

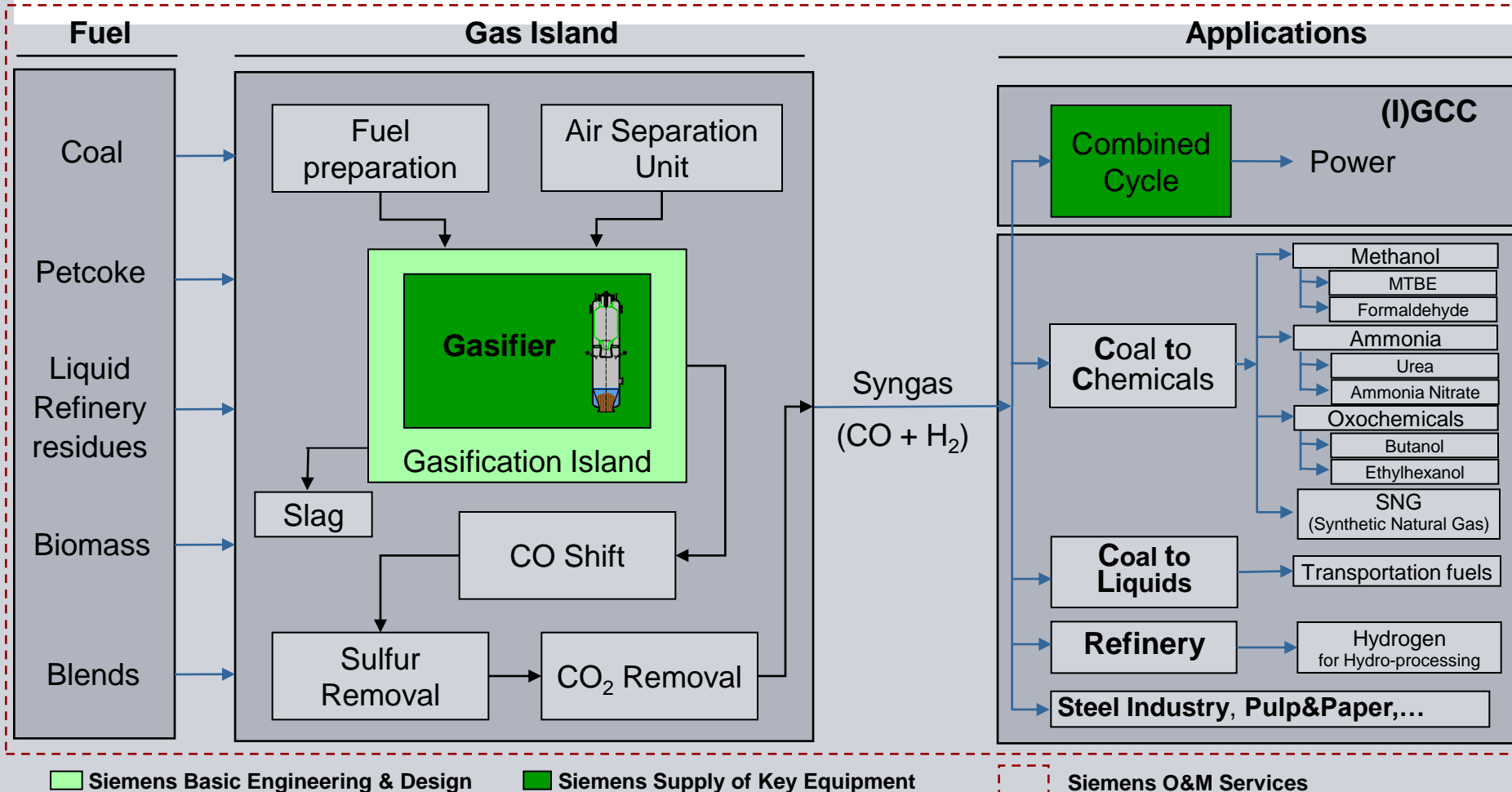
Siemens IGCC and Gasification Update

Harry Morehead

Director, IGCC & Gasification Sales and Marketing, Americas

McIlvane Hot Topic Hour
August 19, 2010

Gasification Plant Design and Applications

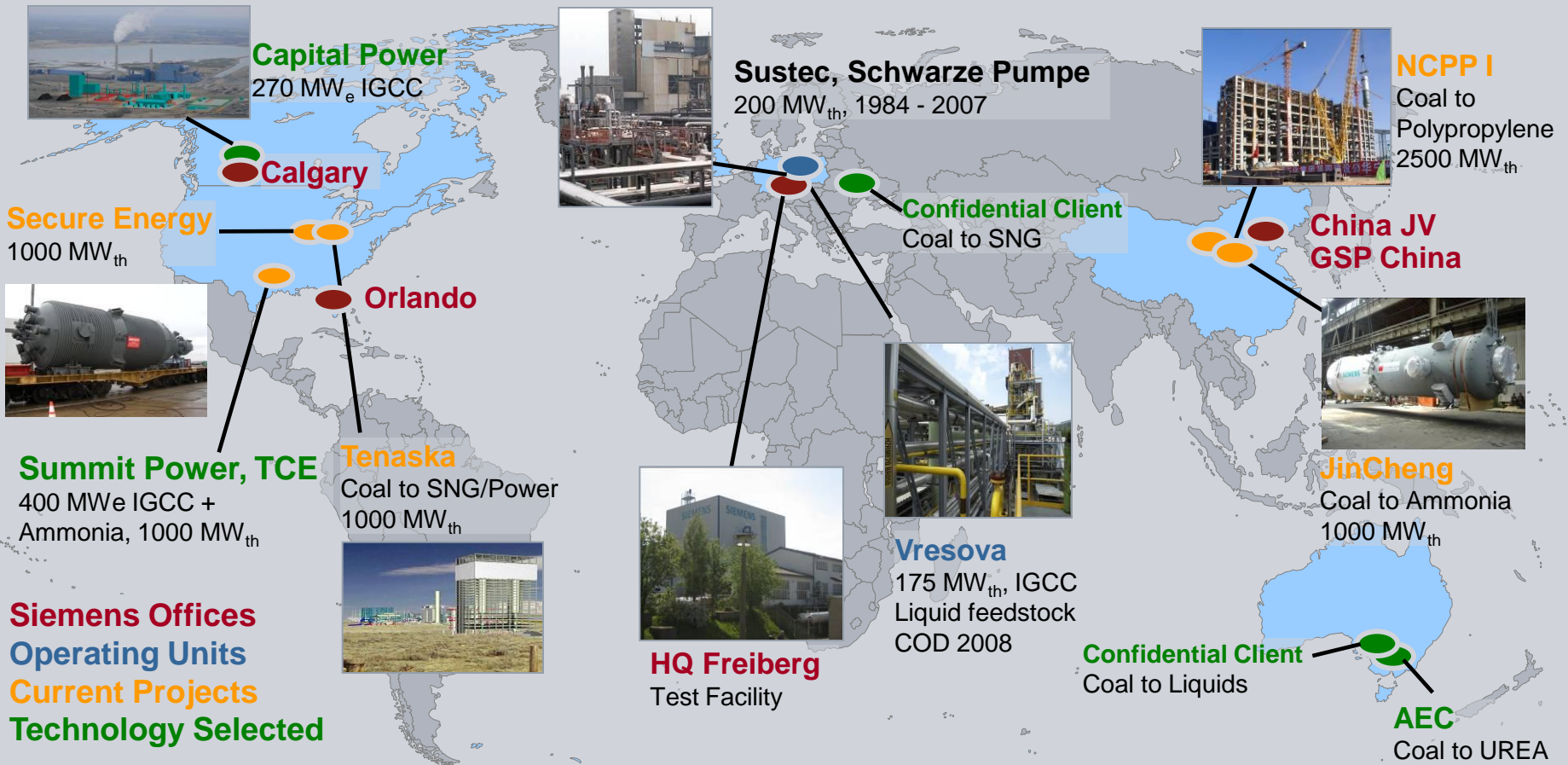


Gasification is able to meet the strictest environmental regulations:

Low emission of particulate matter, organic compounds and easy disposal of Sulfur

Can support the addition of capturing CO₂

Siemens Gasifier Activity Landscape



9 SFG-500 Gasifiers (incl. other key equipment) shipped
 Technology selected and pre-selected for additional projects

Progress at NCPP Project

Downstream Processes



Mid 2009



Mid 2010

Black water treatment



Co

Tenaska, Inc. Taylorville Energy Center

SIEMENS

Location / Fuel: Taylorville, IL
Illinois coal #6

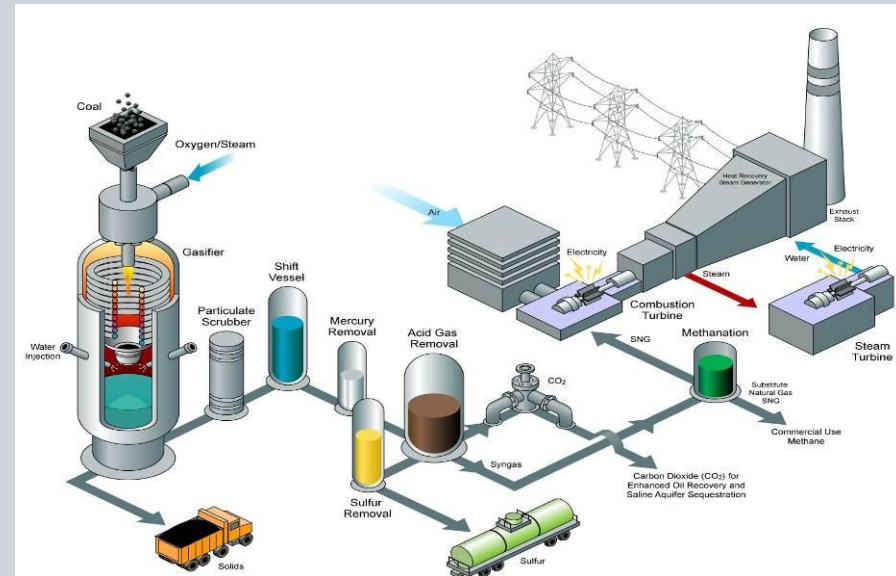
Power output: 500 MW (net)

Siemens scope: 2 x SFG-500 Gasifier and
2 x SGT6-5000F

CCS capture rate: > 50% used for EOR

Time schedule: ICC Decision 2010
Operation total plant: 2015

DOE support: loan guarantee

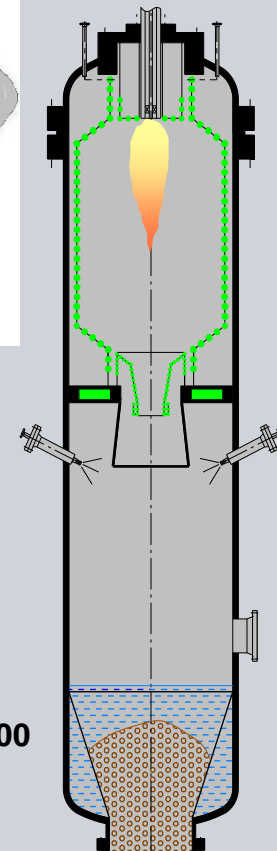
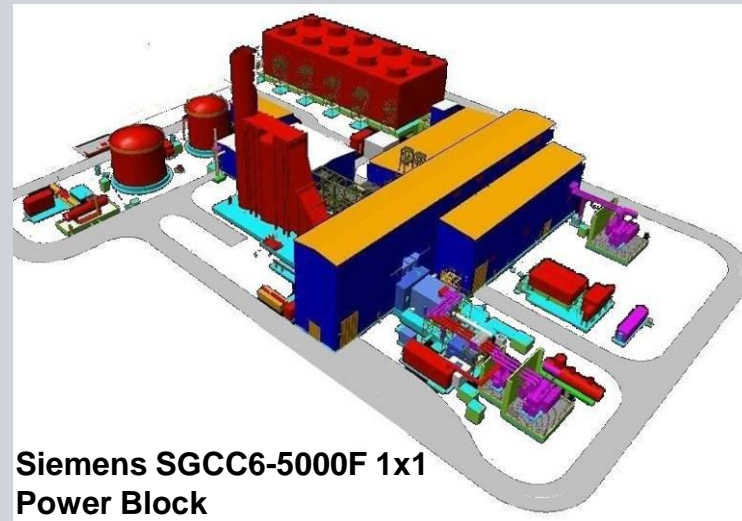


Hybrid IGCC with intermediate SNG production and standard natural gas fired Gas Turbine

Summit Power Group, Texas Clean Energy Project

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- 400 MW_e “Polygen” IGCC project
- 90% carbon capture
(2.7M tons of CO₂/year; CO₂ emissions only 20 to 30% of a natural gas combined cycle)
- Siemens to supply
 - SFG-500 gasifiers
 - SGCC6-5000F 1x1 operating on high H₂ syngas
 - Plant Operation and Maintenance services
- Located at FutureGen “finalist” site directly atop Permian Basin and CO₂/EOR opportunities



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Optimized Family of Gasifier Sizes for Today's Range of Gasification Based Projects

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SFG-200

35-50.000 Nm³/h

(H₂+CO)

SFG-500

100-130.000 Nm³/h

(H₂+CO)

SFG-850

180-210.000 Nm³/h

(H₂+CO)

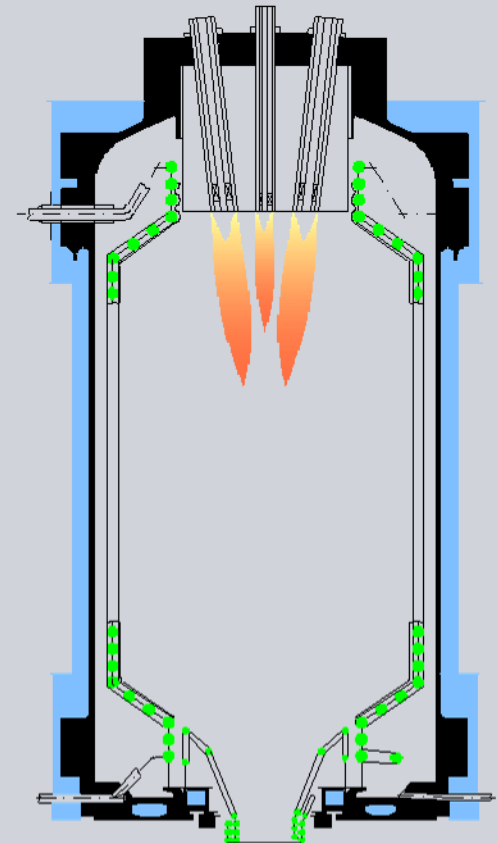
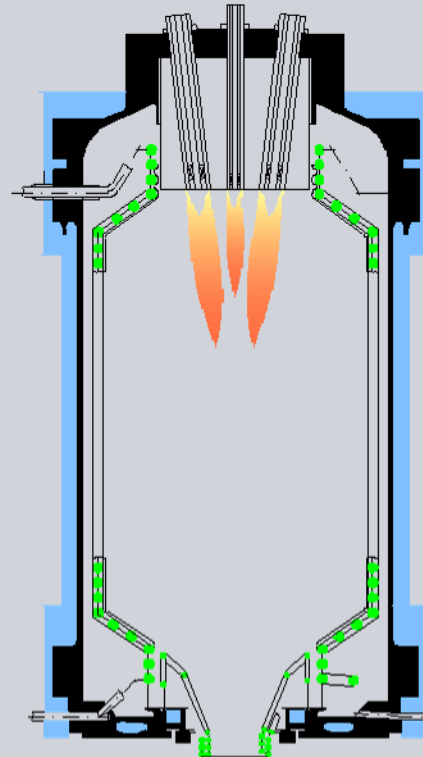
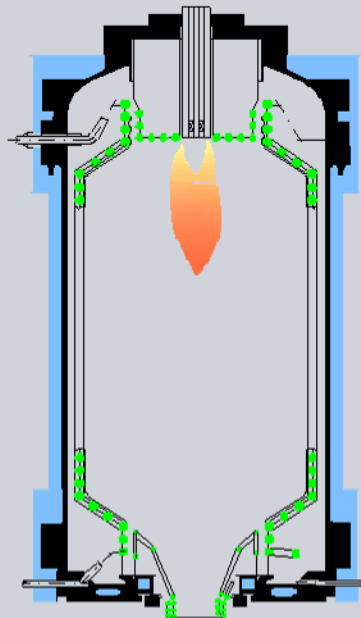
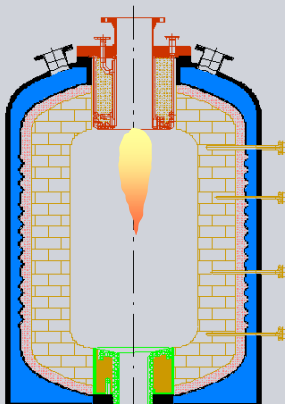
SFG-1200

280-310.000 Nm³/h

(H₂+CO)

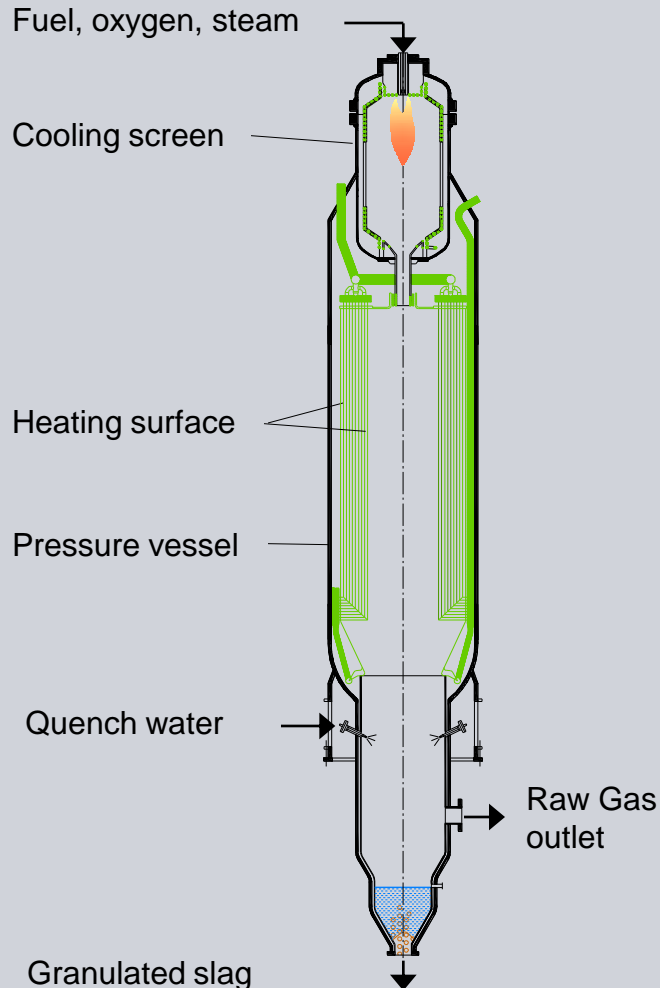
Sized to match
today's 60 Hz F Class
gas turbines

Best for low ash
feedstocks



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SFG with Heat Recovery



Design features

- Radiant Cooler followed by full quench of raw gas
- Efficient use of the high temperature heat in the steam generator for HP steam generation (optional: IP steam)
- High raw gas water content benefits CO-shift
- Proven reactor and quench design extended by Radiant Cooler

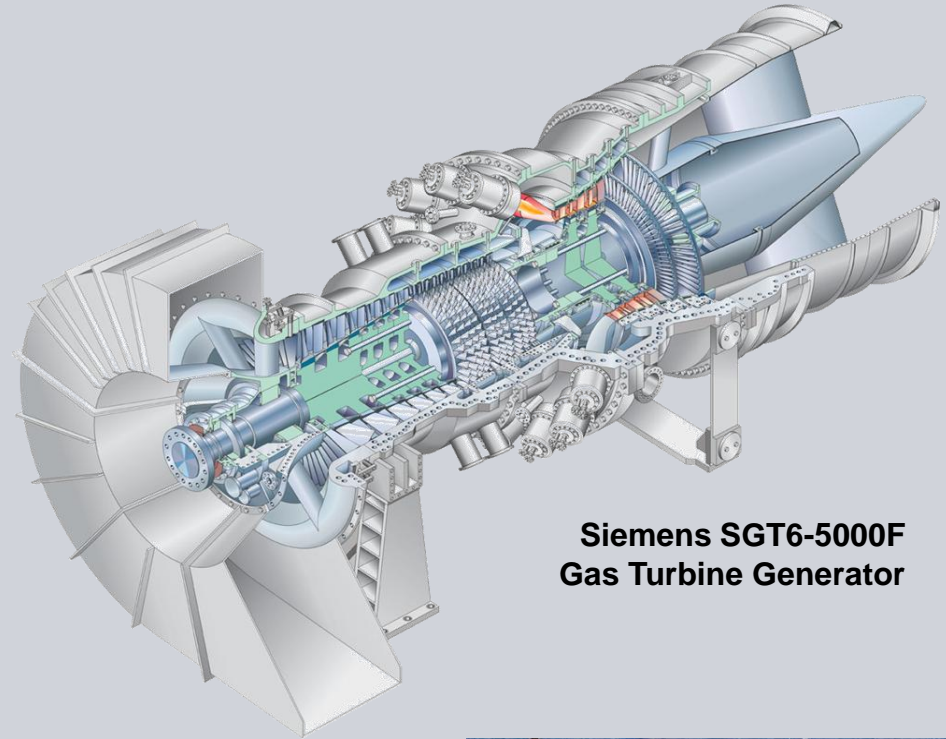
Efficiency improvement potential:

- IGCC w/o CO₂ capture
Plant net efficiency ca. + > 3.5 %
 (depends upon coal type, water/steam condition, gas turbine)
- IGCC with CO₂ capture
Plant net efficiency ca. + > 1.5 %
 (depends upon process conditions of CO-shift, coal type, water/steam condition)

Mississippi Power Kemper County IGCC Project

SIEMENS

- 582 MW_{enet} IGCC project
- ~67% carbon capture
(3 M tons of CO₂/year)
- Siemens will Supply 2 SGT6-5000F
Gas Turbine Generators
 - Will Operate on high H₂ syngas
as the primary fuel and natural
gas as the backup/startup fuel
 - Will include capability to extract
air for integration with the air-
blown gasifier
- Located in Kemper Co., Mississippi



**Siemens SGT6-5000F
Gas Turbine Generator**



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Conclusions

Near term global demand for gasification based solutions is focused on projects that produce high value products and can address climate change now

- Near Term: Using EOR for CO₂ storage
- Longer Term: Price signal for carbon is necessary

Economic hurdles still exist for gasification based projects that the next wave of projects will address

- Government financial support for commercial scale demonstration projects will help accelerate deployment

Longer term energy megatrends will drive demand for gasification based solutions for power, chemicals and clean transportation liquids





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