



***Gasification + Power-to-Gas:
an integrated approach to
increased renewables production***

***David LaMont
TC Biomass Conference
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SunGas Renewables – Who We Are

- Established in 2019 as a subsidiary of GTI International⁽¹⁾
- Deploying proven commercial technologies to deliver low carbon energy products
- Providing licensed technology, equipment and services packages
- Developing, building, owning and operating low-carbon energy projects
- Focused on low carbon energy needs of North American and European markets
- Headquartered in Houston, Texas

⁽¹⁾ GTI International Inc., a holding company and wholly owned subsidiary of the Gas Technology Institute, combines capital, technical expertise, infrastructure, and access to GTI's global network of partners and customers, advanced laboratories, unrivaled training, and resources to help companies expand and grow.

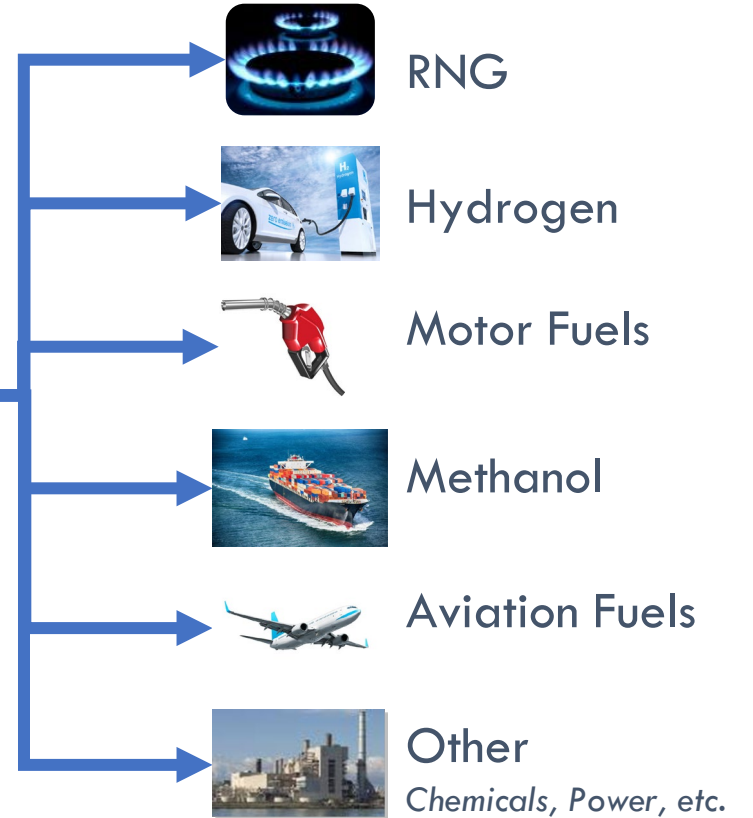
SunGas Enables Low-Carbon Energy



Waste Biomass



Syngas Conversion Technologies



Low-Carbon Fuels Start with Renewable Syngas

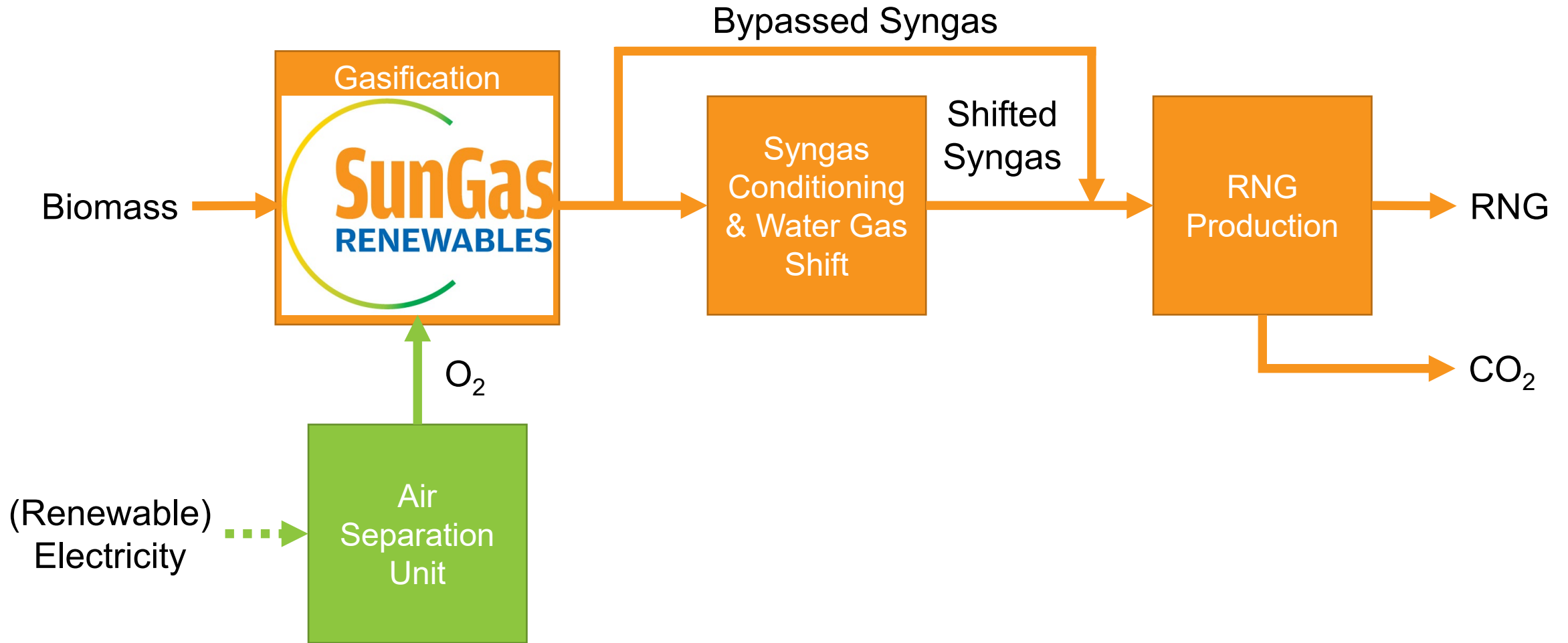
SunGas Proven Technology Platform

- Enables Renewable Energy Production in Multiple Energy Segments
- Enables Production of Low and Negative Carbon Energy Products
- Enables Qualification for Renewable Energy Incentives and Credits
- Reduces Criteria Pollutants by 99% Compared to Biomass Power Plants

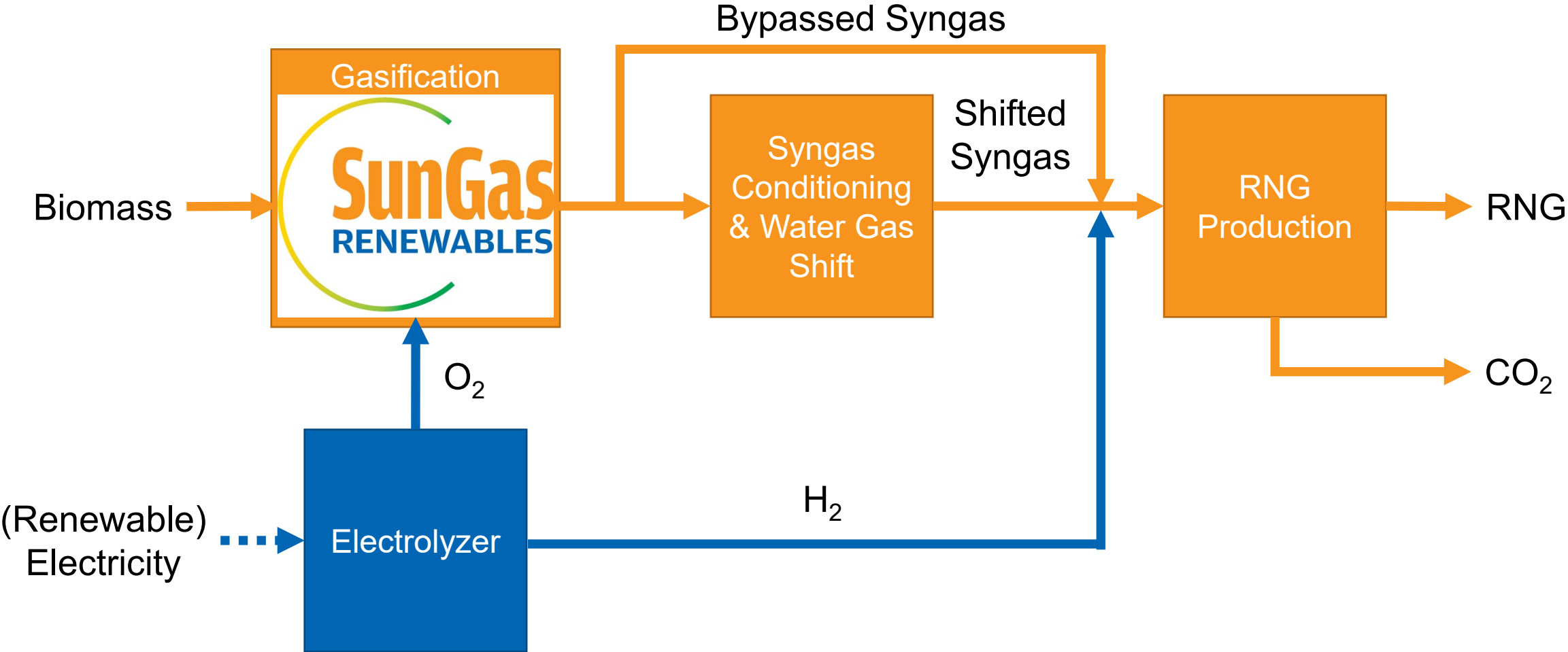
Why is SunGas interested in PTG integration for RNG?

- Utilities, refiners and chemical producers seek renewable solutions
- Few offerings to provide industrial-scale low-carbon gaseous fuels
 - Biogas sources are diverse, fragmented, inconsistent, far from pipe and often small
 - Transport sector incentives concentrate demand
- Increasing volumes of wood waste are available at attractive costs
 - Disposal of agricultural, urban, and forest sources challenged
 - Biomass power plants are closing
 - Some markets are saturated and producers of woody waste must pay to dispose
- Thermal gasification is increasingly viewed as the next big wedge of low-carbon energy
- Power-to-gas with gasification offers a unique integration opportunity

Pure Thermal RNG Production: Key Blocks & Flows



PTG/Thermal Hybrid Integration Case: Key Blocks & Flows



PTG integration with gasification creates several design and operation considerations

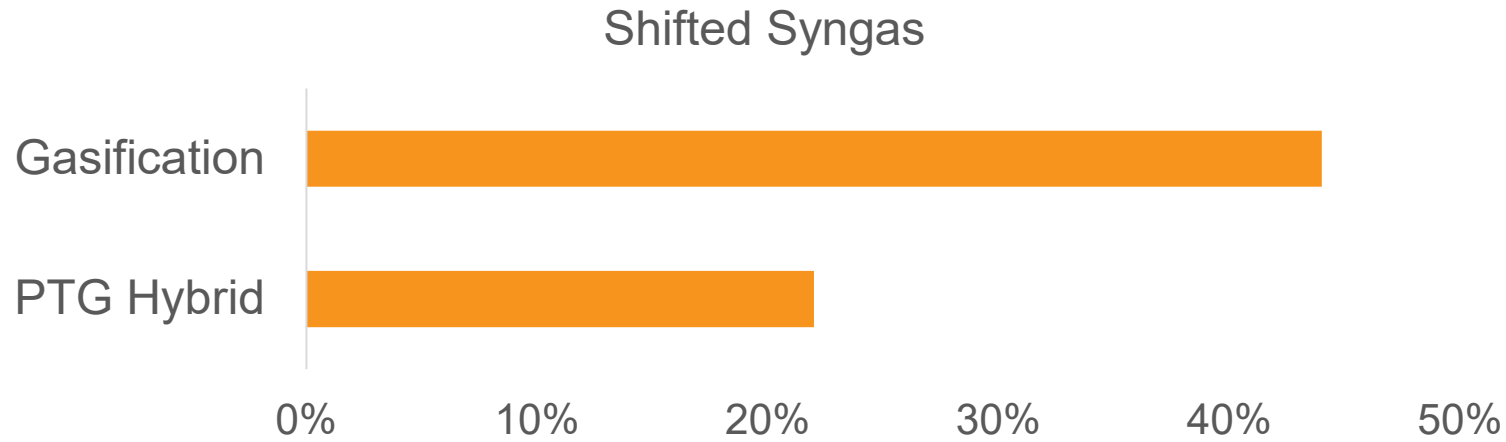
- Nitrogen from ASU no longer available for inerting during startup and shutdown
- Will require on-site storage of pressurized O₂ and H₂
- Water make-up and treatment requirements increase with electrolyzer
- Required plot space won't change considerably

Case descriptions and key assumptions

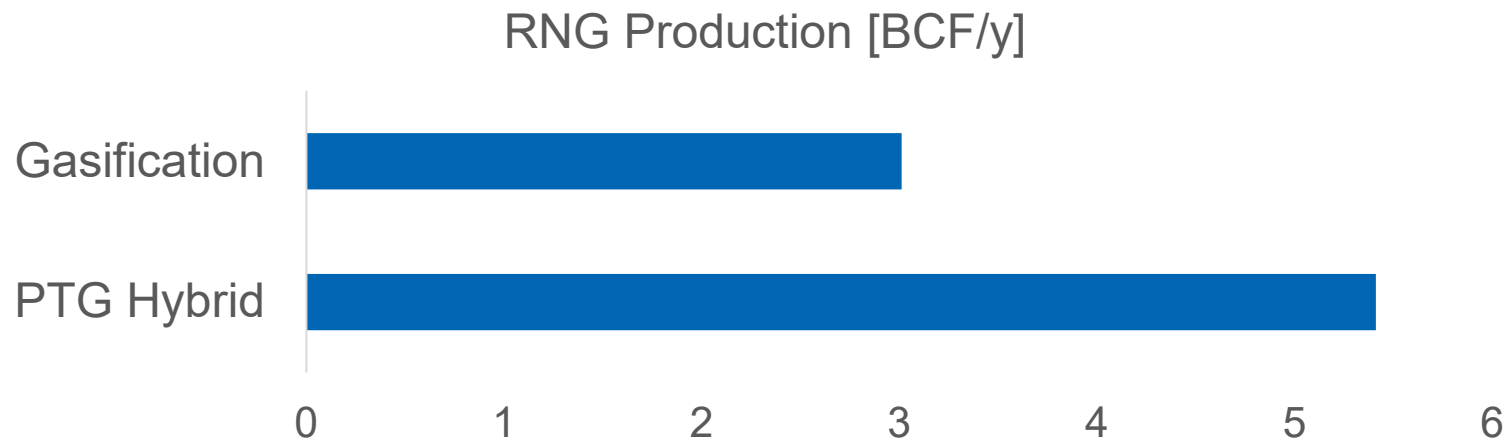
Case	Biomass	O ₂ Source	CO ₂ Capture
Pure Thermal Gasification	350 tons/day	Air Separation	Yes
PTG Hybrid	350 tons/day	Electrolysis	Yes

- Cases based on SunGas System 350™ processing nominally 350 short tons/d of biomass at 17% as-fed moisture
- Internal CO₂ use for solids conveyance is not captured
- Power consumption assumed to be zero CO₂ renewable
- Water gas shift bypass adjusted to meet H₂:CO ratio specification for RNG synthesis
- Electrolyzer O₂ and H₂ delivered at pressure downstream of syngas compression

PTG integration with gasification increases carbon utilization

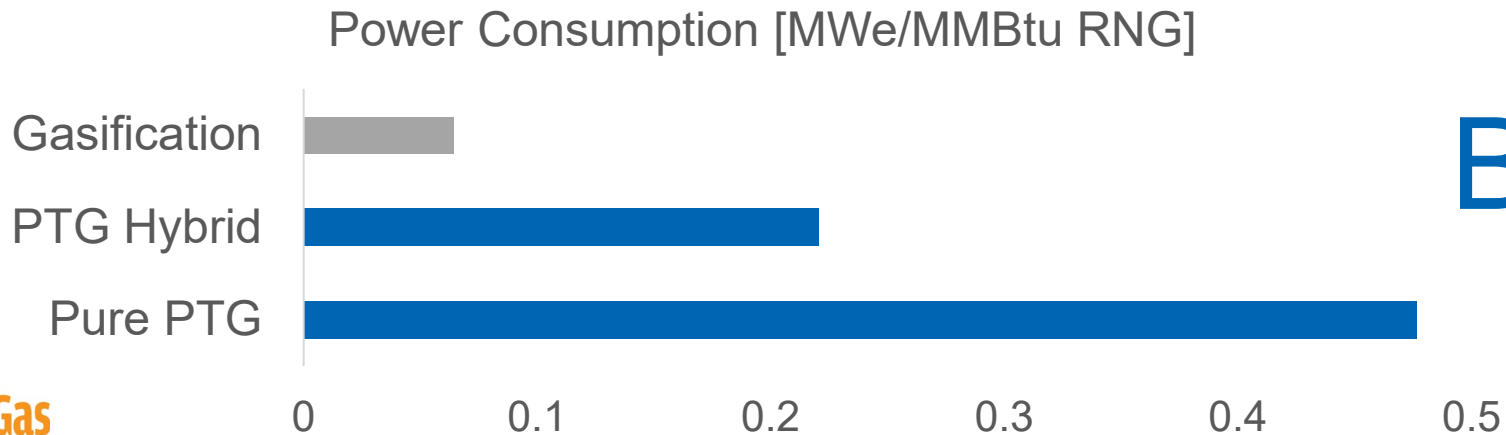
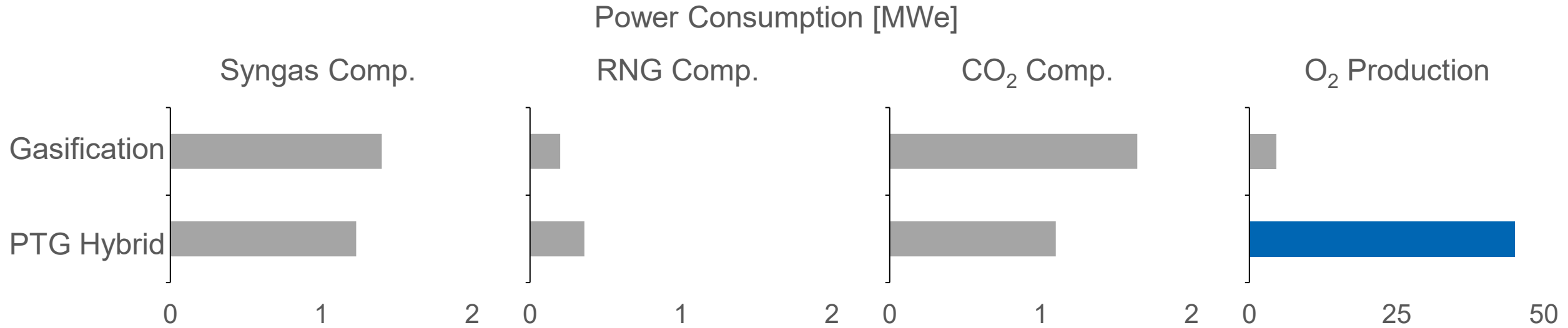


50%
Reduction in WGS



80%
Increase in RNG

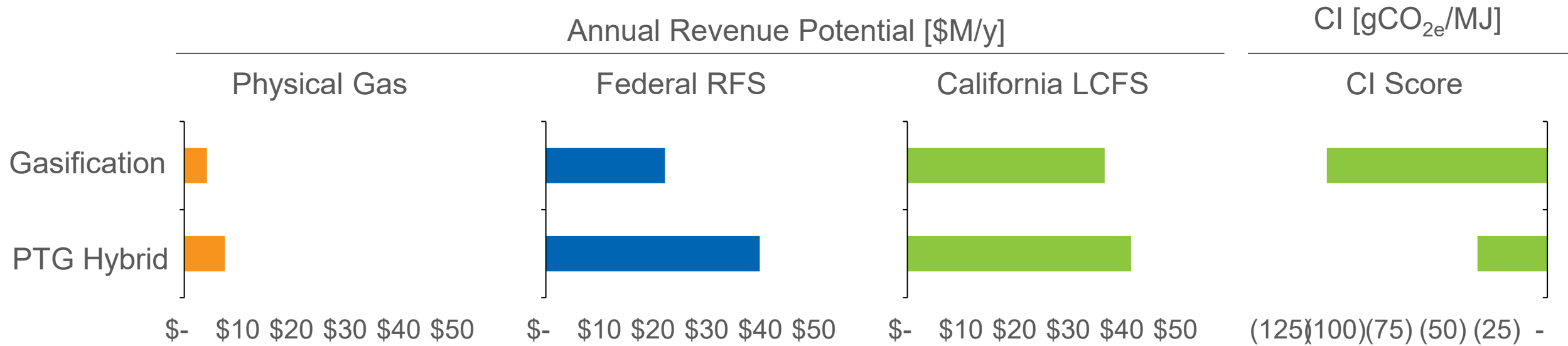
Electrical load increases considerably with PTG integration



But 47% Lower

Specific Power
vs. Stand-alone PTG

Higher production doesn't necessarily mean higher revenue



Proportional Increase in Gas Revenue

Proportional Increase in RFS Revenue

LCFS Revenue Impaired by Higher CI With PTG Hybrid Case



- Power-to-gas integration can significantly increase RNG product yield
- Beneficial utilization of growing supply of woody wastes and low-carbon electricity
- Beneficial utilization of both H₂ and O₂ from electrolysis
- Manageable operational and integration considerations
- Applicable to other renewable products: MeOH, gasoline, SAF, renewable diesel
- Commercially deployed and proven technologies



Questions