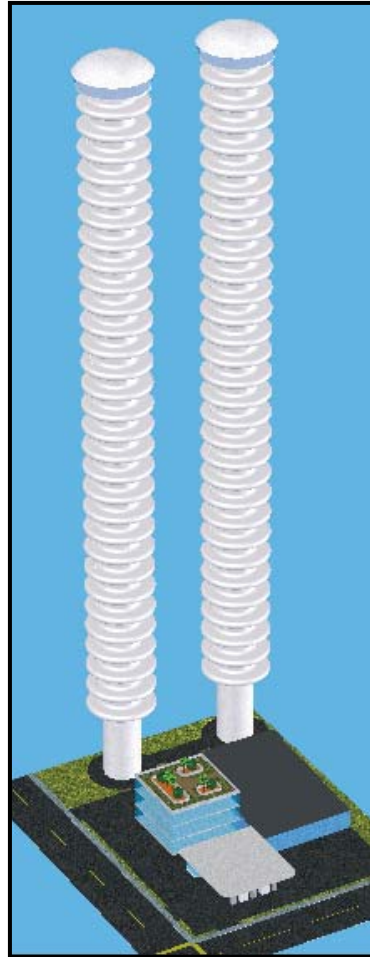


Hannover Fair '06

Hydrogen Ambassadors International Competition

Elemental Fuel & Power



Team Members:

Munir – University of Toronto

Keith Leblanc – University of Waterloo

Laszlo Zsidai – Industry

Elemental Fuel and Power is a new business committed to providing sustainable energy and hydrogen fuel for local transportation purposes. Elemental Fuel and Power takes a holistic approach to its business model and the foot print it leaves on the planet, but it also understands that for it to have a sustained affect on the environment it must be profitable. Without profit, any positive environmental impact made by Elemental Fuel and Power will pass away when the organization is bankrupt. The outline enclosed shows that Elemental Fuel and Power has the potential to have a return on assets of 10%¹ annually.

Elemental Fuel and Power's target customers will be businesses with a fleet of vehicles, such as couriers, taxi, and bus companies. Sales of hydrogen fuel for personal transportation use will also be welcome. Ideal customers will have fleets that are restricted to a particular area as oppose to vehicles designed for long-haul transport. Motivated by either Corporate Social Responsibility policies or image and reputation concerns, many of these companies are considering the use H₂ powered vehicles for a small portion of their fleets. A convenient fuel supplier must be available in order to make these H₂ powered vehicles feasible. This is the value of Elemental Fuel and Power.

Elemental Fuel and Power will be more than just a fuel depot for its customers, but will manage all their H₂ fuel needs. Elemental Fuel and Power will build relationships with its fleet fuel clients and sign fixed price contracts for their fuel needs, thus removing potential volatility in the price. In addition, Elemental Fuel and Power will refuel their clients' vehicles using a valet service during the client's off hours. This allows Elemental Fuel and Power to optimize its customer throughput and releases the client from having to handle refueling during their business hours.

The key raw materials to generate hydrogen are electricity and water. Both are readily available; however, electricity is in short supply and is traditionally generated by dirty means. To remain sincere to Elemental Fuel and Power's mission of remaining profitable while limiting its environmental footprint, two modern wind towers will be used to generate the electricity needed for the H₂².

The electricity generated from the two towers will be used to break distilled water into hydrogen and oxygen. Hydrogen will be compressed and stored in the facility to be later dispensed to the clients. Inventory will be managed so that enough H₂ will be created to service daily needs; however, three days of expected H₂ sales will be available in storage to protect against adverse weather.

Refer to exhibit 1 for a flow sheet explaining the operations of the facility in detail.

In addition to the revenue from hydrogen sales, the height of the two wind towers create an ideal location for telecommunications equipment that can be leased to local telephone, cellular phone, and Internet providers as well as emergency services. This ancillary service provides a very consistent and lucrative monthly cash flow.

¹ Based on EBITDA for information gathered on the Ontario market

² Wind Towers are patented as WARP by Eneco.

Elemental Fuel and Power expects demand for H₂ to be lower than the electrical output of the two wind towers. The extra capacity can be capitalized on by selling electricity to the local power grid³. Many energy markets suffer from under supply and therefore have high price peaks during the day. The extra capacity available from the two wind towers can be used to sell power to the power grid during these price-peaking hours, adding considerable cash flow to the business. This contribution to the power grid will also help Canada achieve its Kyoto commitments and may provide additional revenue in the future through the sale of emission credits.

A full forecast of sales and costs, refer to exhibit 2.

The option to sell to the power grid also hedges Elemental Fuel and Power against poor H₂ sales. If H₂ sales are poor, Elemental Fuel and Power can reduce the amount of capacity it dedicates to H₂ production, and instead increase the capacity it uses to sell to the local power grid. The affect of this diversification, as seen in exhibit 3, is a very consistent revenue stream independent of the demand for H₂.

Elemental Fuel and Power will require a 30,000 square foot property away from any large buildings that would obstruct the wind. Property located on the shores of a large body of water such as Lake Ontario is ideal. A 6,000 square foot building is needed for the production and storage of hydrogen. The roof of the production facility will be slanted to allow the H₂ to rise to the top of the facility, preventing pooling of potentially dangerous gases. A small office building will be used for Elemental Fuel and Power's offices. Estimated cost of this facility is \$900,000(CAD). A 3D concept model of the facility can be seen in exhibit 4.

The two 1.8 MW solar/wind towers used for Elemental Fuel and Power's production are available on the market today and are more efficient than standard three prop windmills. Consider exhibit 4, showing how the wind is focused around the structure of the windmill towards the smaller and more durable wind turbines found on each module. Solar panels can also be equipped on the bottom portion of the modules to further increase the wind tower's productivity. In addition, the durability of the windmills allows for a lower maintenance cost, and the modular design of these wind towers makes construction quicker and cheaper. The estimated cost of the towers and telecommunications equipment is \$4,400,000(CAD).

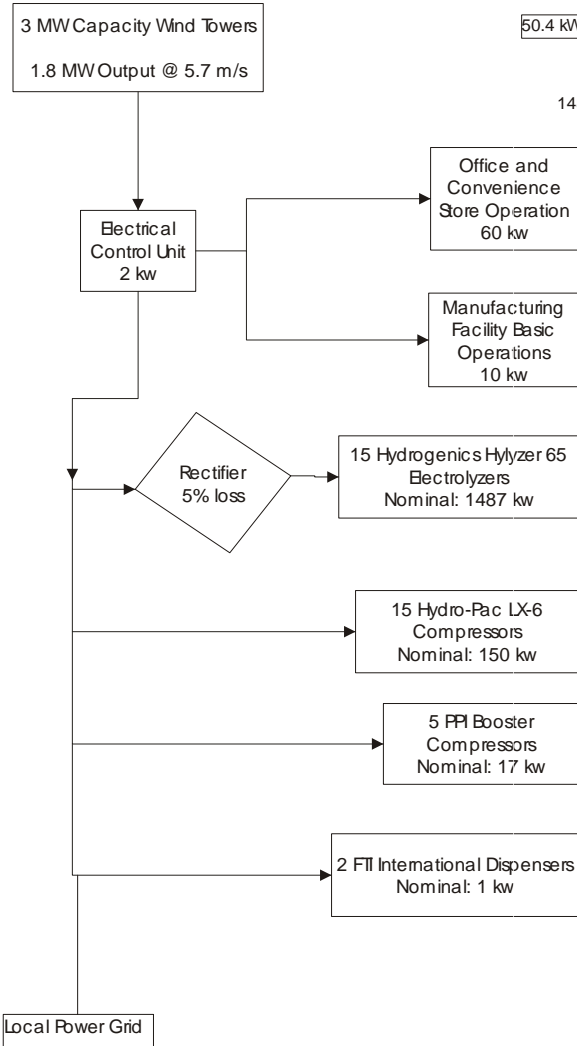
Refer to exhibit 5 for a detailed outline of capital needed.

For the hydrogen economy to further develop, a sound infrastructure and distribution network is required. Elemental Fuel and Power is a realistic and innovative way to bring future sustainable energy to the world today.

³ Ontario market is used for the data in the forecasts seen in this report.

Exhibit 1: Facility Operations

Electrical Flow Sheet



Hydrogen Flow Sheet

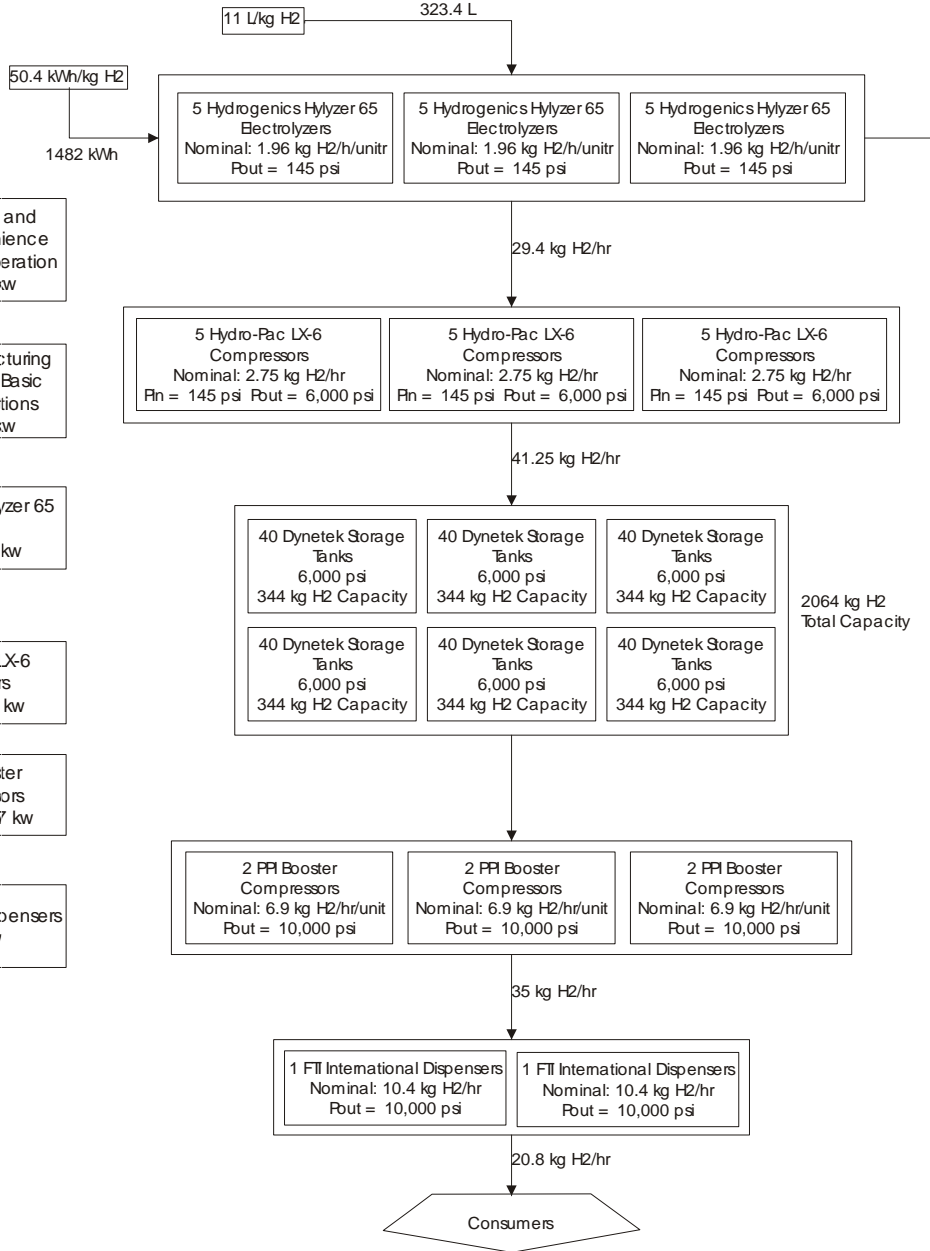


Exhibit 2: Project First Year Income Statements

Best Case

Revenue	Quantity	Price	Total
Hydrogen¹	114,400	\$ 5	\$ 572,000
Telecom	2	\$ 330,000	\$ 660,000
Sales to Ontario Power Grid²	View Model		\$ 284,495
Convenience			\$ 75,000
Total Revenue			\$ 1,591,495
Expenses	Quantity	Cost	Total
Water Charges	84,000	\$ 1.27	\$ 106,680
Maintenance	1	\$ 50,000	\$ 50,000
Marketing	1	\$ 100,000	\$ 100,000
Wages			
Valet	5,200	\$ 11	\$ 57,200
FT Clerks	4,680	\$ 12	\$ 56,160
Pt Clerks	2,600	\$ 8	\$ 20,800
Technician	2	\$ 40,000	\$ 80,000
Senior Tech	1	\$ 50,000	\$ 50,000
Business Manager	1	\$ 80,000	\$ 80,000
Total Wages			\$ 344,160
Total Expenses			\$ 600,840
Earnings Before Interest, Taxes, Depreciation and Amortization³			\$ 990,655

Key Metrics	
Return on Assets	10.04%
Profit Margin	62.25%

Worst Case

Revenue	Quantity	Price	Total
Hydrogen	54,600	\$ 5	\$ 273,000
Telecom	2	\$ 297,000	\$ 594,000
Sales to Ontario Power Grid	View Model		\$ 577,734
Convenience			\$ 56,250
Total Revenue			\$ 1,500,984
Expenses	Quantity	Cost	Total
Water Charges	84,000	\$ 1.27	\$ 106,680
Maintenance	1	\$ 100,000	\$ 100,000
Marketing	1	\$ 100,000	\$ 100,000
Wages			
Valet	5,200	\$ 11	\$ 57,200
FT Clerks	4,680	\$ 12	\$ 56,160
Pt Clerks	2,600	\$ 8	\$ 20,800
Technician	2	\$ 40,000	\$ 80,000
Senior Tech	1	\$ 50,000	\$ 50,000
Business Manager	1	\$ 80,000	\$ 80,000
Total Wages			\$ 344,160
Total Expenses			\$ 650,840
Earnings Before Interest, Taxes, Depreciation and Amortization			\$ 850,144

Key Metrics	
Return on Assets	8.62%
Profit Margin	56.64%

Notes:

1. Hydrogen quantity is displayed in Liters. Quantity sold is based on the following assumptions:

Best Case:

400L sold per week day

40L sold per week-end day

Worst Case:

200L sold per week day

25L sold per week-end day

2. Revenue to the Ontario Power Grid is based on a model with details seen in Exhibit 3. Best case assumes that hydrogen is produced for 16 hours a day and energy is sold to the grid 8 hours a day. Worst case assumes hydrogen sales are poorer and only 7 hours a day are needed for hydrogen production. The remaining 17 hours are used to sell energy to the grid.

3. The earnings presented are before interest, taxes, depreciation and amortization. This is to reflect the fact that many of these variables are unknown at this time and depend on the market selected (taxes and depreciation) as well as the financial structure of the company (amount and terms of debt).

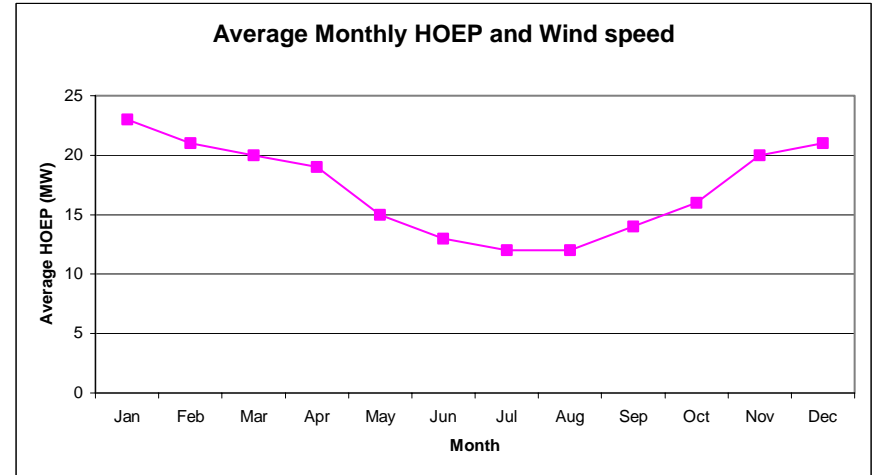
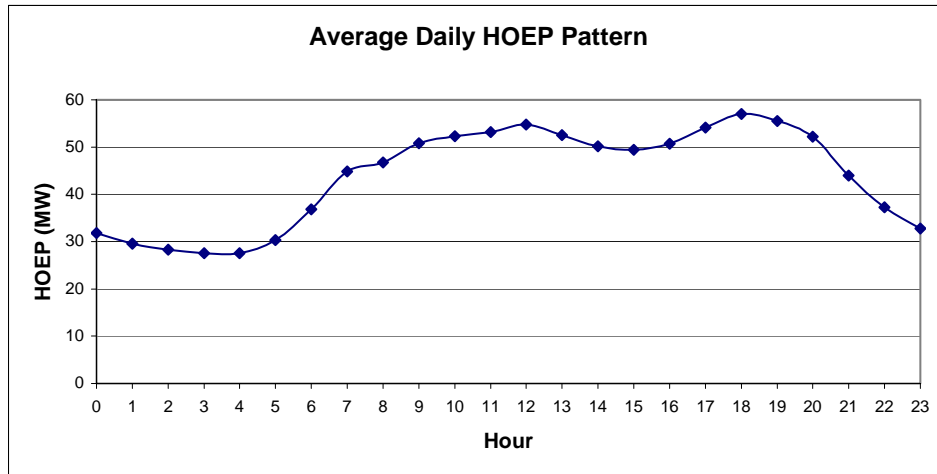
All figures are in Canadian Dollars

Exhibit 3: Forecasted Power Grid Sales

Assumptions

Hourly Ontario Energy Price (HOEP)

- The data presented here is derived from data provided by the Ontario Independent Electricity System Operator.
- HOEP data was collected from May 1st 2001 to March 31st 2005
- Below is a summary of the data

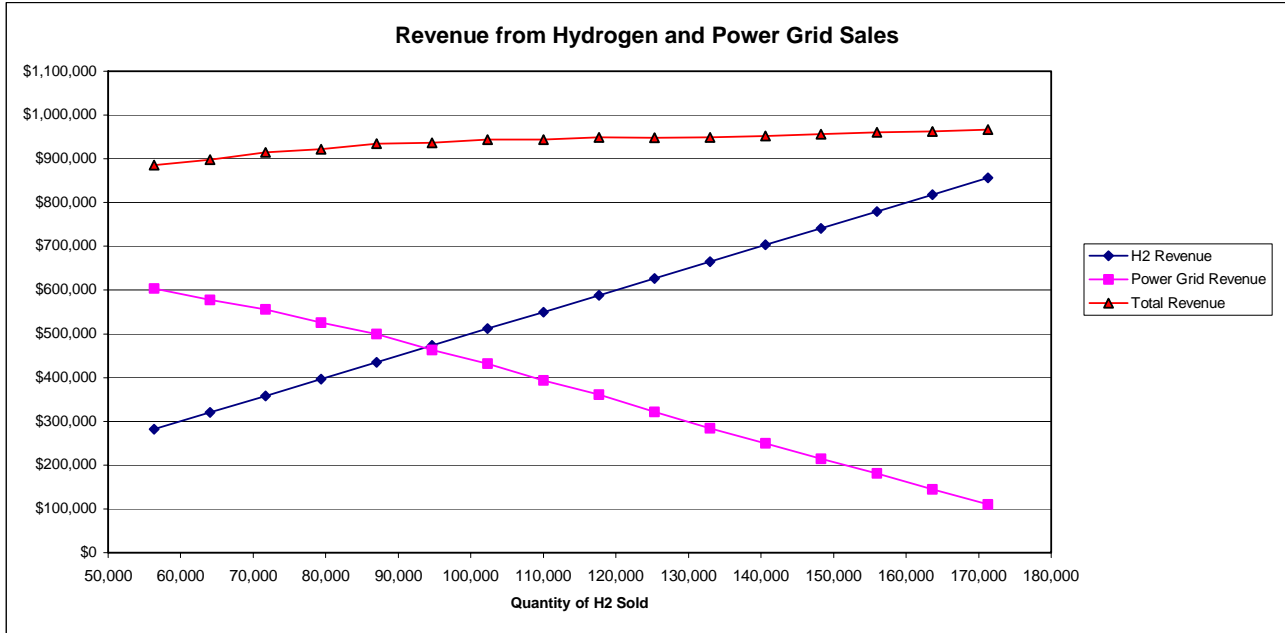


- Projected revenue from power grid sales is based on this HOEP data split monthly.
- The above graph is the average daily price pattern over the two year study period. High-priced hours tend to be between 10am and 2pm, 5pm and 8pm. For many days, the actual daily pattern is a lot more volatile, with price spikes sometimes reaching over \$200.00 Canadian for a MW-hour. The objective of Elemental Fuel and Power will be sell power to the grid during the highest priced "peak" times, and operate its hydrogen production operation during the lower-priced hours.
- To model revenue from the power grid, as hydrogen sales decreased power sales to the grid increased. Equal number of sales were assumed everyday following the same hourly pattern every day. To optimize this, in cases where more hydrogen is sold and less power is generated for the grid, power is sold during the hours that on average have the highest price (10am to 2pm for example). If sales to the grid increase, the hours sold to the grid would expand outward from these highest priced hours.
- In reality the operations will not be so predictable. Instead, a business manager will be hired to monitor hydrogen production, hydrogen requirements, and HOEP. He or she will decide daily based on these factors how to optimize production and power grid sales.

- Wind speed was also a factor incorporated in the model. As average wind speed decreases, so does power generated by the two wind towers. Based on the graph above, *Elemental Fuel and Power* will need to dedicate more hours for H₂ production during the spring and summer.

All Figures are in Canadian Dollars

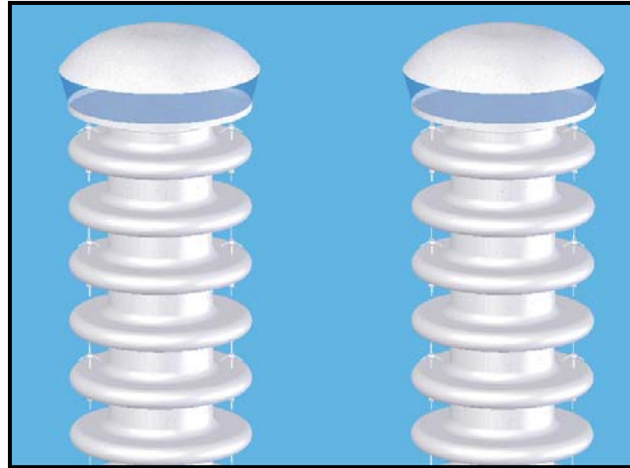
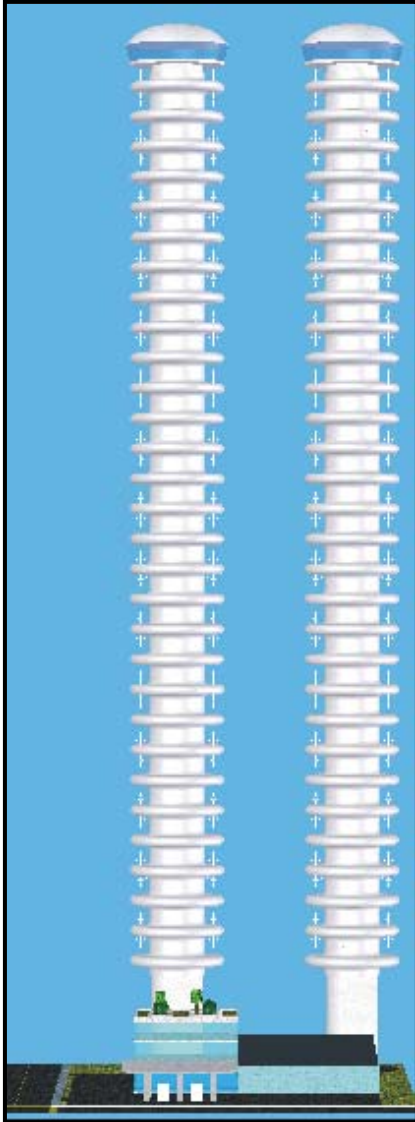
Exhibit 3: Forecasted Power Grid Sales (Cont.)



- The above shows that as quantity of H₂ sold decreases so does the time the resources are dedicated to H₂ production, allowing more energy to be sold to the power grid. This allows Elemental Fuel and Power to diversify its revenue streams and prepare for lower than expected hydrogen sales.
- Elemental Fuel and Power aims to sell power to the grid at the highest priced hours. For this reason, as the number of hours sold to the grid increases, the average price per KW decreases. This causes the slightly concave down affect of the power grid revenue line.

All Figures are in Canadian Dollars

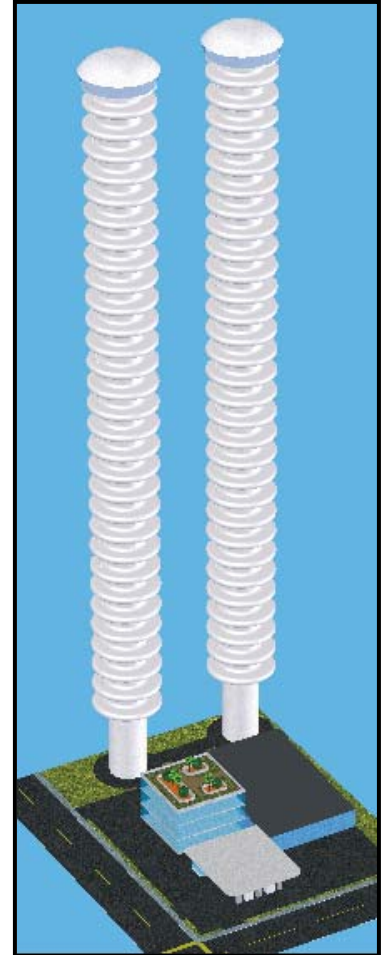
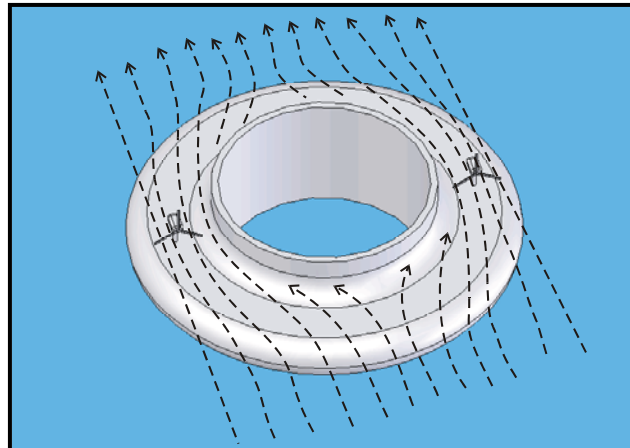
Exhibit 4: 3D Concept Layout



Above: The tops of the wind towers can be used to house telecommunications equipment.

Left and Right: Full views of the station complex.

Below: The advanced wind turbine design used for Elemental Fuel and Power channels air flow into turbines for higher efficiency.



Right: Enlarged view of operations facility.

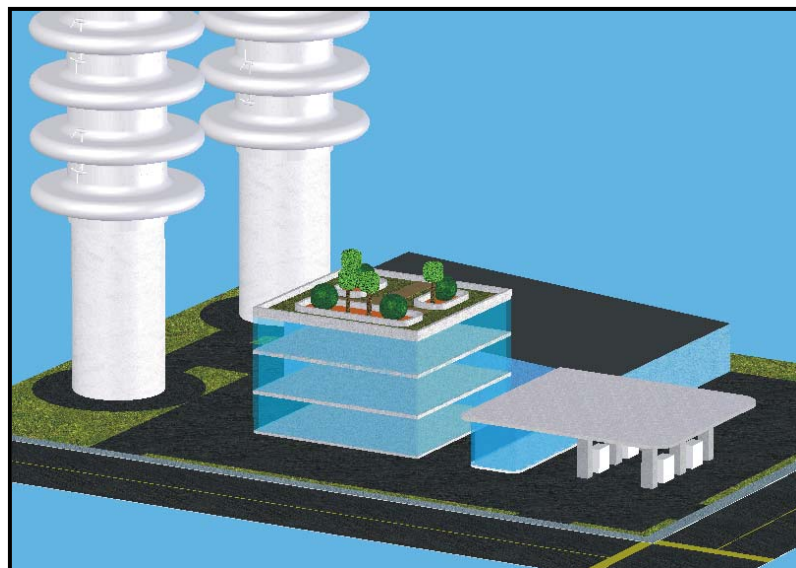


Exhibit 5: Required Capital

Capital Needed

	Quantity	Cost per Unit	Total Cost
Building	1	\$ 500,000	\$ 500,000
2 Towers	2	\$ 2,400,000	\$ 4,800,000
Land	1	\$ 400,000	\$ 400,000
Electrolizer	15	\$ 44,444	\$ 666,660
Compressor	15	\$ 57,200	\$ 858,000
H₂ Storage Tanks	240	\$ 3,000	\$ 720,000
Booster	5	\$ 202,500	\$ 1,012,500
Dispensor	2	\$ 55,000	\$ 110,000
Water Storage Tanks	1	\$ 60,000	\$ 60,000
Control Systems	1	\$ 300,000	\$ 300,000
2.5 MW Rectorfier	1	\$ 218,000	\$ 218,000
Transformers	1	\$ 100,000	\$ 100,000
De-ionizor	5	\$ 10,000	\$ 50,000
FTI Priority Pannels	4	\$ 10,000	\$ 40,000
Office Needs	1	\$ 20,000	\$ 20,000
Convience Store and Invenrory	1	\$ 13,000	\$ 13,000
Total Capital Requirements			\$ 9,868,160

All Figures are in Canadian Dollars