The HydroSync Initiative

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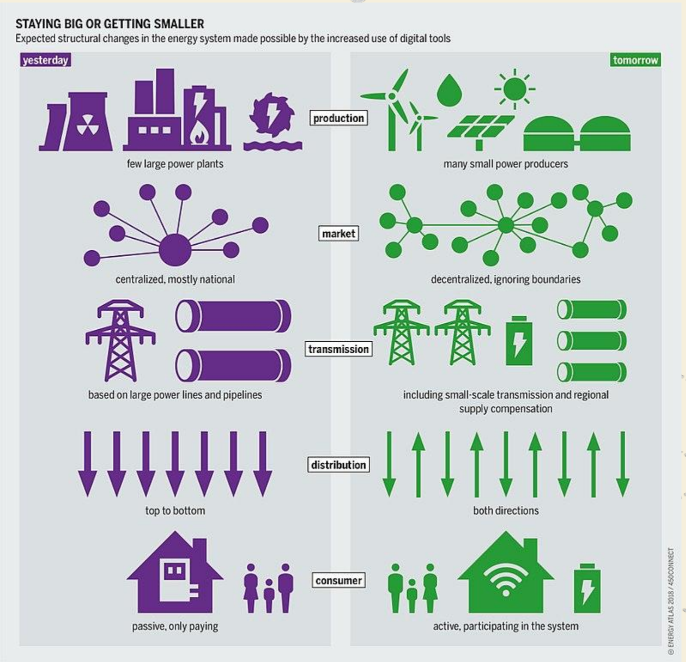
Smart Grids

An electrical power distribution infrastructure that provides two-way communication between the utility provider and customers.

- They can continually adjust supply to match demand and keep themselves operational while supplying everything with power

- Digital technology include power/ current sensors, controls, data centers, and smart meters.



Smart GRID Advantages

Data analytics and optimization

Grid Resilience

Optimized Integration of Renewable Energy

Remote Monitoring

Areas of Improvement

Upgraded Infrastructural Need

infrastructure modernization with advanced technologies remains crucial to meet evolving energy demands.

Demand Response

Active engagement of storage and supply system through customer data is needed

Data Management

Advancements in capabilities are needed to derive insights and optimize grid performance

Golden Circle

Why?

- Increase energy security of hydropower to ensure hydropower base load is stable for the transition from fossil fuels to renewable energy

How?

- Developing systematic changes of precipitation monitoring alongside infrastructures usage to the Smart Grid model.

What?

- Developing smart grid technology to adapt for hydropower.

HydroSync

Utilization of sensors and weather data to monitor precipitation patterns. When heavy rainfall is predicted, the smart grid optimizes the electricity distribution, ensuring that surplus energy generated from increased water flow is effectively utilized and stored for later use during periods of dryness.

Focus Areas of HyroSync

Demand Response

Precipitation data can influence consumer behavior by providing insights into expected weather conditions.

Infrastructural Planning

Long-term precipitation data can inform infrastructure planning and investment decisions

Sustainable Development Goals

Business Model

Key Resources

- Utility Companies - invest in upgrading infrastructure, implementing new technologies, and integrating renewable energy sources to improve grid efficiency, reliability, and sustainability.
- Smart Grid Engineers - assist with technical design and delivery of production systems
- Meteorologist - decode and analyze precipitation data
- Data Analyst- infrastructures data and collection applications

Key Activities

- Development of system changes to include precipitation analysis.
- Collection and analysis of data on current infrastructure usage.
- Implementation of energy conservation from data
- Climate adaption recommendations from data collection

Partners + Key Stakeholders

- Washington State Department of Energy
- Environmental Protection Agency
- City Government and power authority
- Environment Authorities
- Transmission System Operators

Business Model

Type of Intervention

- Smart grid technology for hydropower can be delivered as a service.
- Companies can provide hydropower forecasting services to utilities and grid operators. This includes developing forecasting models based on weather data, water inflow forecasts, and operational constraints to predict hydropower generation and optimize resource allocation and energy trading strategies.

Channels

- Collaborating with utilities and energy providers to incorporate information about precipitation monitoring and Smart Grid technology into their customer communications and outreach efforts.
- Leverage existing channels, such as newsletters, and customer portals, to reach a broader audience.

Segments

- Energy consumers benefit from a more reliable and resilient energy supply. Smart Grid technologies, informed by precipitation monitoring, enable utilities to better manage energy demand and supply, leading to fewer power outages, improved service reliability, and potentially lower energy costs.
- Utilities are responsible for distributing electricity to end-users. They rely on a mix of energy sources, including hydropower, to meet demand. Utilities may pay for hydropower forecasting services to better integrate variable renewable energy sources into their grid operations, optimize dispatch strategies, and ensure grid stability.

Business Model

Value Proposition

- Beneficiary Value Proposition
  - Hydropower Energy security
  - Improved Energy Distribution
  - Emissions reduction
  - Improved infrastructure
  - Lower energy cost
  - Improved data analysis
- Impact Measures
  - Energy Security analysis
  - Energy efficiency reports
  - Cost benefit analysis
  - Environmental reporting
- Customer Value Proposition
  - Increased stability of energy overtime
  - Lower energy cost
  - Cleaner air
  - Cleaner water
  - More efficient usage of resources

Business Model

Revenue

- DOE: Smart Grid Grants or Grid Resilience and Innovation Partnership (GRIP) Program
- City of Seattle
- State of Washington
- Seattle City Light (utility)

Total: $19.2 million revenue for HydroSync

$2 million a year in added value to the city

Cost Structure

- $9.2 Million for Smart Grid Adaption and equipment (55% of cost)
- $1.5 Million Staffing cost per year 5 years (45% of cost)

Total: $16.7 Million

Surplus

- Surplus of $2,505,000 will go to future projects around the United States including expansion into other energy sources

Cost Benefit Analysis for Seattle

Assumptions	Base Case	Best Case	Worst Case	Units
Investment Total =	$ 19,200,000			$
WACC	5%			
Inflation	3.80%			%
Cost savings per year	$ 2,000,000			$
Hydropower Efficiency Rate increase	80%	100%	120%	%
Savings	$ 1,600,000.00	$ 2,000,000.00	$ 2,400,000.00	$
Hydropower Dam Lifespan	15			Years

Base Case

Time	Cost	Total Savings	Net Cash Flow	Cumulative NPV	Incremental NPV	% of Year Used
8/1/2024	$ (19,200,000.00)	$ 2,000,000	$ (19,200,000)	$ (19,200,000)	$ (19,200,000)	
8/1/2025		$ 2,076,000	$ 2,076,000	$ (17,222,857)	$ 1,977,143	1
8/1/2026		$ 2,154,888	$ 2,154,888	$ (15,268,310)	$ 1,954,547	1
8/1/2027		$ 2,236,774	$ 2,236,774	$ (13,336,101)	$ 1,932,209	1
7/31/2028		$ 2,321,771	$ 2,321,771	$ (11,425,974)	$ 1,910,127	1
7/31/2029		$ 2,409,998	$ 2,409,998	$ (9,537,677)	$ 1,888,297	1
7/31/2030		$ 2,501,578	$ 2,501,578	$ (7,670,961)	$ 1,866,716	1
7/31/2031		$ 2,596,638	$ 2,596,638	$ (5,825,579)	$ 1,845,382	1
7/30/2032		$ 2,695,311	$ 2,695,311	$ (4,001,286)	$ 1,824,292	1
7/30/2033		$ 2,797,732	$ 2,797,732	$ (2,197,843)	$ 1,803,443	1
7/30/2034		$ 2,904,046	$ 2,904,046	$ (415,010)	$ 1,782,832	1
7/30/2035		$ 3,014,400	$ 3,014,400	$ 1,347,447	$ 1,762,457	0.2355
7/29/2036		$ 3,128,947	$ 3,128,947	$ 3,089,762	$ 1,742,315	
7/29/2037		$ 3,247,847	$ 3,247,847	$ 4,812,164	$ 1,722,403	
7/29/2038		$ 3,371,265	$ 3,371,265	$ 6,514,883	$ 1,702,718	
7/29/2039		$ 3,499,373	$ 3,499,373	$ 8,198,141	$ 1,683,258	
Net Present Value			$ 8,198,141	Accept		
Internal Rate of Return (IRR)			6.23%	Accept		
Discounted Payback			10.235	Accept		

Best Case

Time	Cost	Total Savings	Net Cash Flow	Cumulative NPV	Incremental NPV	% of Year Used
8/1/2024	$ (19,200,000.00)	$ 2,400,000	$ (19,200,000)	$ (19,200,000)	$ (19,200,000)	
8/1/2025		$ 2,491,200	$ 2,491,200	$ (16,827,429)	$ 2,372,571	1
8/1/2026		$ 2,585,866	$ 2,585,866	$ (14,481,972)	$ 2,345,456	1
8/1/2027		$ 2,684,128	$ 2,684,128	$ (12,163,321)	$ 2,318,651	1
7/31/2028		$ 2,786,125	$ 2,786,125	$ (9,871,169)	$ 2,292,152	1
7/31/2029		$ 2,891,998	$ 2,891,998	$ (7,605,213)	$ 2,265,956	1
7/31/2030		$ 3,001,894	$ 3,001,894	$ (5,365,153)	$ 2,240,060	1
7/31/2031		$ 3,115,966	$ 3,115,966	$ (3,150,694)	$ 2,214,459	1
7/30/2032		$ 3,234,373	$ 3,234,373	$ (961,543)	$ 2,189,151	1
7/30/2033		$ 3,357,279	$ 3,357,279	$ 1,202,589	$ 2,164,132	0.44430906
7/30/2034		$ 3,484,856	$ 3,484,856	$ 3,341,987	$ 2,139,399	
7/30/2035		$ 3,617,280	$ 3,617,280	$ 5,456,936	$ 2,114,949	
7/29/2036		$ 3,754,737	$ 3,754,737	$ 7,547,714	$ 2,090,778	
7/29/2037		$ 3,897,417	$ 3,897,417	$ 9,614,597	$ 2,066,883	
7/29/2038		$ 4,045,518	$ 4,045,518	$ 11,657,859	$ 2,043,262	
7/29/2039		$ 4,199,248	$ 4,199,248	$ 13,677,769	$ 2,019,910	
Net Present Value			$ 13,677,769	Accept		
Internal Rate of Return (IRR)			9.74%	Accept		
Discounted Payback			8.444	Accept		

Worst Case

Time	Cost	Total Savings	Net Cash Flow	Cumulative NPV	Incremental NPV	% of Year Used
8/1/2024	$ (19,200,000.00)	$ 1,600,000	$ (19,200,000)	$ (19,200,000)	$ (19,200,000)	
8/1/2025		$ 1,660,800	$ 1,660,800	$ (17,618,286)	$ 1,581,714	1
8/1/2026		$ 1,723,910	$ 1,723,910	$ (16,054,648)	$ 1,563,638	1
8/1/2027		$ 1,789,419	$ 1,789,419	$ (14,508,881)	$ 1,545,767	1
7/31/2028		$ 1,857,417	$ 1,857,417	$ (12,980,779)	$ 1,528,101	1
7/31/2029		$ 1,927,999	$ 1,927,999	$ (11,470,142)	$ 1,510,637	1
7/31/2030		$ 2,001,263	$ 2,001,263	$ (9,976,769)	$ 1,493,373	1
7/31/2031		$ 2,077,311	$ 2,077,311	$ (8,500,463)	$ 1,476,306	1
7/30/2032		$ 2,156,249	$ 2,156,249	$ (7,041,029)	$ 1,459,434	1
7/30/2033		$ 2,238,186	$ 2,238,186	$ (5,598,274)	$ 1,442,755	1
7/30/2034		$ 2,323,237	$ 2,323,237	$ (4,172,008)	$ 1,426,266	1
7/30/2035		$ 2,411,520	$ 2,411,520	$ (2,762,043)	$ 1,409,966	1
7/29/2036		$ 2,503,158	$ 2,503,158	$ (1,368,191)	$ 1,393,852	1
7/29/2037		$ 2,598,278	$ 2,598,278	$ 9,732	$ 1,377,922	0.99293751
7/29/2038		$ 2,697,012	$ 2,697,012	$ 1,371,906	$ 1,362,174	
7/29/2039		$ 2,799,499	$ 2,799,499	$ 2,718,513	$ 1,346,607	
Net Present Value			$ 2,718,513	Accept		
Internal Rate of Return (IRR)			2.32%	Reject		
Discounted Payback			11.000	Accept		

Sustainability Complex

- Community- initiative in system development and analysis for Smart grid in community change
- City- Planned implementation of Smart grids and infrastructure analysis
- State- Department of Energy contracted to work with current systems

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THANK YOU!