

Smart Solar Powered Charge Stations for Electric Vehicles

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Goals

1. Development of effective decision support tools
2. Robust solar powered charge station designs
3. Successful business plans
4. Reduced greenhouse gas emissions
5. Improved air quality
6. Electrification of transportation
7. Reduced use of petroleum

Abstract:
Smart solar powered charge stations (SSPCS) and smart microgrids that control power flow to electric vehicles at work sites, shopping malls, restaurants, schools, parks, etc. will become important as the number of electric vehicles (EVs) increases. Progress on the development of SSPCS will be presented. This will include the rationale for SSPCS and a triple bottom line analysis of SSPCS. Wide adoption of SSPCS will enhance and support the electrification of transportation and market penetration of EVs. Business models that include free parking and charging at SSPCS can be implemented to encourage people to electrify their transportation. Business models that include charge station control by power companies can include use of the power flow to the vehicles as a form of spinning reserve. Convenient and inexpensive charging of EVs is desirable and beneficial to all because significant electrification of transportation will impact gasoline supplies and prices over time.

Internet site for more information: <http://www.engg.ksu.edu/CHSR/sustainability/Solar/SEASP.html>

Fthenakis (2012) states "A full accounting of the cost of electricity that includes externalities shows that photovoltaics is already cost-competitive with coal in the United States."

Reference: Fthenakis, V. 2012. "Sustainability Metrics for Extending Thin-Film Photovoltaics to Terawatt Levels," MRS Bulletin 37: 425-430.

Environmental Issues

1. Greenhouse gas emissions
2. Air quality
3. Land use
4. Impacts on temperature
5. Impacts on rainfall, flooding, and droughts

Economic Issues

1. Cost of solar powered charge stations
2. Cost of greenhouse gas emissions
3. Air quality costs
4. Cost of gasoline and diesel
5. Defense costs for petroleum
6. Associated health care costs
7. Transmission costs
8. Value of frequent charging
9. Peak power benefits and costs

Social Value Issues

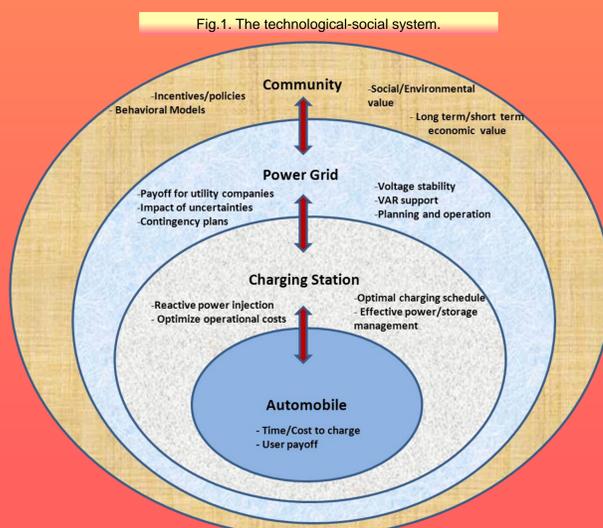
1. Shaded parking
2. Convenience
3. Employment
4. Air quality
5. Climate change

Business Models

1. Free parking and free charging
2. Utility sells power
 - A. As requested
 - B. Interruptible service
3. Parking lot owner rents spaces with free charging

Decision Support Tool Inputs

1. Charge needs of customers
2. Weather data and forecast
3. Anticipated power needs
4. Sources of power and associated costs
5. Objectives of each party
6. Relative importance and costs for interruptible power needs
7. Business model data
8. Historical experiences



Locations for Solar Powered Charge Stations

1. Office parking lots
2. Plant sites
3. Mall parking lots
4. Restaurants
5. Schools
6. Museum parking lots
7. Hospitals
8. Libraries

Fig.4. Architecture for decision support tool.

