

# Decarbonizing the Natural Gas Distribution System with Power to Gas

*Ocean Renewable Energy Conference  
September 19, 2018*

# NW NATURAL OVERVIEW



- 160 year old Oregon company
- Serve over 2.1 Million Oregonians – more than half the state’s population
- Deliver natural gas to businesses and homes
- On the coldest mornings of the year, natural gas meets 90% of our customers’ household energy needs

# IMPLICATIONS FOR NW NATURAL

## NW Natural believes:

- There will be a price on carbon in OR and WA within the planning horizon
- Local communities and some businesses in our region will continue taking action to reduce greenhouse gas emissions
- Election outcomes in November 2018 will determine timing and shape

## In response, we are:

- Working hard to find low-carbon resources like RNG
- Studying emerging technologies like Power to Gas
- Determining how to measure and mitigate tomorrow's risk with investments and policy action today

# WHAT ARE WE DOING ABOUT IT?

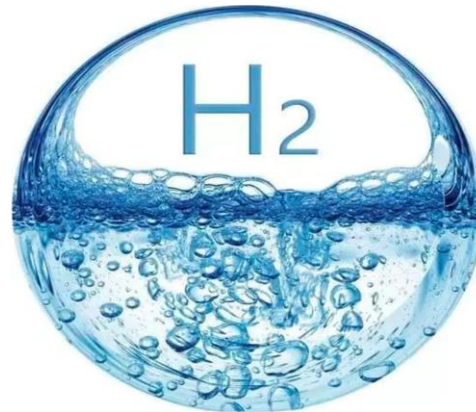
## *Decarbonizing the Pipeline*

### Renewable Natural Gas



Wastewater treatment plants, dairies and landfills are sources of RNG and are interchangeable with natural gas

### Power to Gas



Using excess renewable electricity to make renewable hydrogen can displace pipeline natural gas

### Reach upstream



Reducing methane at the well-head by incenting best practices decreases the carbon intensity of natural gas

# Power to Gas



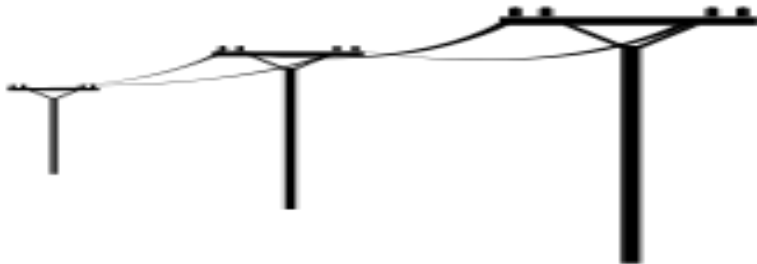
SOLAR



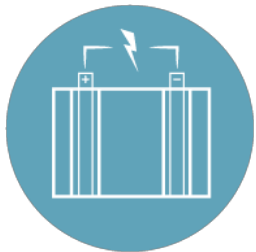
WIND



HYDRO/WAVE



Power-to-gas – or P2G – is a technology that converts electrical power to a gas fuel by splitting water into hydrogen and oxygen by means of electrolysis.



Hydrogen Fuel Cell



Hydrogen Storage for Transportation fuel



Robust Markets for multiple end uses



Natural Gas Distribution System

# Future Curtailment Challenges

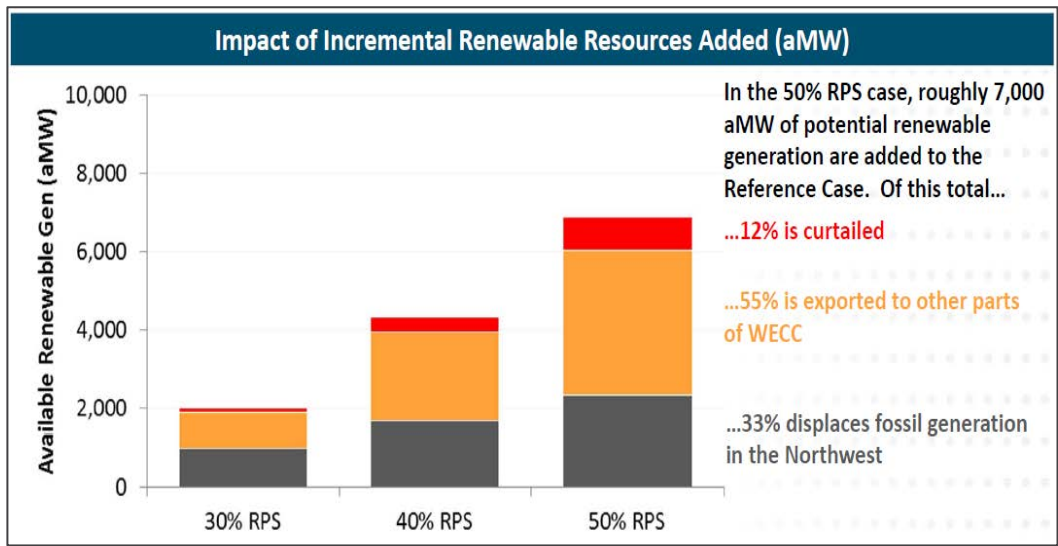
Snapshot of Daily Operations on a High Hydro Day (2050)

Regional 30% RPS

Regional 40% RPS

Regional 50% RPS

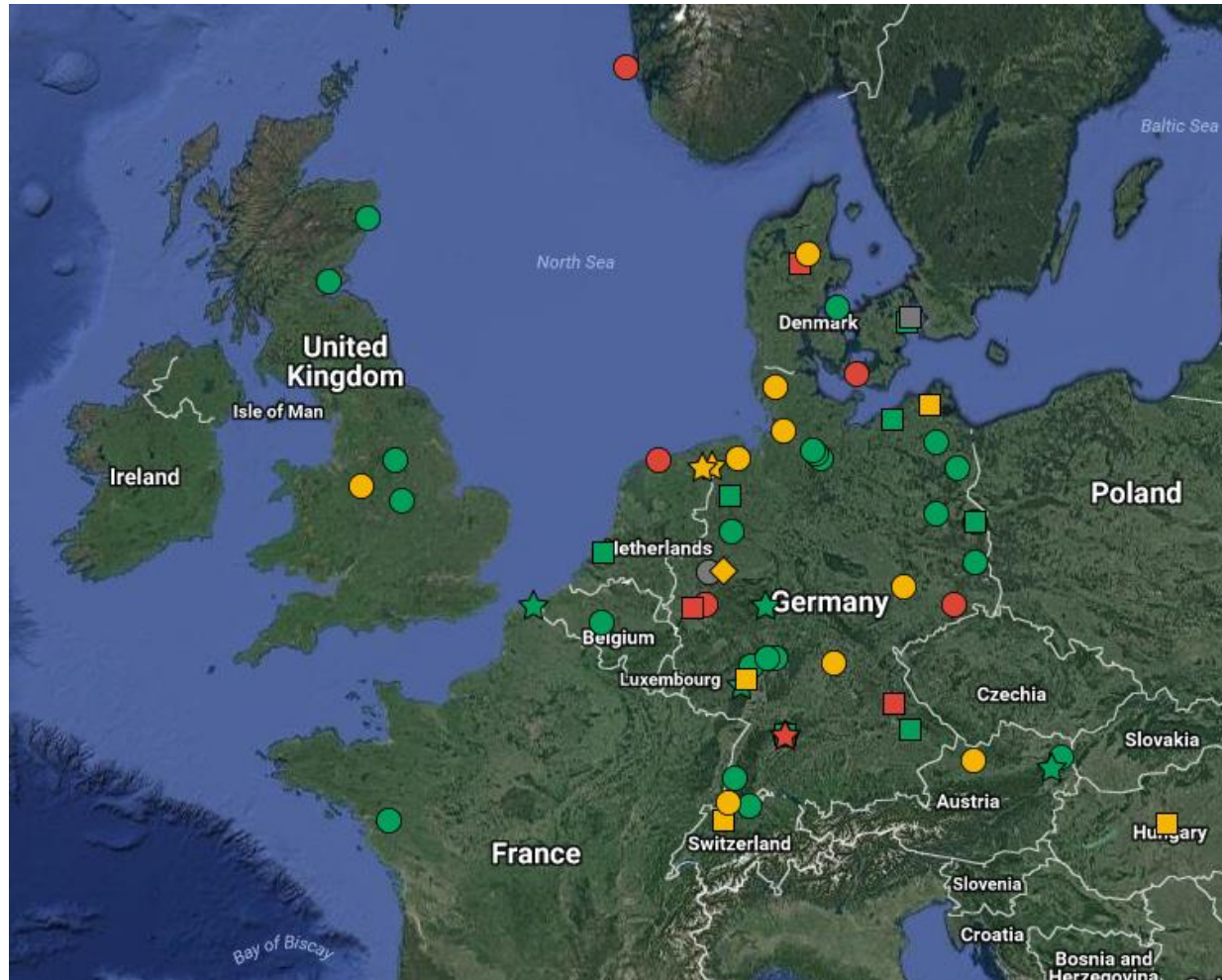
- Curtailment
- DR
- Inc EE\*
- Pumped Storage
- Battery Storage
- Solar
- Wind
- Geothermal
- Biomass
- Hydro (Upg)
- Hydro
- Gas (CT)
- Gas (CCGT)
- Coal
- Nuclear
- Load



Source: E3 Pacific Northwest Low Carbon Scenario Analysis

# P2G in Europe

- Operational
  - Hydrogen
  - Methane
  - ★ Hydrogen / Methane
- Planned
  - Hydrogen
  - ★ Hydrogen / Methane
  - Methane
- Project finished
  - Methane
  - Hydrogen
- Unknown
  - Hydrogen
  - Methane



# Next Steps

## Lots of Questions!

- How do different concentrations affect our pipes?
- How do different concentrations affect our customers' equipment?
- How does hydrogen move through our system?
- How well does hydrogen remain blended with methane?
- Does hydrogen pool in certain areas or impact our odorant needs?

## Current Partnerships

- Oregon State University
  - Early stage assessment of site considerations
- Potential project with NREL and EWEB?
- University of Oregon MBA students assessing solar PV-based P2G facility
- UC Irvine assessment of overall technical hydrogen generation potential in PNW
- Flink Energy
- Renewable Hydrogen Association
  - NW Natural founding focused on education, policy, regulation



# THANK YOU

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