



# Recent Developments in Gasification

Stuart James  
E.ON Engineering

# Contents

1. Proposed IGCC Projects
2. Projects of Interest
3. Common Themes
4. Technology Trends

## 1.1 - Proposed IGCC Projects (Europe)

- Nuon (Magnum, NL)
- Powerfuel (Hatfield, UK)
- Progressive Energy (Teesside, UK)
- E.ON UK (Killingholme, UK)
- RWE (Germany)

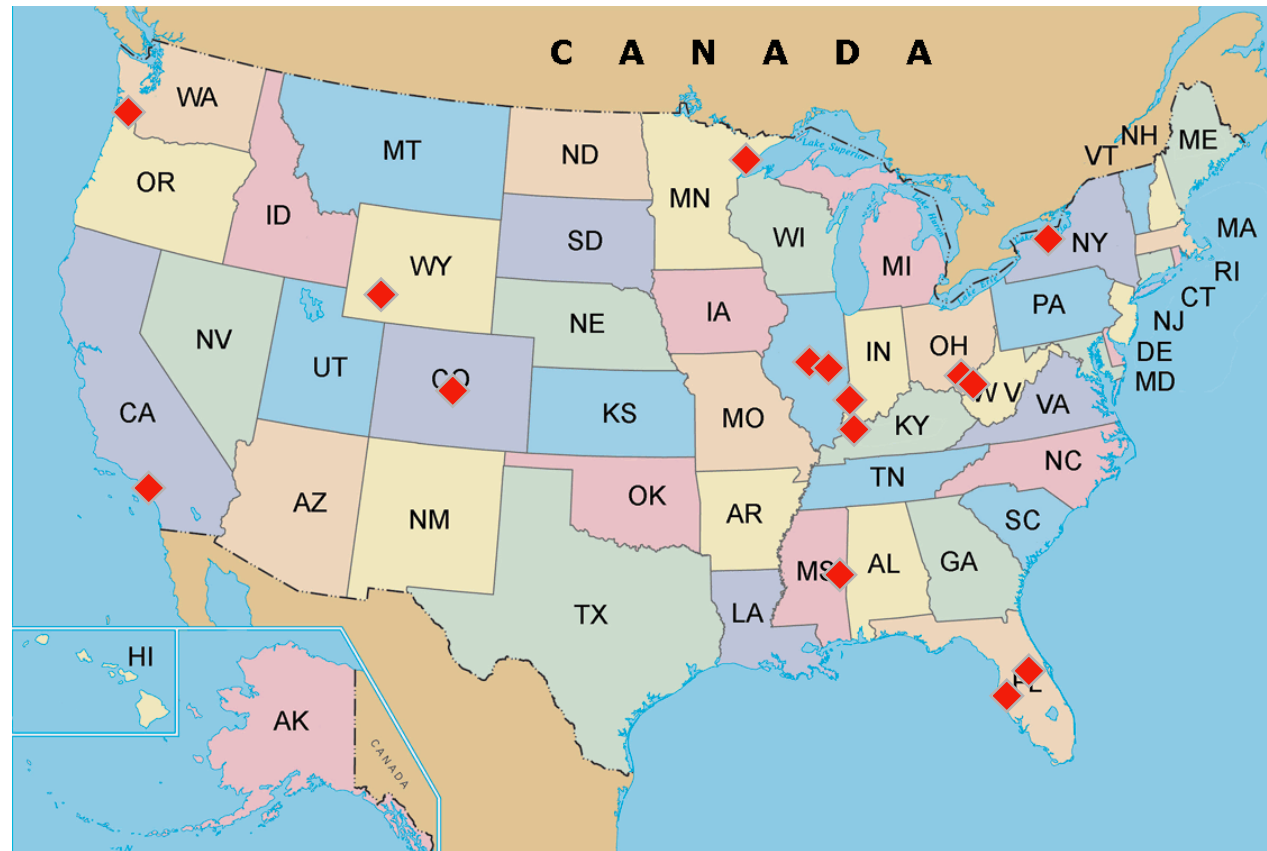


<b>Owner</b>	<b>Status</b>	<b>Notes</b>
Nuon	IGCC element postponed	Cost
E.ON UK	Indefinitely postponed	Cost / UK Comp.
Powerfuel	In progress?	As E.ON?
Progressive Energy	In progress?	As E.ON?
RWE	Decision to build 2010	€5k/kW

Owner	Status	Notes
Nuon	IGCC element postponed	Cost
E.ON UK	Indefinitely postponed	Cost / UK Comp.
Powerfuel	In progress?	As E.ON?
Progressive Energy	In progress?	As E.ON?
RWE	Decision to build 2010	€5k/kW

## 1.2 - Proposed IGCC Projects (US)

- Main Plants
  - AEP (2 off)
  - Duke
  - BP / Edison
  - Southern Co (2 off)
  - Xcel
  - PacifiCorp
  - NRG
  - Tampa Electric
  - Excelsior
  - ERORA (2 off)
  - Energy NW
  - FutureGen



Owner	Status	Notes
AEP (Meigs County, OH)	Post-FEED	CCS-Ready
AEP (Mountaineer, WV)	Post-FEED	CCS-Ready
Duke (Edwardsport, IN)	Post-FEED	CCS-Ready
BP / Edison (Carson, CA)	In progress?	
Orlando / Southern Co. (FL)	Postponed	
Southern Co. (Kemper Co., MS)	Early Planning	
Xcel (CO)	Postponed	CO2
PacifiCorp (Point of Rocks, WY)	Unknown	With CCS
NRG (Huntley, NY)	Unknown	
Tampa Electric (FL)	Postponed	CO2 / Cost
ERORA (Taylorville, IL & Coal Creek, KY)	Unknown	
Excelsior (Mesaba, MN)	FEED	
Energy NW (Port Kalama, WA)	Unknown	With CCS

Owner	Status	Notes
AEP (Meigs County, OH)	Post-FEED	CCS-Ready
AEP (Mountaineer, WV)	Post-FEED	CCS-Ready
Duke (Edwardsport, IN)	Post-FEED	CCS-Ready
BP / Edison (Carson, CA)	In progress?	
Orlando / Southern Co. (FL)	Postponed	CO2
Southern Co. (Kemper Co., MS)	Early Planning	
Xcel (CO)	Postponed	CO2
PacifiCorp (Point of Rocks, WY)	Unknown	With CCS
NRG (Huntley, NY)	Unknown	
Tampa Electric (FL)	Postponed	CO2 / Cost
ERORA (Taylorville, IL & Coal Creek, KY)	Unknown	
Excelsior (Mesaba, MN)	FEED	
Energy NW (Port Kalama, WA)	Unknown	With CCS



## Other Projects of Interest (1 of 3)

- FutureGen
  - 29 January 2008 – Department of Energy announced withdrawal of funding mainly due to higher than expected costs.
  - Future uncertain at this time.



- Possibility of funding additional costs of CCS equipment?
- Possibility of FutureGen being resurrected?

## Other Plants in Development (2 of 3)

- GreenGen (China)
  - Owned by Huaneng (51%) and 7 other Chinese power and coal companies
  - 250MW IGCC being constructed now (Tianjin)
  - 400MW IGCC w/CCS built & operated 2016-2020.



- MHI Nakoso (Japan)
  - Owned by Japanese utilities & government
  - 250MW IGCC (no CCS) – currently being commissioned
  - Aim for 500MW plant in 2013.

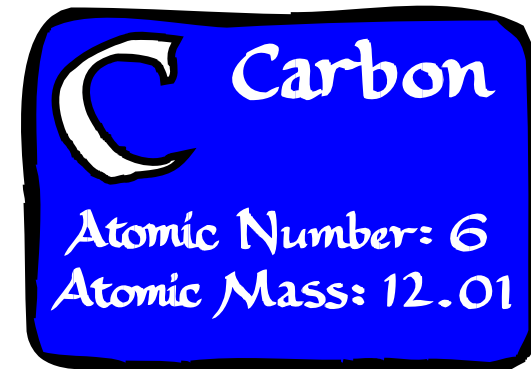
## Other Plants in Development (3 of 3)

- ZeroGen (Queensland, Australia)
  - Stage I: 80MW with CCS by 2012.  
75% CO2 capture, transported by truck.
  - Stage II: 300MW with CCS by 2017.  
90% CO2 capture, stored
  - Approval due mid-2009.



## Common Themes

- COSTS
  - Sharp increase since 2003
  - Not unique to IGCC...
  - ...however, IGCC less suited to "Capture Ready"
  
- UNCERTAINTY OVER CARBON
  - Particularly in the US



## Turnkey Offerings

- General Electric
  - Mitsubishi Heavy Industries
  - Siemens
- 
- All offer gasifiers and high-hydrogen turbines.
  - Partnerships being formed.

## Technology Trends

- Gasifiers tending towards similar designs?
  - GE → Dry Feed
  - Shell → Partial Quench
  - Siemens → Partial Heat Recovery
  
- New gasifier design:
 

<ul style="list-style-type: none"> <li>• Dry Feed</li> <li>• Partial Quench</li> </ul>	<p>Greater efficiency</p> <p>Reduce capital cost</p> <p>Improve reliability</p> <p>CO2 capture advantages</p>
<ul style="list-style-type: none"> <li>• Heat Recovery</li> </ul>	<p>Greater efficiency</p>
  
- Major Difference:           Refractory or Water Wall.



## Challenges Going Forward

- High Costs – Compounded with CCS
- Carbon Storage – Demonstration should reduce public concern
- Reliability – Formation of alliances may help



## And Opportunities

- Polygeneration – Hydrogen, methanol, etc.
- Flexibility – Arbitraging chemicals and power production
- Step changes in technology – ITM, advanced gas turbines, hot gas clean up.



***e.on***

Stuart James  
E.ON Engineering

[stuart.james@eon-engineering-uk.com](mailto:stuart.james@eon-engineering-uk.com)