

## ***Analysis and Market Planning for Distributed Hydrogen Energy Stations***

### **Participants:**

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Client: DTE

Potential advisors: Greg Keoleian, Tom Lyon

### **Purpose of study:**

DTE, a holding company that includes Detroit Edison electric company, has constructed an operational hydrogen energy demonstration project in conjunction with DaimlerChrysler, BP, the Department of Energy, and other participants. The project uses electric power from the grid and from on-site solar cells to split the hydrogen atoms from water molecules. The hydrogen is then stored and used either in fuel cells to produce electricity, or is dispensed at a pumping station that can be used to refuel hydrogen powered automobiles. Now that the project is set up, DTE will collect data that will be used to study the optimum uses for hydrogen under various scenarios. Although data is being collected, the company currently lacks a good analytical model that can be used to evaluate the financial performance of the model under a variety of scenarios. The primary goal of this project will be to develop this model and describe potential scenarios for use of hydrogen power, so that a better understanding of the uses of hydrogen can be developed. The lessons from this project are especially applicable to the development of hydrogen energy infrastructure in northern climates, but will have nationwide and potentially global significance.

### **Research Questions:**

- What would a robust model of alternative energy production that is useful in strategic energy company decision-making look like?
- Is there a market for this technology and system?
- What would have to change (regulation, production costs, etc) in order to make hydrogen energy more viable?
- What are the key obstacles/opportunities for making hydrogen a viable energy source?
- What are the most likely uses of hydrogen energy?
- What are regulatory and environmental policy issues related to hydrogen energy production?
- What would a life-cycle energy and environmental and financial cost analysis look like?

### **Research Procedures:**

*Research methods are likely to include:*

- Review of current literature on hydrogen energy production and integration into the United States energy generation portfolio
- Review of financial models currently used in the energy industry.
- Comprehensive market analysis using a variety of analytical tools.

- Experimentation with a variety of potential model types
- Interviews with local and state government officials to better understand the current and potential future regulatory environment as it relates to hydrogen energy.
- Examination of energy demand/supply forecasts

*Expertise needed:*

- Substantive knowledge of energy production.
- Substantive knowledge of financial marketing.
- Understanding of consumer demand for “green” products.
- Basic understanding of economics.

*Resources needed:*

- Access to current market data.
- Access to data from DTE’s hydrogen energy park.
- Access to publications and documents related to wind energy markets.
- Funding for transportation required to conduct research.
- Any particular research equipment (software, etc)?

**Proposed timeline:**

Initiation date – April 30: Project scoping, literature and regulatory review, and review of existing models.

April 30- August 30: Initial drafting of financial models and scenario outlines. Ongoing review of trade publications and other literature as needed.

September 1 – September 15: Review progress of project with team, advisors and DTE.

September 15 – October 31: Revise models and scenarios, plug in data from hydrogen energy park, repeat.

October 31-December 20: Finalize models and scenarios, begin to draw conclusions about most likely scenarios and their impact on the development of a hydrogen energy infrastructure.

December – April: Finalize analyze and recommendations; write report.

**Standards to ensure a quality product:**

- Regular review by experts in the industry and project advisors.
- Review of model by outside authorities for validity.
- Individual accountability mechanisms for project team members.

**Anticipated findings:**

We believe this project will help us to gain a greater understanding of the feasibility of hydrogen as a major energy source in the United States. We will understand the financial implications of hydrogen to a major energy provider (DTE Energy) as well as the major challenges that DTE faces in utilizing hydrogen as a major energy source.

**Literature Review:**

There is a great deal of literature available on hydrogen and its use as a major energy source in the future. Sources include: companies, government (Department of Energy), and environmental think tanks (such as RMI). This literature will help us in framing the

problem and providing good background about current trends in energy and energy forecasts. There is also literature on what the future of a hydrogen economy would look like in the future.