# Solar Parking Lot Analysis: Smart Investment or Waste of Capital

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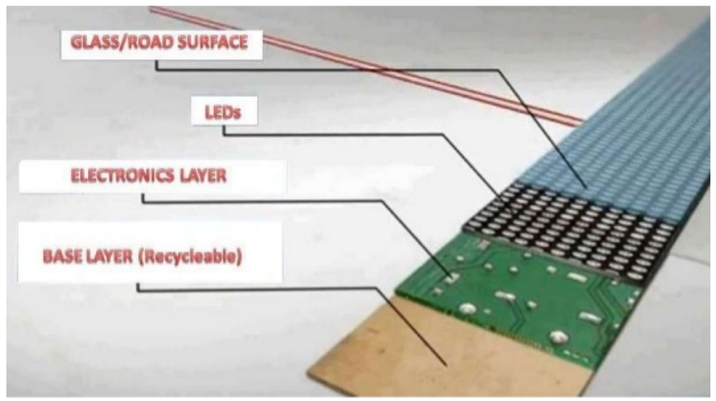
In the past decade solar panels have been developed into a sustainable and effective method for harnessing clean energy. Today, solar panels have engineered into solar roadways. Solar roadways are structurally engineered solar panels which can be installed in the Earth, driven on, and can replace the need for traditional asphalt roads. These solar roadways also include built in LEDs which mimic road lines and light up wildlife crossing the road, making these road panels a very safe alternative. This senior project is an analysis of solar roadways and their capabilities when applied to parking lots. It will specifically evaluate how effective a solar parking lot will be when installed in the local San Luis Obispo Costco parking lot. In the end, a feasibility evaluation will determine if a solar parking lot will save more money than it costs. A critical literature review and energy analysis have been conducted to acquire the most important and relevant information to conclude whether or not solar parking lots could be the future. Multiple industry professionals, who have many years of experience working with solar, and have shared their knowledge on this topic. The implementation of solar parking lots could effectively reverse energy consumption for businesses.

SOLAR ROADWAYS
A REAL SOLUTION

The company responsible for solar road panels

**Key Words:** Solar Panels, Solar Roadways, Sustainability, Energy, Costco




## Three Main Layers:

**Glass Layer:**
Specially engineered tempered glass that can withstand weights of 250,000 pounds which is 3x the weight of a fully loaded semi-truck. This glass is also textured to provide traction for cars. The rough texture will also maintain traction during rainstorms.

**Electronics Layer:**
One of the most important aspect of solar road panels, this layer consists of photovoltaic cells, which convert the solar energy into electricity. The electronics layer also contains a microprocessor which communicates with other panels to make sure they are working in unison. It also controls the LEDs which make up road lanes, "slow down" signs, etc.

**Base Layer:**
The base layer is responsible for taking the electricity created by the electronics layer and sending that electricity to the power grid. The power grid then distributes that electricity to buildings to be utilized.

## Energy Calculations:

**Energy Costco Uses:**
- 823 kW x 11 h/day = 9,053 kWh/day
- 9,053 kWh/day x 365 days/year = 3,304,345 kWh / year

**Solar Energy Harnessed:**
- 370,410 sf / (13.4 sf / 230 W) = 6,358 kW per hour
- 4 peak sunlight h x 365 days/year = 1460 peak sunlight hours / year
- 1460 h x 6,358 kW = 9,282,364 kWh per year
- 9,282,364 kWh x 69% = 6,404,831 kWh per year

## Cost Calculations:

**Investment Cost:**
- $48 / sf x 370,410 sf = $17,780,000

**Costco's Energy Bill:**
- $0.14 / kWh x 3,304,345 = $462,608.3 per year

**PG&E Excess Energy Reimbursement:**
- $0.04 / kWh x (6,404,831 - 3,304,345) = $124,019.44
- $124,019.44 + $462,608.3 = $586,622.74 per year

**ROI:**
- $17,780,000 / $586,627.74 = 30 Year ROI


**Conclusion:**

Considering the panels have a life expectancy of 20-30 years, with a 30 year return on investment, they currently are not cost feasible to justify spending this amount of money on a solar parking lot. Possibly in the next decade they will be more cost feasible and could be an investment worth considering.

How Solar Road Panels Work