Update on Gasification Projects and Technology

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McIlvaine Hot Topic Hour
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“It was the best of times, it was the worst of times” – Charles Dickens
The Worst of Times
IGCCs face strong headwinds in Europe

• Vattenfall permanently closes its 250 MW IGCC located in Buggenum, The Netherlands
  – Cites decrease in power demand in EU and high fixed costs of the comparatively small coal power plant
• The Elcogas IGCC in Spain has seen a similar lack of demand for power
  – Did not operate for 5 months this year
Capital Cost Increases Hit US IGCCs

• Duke Energy’s Edwardsport IGCC: $3.5 billion or $5663/kW “total project cost”
  – Estimated cost at beginning of project (Oct. 2006) was $1.9 billion – actual was 184% of this estimate

• Mississippi Power’s Kemper County IGCC has reached $4.0 billion or $7670/kW “total project cost”
  – Estimated cost at beginning of project (April 2010) was $2.4 billion – current cost is 167% of that estimate
Mississippi Power’s Kemper County IGCC Summer 2013

Photo courtesy of Southern Company
First-of-a-Kind Blues?

• Both the US Dept of Energy and EPRI have predicted costs for “n\textsuperscript{th}-of-a-kind” IGCCs which are much lower than Edwardsport or Kemper

• DOE/NETL-2011/1498 report cites an IGCC with 60% CO\textsubscript{2} capture having a “total overnight cost” of $3024/kW

• Adjusting Kemper’s costs to “total overnight” results in a current estimate of $7190/kW – 238% higher than DOE’s

How do you get to the “n\textsuperscript{th}” project when the 1\textsuperscript{st} is so costly?
The Best of Times
Natural Gas is not cheap in most of the world

World LNG Estimated July 2013 Landed Prices

Asia IGCC Projects (1400 + MW)

- **China**
  - China - GreenGen - 250 MW – TPRI
  - 5 other IGCCs in planning
  - 300 more gasifiers by 2020

- **Korea**
  - KOWEPCO IGCC - 300 MW – Shell/ GE  Start up – 2015
  - POSCO Coal to SNG – E-Gas™

- **Japan**
  - Osaki CoolGen - 170 MW IGCC CCS  Eagle Gasifiers, TEPCO&MHI - 2 x 500 MW
Saudi Aramco Jazan IGCC

• Saudi - Aramco Jazan
  • New 400,000 bpd refinery on Red Sea
  • 3,800 MW gross in multi block configuration

• Shell oil gasifier experience
  • 3 x 550 t/d in Shell Pernis refinery for H₂ plus 110 MW (2 x 6B GTs)
  • 3 x 1200 t/d in Fujian refinery for H₂ plus supply to 2 x 9E GTs

• GT award imminent

• ASU over the fence
Scale-up Plans for EAGLE Gasifier

**EAGLE Project (J-POWER)**
- Coal Feed Rate: 150 t/d
- Test Run: STEP-1 ‘02～’06, STEP-2 ‘07～’09, STEP-3 ‘10～’13
- Objectives: Pilot test of Oxygen-blown Gasification and Carbon Capture Technology

**Osaki CoolGen Project (OCG)**
- Coal Feed Rate: 1,180 t/d (Output 166 MW)
- Location: OSAKI Power Station (Chugoku Electric Power Co.)
- Test Start Day: March 2017
- Objectives: Large scale IGCC test of Oxygen blown Gasification and Carbon Capture Technology

**Oxygen-blown IGCC/CCS commercial plant**
(300 - 600MW class)
Conclusions

• The commercial application of gasification technology is booming in Asia
• At the same time it has lost its appeal in North America and Europe
• If demand for energy picks up in Europe, interest in gasification may return
• In North America, unless natural gas prices return to >$8-10/MMBtu, demand will be limited to niche applications
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