Harvesting Low-Hanging Fruit:
What Have we done with the ConocoPhillips Energy prize?

The Story of WindtoGreen LLC: a Washington Corporation

Matt Kern
Ammonia Fuel Conference, October 2, 2012
San Antonio, TX

WindtoGreen

Who We Are

Founded in 2008

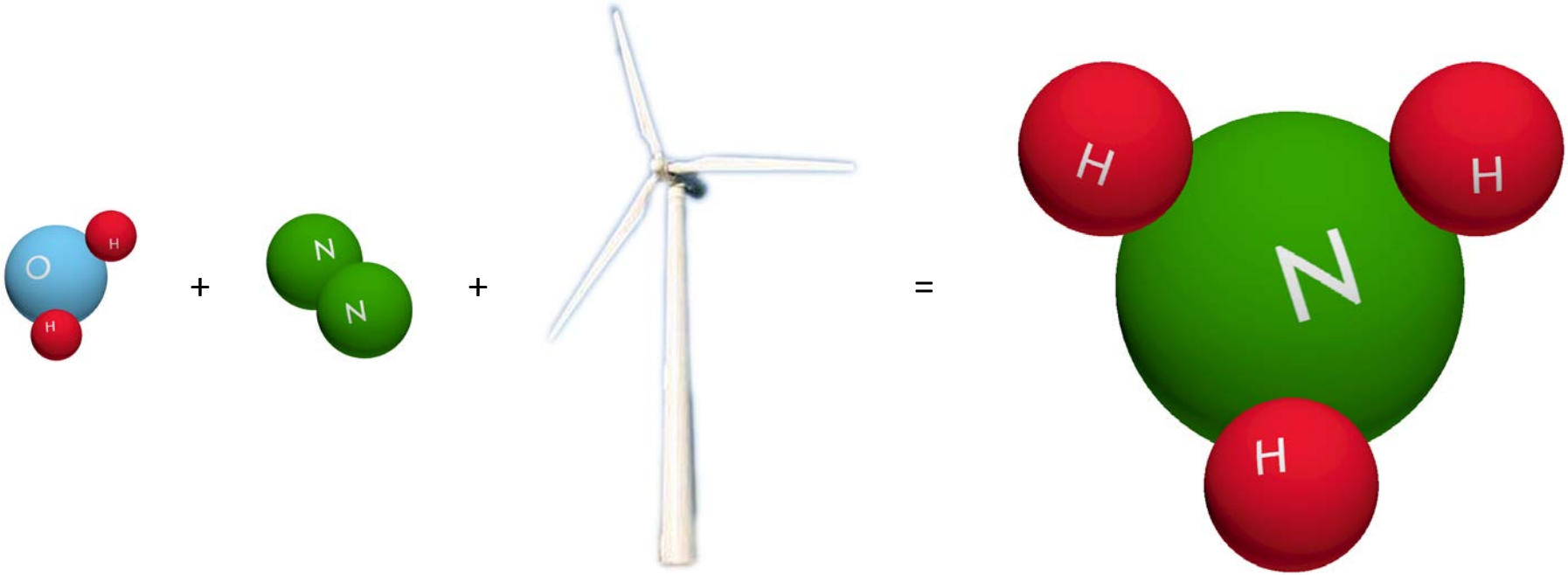
Jack Swearengen

Peter Swearengen

Matt Kern

Who We Are

Our mission

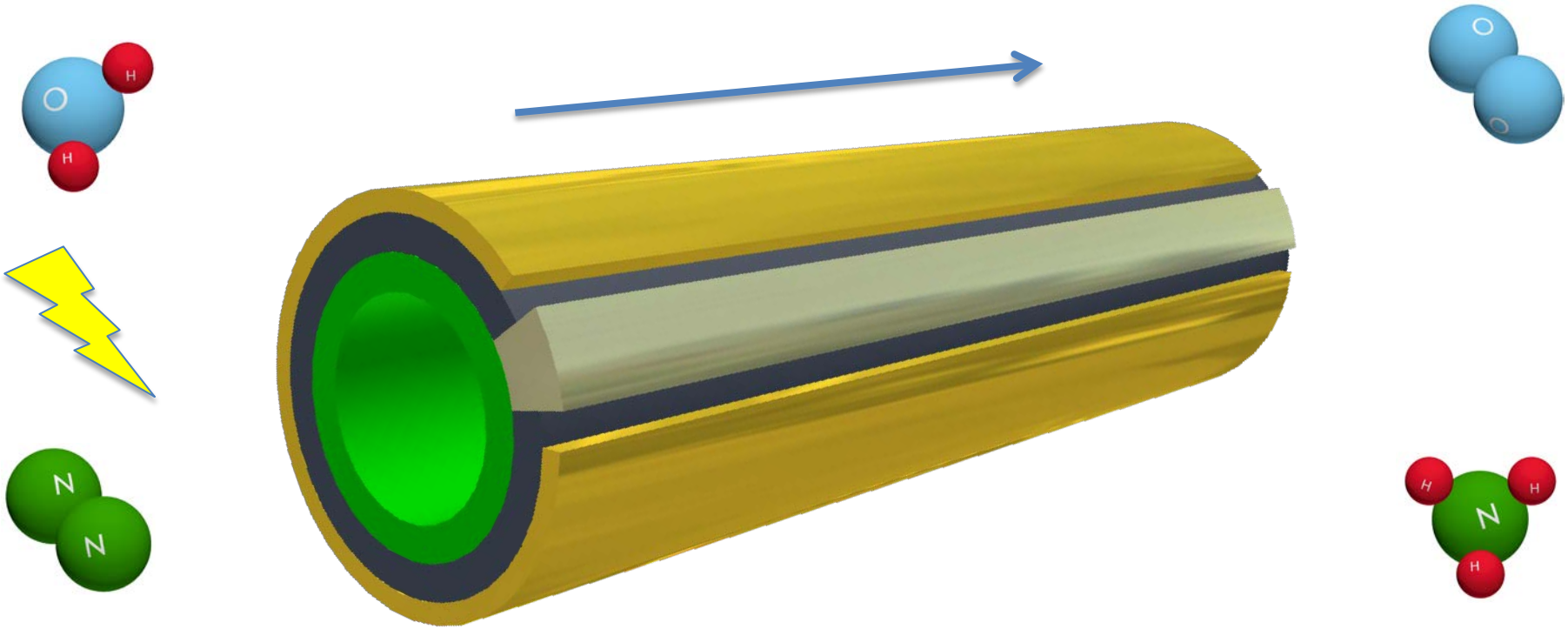


Objective #1

SSAS as core technology

SSAS

Solid-State Ammonia Synthesis - NHThree



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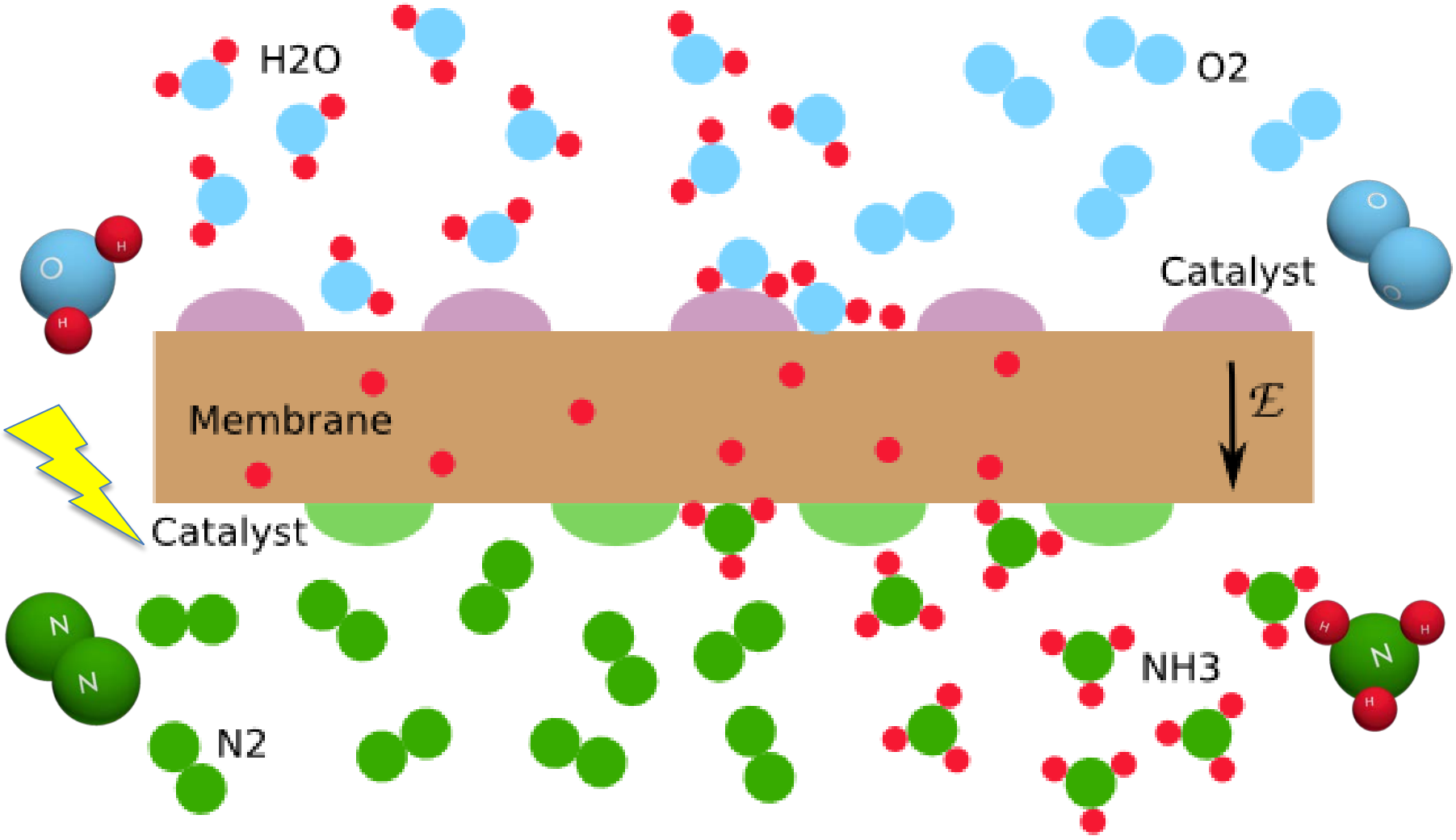
SSAS



Source: Solid State Ammonia Synthesis (SSAS) for Sustainable Fuel and Energy Storage Applications. Joseph D. Beach Physics Department Colorado School of Mines

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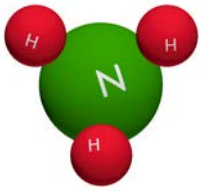
Objective #2

Development for NH_3 applications

NH3 Applications

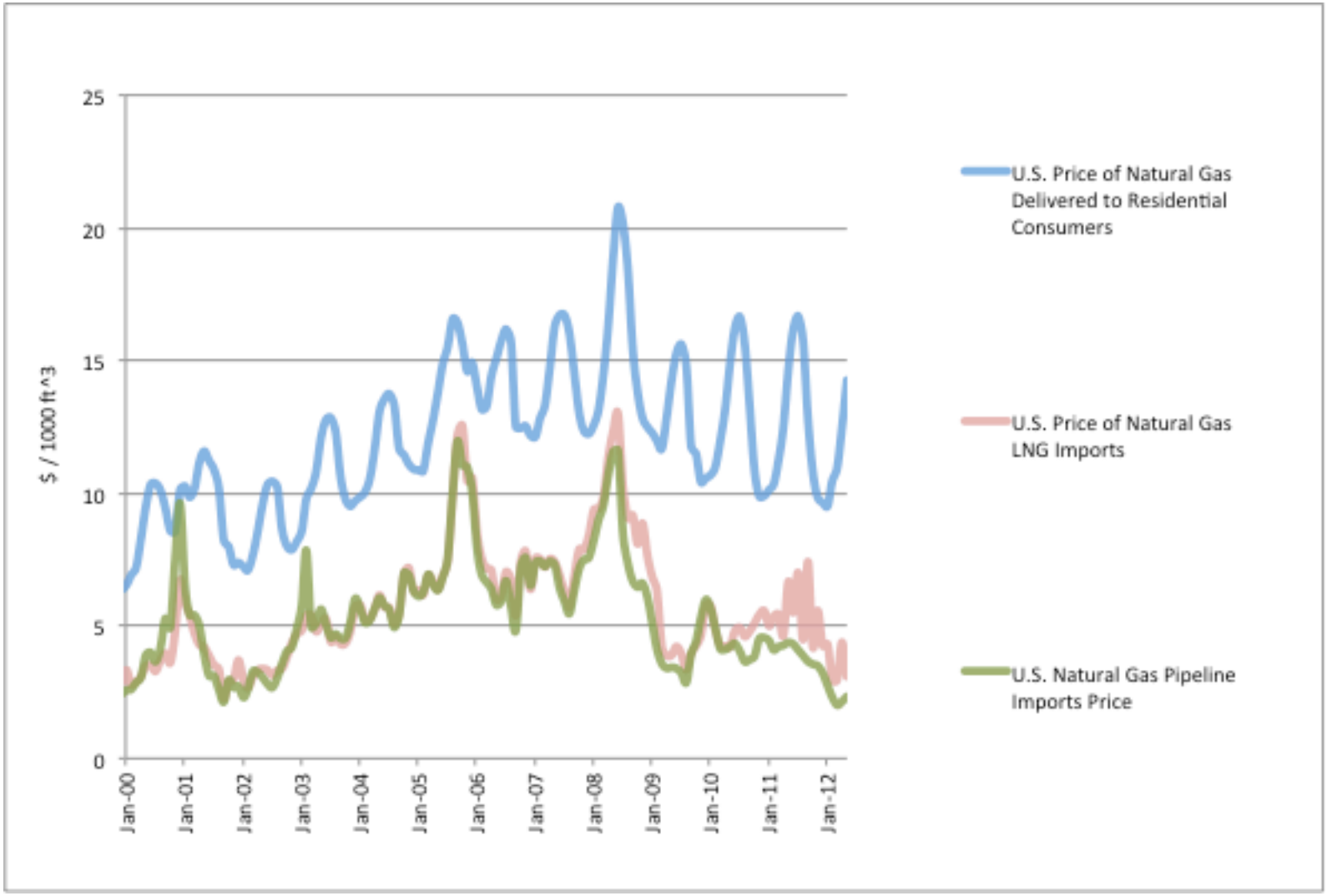
Agriculture



Agriculture

NH3 Applications

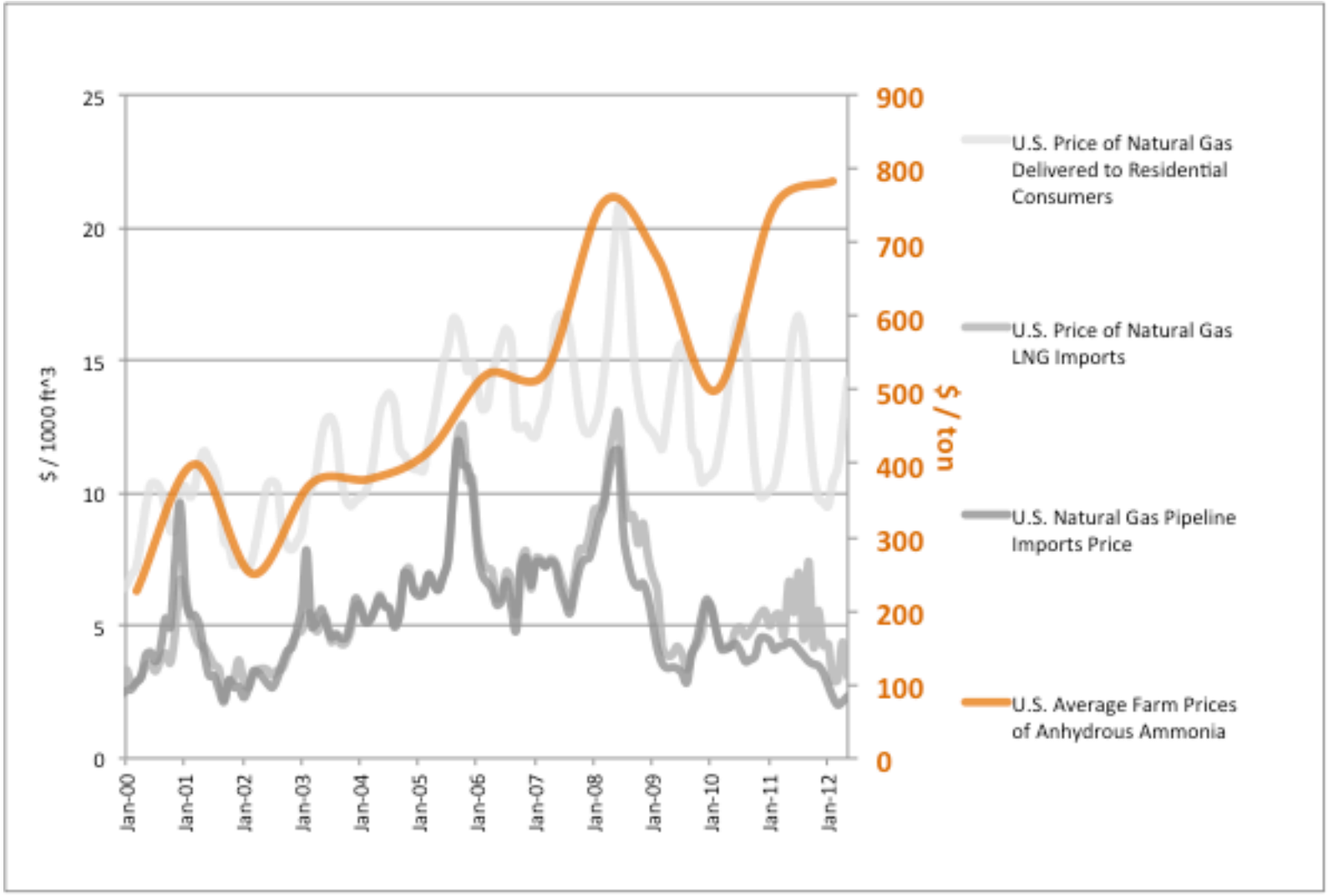
Agriculture



Source: U.S. Energy Information Administration

NH3 Applications

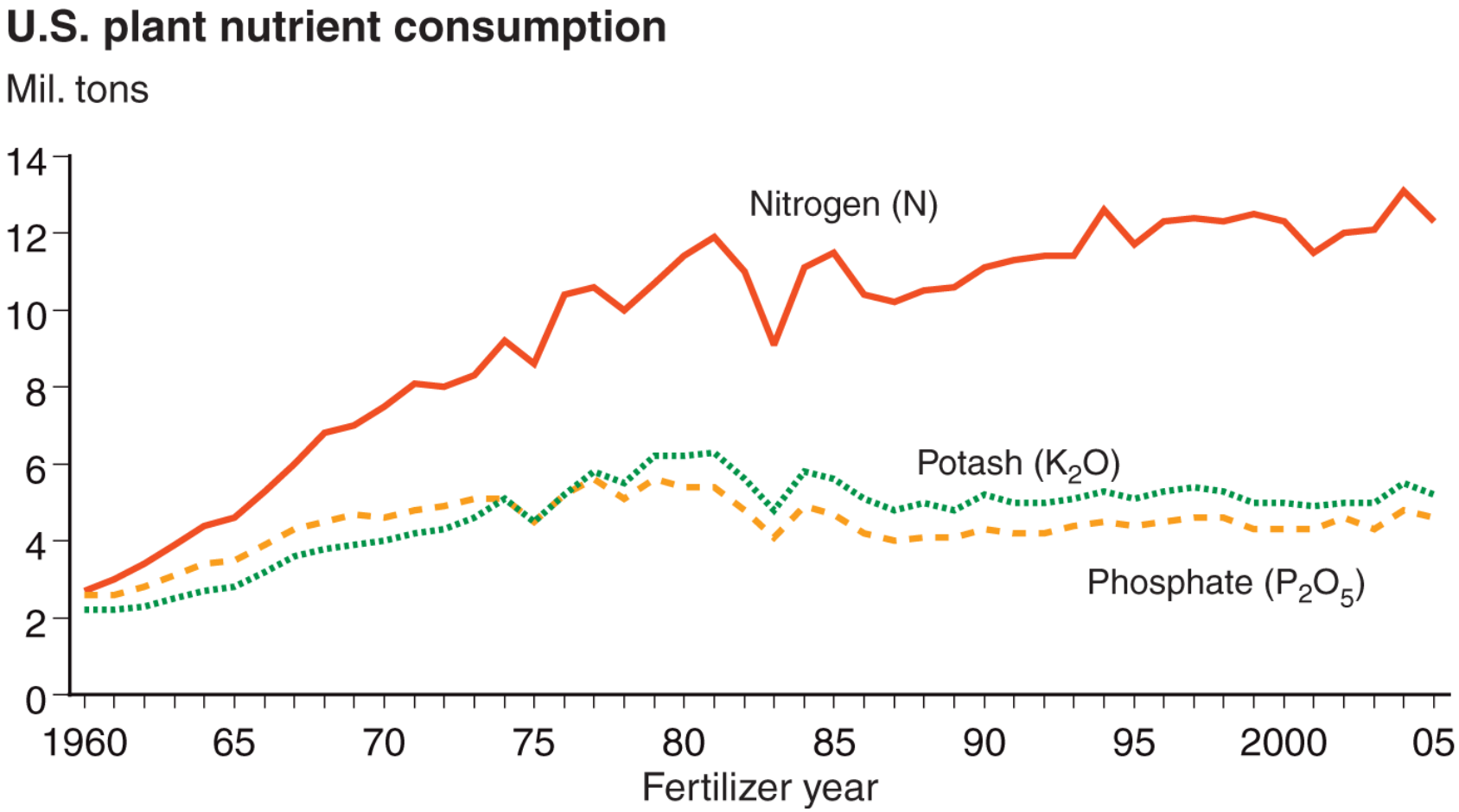
Agriculture



Source: U.S. Energy Information Administration (natural gas)
Agricultural Prices, National Agricultural Statistics Service, USDA (ammonia)

NH3 Applications

Agriculture



Source: U.S. Department of Agriculture

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NH3 Applications

Agriculture

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NH3 Applications

Agriculture

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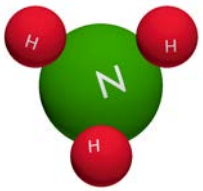
NH3 Applications

Energy Storage



Energy Storage

NH3 Applications

Energy Storage

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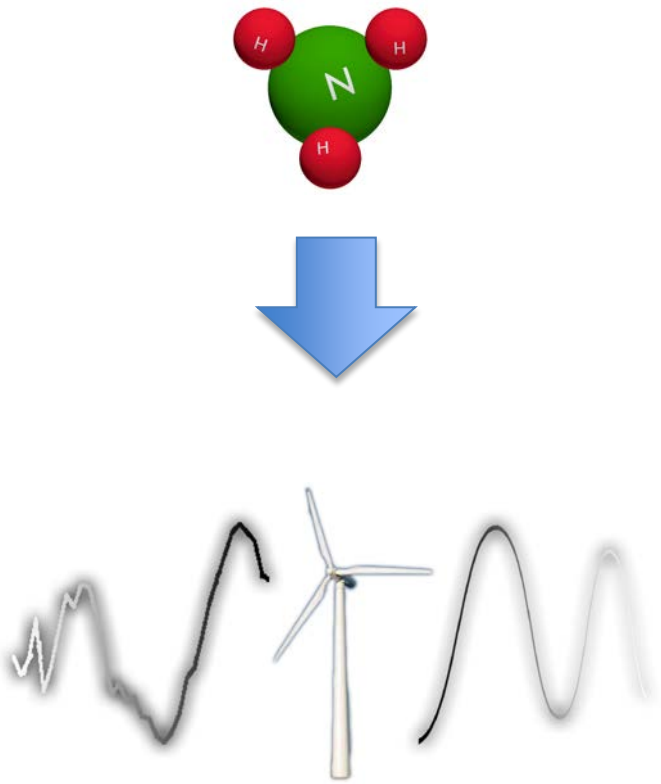
NH3 Applications

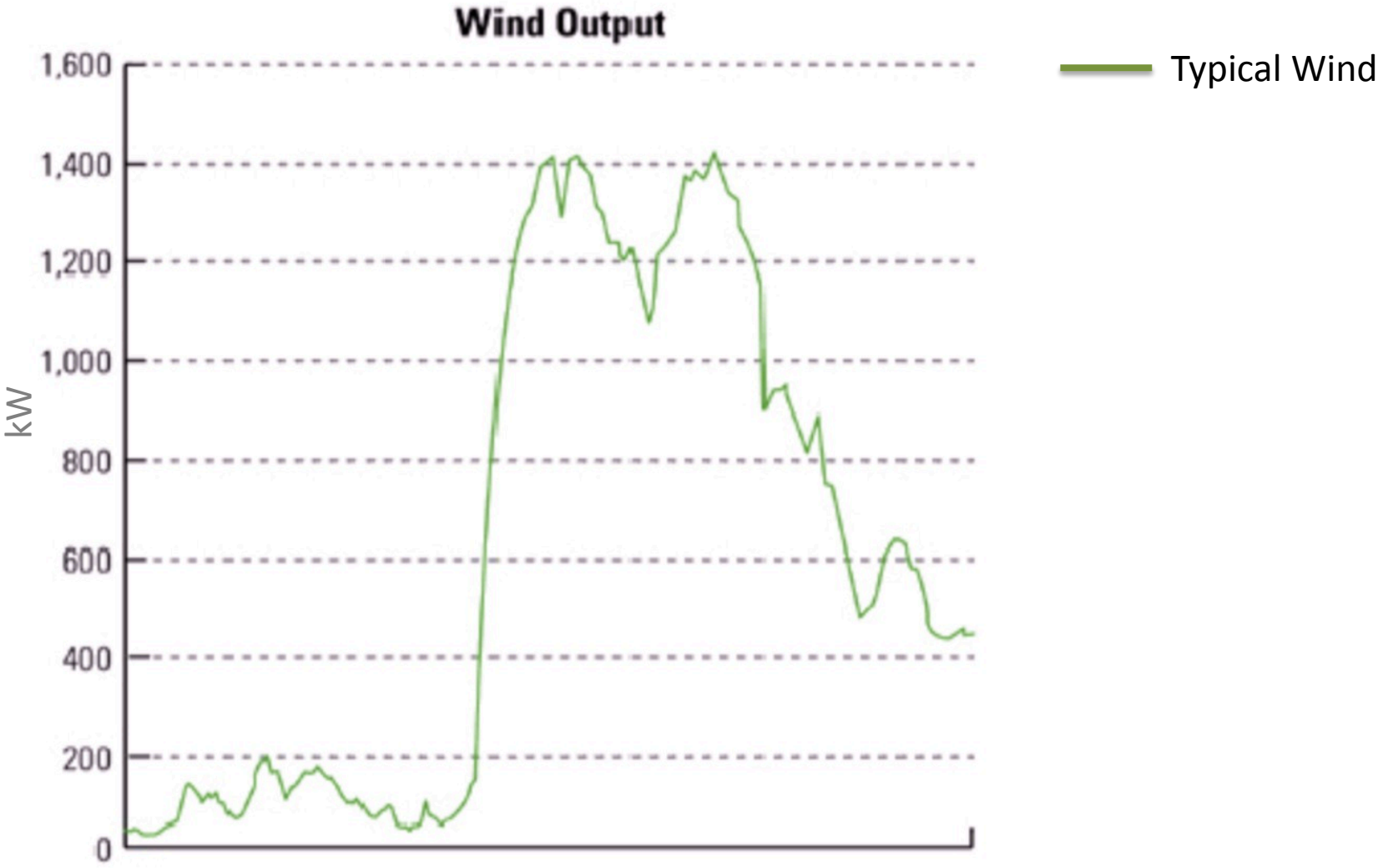
Grid Stabilization



Grid Stabilization

NH3 Applications

Grid Stabilization



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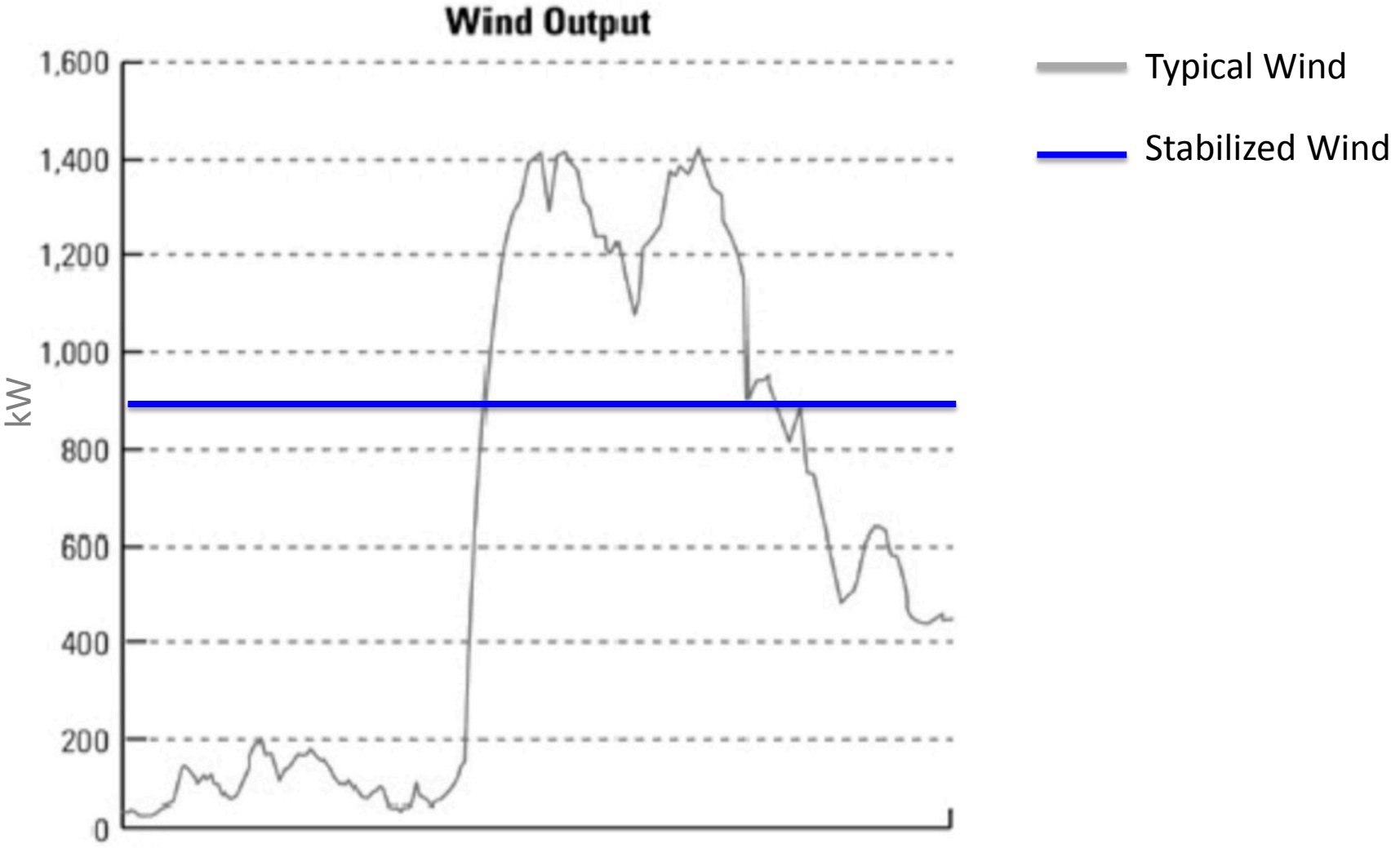
NH3 Applications

Grid Stabilization



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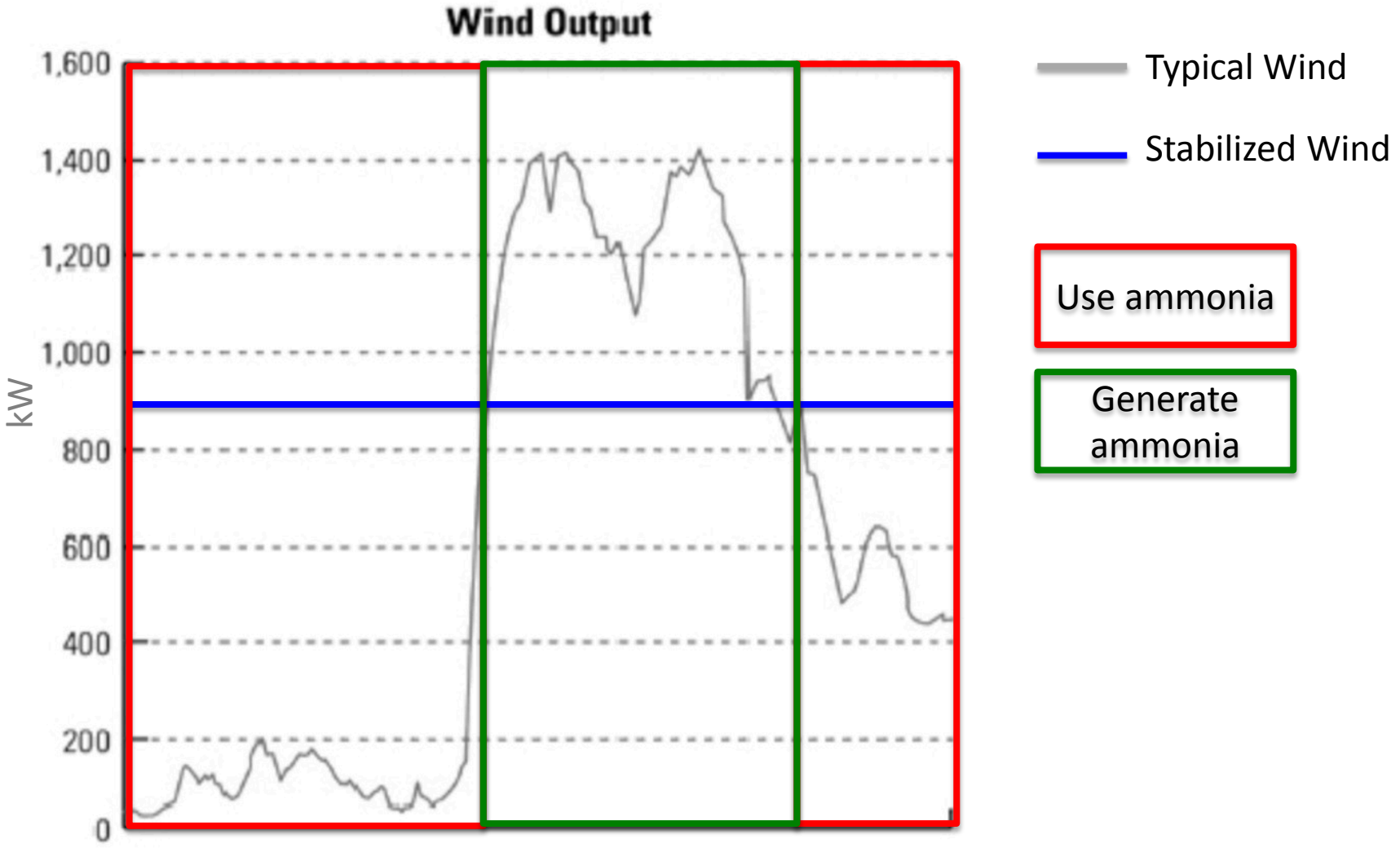
NH3 Applications

Grid Stabilization



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NH3 Applications

Grid Stabilization

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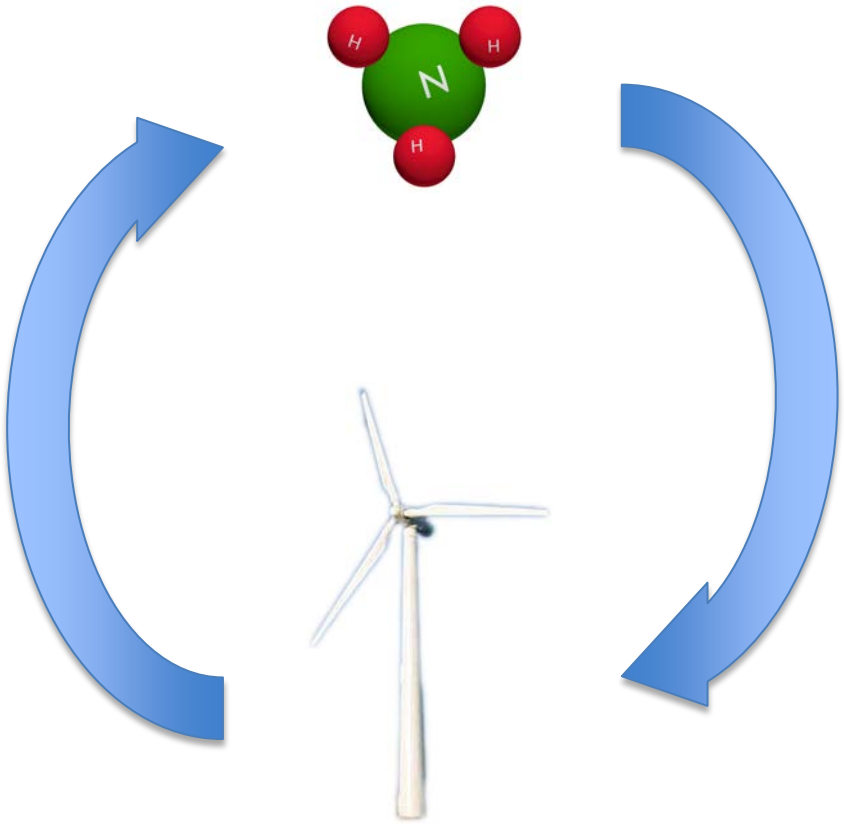
NH3 Applications

Wind



Wind

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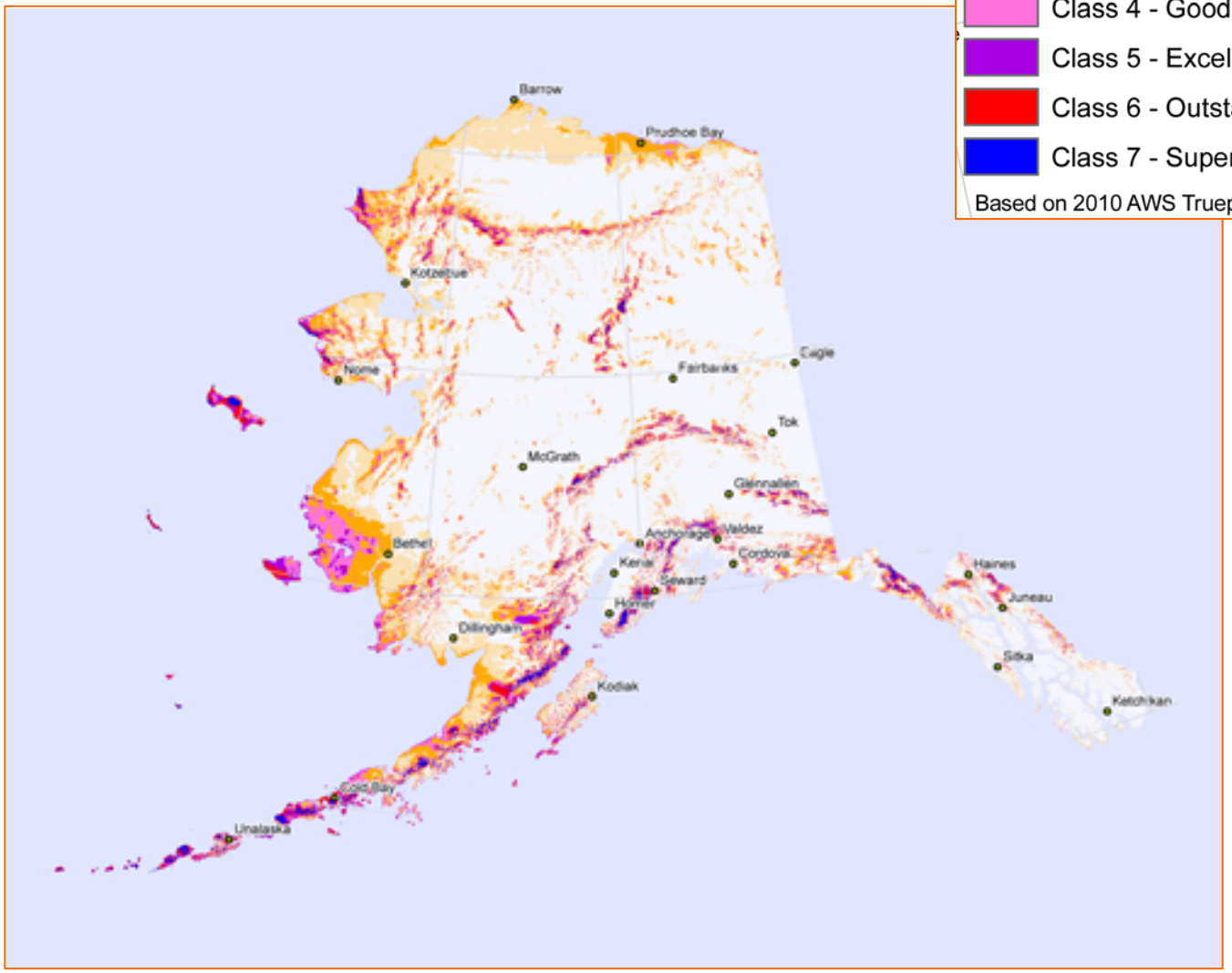
NH3 Applications

Stranded Wind



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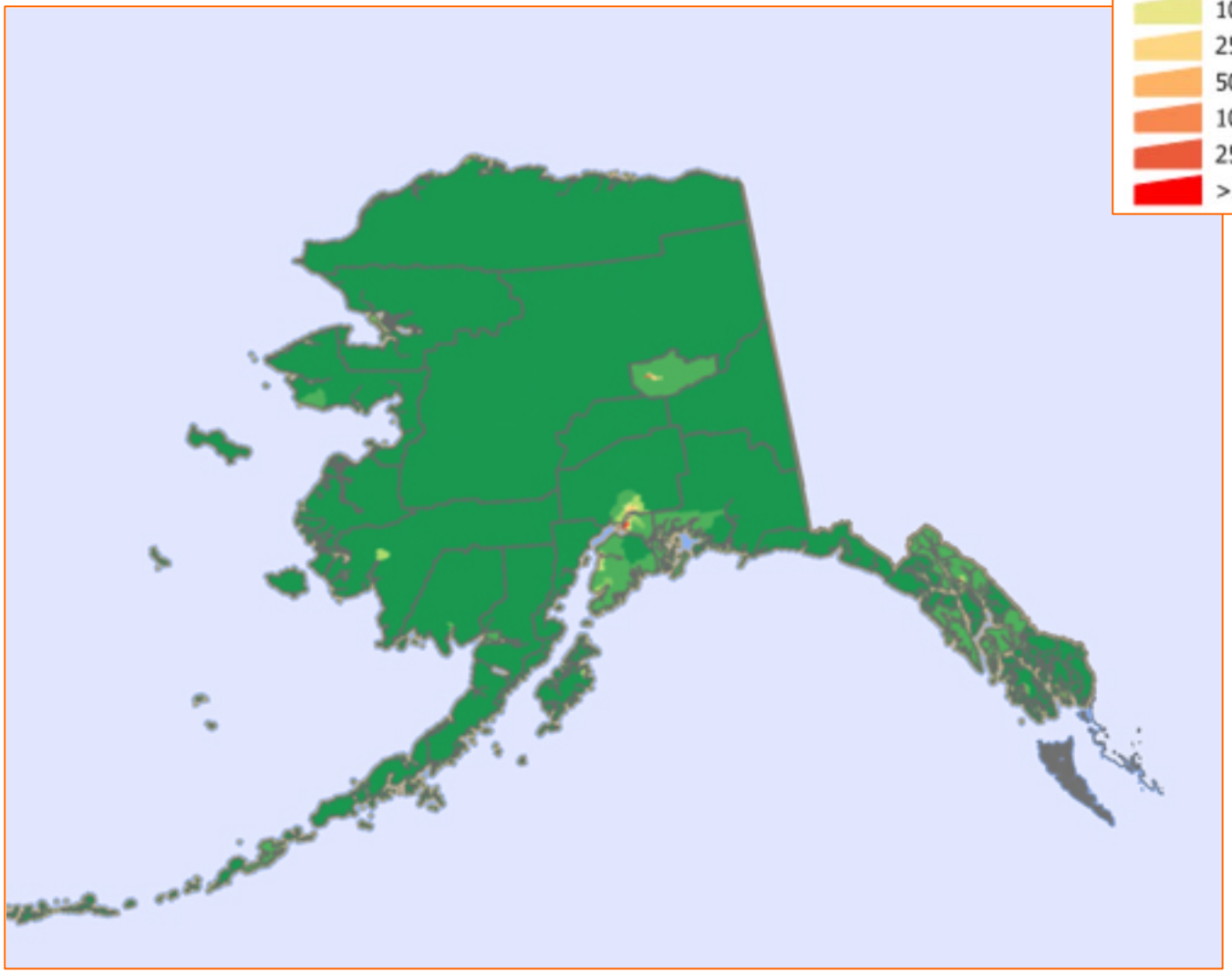
NH3 Applications

Stranded Wind



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NH3 Applications

Stranded Wind

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NH3 Applications

Curtailed Wind

"Bonneville Power Administration (BPA) displaced about 4.3 GWh of wind energy generation for several hours on the morning of April 29, and about 5.8 GWh on the morning of April 30"

Source: http://nawindpower.com/e107_plugins/content/content.php?content.9776

NH3 Applications

Curtailed Wind

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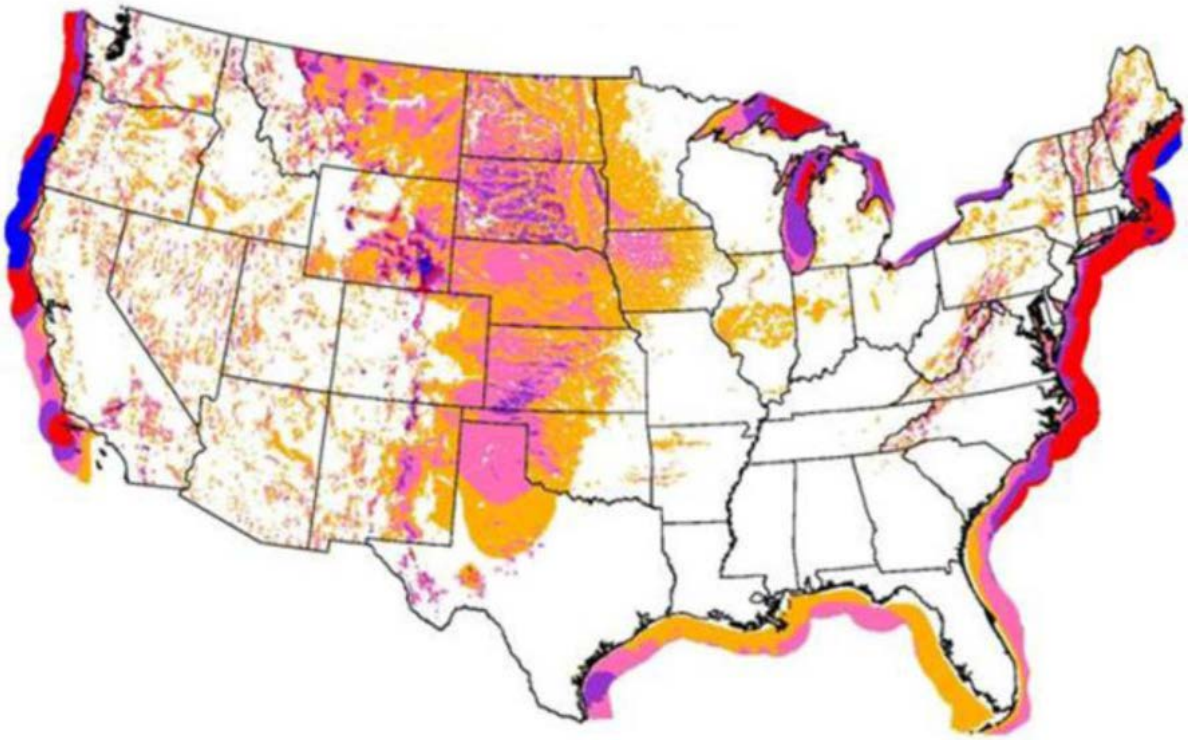
NH3 Applications

Offshore Wind



Source: NREL

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NH3 Applications

Offshore Wind

Source: NREL

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Objective #3

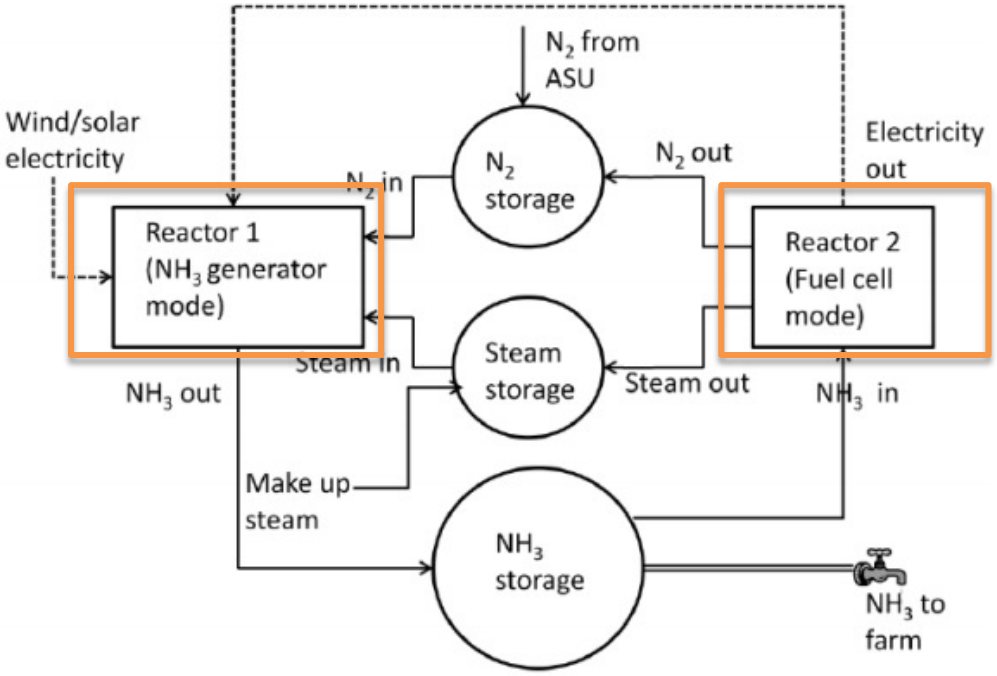
New IP from applications projects

IP

Flow Battery

Grid Stabilization

"Anhydrous Ammonia Synthesis with Internal Flow Battery"



Single-system power conditioning from any power source

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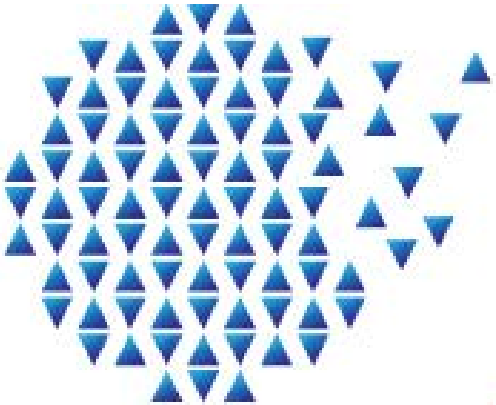
Progress

Progress

Completed Proposals

Progress

Completed Proposals



Breakout Labs™

Feedback

"Show us how we will gain a profit in five years"

"The price of NG is too low for NH3 to succeed"

"Auto companies are afraid of NH3 as a transportation fuel"

"The technical risk is still too great"

"SSAS requires solutions to problems that have stymied the development of SOFC"

"Are the scarce/precious metals going to be available in the quantities required?"

"Do you have a recycle/reclamation process for them?"

"Grid-scale technologies have too much of a head start"

Underlying Issues

Transient renewable power

Cheap natural gas

Declining interest in green tech

Tighter venture capital

End of wind credits

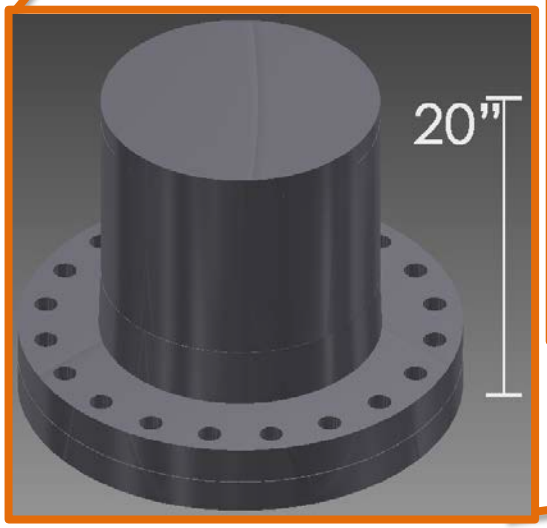
Missing data for SSAS scale-up

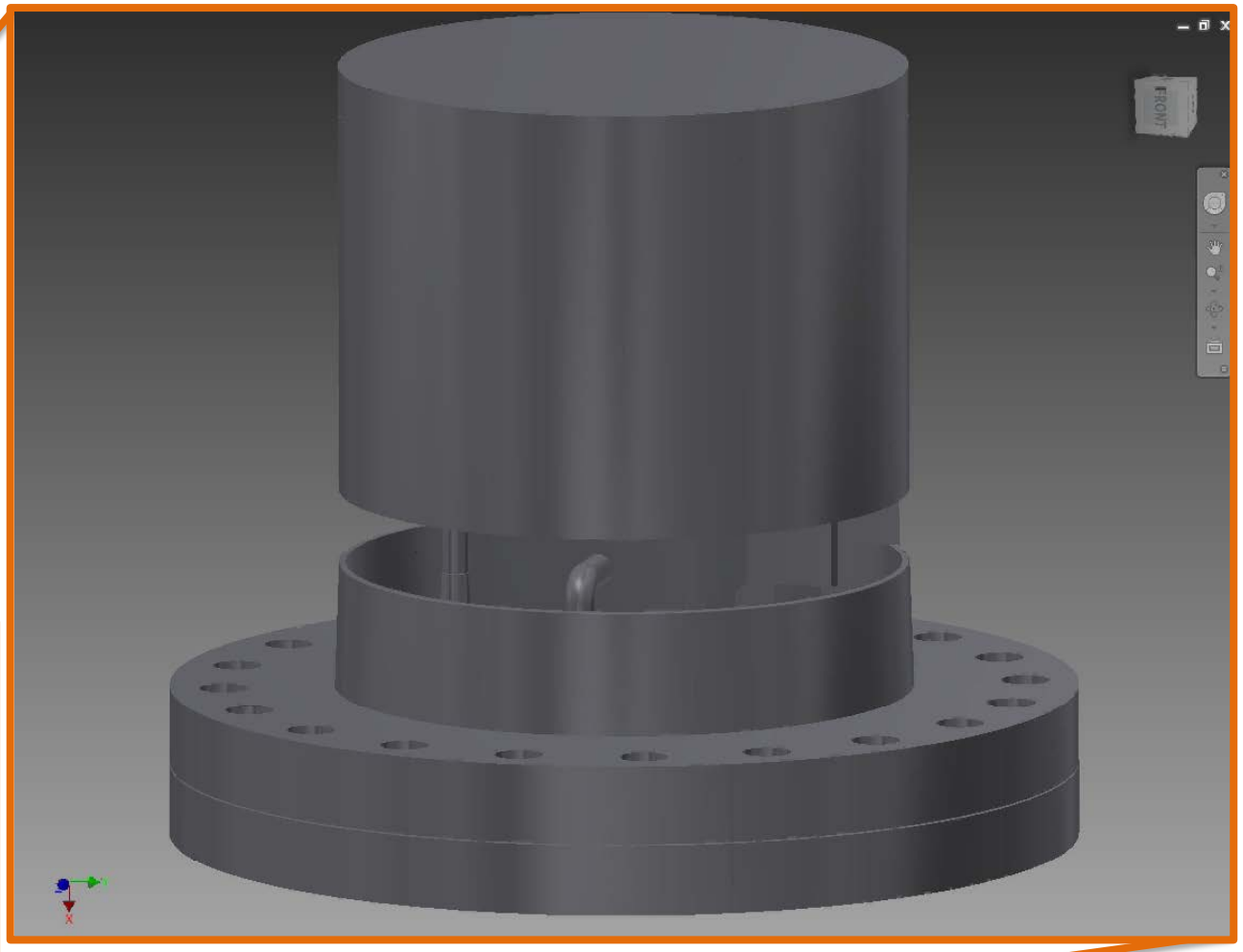
Fixation on H_2 and grid storage

Fear of NH_3 toxicity

Progress

1 kg/day SSAS Reactor Design





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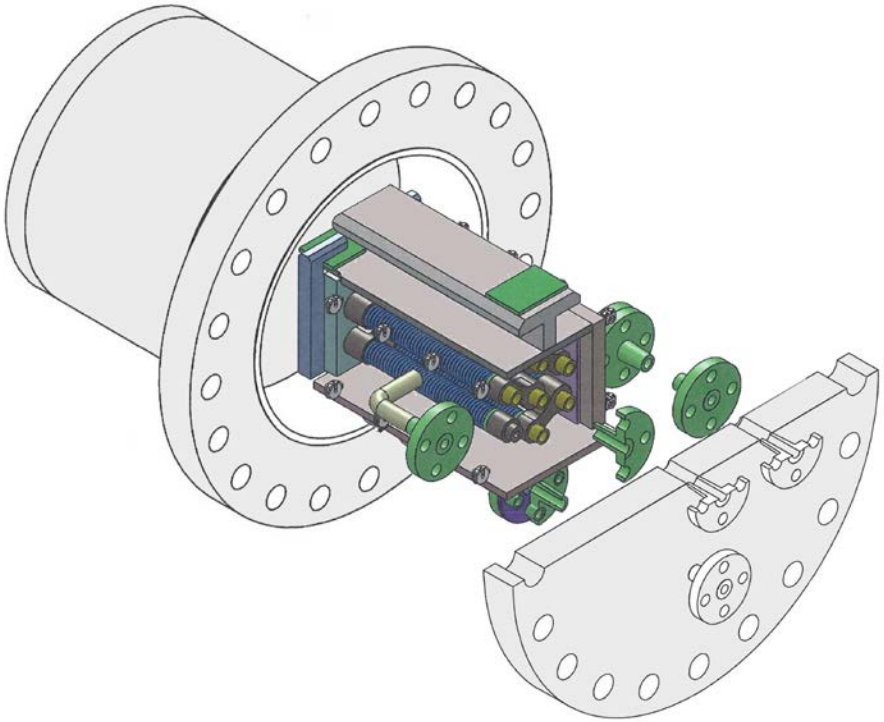
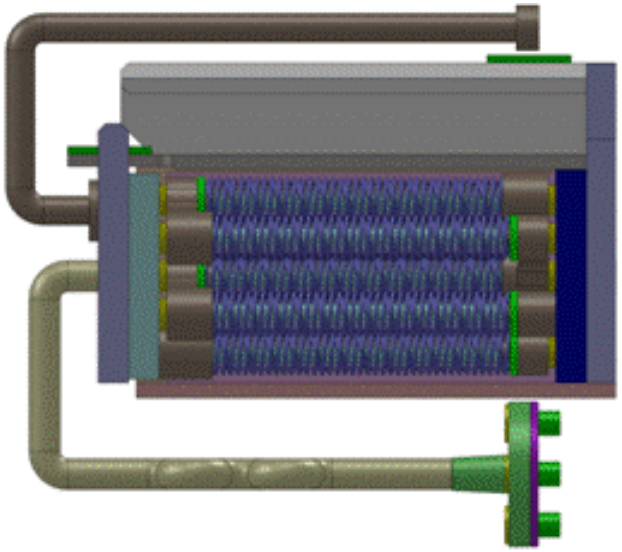
Progress

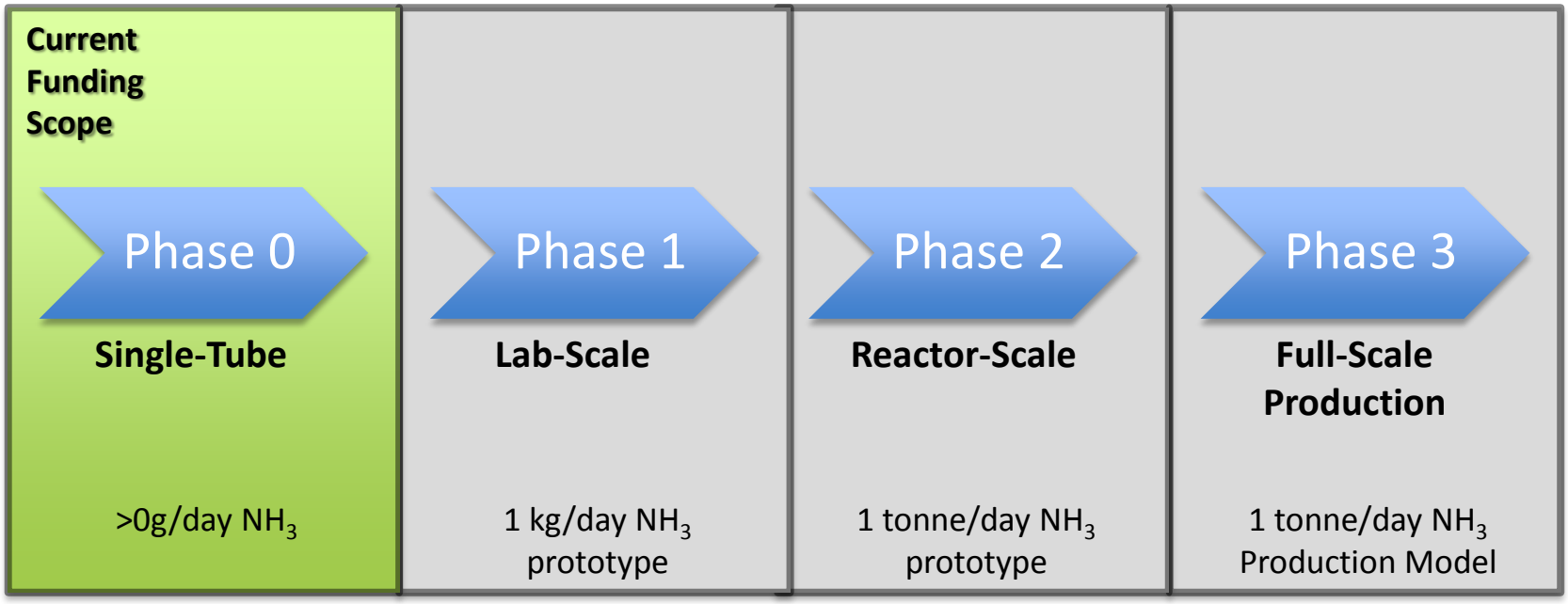
1 kg/day SSAS Reactor Design





Progress

Four-stage development and commercialization plan



Progress

Pending proposals

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Progress

Pending proposals

Progress

Green tech investors

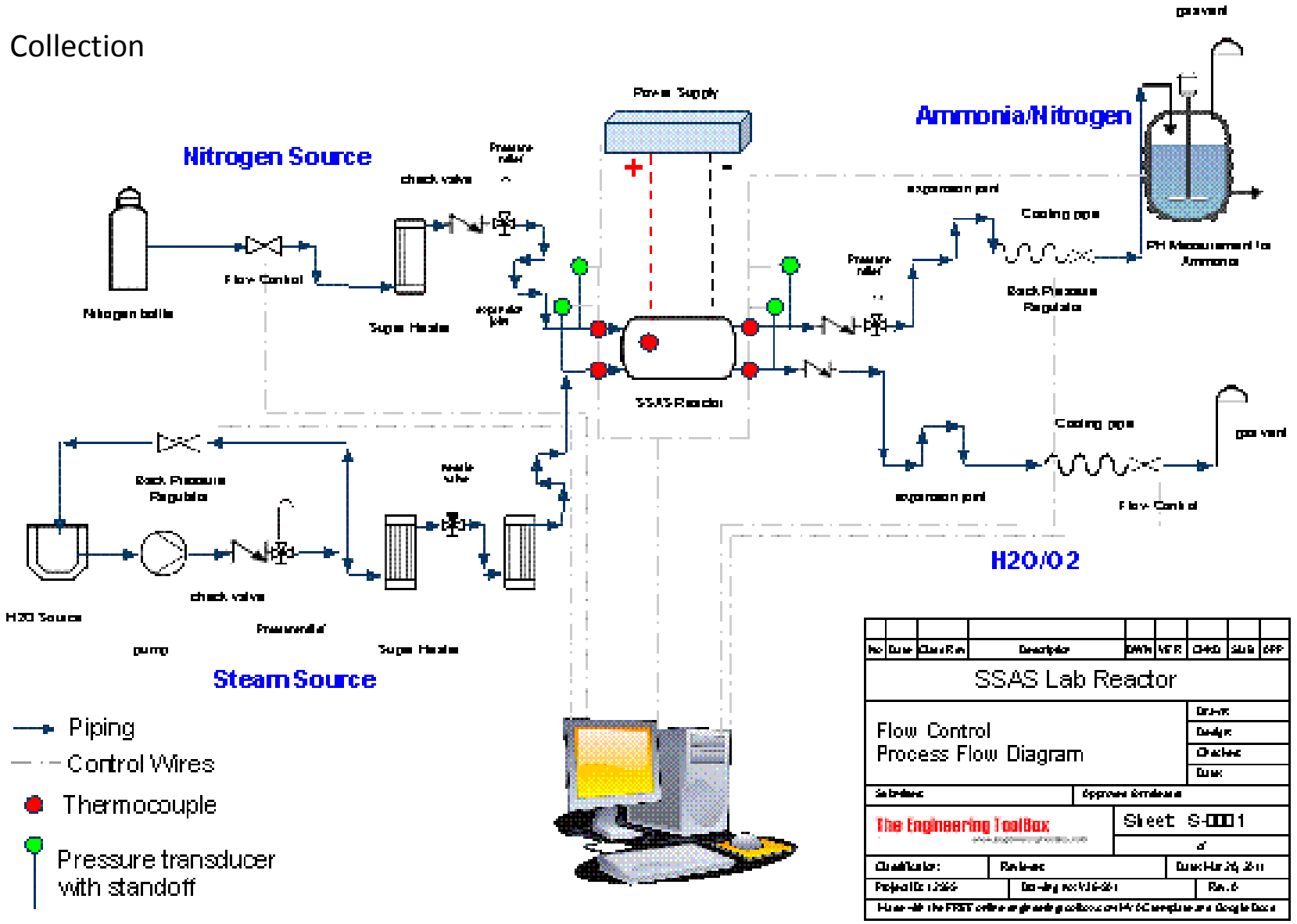
Progress

Pending proposals

Innovation

Innovation

Data Collection



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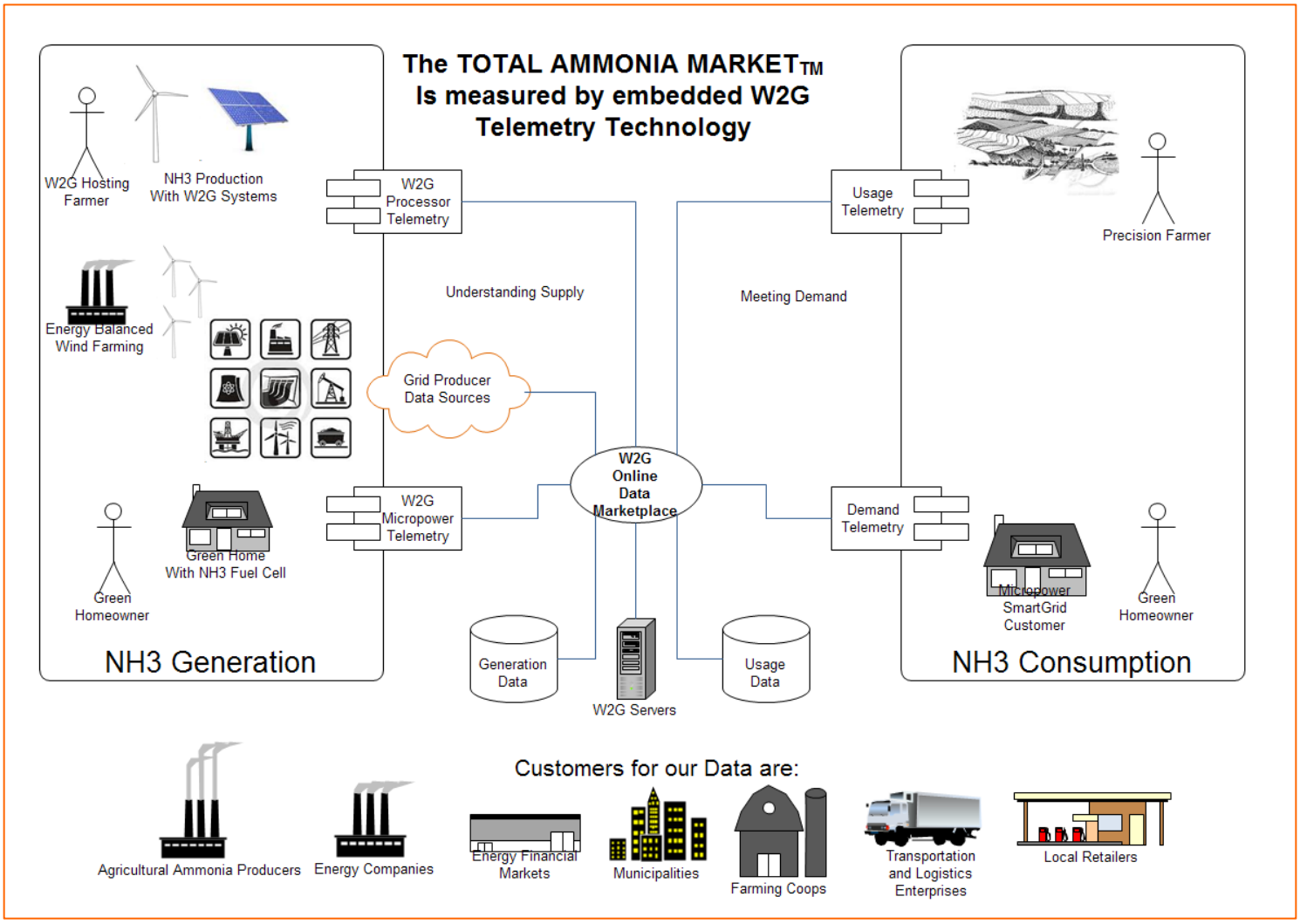
Innovation

Total Ammonia Marketplace



Innovation

Technology Sharing

- Goldcorp case study

Sharing of trade secret mining data

$575,000 in prizes

$6,000,000,000 in gold discovered!

Moving Forward

Involve customers and stakeholders

Start Local, move to regional

Ever-improving business plan

Thank you!

Questions?

Comments?