

## **Energy Storage with Power-to-Gas**

**November 6, 2019**

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### **Introduction and Overview for the Maine Energy Storage Commission**

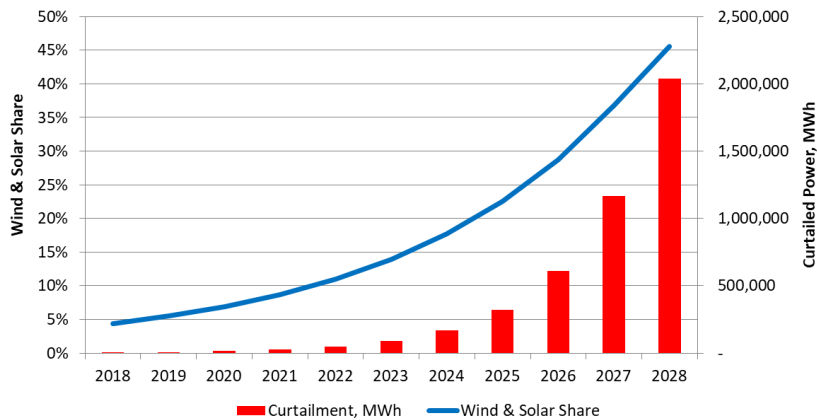
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**Brad Bradshaw  
President, Velerity  
President, Hydrogen Energy Center  
brad@velerity.com**

# Increasing penetration of renewable energy will lead to increasing curtailment and falling wholesale electricity prices

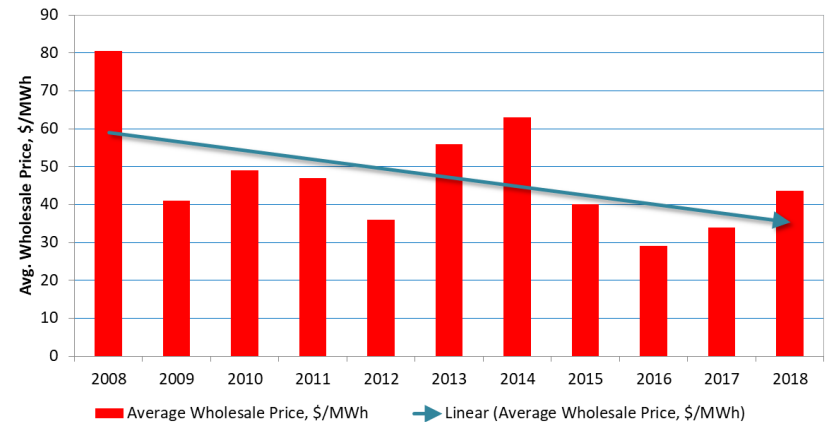
## Expanding Variable Wind & Solar Energy Leading to Curtailed Power

New England Wind & Solar Curtailment Projection



## Falling Wholesale Electric Prices

ISO-NE Average Wholesale Price, \$/MWh



# Natural Gas Infrastructure facing transmission constraints, while efforts to reduce carbon emissions are broadening

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## Increasing Use of Natural Gas for Power Creating Winter Pipeline Constraints

“In New England, increasing pressure on an already-constrained natural gas infrastructure is our most pressing and urgent challenge... New England’s pipeline infrastructure is inadequate to serve demand by local distribution companies (for home heating) and power generators in the winter period. This constraint has led to significant electric reliability challenges.”

- Gordon van Welie, President and CEO of ISO-NE.

## Sectors Targeted for Carbon Emission Reductions Expanding

**Electric Grid** – Continued expansion of renewable energy

### Transportation

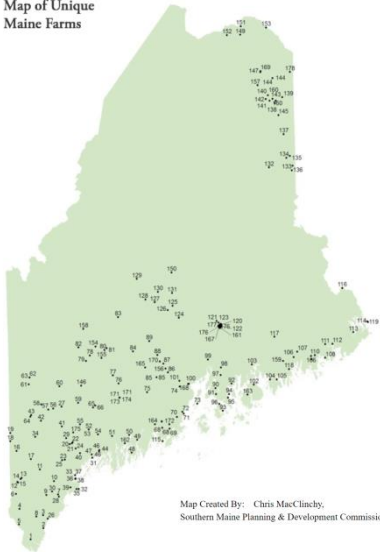
- Expansion of electric vehicles & Charging Infrastructure
- Implementation of the Transportation and Climate Initiative (TCI).
- Expanding use of alternative fuels including natural gas & hydrogen.

**Space & Water Heating** – Expanding Electrification with Air Source and Geothermal Heat Pumps

# Maine has significant potential for generating renewable natural gas

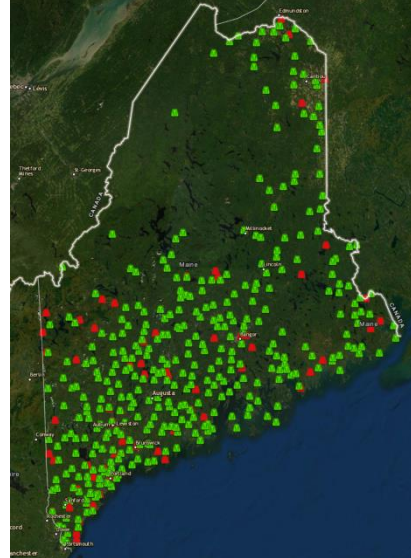
## Dairy Farms

Map of Unique  
Maine Farms



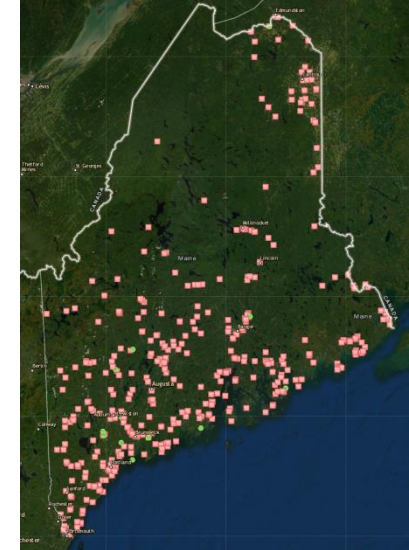
**555,107,000 cubic feet/year**

## Landfills



**2,222,987,000 cubic feet/year**

## Municipal Wastewater

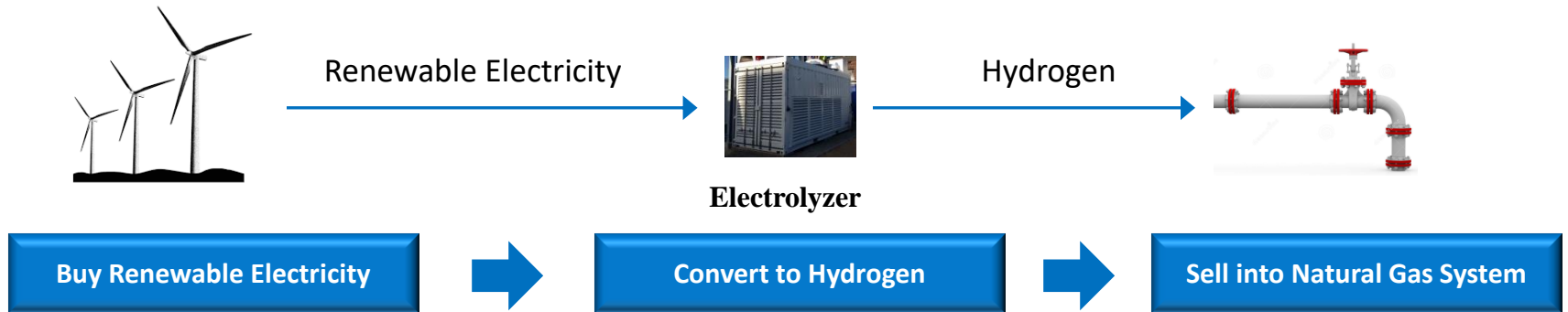


**241,743,000 cubic feet/year**

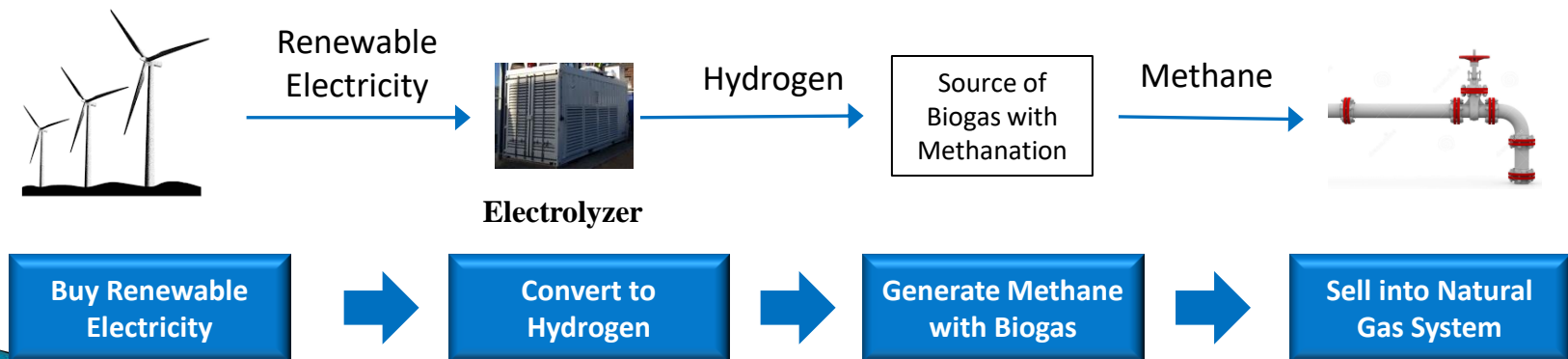
**Total 3,019,837,000 cubic feet per year**

Preliminary estimates subject to refinement,  
represent maximum technical potential  
Market & economic potential will be less

# Power-to-Gas Generates Gas from Stranded Renewable Electricity and Stores it in the Natural Gas Pipeline System



Or



# Proposed Addition of Power-to-Gas at Brunswick Landing will increase Renewable Natural Gas Production by 70%

## Renewable Natural Gas Generation With Power-to-Gas

