

Gasification Solutions

IGCC

Tim Huskey
Director, Gasification Operations, GE Energy

December 9, 2009



Coal: a critical but challenged resource



- “Coal is a national and globally abundant, low cost resource that is and will continue to be a predominant generation choice in developing nations.”

John Krenicki, GE Vice Chairman

Testimony before the Environment & Public Works Cmte, U.S. Senate, July 16, 2009



- “Coal is an abundant, reliable, and a relatively inexpensive energy source. Using it is necessary for energy independence and US competitiveness.”

John Rice, GE Vice Chairman



The landscape

Coal faces decline...

The Year in Coal 2008: 24 New Plants Killed in the U.S.

by Stacy Feldman - Jan 1st, 2009 in [Clean Energy](#) [No More Dirty Coal](#) [Sierra Club](#)

U.S. coal output to fall in 2009: EIA

Tue Dec 9, 2008 11:13am EST

Arch Coal sees flat output in 2009; eyes on buys

Mon Dec 8, 2008 12:14am EST

... without carbon capture

EPA Ruling Is Major Setback for Coal-Fired Power Plants

Coal power plants may have to limit emissions

Posted 11/13/2008 8:59 PM | [Comment](#) | [Recommend](#)

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By Paul Davidson, USA TODAY

E.ON delays coal-fired power plant to await carbon capture ruling

[Mark Milner](#), industrial editor
The Guardian, Tuesday 1 April 2008
[Article history](#)

Since 2001, ~86GW of planned new coal-fired power plants in the US have been cancelled or postponed...and the existing fleet continues to age...103GW is 20+ years old

The utility's dilemma



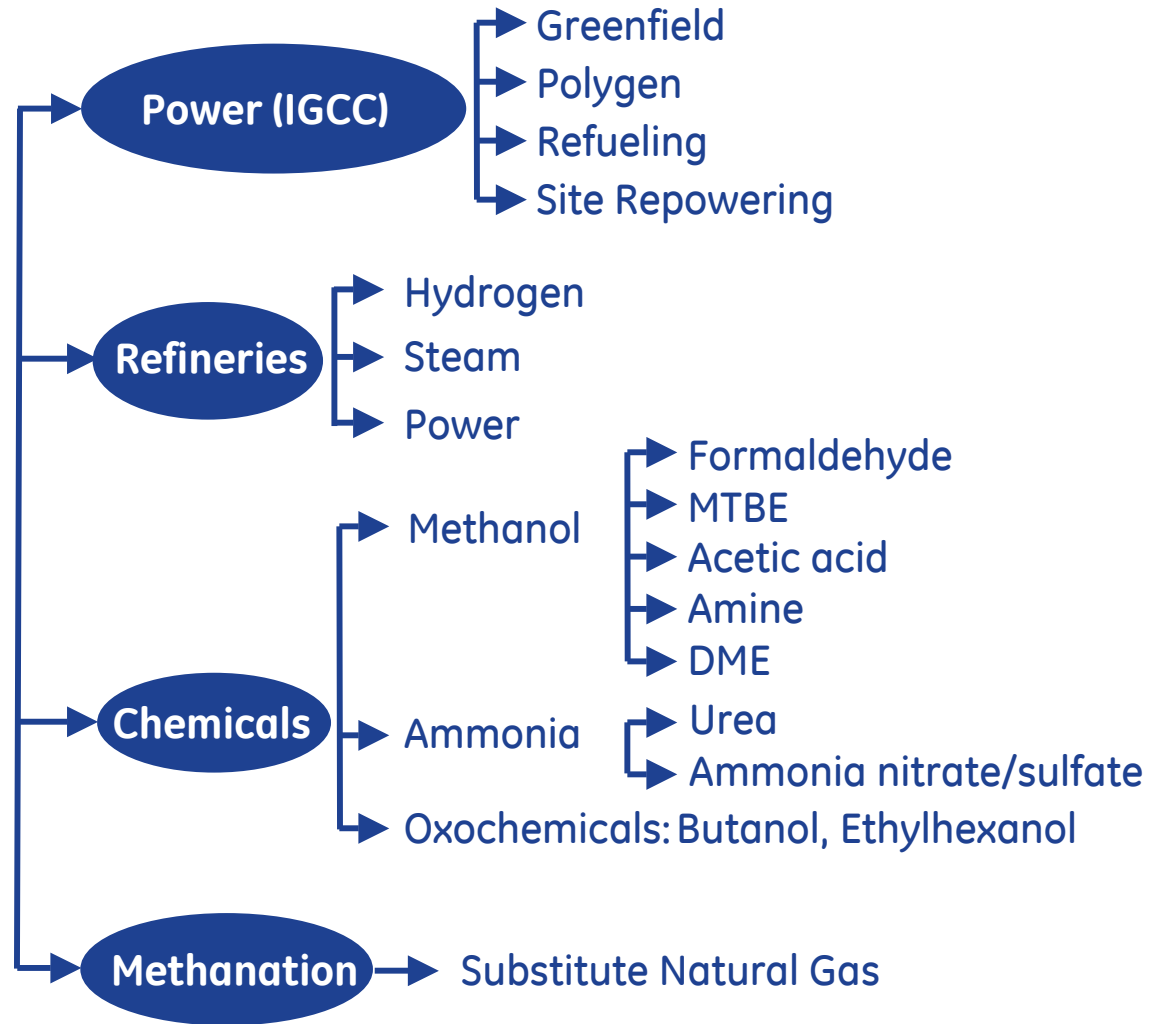
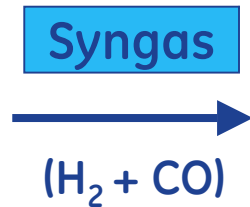
IGCC offers a path forward for coal... a cleaner coal solution



imagination at work

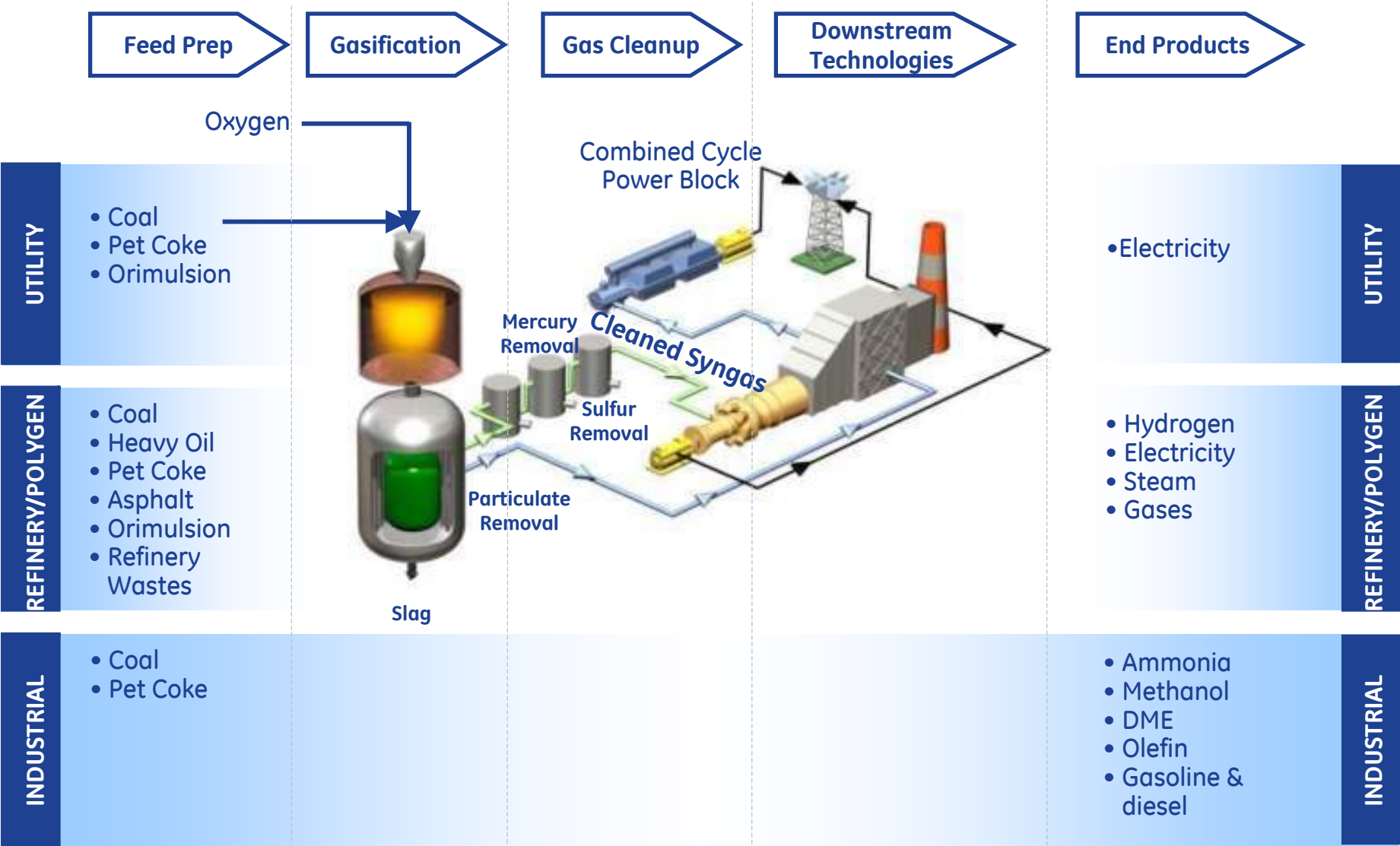
Multiple gasification solutions

Gasification Technology



Gasification is a partial oxidation process that can convert any hydrocarbon into carbon monoxide and hydrogen (syngas).

Application to Multi-Industrial Segments



Technology is commercial today...

GE Energy's Leadership

- Gasification leader since 1948 with ~70 facilities currently operating worldwide
- ~120 gasification vessels in operation
- First coal gasification plant in 1978
- 27 gas turbines operating on syngas ... > 1 million operating hours
- Coolwater...technology pilot...1984-1989
- Tampa Electric...demo...1996-present
- Duke Energy...commercial plant ~630MW ...under construction...2012 COD
- ~40 projects globally that separate CO₂
- IGCC Leader- >3GW with GE Energy technologies



Tampa Electric Polk Power Station 1



- Low emissions
- Low cost feedstocks
- Low cost electricity

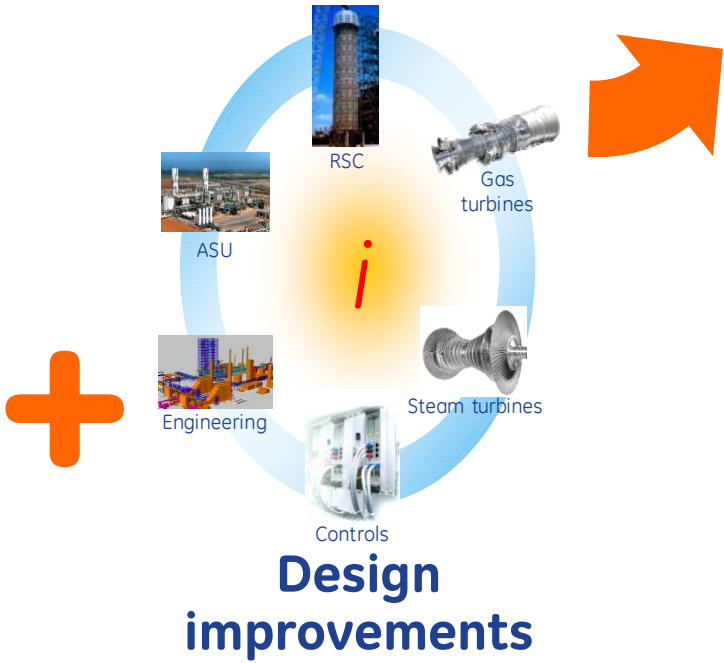
**Polk rated the “Cleanest Coal Fired Power Plant in North America”
by the Energy Probe Research Foundation**



Current IGCC plant progresses Tampa design/components



"Tampa x 2"



Current (Duke)



60Hz IGCC Reference Plant



- 630 MW output*
- 85% coal to power availability*
- Wide range of bituminous coals
- Guaranteed output, heat rate, emissions & schedule
- Carbon capture ready

Emissions**

- 33% less NOx
- 75% less SOx
- 40% less PM10
- 30% less water

Fuel Flexibility

- Up to 30% coke blends
- Up to 7.5 lb/MWh sulfur, 14% ash
- 3,000 ppmv chlorides
- Natural gas or distillate backup fuel



*Coal, site, operating condition dependent
**Compared to SCPC coal plants

Duke Energy Edwardsport IGCC

- 630MW on Indiana 5 coal
- NTP in 2007, COD in 2012
- Detailed engineering near completion
- Construction on-track
- RSC shells arrived summer 2009
- Gas turbines and steam turbine ship in 2010
- Sited & permitted next to aging PC facility

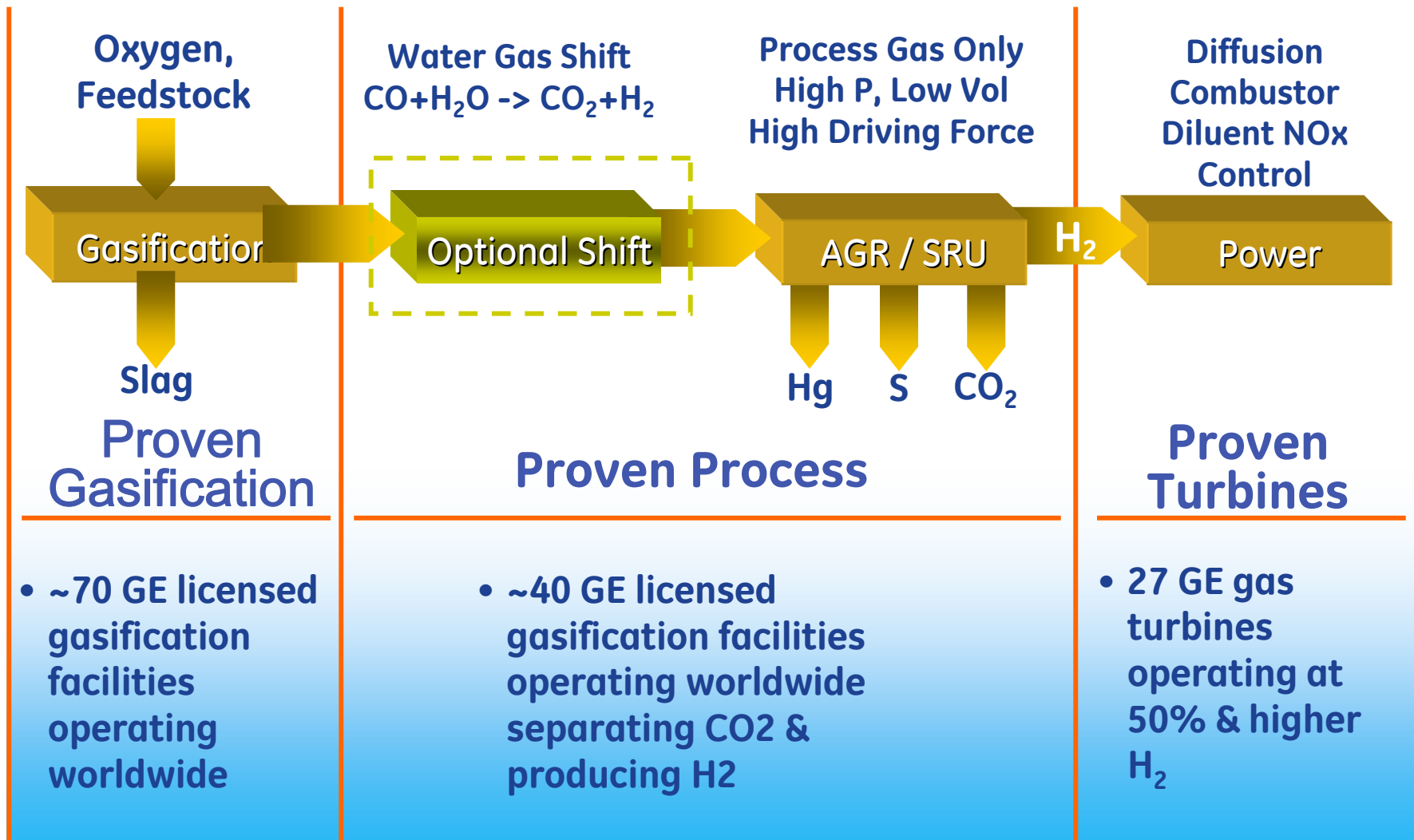


“ We have an opportunity to make history with the Edwardsport plant. The facility could very well be one of the cleanest coal-fired power plants in the world. It will produce nearly 10 times as much energy as the existing Edwardsport plant with much less environmental impact.” - Jim Turner, President & COO, U.S. Franchised Electric and Gas-Duke Energy

Duke Energy press release, Jan. 25, 2008

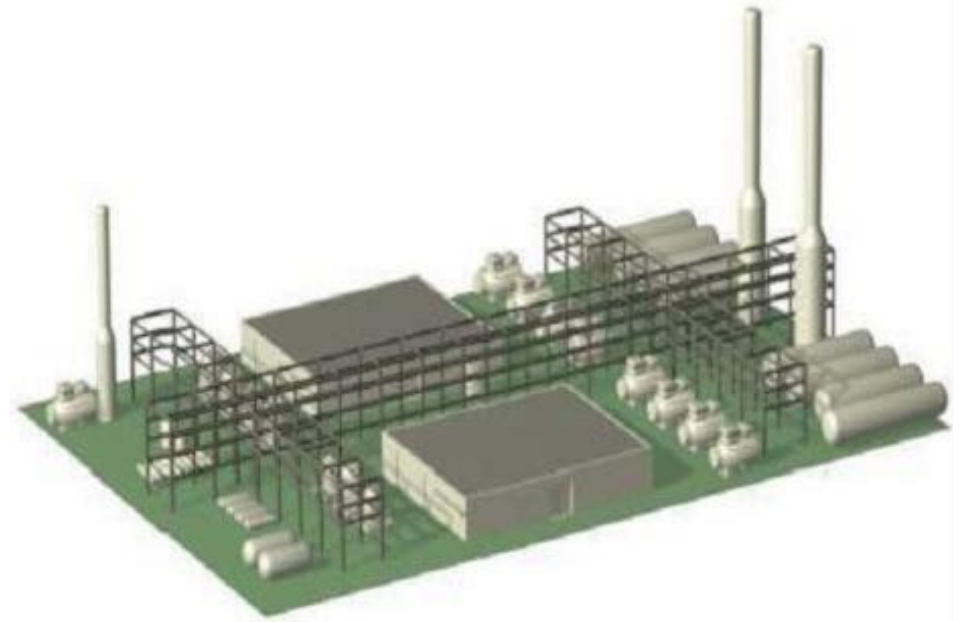


IGCC CO₂ capture ready...today



GE's Carbon Island™

- Commercially offered today
- Greenfield or retrofit
 - Low cost/performance impact
 - Integrated with existing Acid Gas Removal (AGR)
 - Installed during turbine maintenance
- Flexible carbon capture options
- Tie-ins matched GT outages



NG Eq. CO₂ Footprints

- Simple Cycle:
50% carbon capture
(~1,100 lb/MWh)
- Combined Cycle:
65% carbon capture
(~770 lb/MWh)

Summary

- IGCC offers a path forward for coal ... commercial cleaner coal option today
- GE is the leading provider of gasification & IGCC technology
- Brings together experience in gasification, gas turbines and controls for a tightly integrated plant solution