Solar/Wind Hydrogen Fuelling Station at IIT

IPRO 304b Project Plan
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Team Members

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Alex Bartman          Alija Hubjer          Mahdi Mohammad
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Abdoulaye Diao        Dimitre Kolev        Douglas Stauber
Joseph Gottardo       Adam Mancina         Edwin Vargas
                                      Mark Witkowski

Objective

The objective of this project is to design a renewably powered hydrogen fuelling station at IIT to be part of the Illinois Hydrogen Highway. Based on past recommendations a project site will be selected for the fuelling station. This site will also include a wind turbine and solar panel array to capture renewable energy. The principles of process design will be used to layout hydrogen production, storage, and implementation of renewable energy technologies. The stations will meet all local codes for hydrogen storage, production, and usage. This station will be designed in conjunction with the House of the Future, which is part of IIT’s Sustainable Village.

Background

This project is part of a state-wide effort to create a hydrogen transportation infrastructure to encourage hydrogen use in Illinois transportation. This effort will support the widespread deployment of environmentally friendly technology called the hydrogen-powered fuel cell. Hopefully, this initiative will help move us toward a full hydrogen economy limiting the use of fossil fuels.

Hydrogen is the most abundant element in the universe. It does not naturally exist in large quantities or in high concentrations on Earth, so it must be produced from other compounds. Hydrogen can be produced from fossil fuels; renewable sources such as wind, solar, or biomass; nuclear or solar-powered thermonuclear reactions; and solar photolysis or biological methods. Various methods of production have unique needs in
terms of energy and generate unique by-products or emissions. Between 55-60% of the hydrogen being produced in the world today is produced by steam reformation. Hydrogen is also produced via water electrolysis using electricity supplied by coal, nuclear, solar, and wind technologies.

Research Methodology

The goals of this IPRO will be met using the following techniques:
- Researching current technologies and codes
- Locating Project Site
- Determining best technologies for project
- Design of station, hydrogen production, and mechanical systems
- Presenting proposal for renewably powered hydrogen fuelling station

Expected Results

Hydrogen Production and Storage Team
- Research hydrogen production methods and decide on viable options
- Work with renewable energy team to size hydrogen production components and storage including tank specs and costs
- Determine compressor specifications for our application and, if possible, determine costs
- Design hydrogen transportation system including pipes, interconnections, safety/relief valves, hydrogen venting system and include appropriate specifications
- Provide complete fuelling system schematics and write final proposal

Renewable Energy and Simulation Team
- Specify and determine the size of the renewable energy components for hydrogen generation and electricity needs.
- Determine the cost of components, other engineering work and installation of the system.
- Take wind measurements at the potential site of the wind turbine and construct a plot showing the wind data for the final report
- Compile information and write final proposal
IPRO 301 Coordination, Location, Layout and Design Team

- Choose a site on IIT’s campus for the fuelling station including comprehensive reasoning as to why the site was chosen
- Design the station to house the components specified by the other teams and that is aesthetically pleasing
- Work with the IPRO 301 team so that the fuelling station and House of the Future are not only compatible, but also complement each other
- Create AutoCAD models and/or renderings of fuelling station
- Build physical scale model of fuelling station
- Compile information and write final proposal

Code and Safety Team

- Determine safety codes acceptable to the City of Chicago
- Assist other teams in identifying applicable codes
- Compile information

Project Budget

- Model Costs - $150
- Code Books - $150

Individual Team Member Assignments

Niyanta Arora - IPRO 301 Coordination, Layout and Design Team Leader
Alex Bartman - Hydrogen Production and Storage Team Leader
Michael Condei - Renewable Energy and Simulation
George Derrick - Renewable Energy and Simulation
Abdoulaye Diao - Code and Safety
Joseph Gottardo - Renewable Energy and Simulation
Kendra Hardin - Renewable Energy and Simulation Team Leader, IPRO Team Leader
Alija Hubjer - IPRO 301 Coordination, Layout and Design
Matthew Isoda - Code and Safety Team Leader
Aydra Kalynchuk - Code and Safety
Dimitre Kolev - Hydrogen Production and Storage
Adam Mancina – IPRO 301 Coordination, Layout and Design
Amy McDowell - Hydrogen Production and Storage
Mahdi Mohammad - Hydrogen Production and Storage
Bilques Qureshi – Controller Logic
Wojciech Sierka - Renewable Energy and Simulation
Douglas Stuber - IPRO 301 Coordination, Layout and Design
Edwin Vargas – IPRO 301 Coordination, Layout and Design, Meeting Minutes
Schedule Tasks and Milestone Events