

**Commercializing IGCC:
One Company's Odyssey**

Presentation by Eric Redman
to
The Edison Foundation
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The Company: Summit Power Group

- Founded by Donald Paul Hodel & Earl Gjelde
- Hodel: President Reagan's Secretary of Energy and Interior
- Gjelde: Hodel's #2 in both Cabinet positions
- Each had earlier run the Bonneville Power Administration
- Both moved to Summit County, Colorado after Reagan years
- Began helping owners get power projects "unstuck"
- Helped smooth Siemens-Westinghouse consolidation
- In the 1990s, developed ~ \$4B of gas-fired power plants
- Gas-fired power plants "hit the wall" in early 2000s

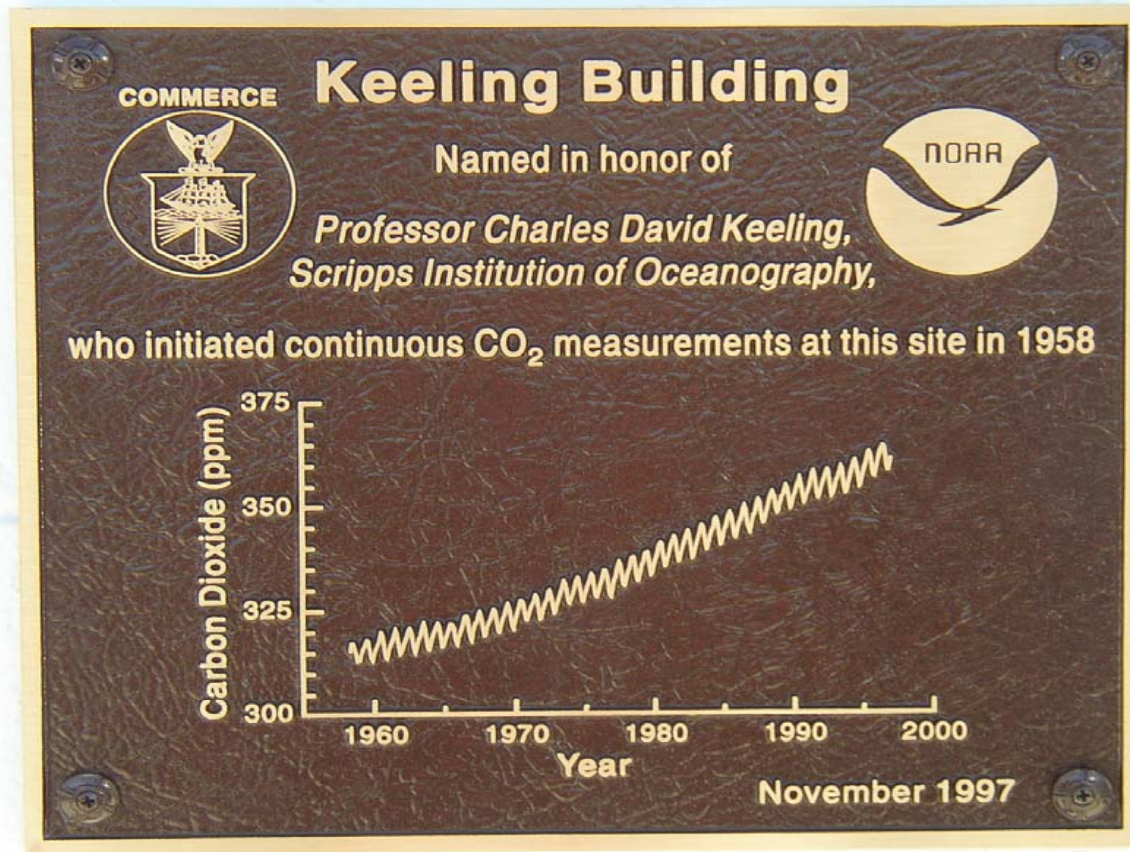
A River with Three Sources – and a Constraint

- #1: Inability to keep adding new gas-fired plants for base loads
- #2: Need to make use of America’s abundant coal supplies
 - For economical, reliable, secure base load power
 - For U.S. energy security & independence
 - To stanch the flow of petrodollars abroad & protect US economy
- #3: Need to deal with climate change issues
 - Summit also wanted to keep clean air benefits of natural gas
 - Summit also alert to black carbon (soot) as a climate “villain”
- Constraint: “Don’t waste time on plants that people oppose.”

Summit IGCC Project 1.0

- Clean Air Task Force provided intro to IGCC and CCS
- Summit & Siemens devised a possible “reference plant”
 - ConocoPhillips gasifiers
 - Siemens 2x1 F-class combined cycle power generation
 - “Carbon capture ready” – no shift reactor actually installed
 - Economics seemed surprisingly competitive w/ pulverized coal
- What happened?
 - Various “jitters” (risks, economics, reliability) hit the industry
 - Carbon issues & policy predictions became increasingly complex

Interlude: A Trip to Mauna Loa Observatory in 2005



(Redman photo)

Summit IGCC Project 2.0

- Project re-designed for half power, half synthetic natural gas
- Two variants: ConocoPhillips gasifiers, or Siemens gasifiers
- Expected benefits of the split configuration:
 - Reduce average costs per unit of output
 - High availability/reliability achieved without idle gasifier capacity
 - SNG is a more profitable product line than electric power
 - Shift reactor would be built in (for SNG), not added later
- What happened?
 - More economic/commercial “jitters” as construction costs rose
 - “Carbon capture ready” no longer seemed enough

Summit IGCC Project 3.0

- Still split configuration, but different split
 - Four 500 MWth Siemens gasifiers (vs. eight 200 MWth ones)
 - 1x1 F-Class CCCT – all added syngas went to make SNG
 - Resulting syngas split: 43% to power, 57% to SNG
- Linde joins Siemens to provide methanation & other elements
- Design standard for carbon capture: ≤ 1100 lbs CO₂/MWh
 - This is the California and Washington GHG emissions standard
 - Enhanced oil recovery (EOR) revenue needed for economics
 - Summit reluctantly drops proposed OR project, focuses on Texas

Summit IGCC Project 4.0: Things come full circle?

- 4.0 = possible alternative to 3.0 (not a simple choice)
- 4.0 = pure IGCC plant, no SNG production
 - Still 4 x 500 MWth Siemens gasifiers
 - 2x1 Siemens newest F-Class power generation equipment
 - Still designed to meet CA & WA GHG emissions standard
- Possible benefits:
 - Less integration needed in total in order to optimize design
 - Power production “hit” for SNG may not entirely pay for itself
 - Potentially more attractive as a reference plant design

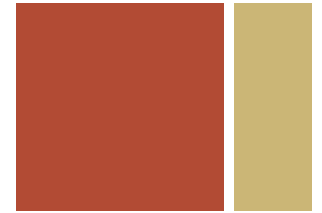
Summit IGCC: The Path Forward

- Large surface gasification: will proceed w/ Summit 3.0 or 4.0
- Industrial scale surface gasification: working with Siemens, Fluor, R.W. Beck, and major industry on a possible plant
- Advanced surface gasification: considering first project
- Underground coal gasification (UCG): Laurus & Ergo Exergy
 - Summit will develop power plants for first three N.A. projects
- All these projects designed to meet the CA & WA standard
- All are commercial (surface projects depend initially on EOR)
- Summit also developing wind power, solar, & gas-fired plants

Where you stand depends on where you sit

- “Agnostics” – want to see if IGCC can work commercially
- “Skeptics” – doubt it can work commercially (or don’t want it to)
 - Skeptics include many in industry, and some environmentalists
 - Risk fears + death of conventional coal → proliferation of CTs (?!)
- “Clueless” – don’t see why IGCC matters
 - “All we need is more efficiency and renewables” (“And nukes”)
 - “All we need is post-combustion carbon capture”
 - “Carbon sequestration should be proven first” (or “CCS won’t work”)
- Early adopters – “IGCC & CCS will work, and they do matter”

Compare & Contrast

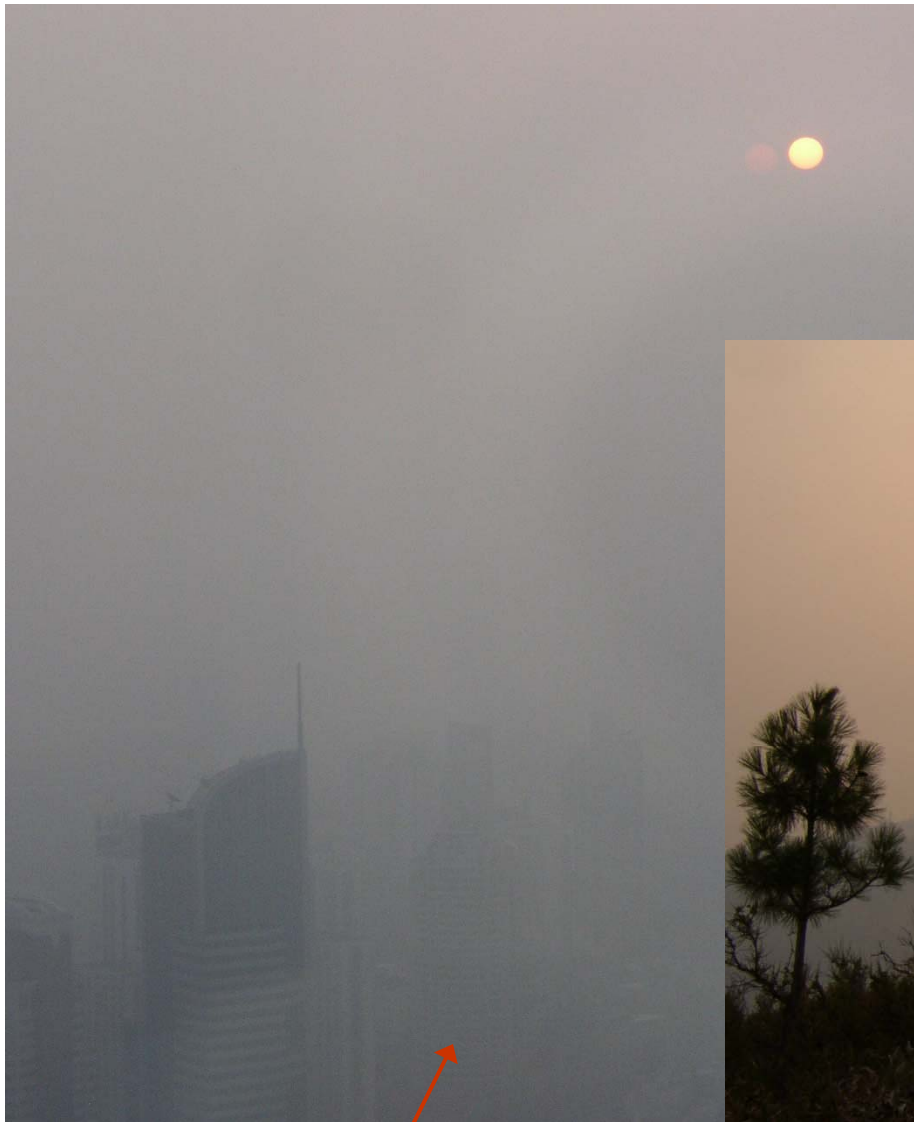


Sunrise: Methow (WA) forest fire (2006)



(Redman photos)

HellerEhrman_{LLP}



Sunrise: Shanghai (Feb 2007)



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Heller Ehrman LLP represents Summit Power on coal gasification projects, as well as various advanced coal gasification technology companies, both surface and underground. (Views expressed here are those of Mr. Redman, not necessarily those of Summit Power, Heller Ehrman LLP, or the law firm's clients.)

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