



2018 FALL WORKSHOP

**Gas Turbine Energy Systems:
Clean and Reliable Energy on Demand**

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Role of Gas Turbine Energy Systems

- **Clean Energy Synergies and Tradeoffs**
- **Some Misconceptions**

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The GTEN Committee shall not be responsible for statements or opinions advanced in technical papers or meeting discussions.

Climate Change & Health Synergies

All materials burn as vapours

- Natural Gas is already there

NG energy is mostly from Hydrogen

- very clean; used close to demand

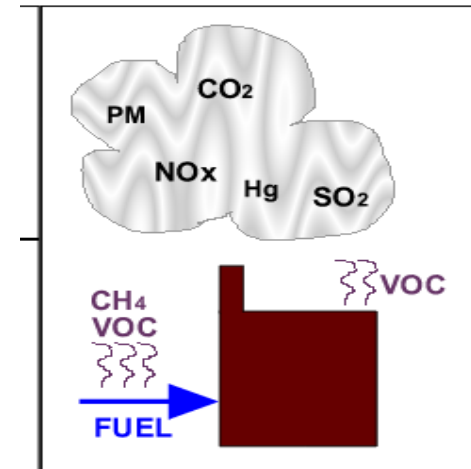
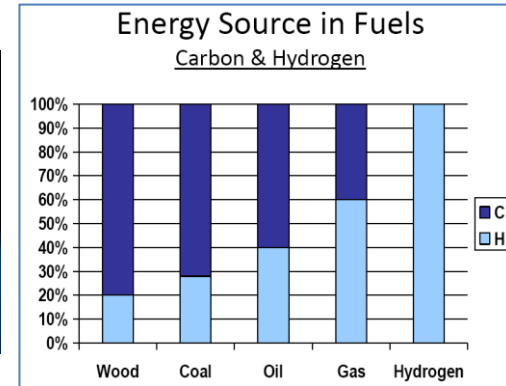
CHP; 250 kg_{CO2}/MWhr, 0.5 kg_{NOx}/MWhr

CAC, toxic & CO₂ emissions must occur together;

- NG has good total profile vs avg coal
- 70% red'n in GHGs, 95% in CACs

Links with Renewable energy

- integration of GTs and NG systems



System Efficiency Considerations

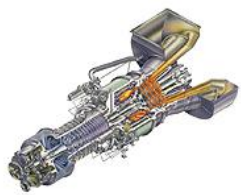
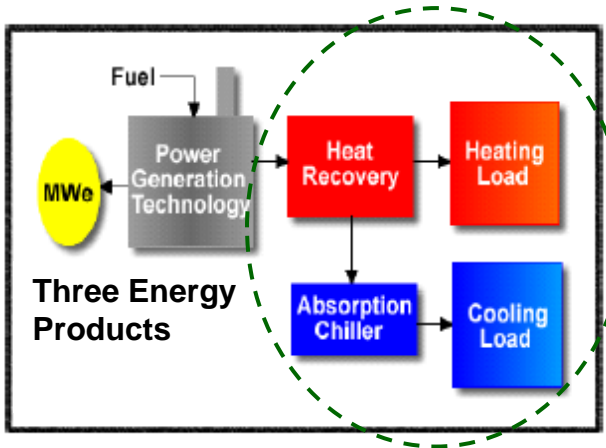
Fuel burning does not make Power, always makes Heat first (C-H-P byproduct power)

Waste Heat use is 'Zero emission' energy, similar to Renewable energy

Small gas turbines, high CHP efficiency

Thermal allocation, HHV vs LHV, Heat:Power ratio; Fuel Chargeable to Power

- Energy Diversity and Resilience;
- Power Disruptions are Important;
 - Onsite CHP can function through outages



vs



Courtesy of GE Power Systems

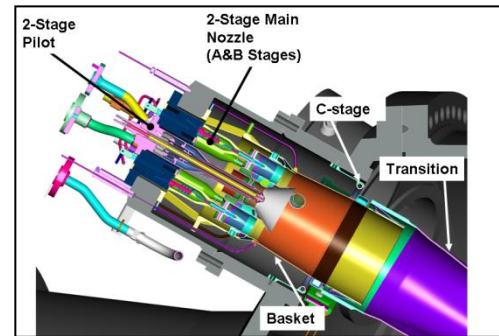


Onsite CHP: Adaptation

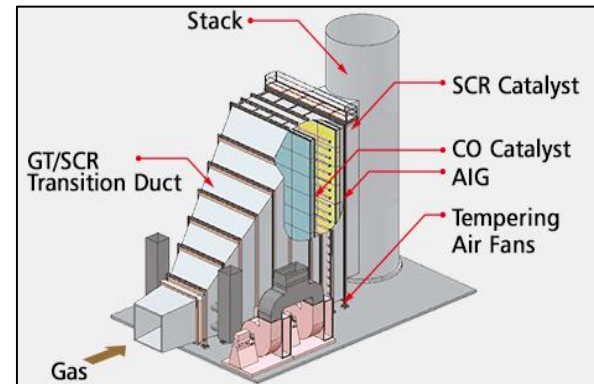
Air Emissions; System Tradeoffs

High pressure DLN combustors;

- Too Low NO_x, Operating Range
- Upsets from unreliable DLN (CH₄ venting)



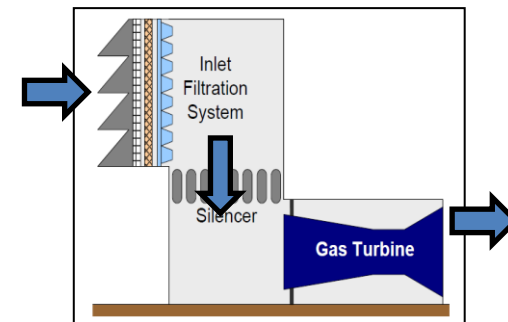
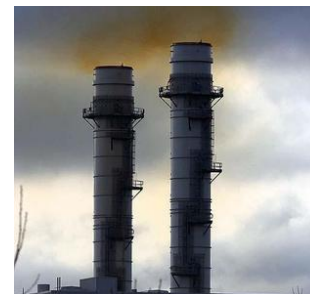
- SCR systems, collateral impacts of NH₃, PM, CO₂, N₂O, safety risk



- GT power from Inlet Airflow ; absorbs some local PM ?

- Flexibility; Plant cycling affects efficiency & visible emissions

- Concentration 'ppmv' vs Output-based stds



Opportunities for Clean GT and NG Systems

Promote Energy Diversity and Innovation

Efficient H₂-based Natural Gas solutions

Collaboration with Renewable Energy

Fugitive methane mitigation programs

National waste heat and CHP objectives

Training & Outreach, Site visits



Energy Strategy ?

