Clean Hydrogen Production Impacts on Ammonia Carbon Intensity: Challenges and Methodology

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Ammonia Energy Association
Global Certification Standards and Schemes
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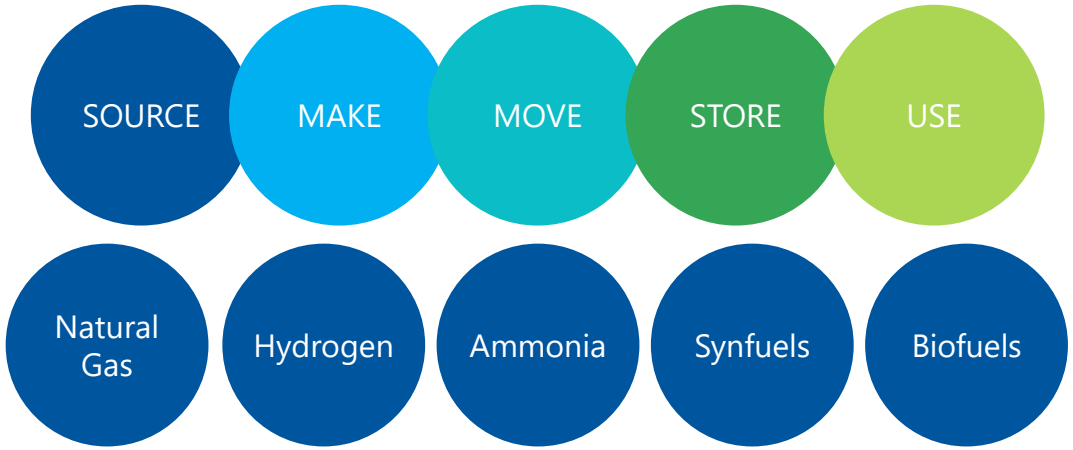

Accelerating developments needed to produce, store, deliver and use low-carbon alternative energy carriers

Ammonia Portfolio

- AEA members since 2019, attendees since 2017
- FEED on WVR 1600mtpd ammonia plant
- ARPA-E ammonia cracking membrane reactor with RPI and U South Carolina
- GTI Patented System and Method to Synthesize Ammonia, US 10,974,970 B2
- US DOE funded Gas Turbine Ammonia Combustion Project with partners Electric Power Research Institute, Georgia Institute of Technology, University of Central Florida, and CrafTech Industries, Inc.
- Ammonia as aviation fuel project with RTX, APRA-E
- NH_3 based heat pump(s) development and deployment
- Hydrazine Fuel Cell Program with Diahatsu (2007-2010)

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Open Hydrogen Initiative

GTI ENERGY

Building an open-sourced and standardized accounting methodology for hydrogen emissions at the **facility level**

Advancing transparency and credibility to hydrogen markets

Compatible with international norms & best practices

Download the toolkit!
https://www.gti.energy/ohi/

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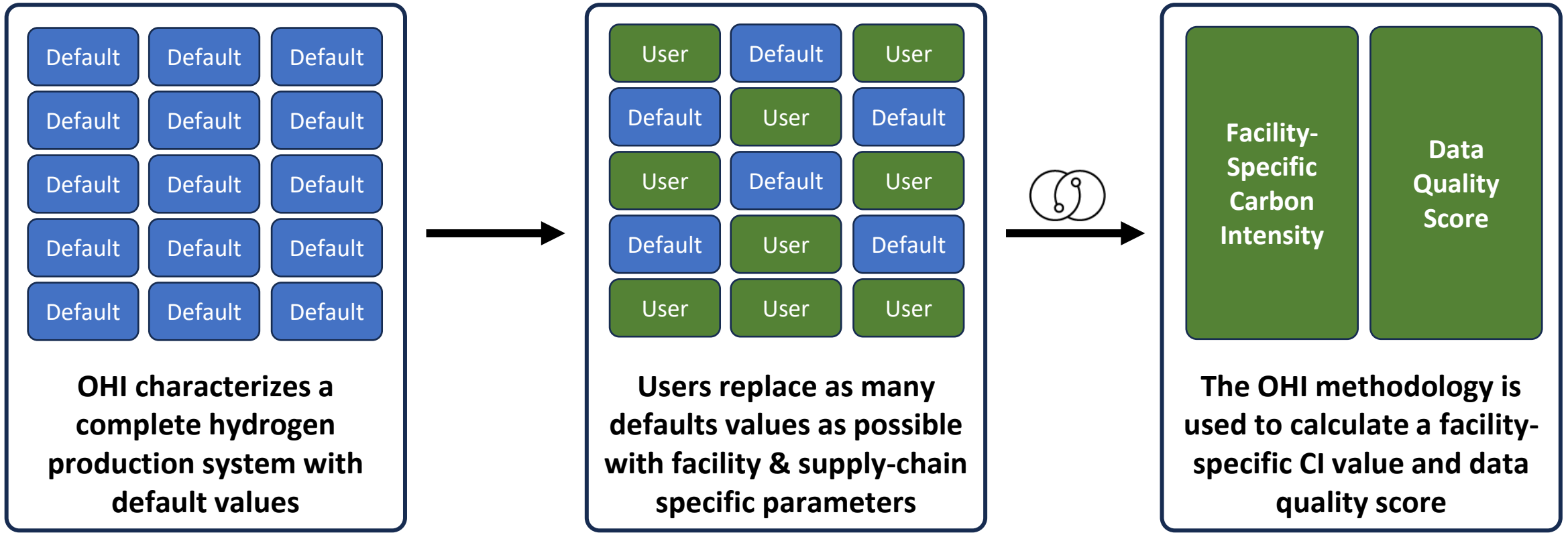
TEXAS
The University of Texas at Austin

Open Hydrogen Initiative (OHI)

Captures facility-specific results to calculate a facility-specific carbon intensity



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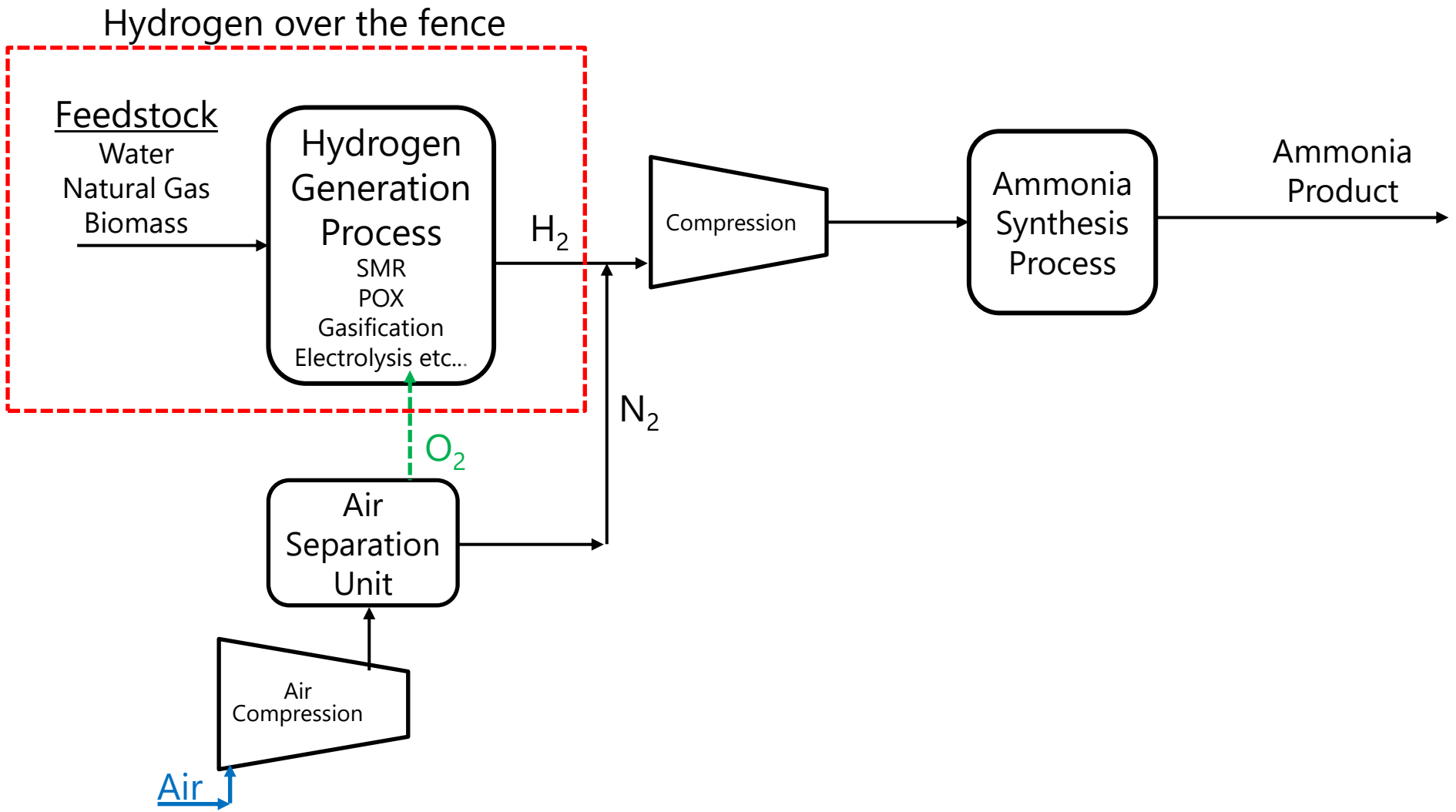
Challenge for Ammonia Cases with OHI



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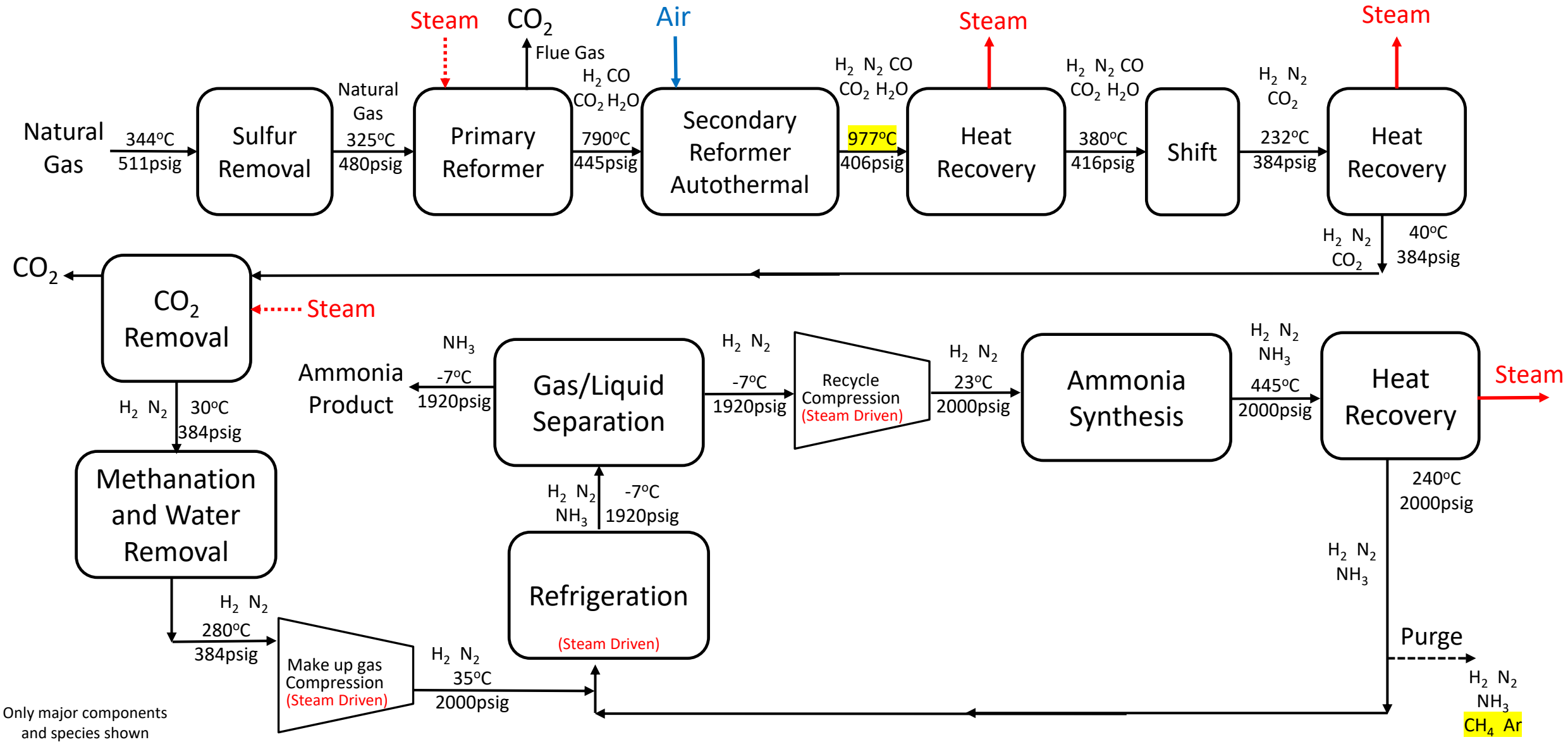
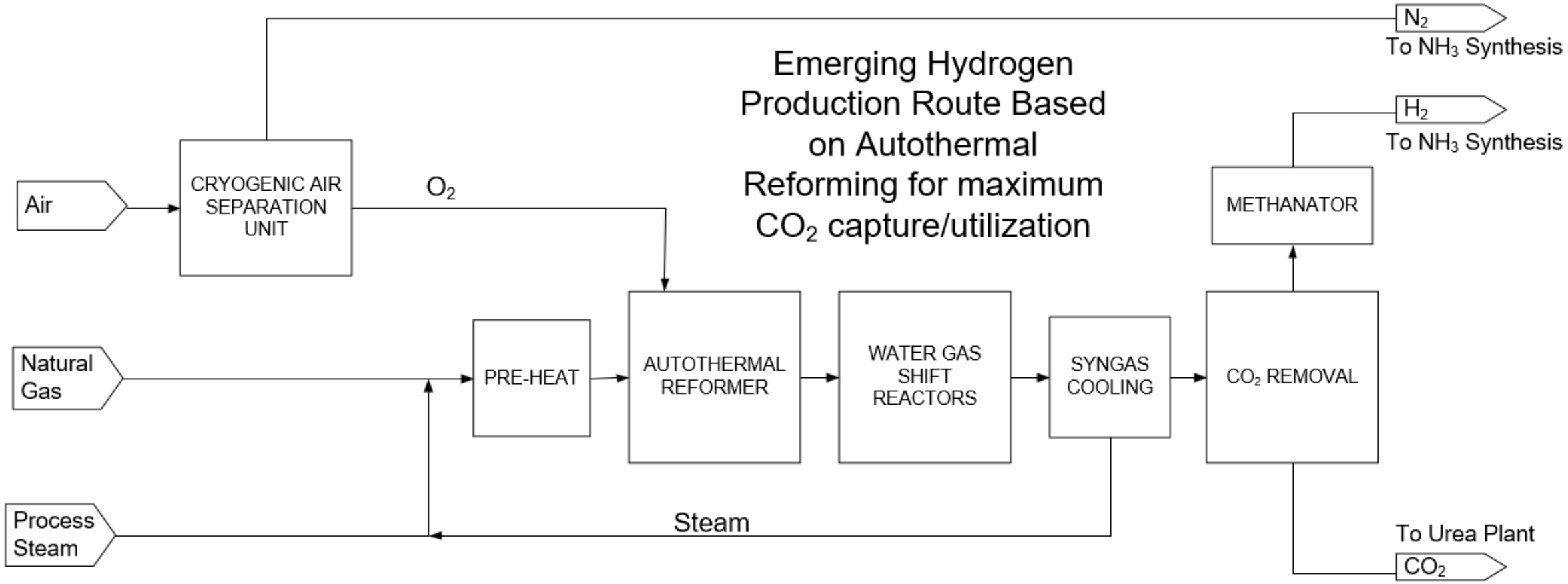
Ammonia From Natural Gas - Simplified



Only major components and species shown

ATR Route for maximum carbon capture



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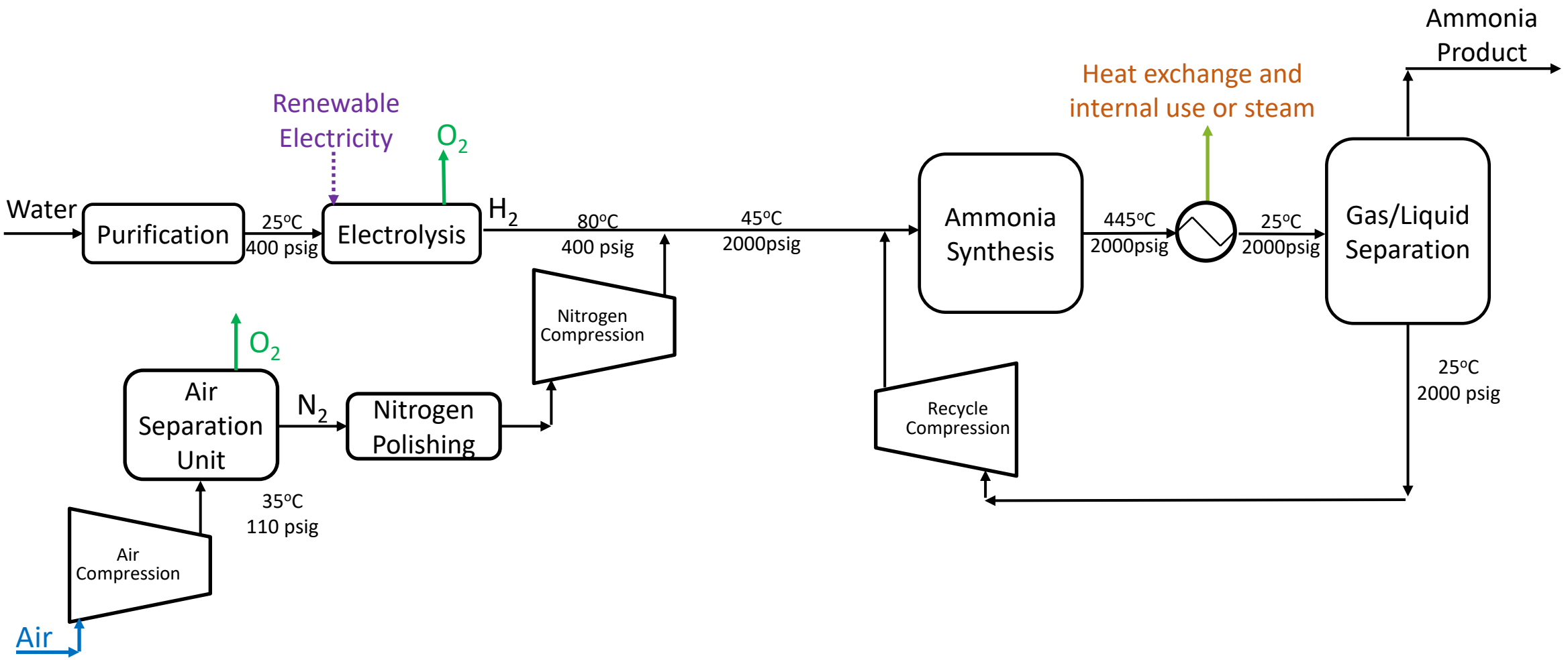
Renewable Ammonia from Water and Air



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Methodology:
Develop literature informed integrated process models

OHI Cases of Hydrogen Generation for Ammonia Synthesis	Notes
Steam Methane Reforming (SMR) without CCS	Baseline Case
SMR with CCS	Retrofit of the baseline (brownfield)
Autothermal Reforming (ATR)	Greenfield
Autothermal ATR with CCS	Greenfield
Biomass Gasification	Nitrogen available
Biomass Gasification with CCS	Nitrogen available
POX	Nitrogen available
POX with CCS	Nitrogen available
Electrolysis	No heat integration likely Needs nitrogen
Methane Pyrolysis	Needs nitrogen

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