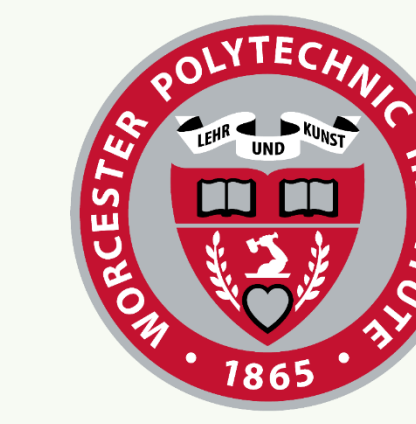


Economics of Reusing EV BATTERIES for GRID LEVEL STORAGE

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WPI

CR3

OBJECTIVE

The overall goal for this project is to determine the benefits, economic feasibility, and cost effectiveness of using recycled electric vehicle (EV) batteries as grid level storage for the remainder of their lifespan as well as to create a model that will allow consumers to predict the profitability of installing a battery system in their home.

BACKGROUND

- Lithium ion batteries are no longer useable in EV at 80% capacity
- Grid level storage increases effectiveness of renewable energy
- Supply of lithium is running low due to increasing demand
- Varying prices in energy rates makes it possible for energy storage to be profitable

METHODOLOGY

The model below was generated by the following equations:

- 1) $(\text{Average Daily Peak Price} - \text{Average Daily Off-Peak Price}) * (365 \text{ Days}) * (\text{Efficiency of Battery}) * (\text{Lifespan of Battery in Years}) = \text{Savings}$
- 2) $\text{Savings} - \text{Battery Cost} - \text{Installation Cost} - \text{Transportation Cost} = \text{Overall Profitability}$

Peak vs Off-Peak Energy Rates



PEAK SHAVING

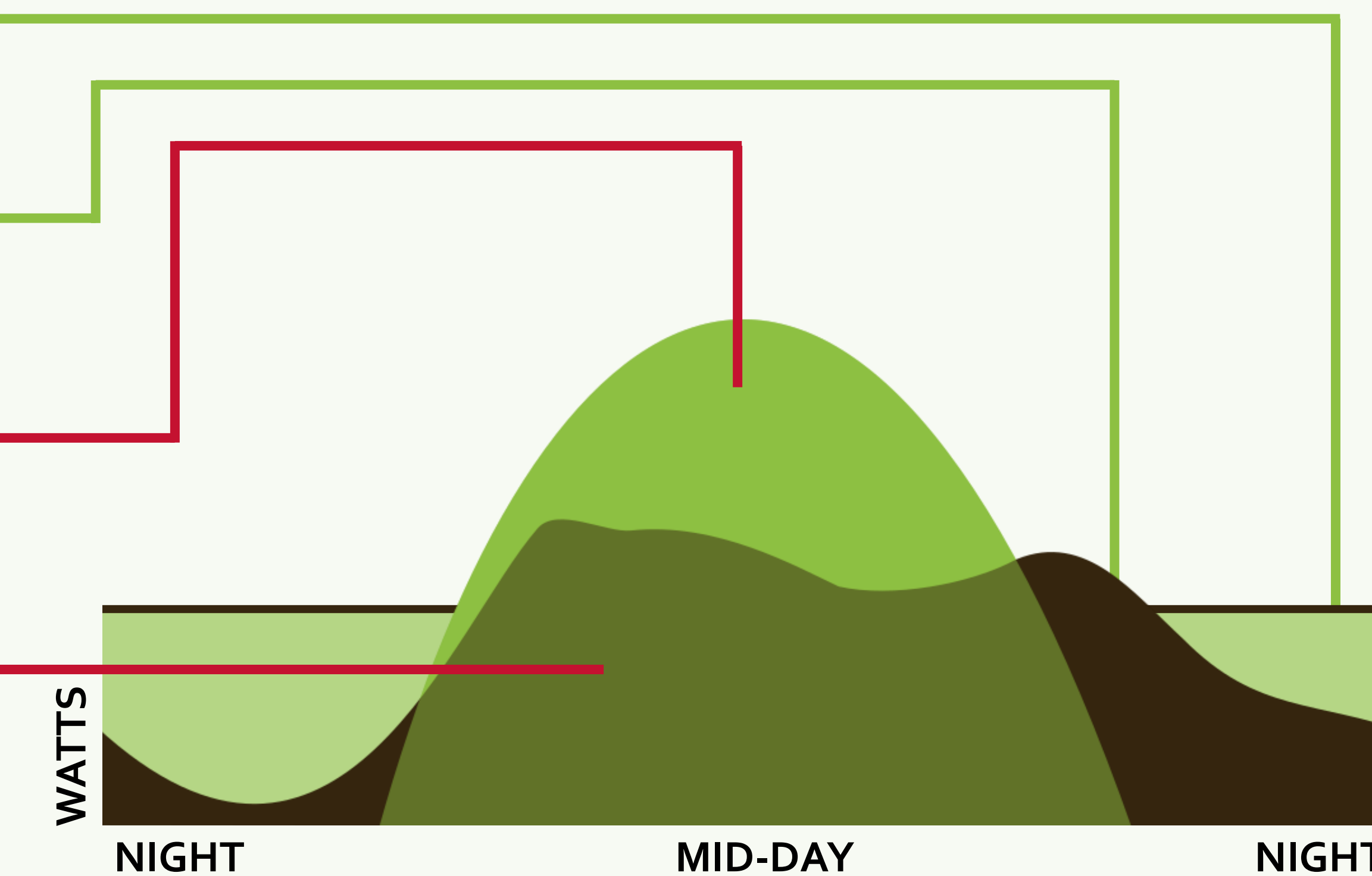
The cost of electricity varies throughout the day with the highest rates when the most people are using energy. By collecting energy at night (off-peak) a consumer can supplement their daytime energy usage saving money and stabilizing the grid.

Buy Energy From Grid

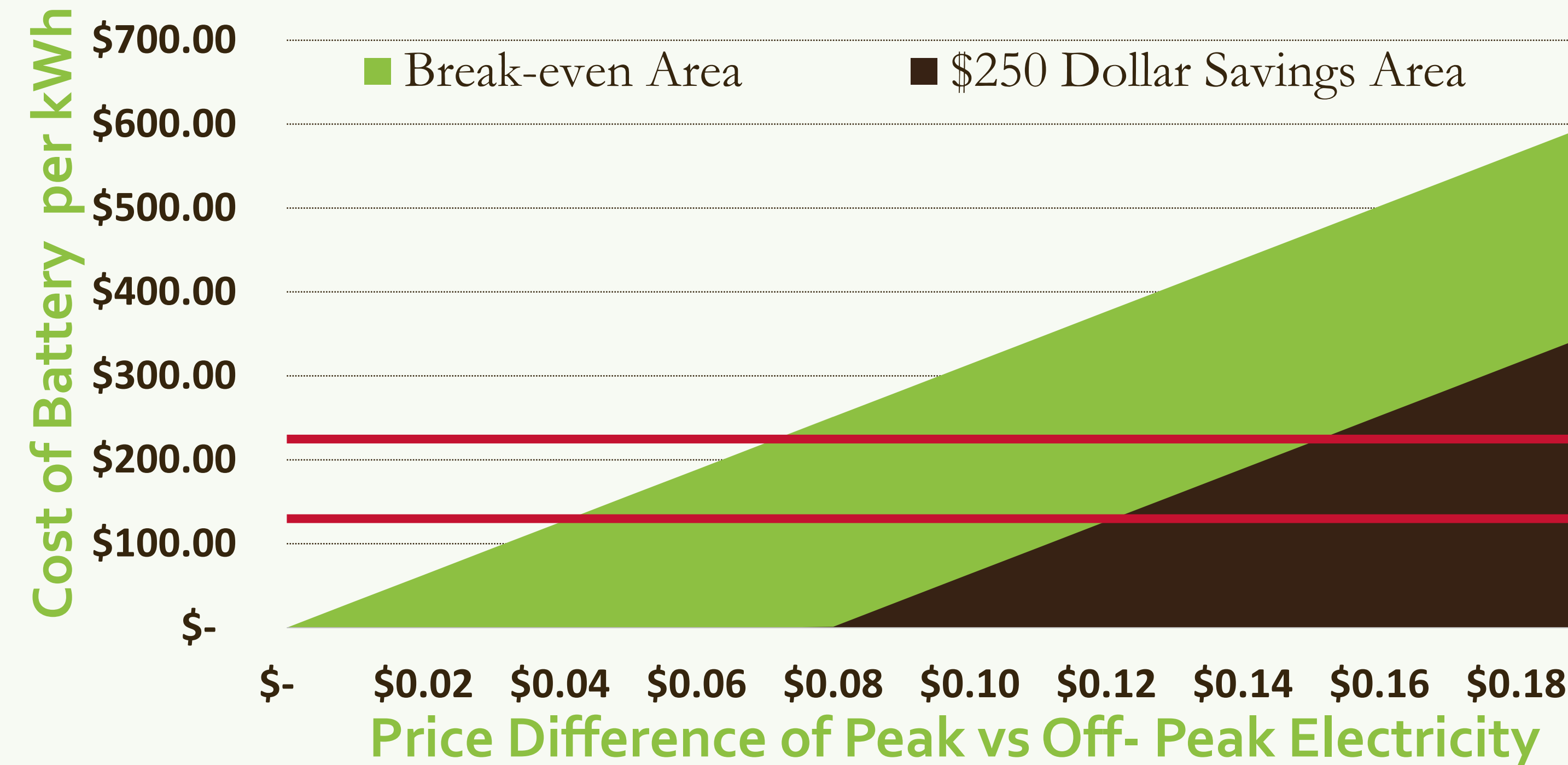
Energy Demand (supplied by grid)

Excess Energy In Cells (Sell Back to Grid)

Energy Demand (supplied by batteries)



SAVINGS PER kWh OVER A TEN YEAR PERIOD



RESULTS / RECOMMENDATIONS

The profitability of using recycled EV batteries needs to be evaluated on a case by case basis. The model we created allows consumers to select the price difference for their energy company between peak and off-peak hours as well as the cost of the battery to determine if their situation will be profitable.

CHEVY VOLT
(14.4 kWh)

NISSAN LEAF
(18 kWh)