## DCPUD HYDROPOWER TO HYDROGEN CASE STUDY

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## Douglas County PUD (DCPUD)

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



## Why Hydrogen? (Resource Mgmt)

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



## **Initial Decisions**

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



## Hydrogen Has Value

#### WHOLESALE ENERGY MARKET

#### 2020 ICE Peak Price



- Can Curtail H2 Production
- Pwr Price Low
  - Can Increase H2 Production – Hydrogen Gas 'Can' be worth more than power



## H2 Electrolyzer Selection





## Path to H2 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
  - Mkt Distance and Delivery method combined
- Liquefaction expensive and Power intensive
- Minimize Storage (high capital costs \$\$\$)
- Delivery or Onsite Fill
  - Delivery is added cost
  - Onsite must have facilities for timely filling

## **DCPUD H2 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



### **Project 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

## H2 Production Facility



130 Acres with great power & water supply

She

C & O Nursery

Porty Pod

PACIFIC PRIDE

## LESSONS LEARNED (Part 1)

- Govt permitting process is <u>Time Consuming</u>
  - DOE
  - \*\*\*AHJ County/City Building Permit process
  - Fire Department
  - Water/Septic/Sewer, Well Water Rights
  - Required Studies (Archeological, Avian, Botanical, Traffic)
  - Many still Work from Home (Covid Hangover)
  - Not my Bird
- Electrolyzer Manufacturers
  - Focus on their equipment
  - Integration a problem
  - Permitting not their concern unless you make it so
  - Takeovers are plentiful
- Expertise keeps getting stolen
  - Experts are in high demand

## LESSONS LEARNED (Part 2)

- 2021-2022 was NOT a good time to start this
  - Delays for Covid
  - Delays for equipment (Not the usual suspects)
  - Scarcity of materials, particularly steel, conduit
- Material Issues still exist (Covid Hangover)
  - Long equipment lead times
  - Basic construction materials still scarce
- Lack of Construction Personnel (Covid Hangover)
  - Many still staying out of the work force
- Consultant (Carefully select a specialized Consultant)
  - Recommend one with H2 Expertise and have them handle entire project scope
- COSTS rising
  - Consequences of Legislation

## Remember Initial Power Prices

#### WHOLESALE ENERGY MARKET

#### 2020 ICE Peak Price



- AVG Price \$25/MWH
- Pwr Price High
  - Can Curtail H2 Production
- Pwr Price Low
  - Can Increase H2
     Production –
     Hydrogen Gas 'Can'
     be worth more than
     power

## Hydrogen Has Value

#### **YTD WHOLESALE ENERGY MARKET**

 AVG Price \$150/MWH ICE MID-C Peak Price Pwr Price VERY High 1200 Can Curtail H2 **Production** 1000 800 • Pwr Price rarely Low Hydrogen Gas 600 worth LESS than power Cost to 400 produce it in all circumstances. 200 2/1/2023 9/1/2022 1/1/2023 3/1/2023 4/1/2023 5/1/2023 10/1/2022 11/1/2022 12/1/2022 7/1/2023 8/1/2023 6/1/2023

#### **Douglas PUD site under construction now**



Some Equipment Delivered & Installed











# QUESTIONS



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