DOUGLASPUD HYDROPOWER TO HYDROGEN

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Douglas County PUD (DCPUD)

- Profile
- Central Washington
- Wells Dam
 - Hydrocombine
 - 840 MW Peak
 - 10 Turbines
- Meters
 - >21,000
- Res Power Rates
 - < 0.03 per KWH



Resource Management Challenge

- Minimize Spill
 - Lost Potential Energy
 - Fish health
- Reduce Turbine/Mechanical Wear
- Maximize Efficiency
- Spinning Reserve

Possible Solutions

- Energy Storage
 - Pumped Storage
 - Batteries
- Construct extra Generation to use for balancing

• Supply a flexible/interruptible load

- Large enough to make a difference
- Load that produces something of value
- Can be ramped Up/Down quickly

WHY RENEWABLE HYDROGEN?

- 1. Reduce mechanical wear and tear
- 2. Reduce Spill
- 3. Alternative Spinning Reserve
- 4. Hydrogen gas Can Be worth more than power

Hydro units Ramping Up-and-Down



WHOLESALE ENERGY MARKET



2020 ICE Peak Price

MAJOR INITIAL DECISIONS

- Authority to market?
 Type of Electrolyzer?
 Gas, Compressed Gas or Liquefaction?
- 4. Storage? How much?
- 5. Deliver or only onsite Trailer Fill?

Path to Hydrogen Production

- Legislation Passed to allow Washington PUDs to produce and market Hydrogen April, 2019
- Alkaline vs PEM Electrolyzer
 - Alkaline: Larger, less expensive, produces KOH waste stream, slower response
 - PEM: Small, Fast response
- No compression desired but location made decision for us
 - Location and Delivery method combined
- Liquefaction expensive and power intensive
- Storage has high capital costs \$\$\$
- Delivery or Onsite Fill
 - Delivery is added cost
 - Onsite must have facilities for timely filling





RENEWABLE HYDROGEN PROJECT

- 5MW Electrolyzer (PEM)
- Over 2 metric tons of hydrogen per day
- Hydrogen sold wholesale for industrial and transportation uses
- Facility is expandable
- Long-term storage goal



Hydrogen Production Facility



Expansion

- Initial Startup 5MW using a Single Electrolyzer
 - 30 Bar (Source Pressure)
 - Can Compress up to 520 Bar (7,500 psi) for Trailer Fill
- Each Building can support 4 Electrolyzers
 - 20 MW
 - Over 8 metric Tons per day of Hydrogen
- Project can support Multiple Bldgs
 - Future Possibilities
 - Permitted for up to 6 Buildings
 - Total 120 MW
 - Over 50 metric Ton/Day capacity



LESSONS LEARNED (So Far)

- Electrolyzer Manufacturers
 - Focus on their equipment
 - Integration a problem (Carefully select a specialized Consultant)
- Govt permitting process is Time Consuming
 - DOE
 - *County/City Building Permit process
 - Fire Department
 - Water/Septic/Sewer
- 2021-2022 was Not a good time for construction
 - Delays for Covid
 - Delays for material
 - Scarcity of materials, particularly steel, conduit
- Consultant

QUESTIONS

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THANK YOU