Here Comes the Sun

California has a fever. Six out of the ten most polluted cities in the United States are located in the Golden State and one third of California residents live in areas where ozone levels exceed the federal health standard (Kirkpatrick, 2017). California has a fever, and the only prescription for this fossil fuel addiction is solar energy. Solar is clean, cost-efficient, and compatible with California's sun-kissed climate. It is vital that solar energy development be ramped up immediately if climate change and rampant pollution are to be effectively combatted throughout the state. Solar is practical, has precedence in California, is cost effective, and has access to new developments in grid and photovoltaic cell development that can help its viability.

California is a perfect place to implement solar, given the state's past use of the technology and solar's environmentally-friendly features. California has 580,741 solar projects in progress and 4,558 megawatts' worth of cells already installed (Paulos, 2016). The Mojave Desert alone boasts 1,000 acres of solar plants, with enough energy to power 160,000 households (Goldenstein, 2015). In 2016, solar energy powered 4,732,000 homes, providing approximately 466 watts per person (California, 2017). California's climate is also well-suited to exploit solar energy's full potential, with an average 261 days of total sunlight across the entire state (Days, 2017). Enhancing California's solar energy resources will resolve the state's environmental and energy needs in a clean, efficient manner.

Another reason for solar's practical application is that photovoltaic cells are intrinsically clean; they produce no greenhouse gas emissions and require no external resources to maintain operation. They are also long-lasting: at worst, cells only degrade to 90% efficiency in 35 years (NREL, 2016). This is because they induce current through the displacement of electrons, instead of extracting energy from chemical reactions, like fossil fuels or nuclear energy. In contrast,

fossil fuels require extensive construction, maintenance of facilities, and excavation of natural resources for operation - all of which are not applicable to solar. These contribute to solar being cheaper than coal or nuclear in a place like California, especially as resource scarcity forces fossil fuel costs even higher (Patel. 2015).

Conversely, recent advances in solar cell efficiency and electrical stability have made solar cheaper and more viable. Although conventional silicon crystalline solar cells can only convert around 15% of solar light into electricity (at a theoretical maximum efficiency of 50%), new solar cells using layered photovoltaic materials on top of the base silicon gives the solar cell the ability to absorb a greater range of the light spectrum, thereby increasing its efficiency in converting electrical energy (Stanford, 2017; Soloman, 2016). These new cells boast practical efficiencies of 30 and 35 percent, respectively (Stanford, 2017; Soloman, 2016). By investing in newer, more efficient solar cells, there is no longer an issue of power consumption, but instead one of power storage and usage.

Improving grid infrastructure and carrying capacity, which have remained untouched since Edison's time, is the logical solution to this problem. Renewable resources, including solar and wind, don't always run at maximum efficiency, creating fluctuations between extremes that can cause electrical instability and blackouts (Blumsack, 2015; Diesendorf, 2016). However, this problem can be solved by diversifying the geographic location of the panels (Diesendorf, 2016)). The smart grid allows for two-way communication between electricity sources and electricity consumers, resulting in greater flexibility of energy expenditure and a more stable grid. Power can be rerouted automatically, allowing for more fluid transitions between renewable and traditional energy. The smart grid is anticipated to cost between $338 billion and $476 billion, but this pales in comparison to the $1.3 trillion to $2 trillion return in benefits over the

first 20 years of its lifespan (Behr, 2011). The ability to reallocate energy can also be used during natural disasters that may take place in the Californian region, such as earthquakes and floods. Along with the smart grid, installing an electrical superhighway would be beneficial as well. Currently, renewable energy sources must be local, as there is no way to transport large quantities of electricity over large distances. The superhighway is a way for mass amounts of power to span hundreds of miles, so more solar farms could be opened in remote locations, but still provide power to areas of high population density. This would satisfy the need for geographic diversity discussed earlier. Through the implementation of the smart grid and solar highway, solar power can be harnessed, stored, and distributed more effectively.

The cost of installing new solar technology is insignificant compared to the benefits it provides. Although more efficient solar cells are still in development, they are estimated to cost less than alternative cells due to a low-cost manufacturing process. In the meantime, costs for traditional solar technology have dropped 64% in the last five years. Due to power inverters, panel componentry and even wiring and cable housing products getting cheaper, the price of solar power has been steadily declining from $5.24 per watt in 2014 to $4.28 per watt in 2015 and $3.57 per watt in 2016, with projected solar costs "[falling] below $1 per watt by 2020" (Go Solar California, 2016; Paulos, 2016). With decreasing solar cell costs and the promise of even cheaper ones, as well as the high return on investment it provides, solar power proves to be a financially feasible avenue.

The widespread availability of solar energy allows it to be implemented across the state within the next five years, contributing immensely to alternative energy generation. Furthermore, recent advancements of solar panels allow for efficient energy conversions, generating enough power for practical use. Implementing more solar power requires modifications to the electric

grid, propagating the need to revolutionize our archaic power grid into a smart grid and superhighway. In order to save our world from the air pollution that fossil fuels expel and prepare for the inevitable day when non-renewable energy is exhausted, a definitive step towards solar energy is imperative.

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