Texas Clean Energy Project: Update & Additional Projects

Eric Redman, Co-Chairman
Summit Power Group, LLC

12th Annual CO_2 EOR Carbon Management Workshop
Midland ● December 9, 2014

TCEP Timeline

- **2009: Site selected near Odessa – site had been finalist for FutureGen**
- **2010: DOE award under Clean Coal Power Initiative; begin Front-End Engineering & Design (FEED) Study; begin permitting & contract negotiations; first indication of potential Chinese participation in TCEP**
- **2011: Signed lump-sum turnkey (LSTK) EPC contracts with Linde (chemical block) and Siemens (power block); complete permitting; work with European export finance agencies to get project loan**
- **2012: In mid-year, switch to Chinese EPC contractor as lead for Chemical Block, and to Export-Import Bank of China for project debt**
- **2013: EPC contractors "refresh" LSTK pricing; because of boom in Texas construction market, new LSTK pricing is too high for financing**
- **2014: Project updated/revised to cut costs; new lead EPC contractor (HQC) selected; EPC contracts restructured so Texas-based EPC team is responsible for constructing entire plant; PPA with CPS Energy renegotiated; new DOE milestones established and are being met**

Last Year's Problems

- **Total price became too high when EPC contractors "refreshed" pricing, because of extraordinary conditions in the Texas construction market**
- **Lead EPC contractor, Sinopec Engineering Group (SEG), had developed gasification projects but none with Siemens gasifiers; this caused qualms about guaranteed pricing and schedule in LSTK contract**
- **The "vertical" EPC contract structure for the Power Block and Chemical Block resulted in duplication/overlap in project construction**
- **Our EPC contractors lacked much on-the-ground experience in Texas**
- **U.S. government's strong support for TCEP wasn't matched by Chinese government <u>publicly</u> committing China to TCEP:**
  - **support from Chinese government is important for Chinese EPC contractors and the Export-Import Bank of China**
  - **the planned July event for joint US-Chinese public endorsement of TCEP in Washington was scuttled by the US for unrelated reasons**

This Year's Solutions

- **Price reduced by nearly 20% (using H-class turbine & 850MW gasifier)**
- **Summit hired HQC (China Huanqiu Contracting & Engineering Corp.) as new lead EPC contractor; HQC has experience with Siemens gasifiers**
- **HQC already has Houston office & projects in North & South America**
- **HQC chose Technip as consortium partner for all construction – they have other projects together; Technip's 3,000 person Houston office is former Stone & Webster; Technip has confidence in construction mkt**
- **HQC & Technip accept EPC contract structure & shorten the schedule**
- **DOE Secretary Moniz is focused on getting projects built, esp. TCEP**
- **U.S. government & Chinese government have jointly, publicly, and repeatedly committed both nations to TCEP**
- **Summit hired Jason Crew as its new CEO (former head of gasification business unit at General Electric and an experienced "China hand"), among other steps to add strength to our TCEP team**

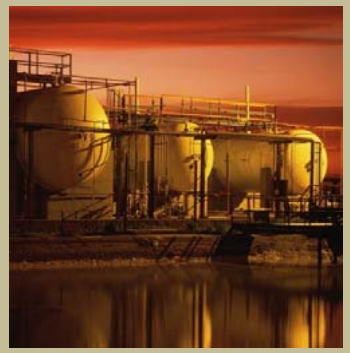
Schematic Diagram of TCEP Configuration & Outputs: A "Polygen" Plant with Diverse Revenue Streams, Capturing 90% of the Carbon from Coal Feedstock

Coal Gasification and Gas Cleanup

Coal 1.8mm tons per year

Water

Oxygen



60% of Syngas

Low carbon power delivered to City of San Antonio and used for onsite commercial loads.

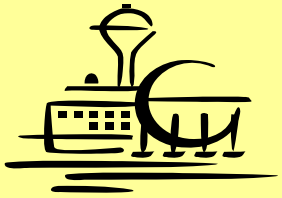
High Hydrogen Power Plant (400MW CCCT)

40% of Syngas

1/6 of CO_2

5/6 of CO_2

Ammonia / Urea Complex



>720,000 tons/yr delivered to CHS Inc.

CO_2 Delivered to Oil Fields via Pipeline

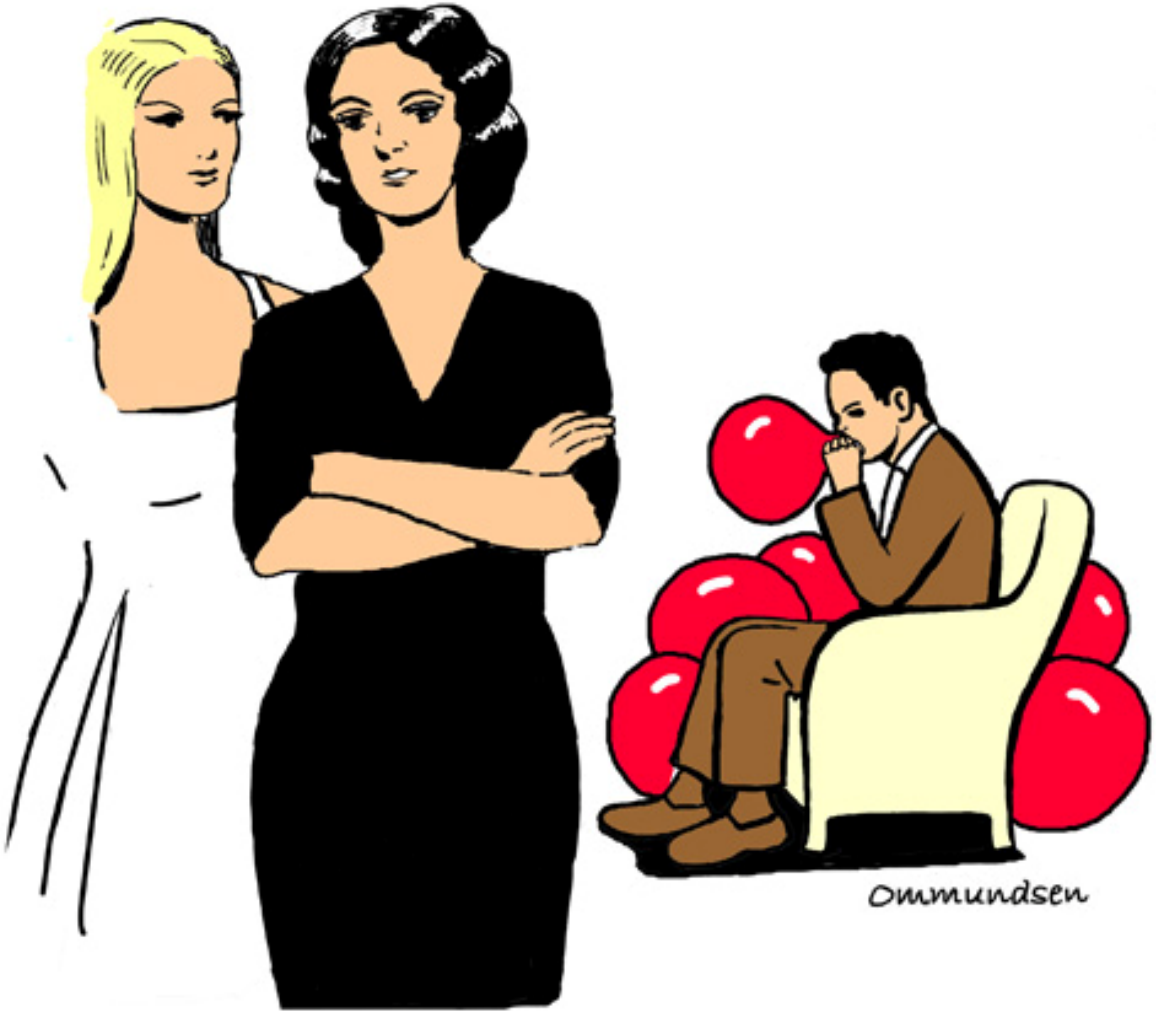
~2 mm tons per year delivered to oil producers

** Additional revenue from sales of sulfuric acid, argon gas, & minor products*

World's largest gasification project: In Ningxia, China – Siemens Gasifiers HQC was the EPC Contractor

TCEP Signing Ceremony: US-China Strategic & Economic Dialogue: Summit, HQC, US DOE, Chinese Gov't (NEA), Siemens, CH2M

Larger Context: CCUS is Gaining Traction



"Frank's into carbon sequestration."

CCUS & Emissions Reductions from Coal

- **US & China have committed to CO_2 emissions limits**
- **US is working with China on CO_2 capture from coal (esp. from gasification) & CO_2 for EOR in China**
- **TCEP is the leading (perhaps only) joint US-China CCUS project with net positive emissions reductions**
- **Presidents Obama & Xi last month committed both nations to a TCEP-like successor project in China**
- **Boundary Dam project is on-line; Kemper Co. will be soon; NRG's Parish Project PCC retrofit under way**
- **Expansion of UK's CCS program to "Phase 2" projects (this includes Summit's Caledonia CEP) announced in August; includes focus on CO_2/EOR**
- **TCEP's Chinese parties plan to participate in CCEP**

The "Long Play:" A North Sea Example of CO_2/EOR Possibilities

The Long Play refers to a sustained effort to develop:

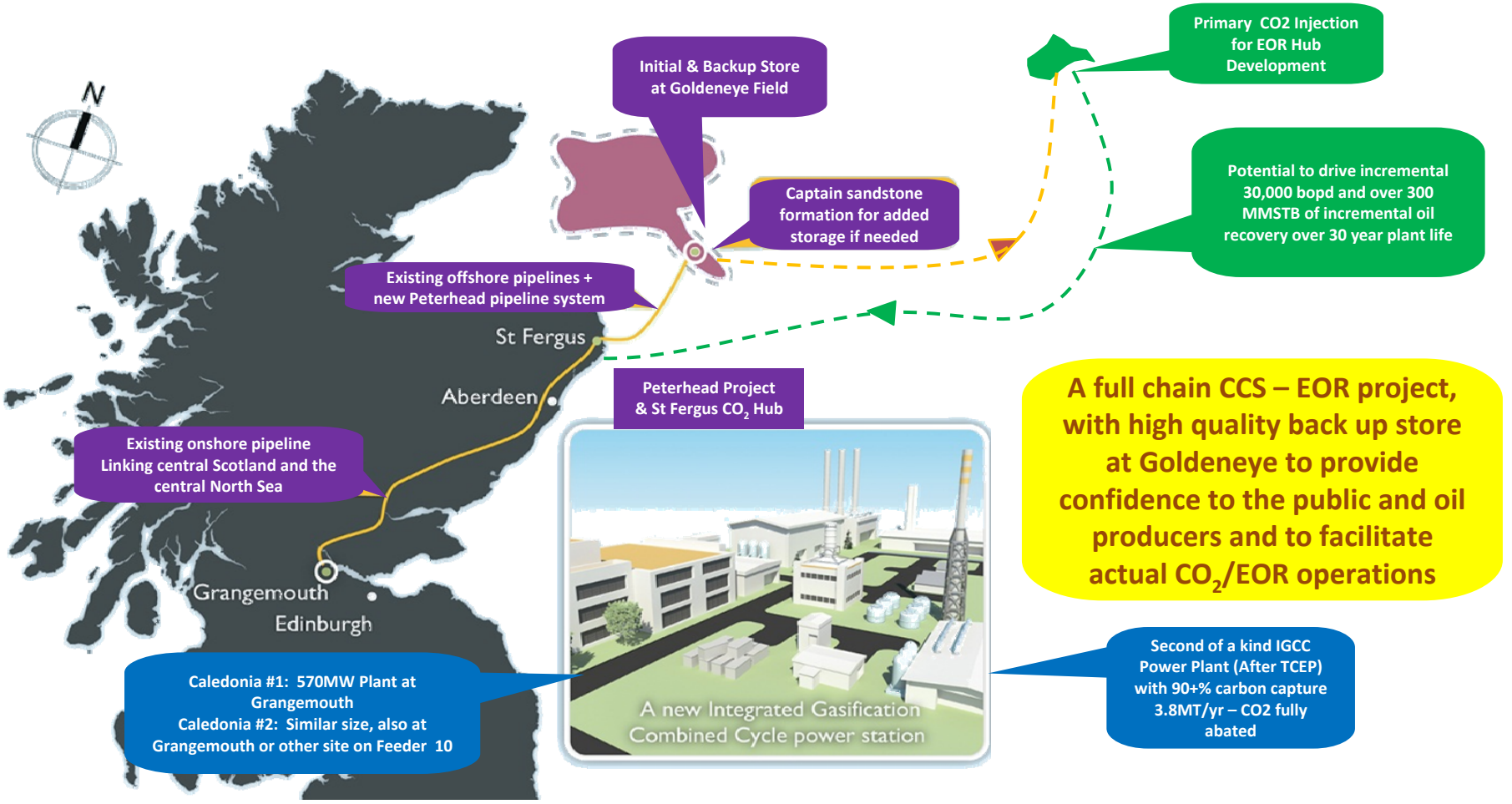
- **An entire integrated system, consisting of**
- **Clustered CO_2 capture projects (not just one project),**
- **Sharing a common CO_2 pipeline and offshore infrastructure,**
- **In order to produce low-carbon electric power to replace the UK's coal plants (which are slated for closure within 15 years), and**
- **To store carbon in depleted North Sea gas fields and saline formations, while also**
- **Creating a CO_2 for enhanced oil recovery (EOR) sector in the North Sea, with its own secure geological storage of CO_2.**

Summit's proposed Caledonia Clean Energy Project (CCEP) is intended to anchor the Long Play.

The Long Play: Based on Permian Basin Experience, but Different

- **Impetus in UK is primarily to de-carbonize the power supply**
- **To help de-carbonize the power supply via CCS, one needs more than one or two isolated CCS projects**
- **"Single source, single sink" should be avoided; multiple sources & sinks is the right way to do CCS**
- **Use of common CO_2 transport & storage infrastructure will significantly reduce the costs of CCS (including industrial)**
- **Environmental benefits: ≈ 1,500 MW of ultra low-carbon power, plus some 10 million tons/year of CO_2 sequestered**
- **Capital investment could total £10 billion or more**
- **Major employment & economic development benefits**
- **Increased tax revenue on eventual added production of millions of barrels of additional oil per annum**
- **World leadership in CCUS with key take-aways for China**

Schematic of the Long Play



A full chain CCS – EOR project, with high quality back up store at Goldeneye to provide confidence to the public and oil producers and to facilitate actual CO_2/EOR operations

Summit's Plans for Gasification-Based CCUS Projects in 2015

- **Complete financing of TCEP and start construction**
- **Commence design and permitting of CCEP**
- **Celebrate both events here at next year's CO_2 Conference in Midland!**

Jason Crew, CEO: jcrew@summitpower.com
Eric (Ric) Redman, Co-Chairman: eredman@summitpower.com