period 2	\$ 0.6231 per kWh
Period 3	\$ 0.36536 per kWh
Period 4	\$ 0.22226 per kWh
Period 3	\$ 0.56566 per kWh
Period 4	\$ 0.22226 per kWh

Table A.3.1 SCE Energy Usage Charge Structure – rate schedule TOU-D-PRIME

Homeowners obtain higher NPV and ROIs than shown in the baseline PGE analysis above when they utilize a FranklinWH home battery to avoid peak electrical prices in SCE because SCE peak period utility rates are substantially higher than PGE.

Installed System Cost (1+1)	(\$ 16,999)												
Investment Tax Credit @ 30%	\$ 5,100												
Net Homeowner Cost	(\$ 11,899)												
	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12
On-Peak kWh Rate (Annual Average)		\$ 0.59	\$ 0.61	\$ 0.63	\$ 0.65	\$ 0.67	\$ 0.69	\$ 0.71	\$ 0.73	\$ 0.75	\$ 0.77	\$ 0.80	\$ 0.82
Warranted Energy (MWh) Total		43	43	43	43	43	43	43	43	43	43	43	43
Warranted Energy (MWh) Annual		3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58	3.58
Annual Electricity Cost Savings		\$ 2,126	\$ 2,190	\$ 2,256	\$ 2,323	\$ 2,393	\$ 2,465	\$ 2,539	\$ 2,615	\$ 2,693	\$ 2,774	\$ 2,857	\$ 2,943
Homeowner Cash Flow	(\$ 11,899)	(\$ 9,773)	(\$ 7,583)	(\$ 5,328)	(\$ 3,004)	(\$ 611)	\$ 1,853	\$ 4,392	\$ 7,007	\$ 9,700	\$ 12,474	\$ 15,331	\$ 18,275
Homeowner NPV	\$ 21,908	** Assumptions Battery is only used for self consumption during peak hours Consumer has sufficient onsite PV to charge the battery (s) for \$0/w Consumer has sufficient electrical demand during On-Peak Rates to fully consume the battery capacity Discount Rate 5.0% Utility Annual Inflation 3.0%											
Homeowner Net Value of FWH Battery	\$ 10,008												
Payback Period	6												
Return on Investment (ROI)	59%												

Table A.3.2 FranklinWH aPower X economic analysis over system warranty period in SCE utility rate territory. Rate schedule TOU-D-PRIME

NPV analysis in SCE territory for adding a FranklinWH battery to a home yields NPV of \$10,008 or \$10,000 and ROIs of 59%. In the analysis, only the utility rate is updated for SCE territory, all other variables are held constant.

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