

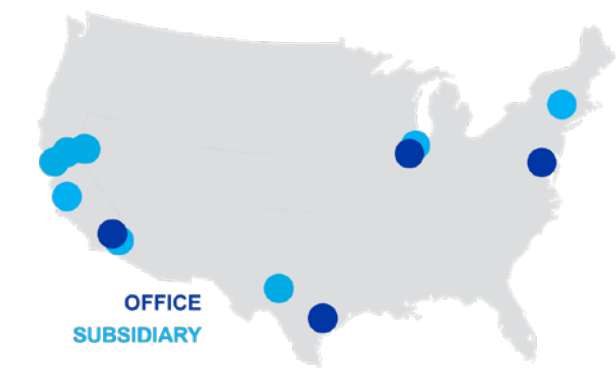
# International Cooperation on Clean Energy Technology Demonstration Projects

---

- > USEA Panel on Approaches for International Collaboration and Financing for CCUS Pilot Projects

Don Stevenson  
Executive Director – R&D  
Gas Technology Institute  
13 November 2017

# GTI Overview



**World-class facilities  
headquartered in Chicago**



# Current GTI Experience in International Partnerships



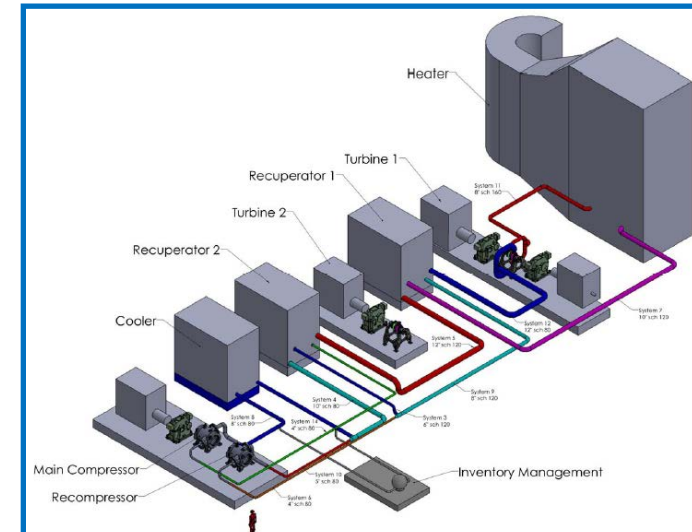
**IH2® Demonstration Project**  
Bangalore, India



**R-GAS™ Gasification  
Demonstration Project**  
Taiyuan, China

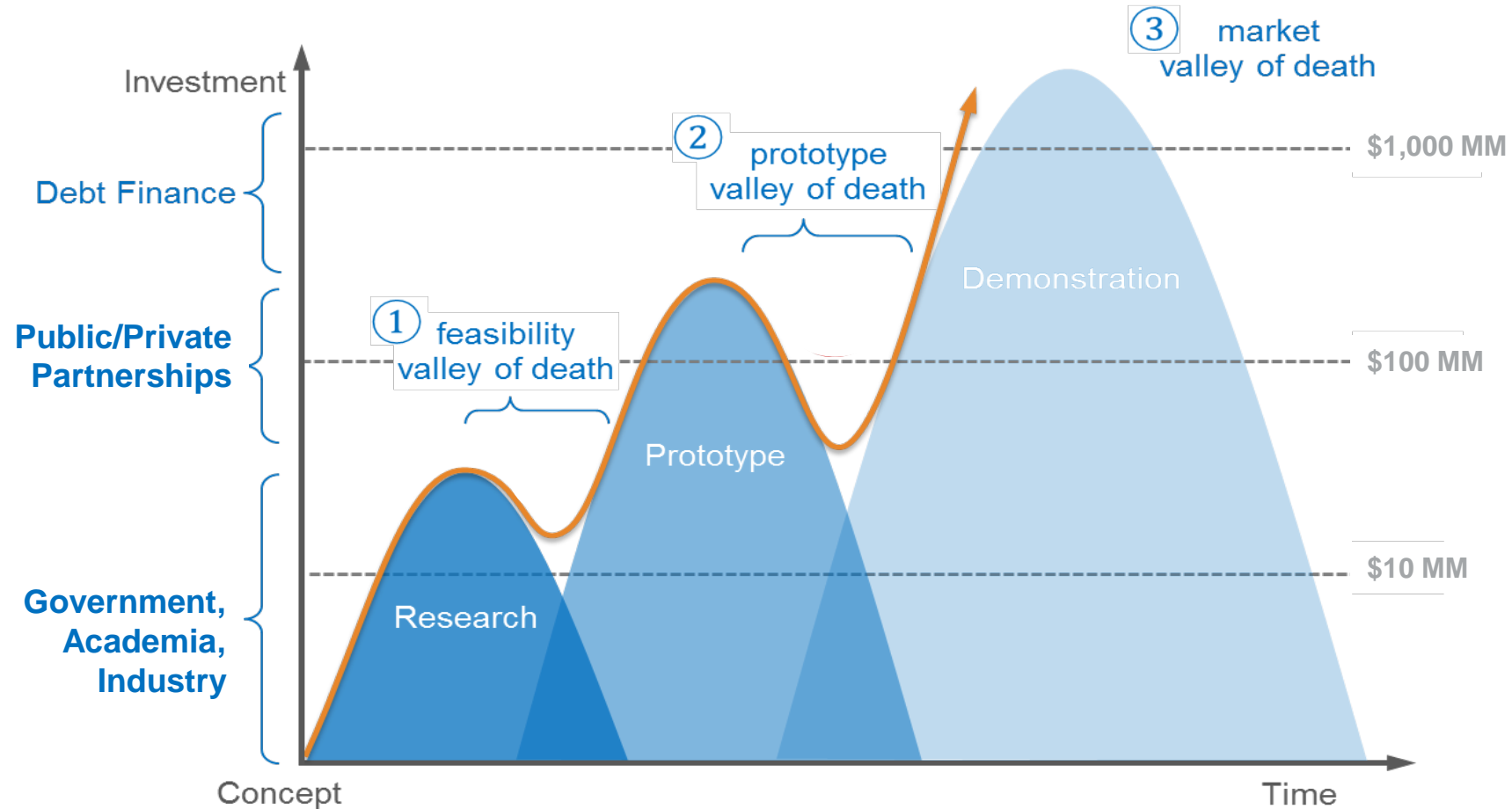


**Oxy-PFBC Pilot Plant**  
Ottawa, Canada



**10 MWe STEP Pilot Plant**  
San Antonio, TX, USA

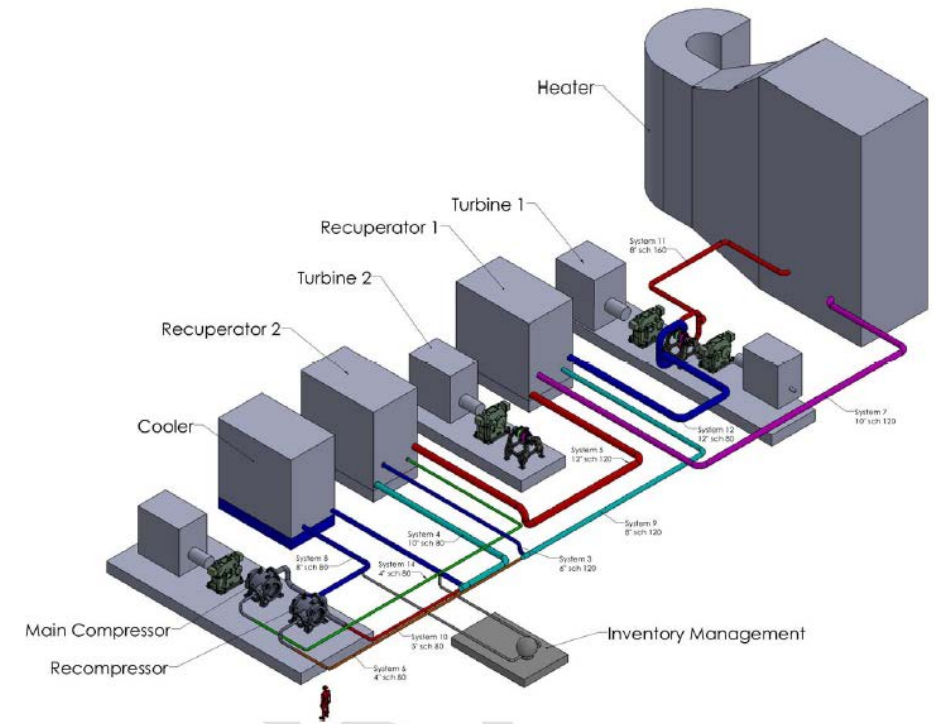
# Funding Hurdles Only Intensify with Scale!





# 10 MWe STEP Pilot Test Facility

- Objective: Develop 10 MWe pilot facility to advance high efficiency supercritical CO<sub>2</sub> (sCO<sub>2</sub>) Brayton cycle systems for power generation
- Sited in USA (San Antonio, TX)
- U.S. DOE contract (~70% U.S. Gov't funded)
- Non-government, international participation through Joint Industry Program (JIP) to partially fund industry cost-share contribution
  - Canada, Korea, China, Australia, Italy



# IH<sup>2</sup>® Demonstration Project

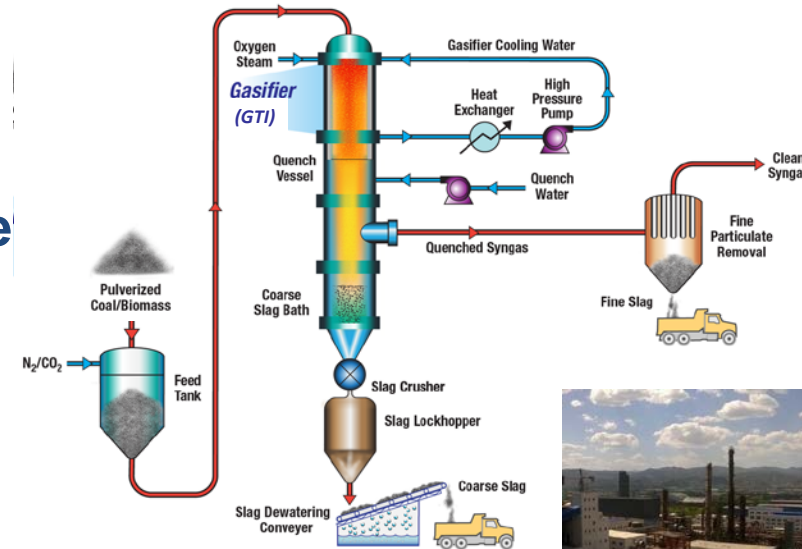
- Objective: Commercial scale-up and 200 L/day demonstration of Integrated Hydropyrolysis and Hydroconversion (IH<sup>2</sup>®) Process to produce drop-in fuels from biomass
- Sited in Bangalore, India
- Prior technology development and piloting supported by U.S. DOE grants
- Licensing Partnership with CRI Catalyst (Division of Shell)



# R-GAS™ Demonstration Project

- Objective: Commercial scale-up and 800 t/d demonstration of R-GAS™ gasification process
- Sited in Taiyuan, China
- Prior technology development and pilot-scale testing supported by U.S. DOE
- Demonstration project fully funded by China commercial partners
- Collaboration facilitated through joint U.S./China Clean Energy Research Center

gti®



# Oxy-PFBC Pilot Plant

- Objective: Build and test 1 MWth pilot plant to develop oxygen-fired, pressurized fluidized bed combustion process for reduced cost of CO<sub>2</sub> capture
- Sited in Ottawa, Canada (CanmetENERGY)
- U.S. DOE contract (~70% U.S. Gov't funded)
- International partners (NRCan/Canmet and Linde) contribute to industrial cost share





# Thoughts on International Collaboration

---

- **Financing of large-scale pilot and demonstration projects very difficult due to technology risk, economics of scale and no/low payback**
- **Despite challenges, multiple examples of successful international cooperation exist from which lessons can be learned**
- **Robust Government-to-Government collaboration exists in basic research (e.g. CERC)**
- **Government-to-Government collaboration on large scale pilots and demonstrations is needed to address GHG emissions reductions objectives**
  - **Non-Government financed projects are motivated entirely by market and financial returns**
  - **Economics not favorable for GHG emissions reductions technologies**

# Turning Raw Technology into Practical Solutions

[www.gastechnology.org](http://www.gastechnology.org) | [don.stevenson@gastechnology.org](mailto:don.stevenson@gastechnology.org)

