Fluor’s Econamine FG+SM (EFG+SM) technology enables large-scale, post-combustion CO₂ capture from coal, oil and gas fired power plants.
Fluor’s Econamine FG+SM Experience
Fluor has several decades of experience in CO$_2$ projects and facilities, including:

- **Capture**
  - Pre- and post-combustion including Fluor's Econamine FG+ technology
  - Gas processing: Removal of CO$_2$ from synthesis gas & natural gas; over 400 units

- **Transport**
  - Pipelines, piping systems, compression and pumping
  - Drying
Fluor’s Econamine FG+SM Experience

- One of the most economical post-combustion CO₂ capture process available:
  - Vast body of commercial experience
  - Licensed 28 plants to date, 7 currently being built

- Fluor has been active in Post-Combustion Capture since the late 1980s

- Suitable for range of oxygen and CO₂ containing gas streams
  - CO₂ : 3% to 20% by volume
  - O₂ : 1 to 15% by volume
Fluor’s Econamine FG+SM Experience

- Commercially proven on low-grade fuel oil
  - Extremely corrosive flue gas
  - Gas contains particulates & vanadium
  - Successful operation for three years

- Commercially proven on gas
  - Bellingham NGCC Power Plant

- Demonstrated on coal
  - TEPCO Econamine FG+ Demonstration Plant
Fluor’s Econamine FG+℠ Experience

Fluor continues to enhance the technology. Over the last 7 years, significant improvements have been made:

- Several patents
- Developed and validated new reclamer technology
- Reduced steam consumption by 20%
- Reduced electricity consumption by 18%
- Significant overall capital and operating cost reductions
Project Profile: Bellingham, MA

Project Profile

- Plant location: Bellingham, MA
- Capacity 330 t/d
- 40 MW fluegas flow from NGCC power plant
- CO$_2$ Concentration: 3.5% v/v
- O$_2$ Concentration: 13 to 14% v/v
- 100% air cooled
- Product Usage: Food-grade CO$_2$
- Status: Continuous commercial operation from 1991 to 2005.
  - 98.5% on-stream factor in 2004.
  - Shutdown due to high natural gas price.
Bellingham Plant Ground View
Demonstration on Coal
Coal-Based Flue Gas EFG+ Demonstration

- In July 2008, E.ON and Fluor Corporation formed a partnership to jointly build a CO$_2$ capture project to demonstrate the performance of the EFG+ technology.

- The plant is sited at E.ON’s coal fired power station at Wilhelmshaven near Bremen, Germany.

- The Wilhelmshaven power plant burns hard coal and has a net output of 757 MW.
E.ON Kraftwerke Site, Wilhelmshaven
Fluor + E.ON Demonstration Plant Features

- 70 Te/d carbon dioxide
- 17,000 Nm$^3$/h flue gas
- 90% recovery of CO$_2$
- Operation starting in September 2011
The project will demonstrate:

– Compliance with environmental requirements

– Compatibility of EFG+ technology to retrofit coal-based power plants

◆ Next generation EFG+ solvent will be demonstrated

◆ Advanced EFG+ features will be incorporated

◆ Fluor and E.ON will jointly operate the plant

◆ Web based operation and surveillance
Econamine FG+ Projects

- Over 60 studies studies for applications including coal fired power plants, NGCC plants and fertilizer and methanol plants
- 7 Units in Europe for food grade (beverage) CO$_2$
  - Currently under execution
Recent and Current Projects

- E.On + GDF Suez ROAD Project (Netherlands)
  - 250 MW coal fluegas
  - FEED Package completed
- Enel Porto Tolle Project, Italy
  - 250 MW coal plant
  - FEED in progress
- NRG Texas, (DOE funded Demonstration Plant)
  - 250 MW coal based fluegas
  - FEED package in progress (sole source)
- Tenaska Trailblazer, Texas, USA
  - 860 MW gross coal plant
  - FEED package in progress (sole source)
Fluor’s Econamine FG+SM Process Flow Diagram
Econamine FG+ for Coal Fired Power Plant Flue Gas
Summary

- Econamine FG Plus℠ technology is a proven, cost-effective process for post-combustion CO$_2$ capture

- The EFG+ technology has a menu of advanced features that result in:
  - Low energy consumption
  - Low solvent and chemical costs
  - Friendly environmental signature
  - Reduced footprint
Questions

Thank you for listening!