Ken Hall, PE
Director of Technology Integration
Siemens Energy (North America)
Chairman, Gas Turbine Association
GAS TURBINE MARKETS

- Utility and Industrial Power Generation
- Industrial Power Generation
- Oil & Gas Industry
INDUSTRIAL AND PROCESSING FACILITIES

- Chemicals
- Pharmaceuticals
- Foods and Ingredients
- Dairies and Dairy Products
- Beverages
- Breweries
- Grain Processors
- Ceramics
- Cement / Gypsum
- Paper / Wood Products
- Plastics
- Tires / Rubber Products
- Refineries
- Manufacturing

BUILDINGS AND INSTITUTIONS

- District Heating and Cooling Plants
- Universities
- Hospitals
- Resorts and Hotels
- Commercial Buildings
- Telecommunications Complexes
- Computer Centers
OIL AND GAS APPLICATIONS

- Gas Transmission
- Storage and Withdrawal
- Waterflooding
- Gas Gathering
- Gas Lift
- Field Pressure Maintenance
- Air, Process, and Refrigeration Applications
- Electrical Power Generation
POWER GENERATION APPLICATIONS

- Large and Small Utilities
- Cogeneration
- Standby Power
- Peaking Power
- Power Generation for Industrial and Processing Facilities
- Areas with Rapid Demand Growth
- Mobile Power
- Remote Locations
- Load Management
The Rise of Natural Gas for Electricity Generation

Sources: EIA and Industry Reports;

- Blackouts in England and New York City create interest in using natural gas turbines as backup generators. Combined-cycle technology makes gas turbines more efficient.
- Powerplant and Industrial Fuel Use Act of 1978 (PIFUA) prohibits use of natural gas in new power plants.
- Natural gas price drops by more than half from 1983-1994.
- 1990: Clean Air Act amendments add additional rules for power plants.
- 2005-2014: New natural gas drilling technology, including “fracking,” increases U.S. natural gas production more than 40% in 10 years.
- April 2015: For the first time, natural gas produces more power than coal in the U.S.
- August 2015: EPA announces its Clean Power Plan calling for natural gas to produce 33% of the nation’s electricity by 2030, and coal 27%.

1960’s

1970

1980

1985: Coal generates 57% of the power in the U.S.

1987: PIFUA repealed

1990

1990’s: steps taken at the federal and state levels to loosen regulations on electric utility markets. Non-traditional power producers begin building generation capacity, almost all of it from new natural gas turbines.

2000

2000-2002: Coal generates 57% of the power in the U.S.

2010

2015: For the first time, natural gas produces more power than coal in the U.S.
Natural gas expected to surpass coal in mix of fuel used for U.S. power generation in 2016

Annual share of total U.S. electricity generation by source (1950-2016)
percent of total

- 2016 forecast
  - natural gas (33%)
  - coal (32%)
  - nuclear (19%)
  - nonhydro renewables (8%)
  - hydro (6%)
  - other (1%)

EIA
Gas Turbines: Cleaner use of fossil fuel

CO2 Creation

Fun Fact
The amount of CO2 that would be saved annually by a 1% improvement in average GT fleet efficiency would be more than twice the amount saved by solar power produced in 2014.

High Thermodynamic Efficiency + Low Carbon Fuel = Low CO2 Emissions
Power Generation on Grids with renewables

Lots of non-renewable generation is operating all of the time

The “Duck Pond” Non-renewable generation

The non-renewables remain more environmentally influential than the renewable generation

Lots of non-renewable generation is operating all of the time
Generating Capacity Additions

Reference Case through 2040

Figure MT-32. Additions to electricity generating capacity in the Reference case, 1985-2040
Congressional Briefing on Advanced Gas Turbine Technologies and Manufacturing

Kenneth Hall

Director of Technology Integration, Gas Turbine Engineering
Chairman, Gas Turbine Association

4400 Alafaya Trail
Orlando, Florida 32826
Phone: 407-810-5409
E-mail: kenneth.hall@siemens.com