



2007
Summer
Seminar

The Challenges for Renewables and Coal

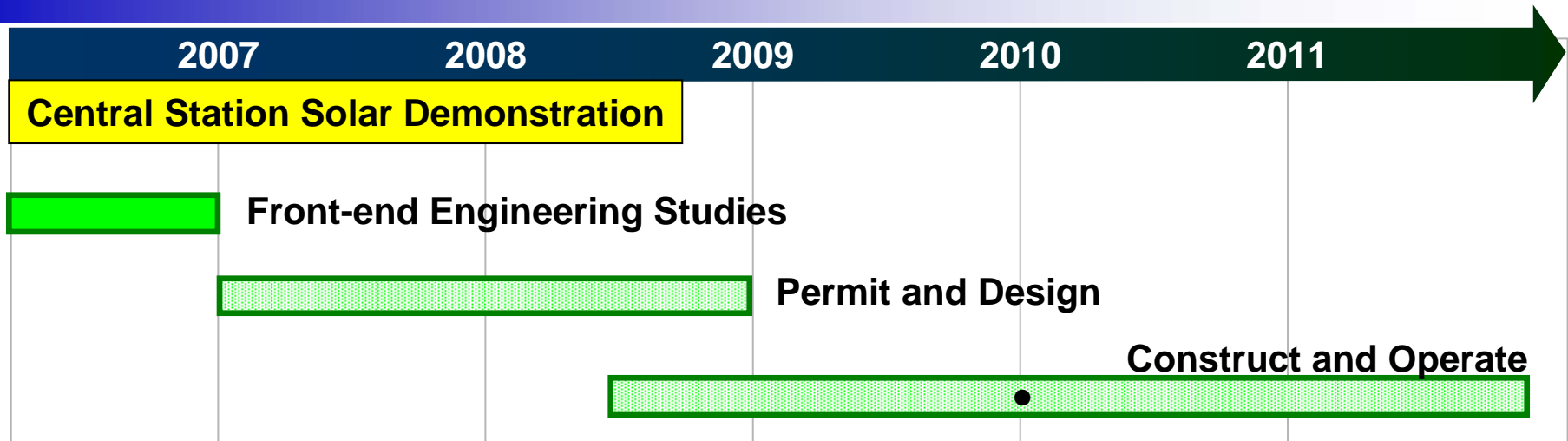
Chris Larsen

Vice President, Generation

Overview

- Renewables:
 - Solar
 - Ocean Energy
- Large Scale CO₂ Capture and Storage:
 - Pilots
 - Component Demonstration
 - Enabling Technology – O₂ Production
 - Pre-commercial Demonstration

Central Station Solar Power Demonstration



EPR2 | ELECTRIC POWER RESEARCH INSTITUTE

Central Station Solar Demonstration

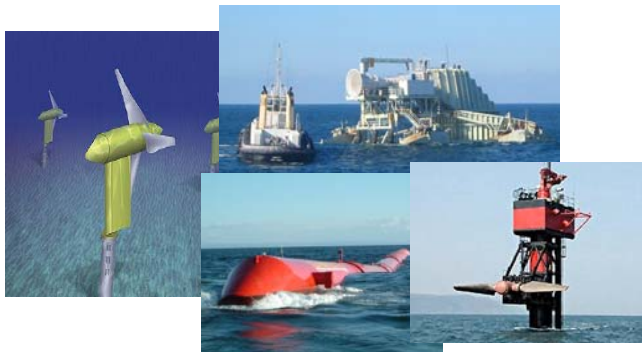
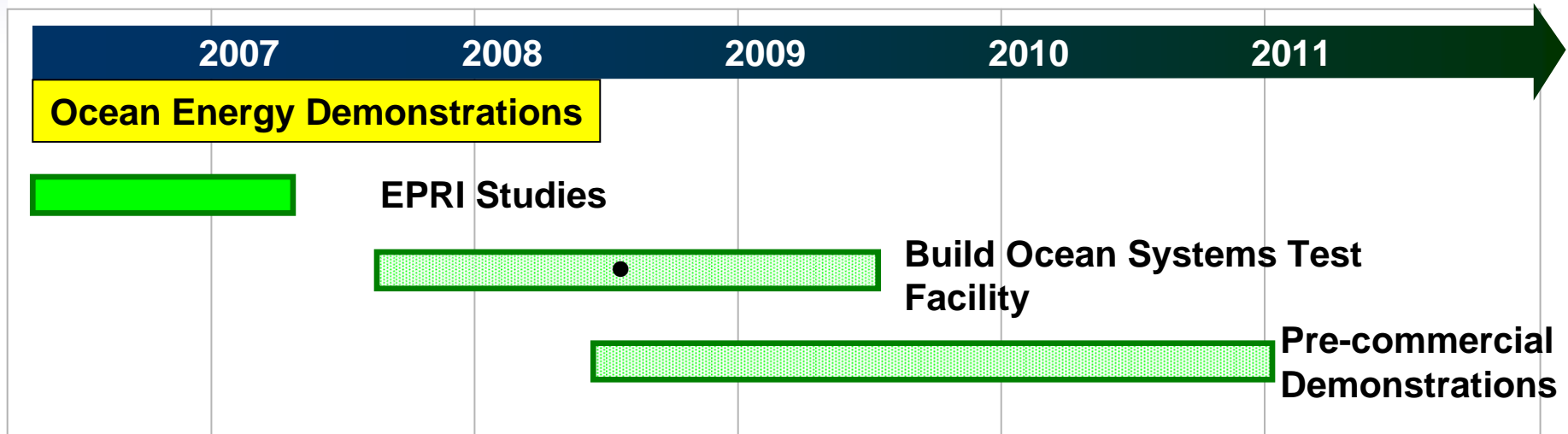


- 50 – 2x250MW Scale
- 2010 Operation Date
- Front end study in 2007
- Technical/Economic Feasibility
- New Mexico



Technologies Emerging... Collaborative Underway

Ocean Energy



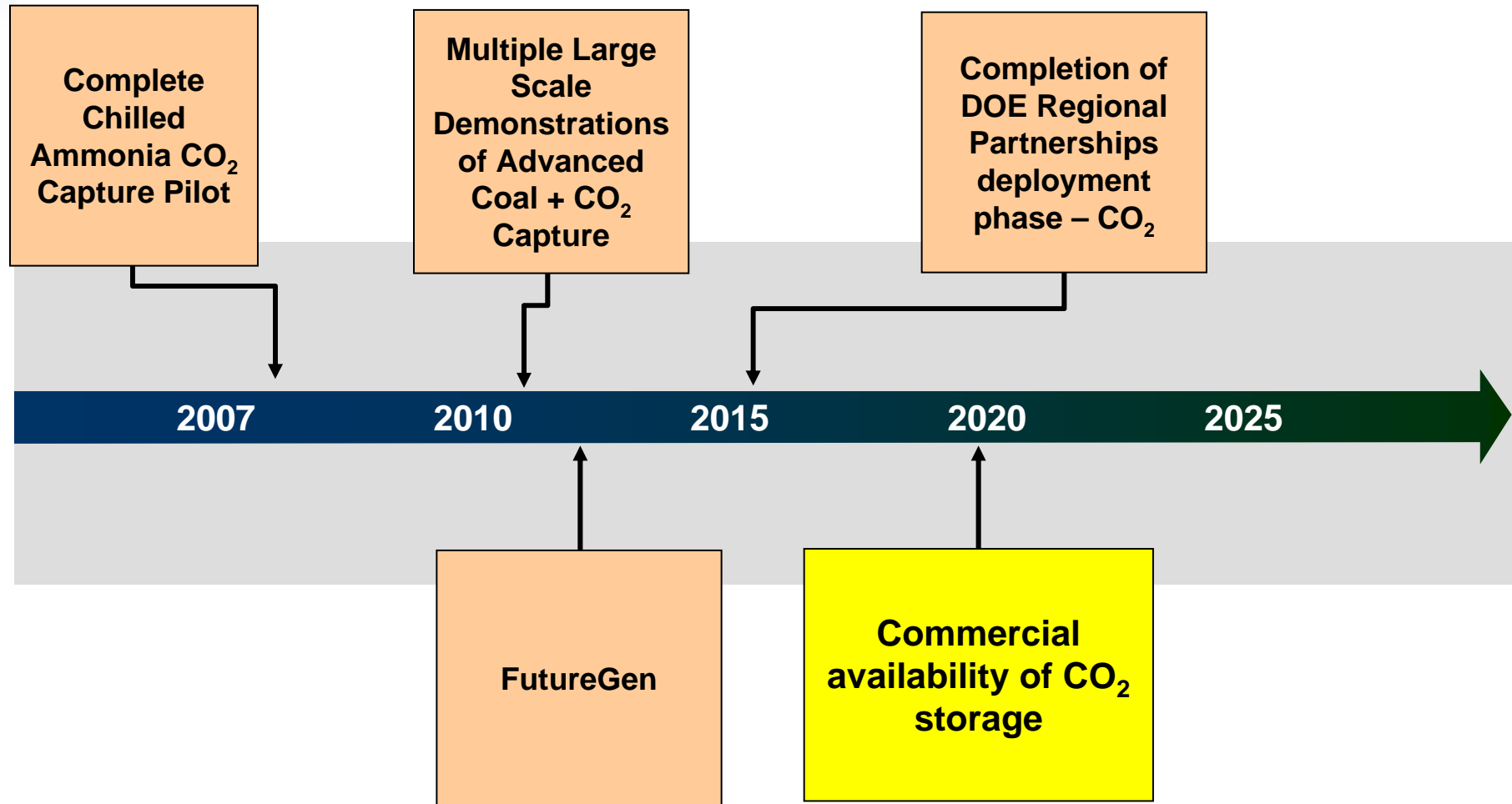
Ocean Systems Test Facility



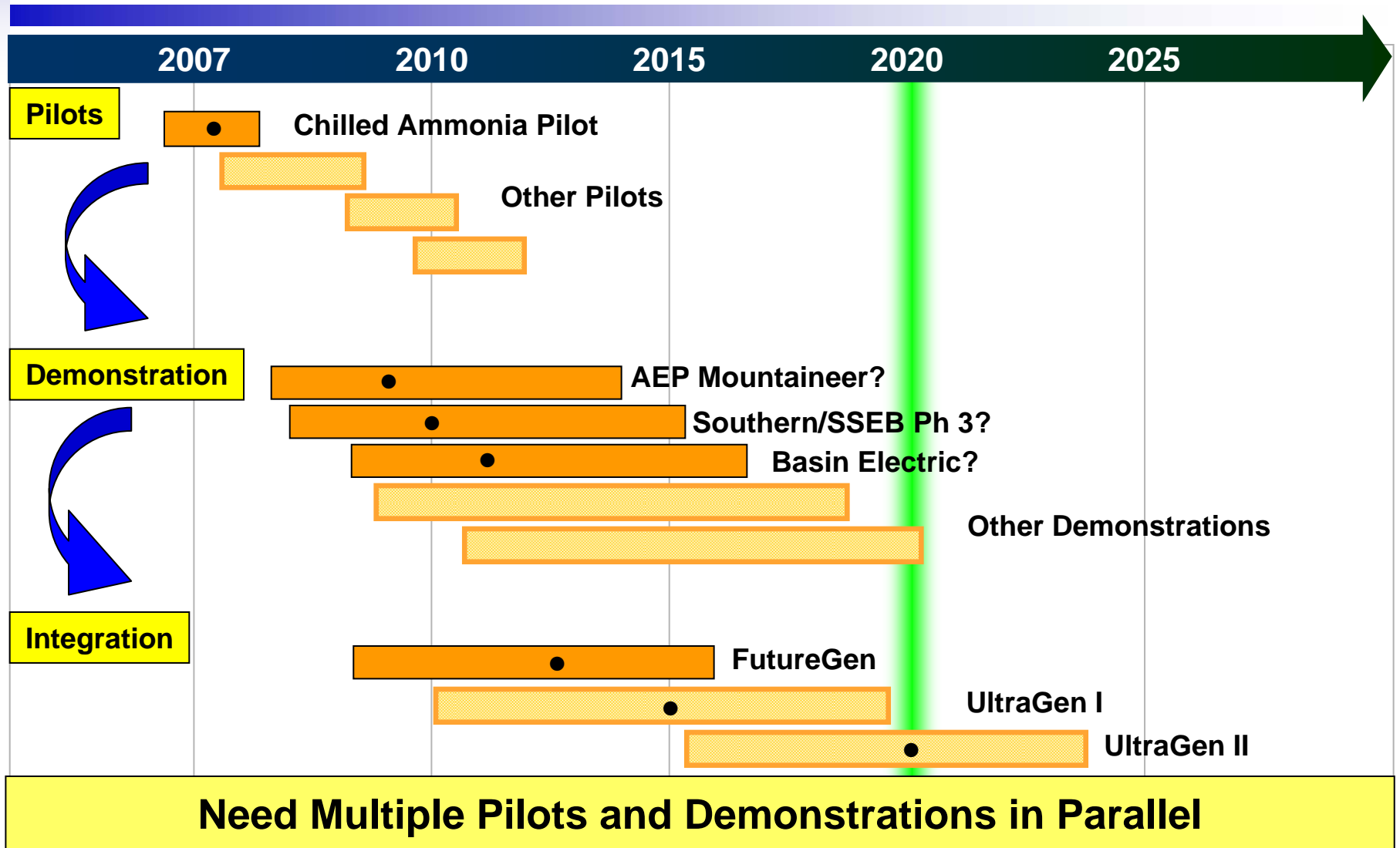
- Test multiple technologies
- Establish environmental impact profile
- Integration
- Applied R&D on pilot and pre-commercial scale
- Reduce uncertainties

Collaborative for Ocean Energy Technologies

Key Milestone: 2020 – Technology Available

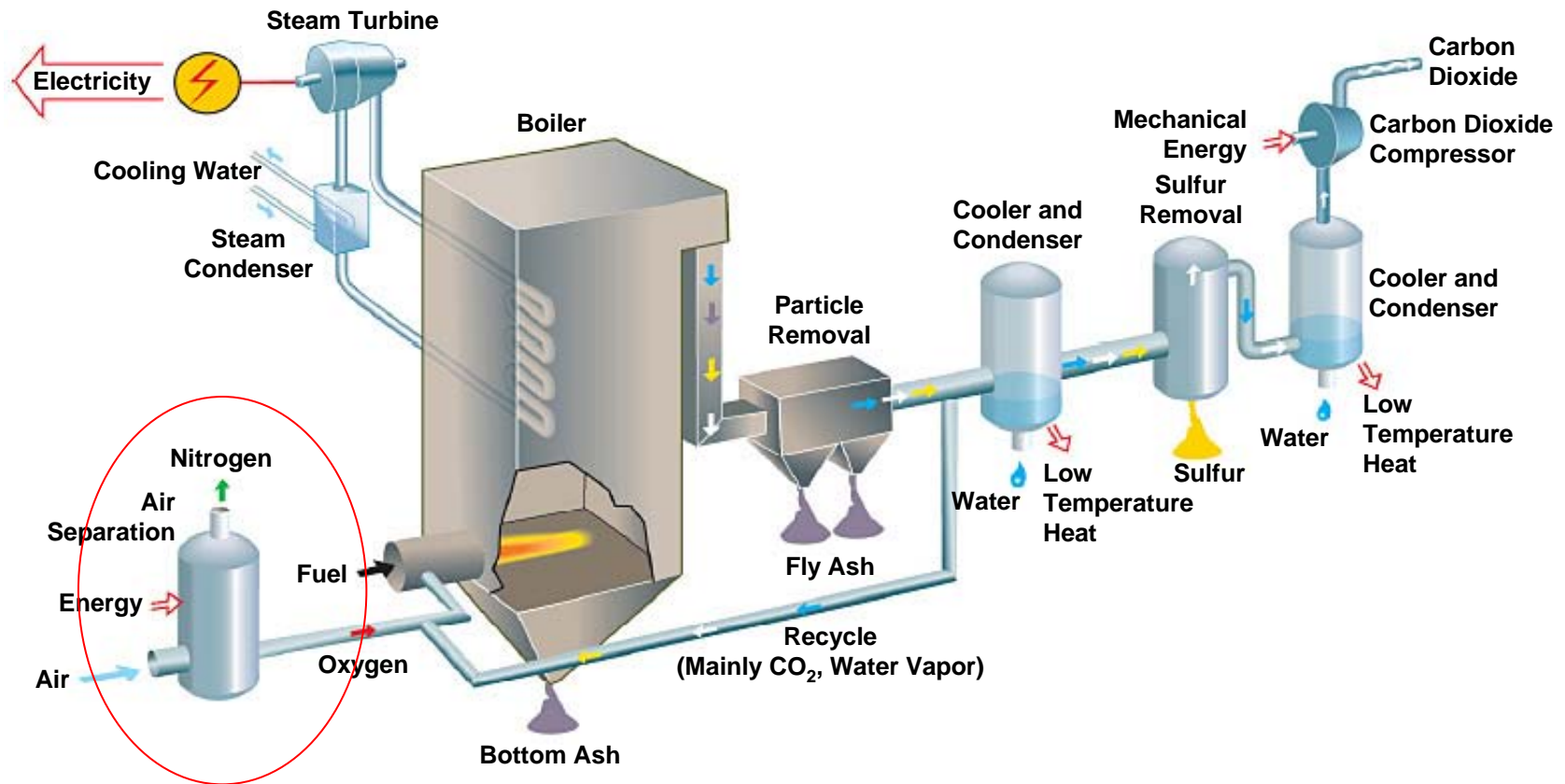


Coal Plant CO₂ Capture and Storage



Oxy-Combustion Capture

O₂/CO₂ Recycle (Oxyfuel) Combustion Capture



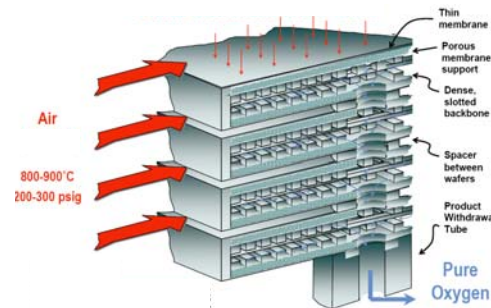
Source: Vattenfall

The Need for Cheaper O₂

- **IGCC and Oxy-Fuel will require a significant amount of O₂**
 - IGCC: 3000+ Tonnes per day (500MW plant)
 - Oxy-Fuel: 7000+ Tonnes per day (500MW plant)
- **Could improve plant thermal efficiency (HHV) up to 4% points => significant fuel, cost and emissions savings**



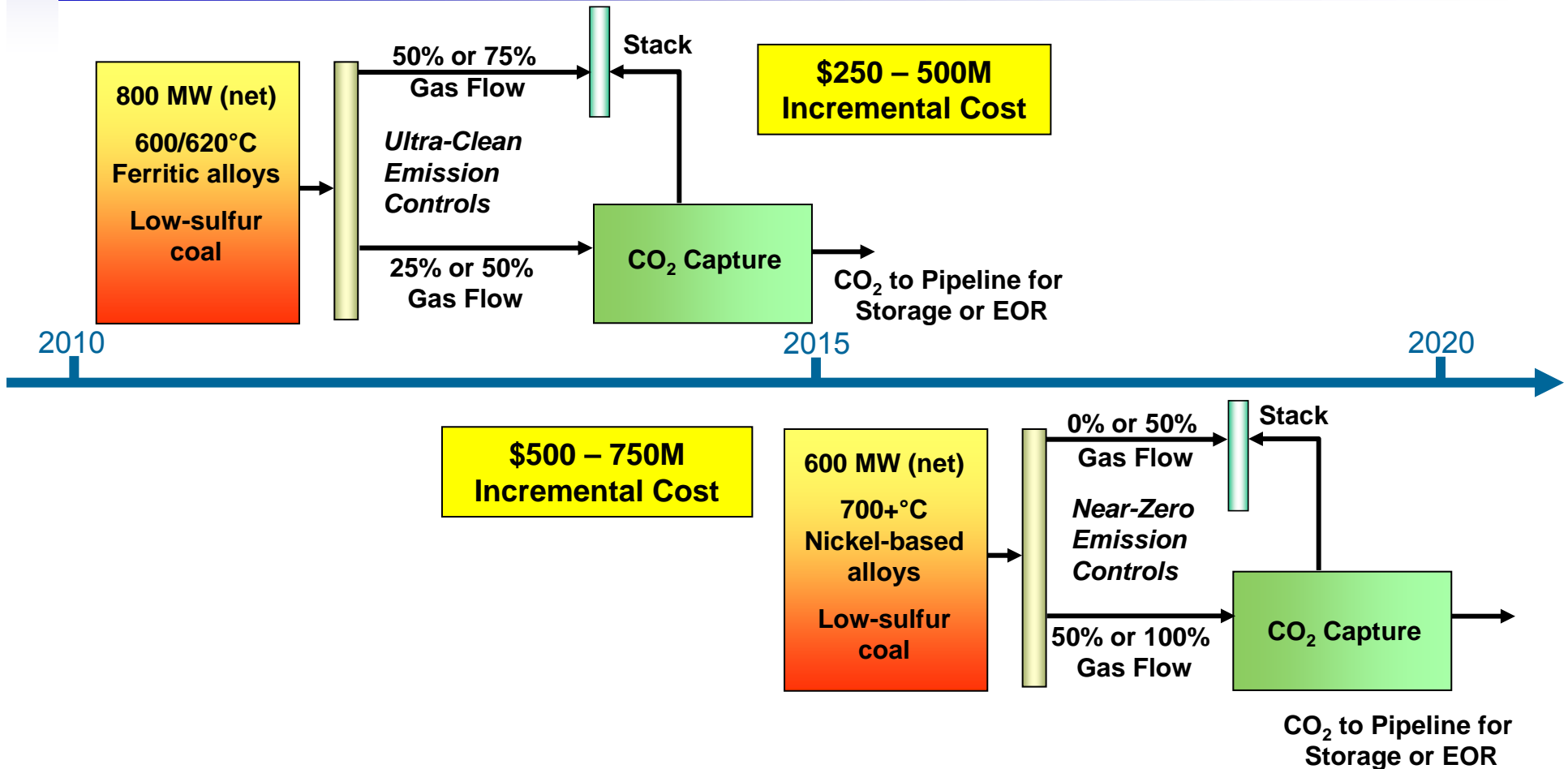
Ion Transport Membrane Demonstration



- 150 Tonnes per day
- Launching now
- Significant funding from DOE, Air Products and EPRI

Collaborative for Key Efficiency Technology Demonstration

UltraGen – Combustion Complement to FutureGen



Opportunity for Broad, Reduced Risk Collaboratives