Hot SCR Reference Project

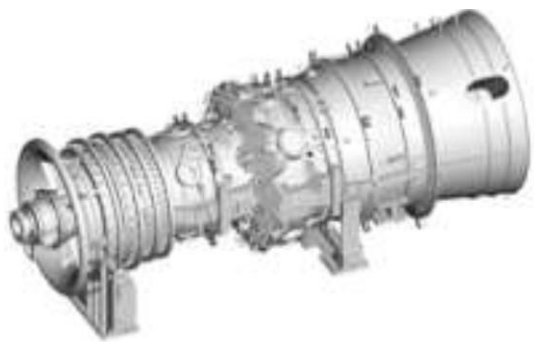
- Project Features
  - Four (4) SGT6-5000F CTG's
  - GT Peaking plant nominal 750 MW
  - Max operating temp: 1,146F
- Emission Limits (15% O_2 Dry Basis)
  - NOx & CO 2.0 ppm
  - VOC 1.0 ppm
- Operational since 2013
- Many 1st in class technologies
  - Innovative tempering air injection
  - Fast start vaporization skids
  - High density ammonia injection
  - NOx control over ramp conditions

NRG Marsh Landing
SCR for Large Frame Simple Cycle

Additional Frame Experience List

Project	GT Frame
K-Point	M701F
SMUD McClellan	GE 7EA
TEPCO Yokosuka	M701DA

Gas Turbine Package for Simple Cycle and SCR



GAC-Fast Peaker

+

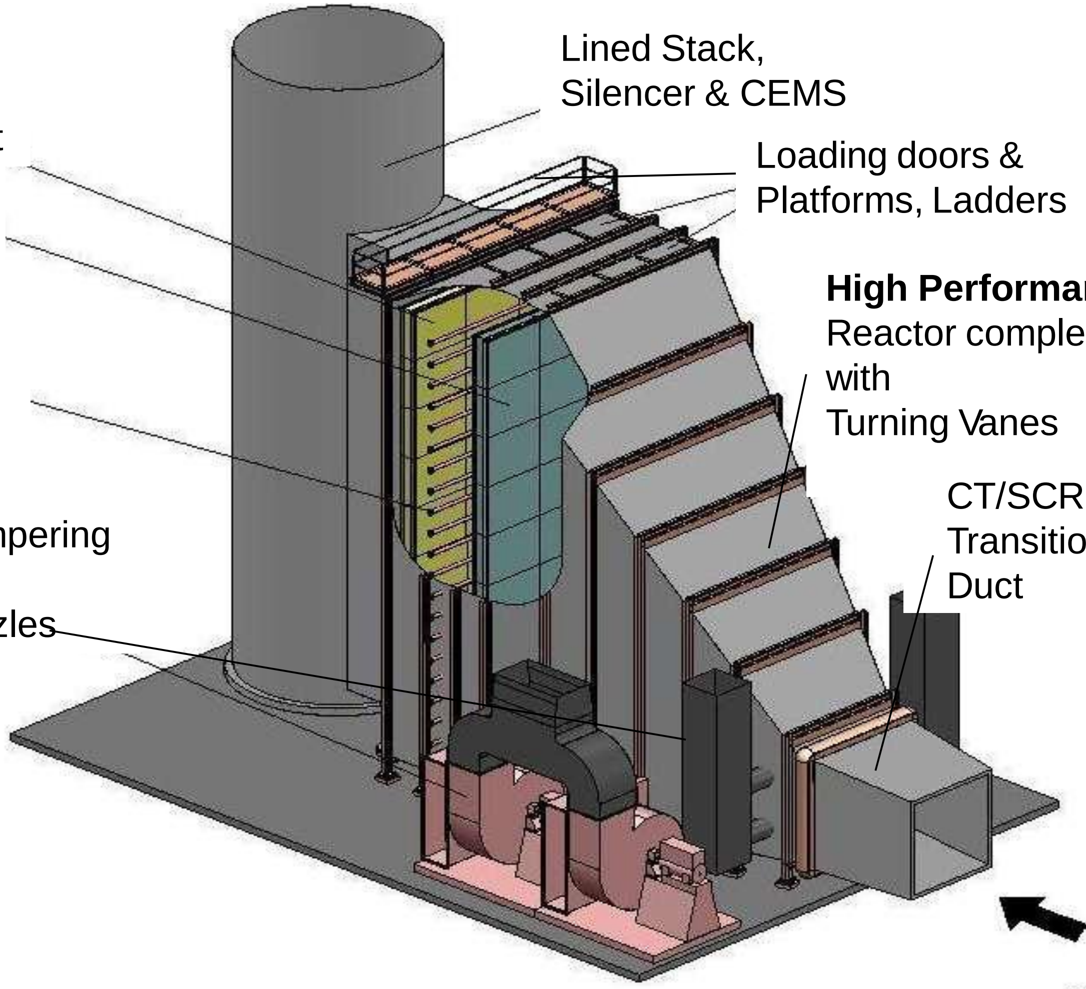
Hot SCR

	GAC-Fast	w/ Hot SCR	BACT	LAER*
NOx	9 ppm	≤2 ppm	2-25 ppm	<2.5 ppm
	15 ppm	≤2 ppm		

*Requirement in Nonattainment Regrons (and Growing)

Fast Ramp Gas Turbine and the SCR for Simple Cycle Applications
to meet Current and Future Environmental Regulations

SCR FOR HOT SIMPLE CYCLE GAC–FP GT (TYPICAL SCOPE ON A <70' X 150' PLOT)



Add'l Scope
- AFCU
- PLC
- Tech Advisor Training

Options
- Ammonia Tank Pump Skid

Guarantee
- NOx; CO; VOC
- Ammonia Slip
- Parasitic Power
- Pressure drop
- Noise
- Catalyst Life

KEY CONSIDERATIONS FOR GAS TURBINES SCR

Service life (customer requirement)	Ammonia slip
Exhaust gas temperature	Catalyst temperature
Turbine exhaust NO_X levels	Reactor duct configuration
Required NO_X removal	Flue gas flow/temperature distribution
Pressure loss allowance	SO2 to SO3 Conversion
Volumetric flow rate	NH_3/NO_X distribution

SCR System Design Considerations

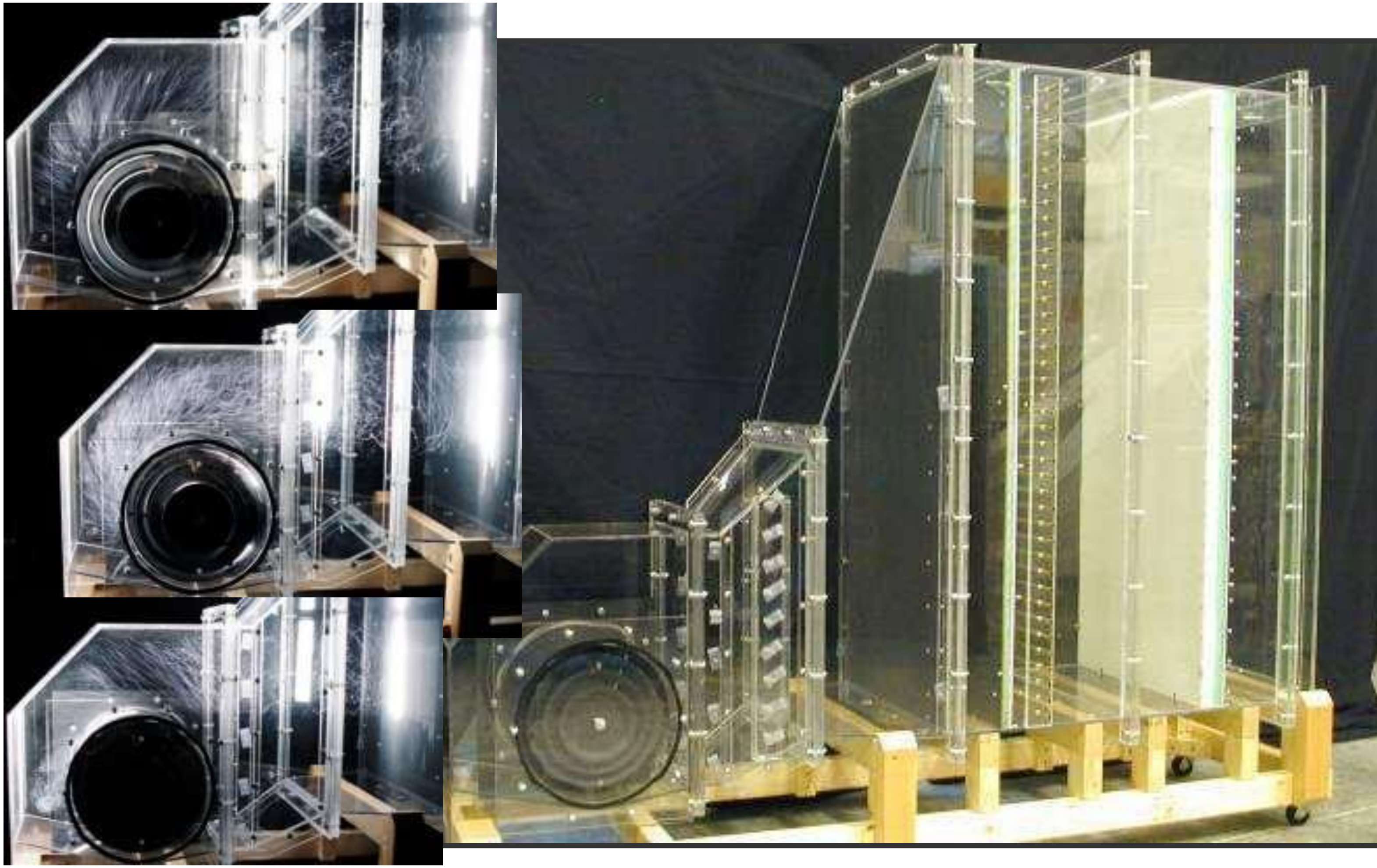
- Seismic and Wind Loads
- Thermal Growth
- Catalyst Support & Sealing
- Accessibility (Internal and external components)
- Thermal Insulation & Liner System
- Extent of Prefabrication
- Constructability – Lowest Installed Cost
- Operation & Maintenance

- Standardized design
  - Operational philosophy
  - Modular design
  - Catalyst modules and loading system
  - Skid design (optimized to match site requirements)
- Flexibility to design around plant specific restrictions and needs. Carry out flow studies, as necessary, to determine best layout and configuration

Cold Flow Modeling

- Cold flow modeling is the core method of determining complex flow fields.
- Scale of 12:1 typically used.
- All internal structures greater than 6" diameter are duplicated
- Highly reliable data achieved based on actual flow conditions
- Compliments to CFD modeling

Flue Gas Path Management (NH_3 Mixing – Cold Flow Model)



Near Side

Center

Far Side

Simple Cycle Physical 1/12th Scale Model

Flue Gas Path Management (High Volume Tempering Air Mixing – CFD)

– Major Design Concern;

a)Short Distance Available to Mix the Air

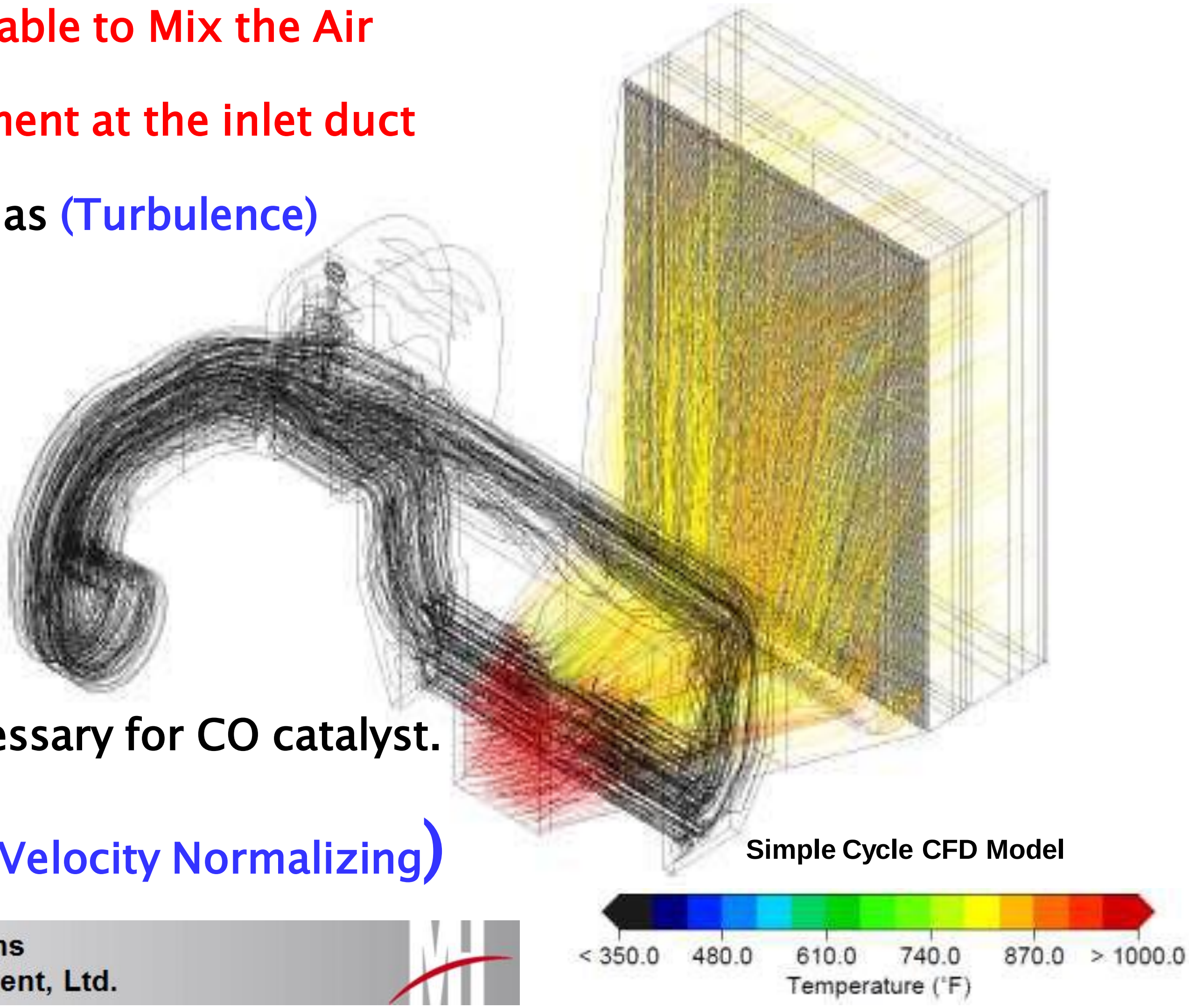
b)Conflicting requirement at the inlet duct

Mix the air into flue gas (Turbulence)

VS..

Uniform gas flow necessary for CO catalyst.

(Flow Straightening & Velocity Normalizing)



Simple Cycle CFD Model

PERFORATED PLATE & TURNING VANES

TEMPERING AIR SYSTEM REDUNDANCY & SIZING