Pegasus Technologies' Mercury Specie and Multi-Pollutant Control Project

Project Presentation

Clean Coal Power Initiative

- Round 2 -

Installation and Testing of Critical Sensing Devices to Monitor and Control Power Plant Inputs and Emissions

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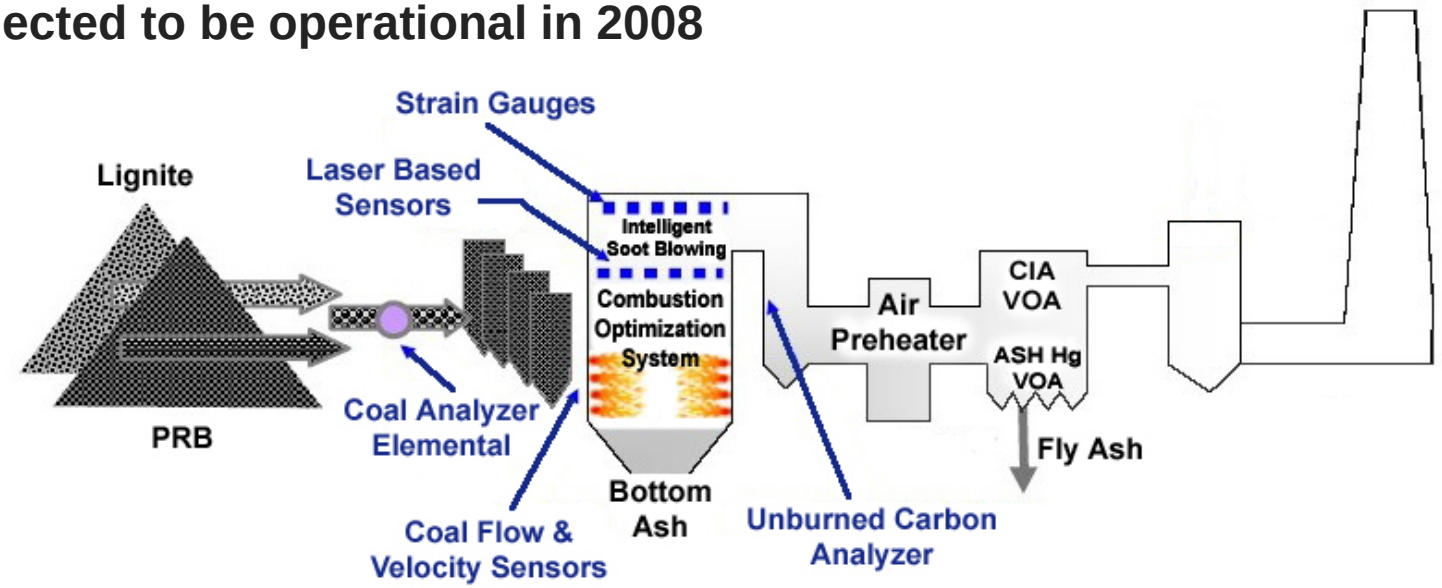
Mercury Specie and Multi-Pollutant Control Project

- A multi-pollutant control project to minimize emissions of Hg and other pollutants using intelligent software, sensors, and neural networks in coal-fired power plants
- Total project cost: $14.2 million (DOE share: $6.1 million)
- Burning a mixture of 70% Texas Lignite and 30% Powder River Basin sub-bituminous coal (14,500 tons/day) at an existing 890 MW coal-fired utility boiler in Houston, TX
- Projected to be operational in 2008



Background

- **Pegasus Technologies, Incorporated (Pegasus), a developer of power plant control and optimization technologies, will demonstrate the capability of artificial intelligence (AI) for increasing control of mercury and other pollutants from an existing power plant**
- **Team members include:**
  - Pegasus Technologies, Incorporated. (Chardon, OH)
  - Texas Genco (Houston, TX)
- **Fuel**
  - 30% Powder River Basin sub-bituminous coal
  - 70% Texas lignite
- **Coal Input: 14,500 tons/day, Electrical Output: 890 MW**
- **Demonstration at an existing utility boiler located in Houston owned by Texas Genco (Limestone Plant)**

Background (continued)

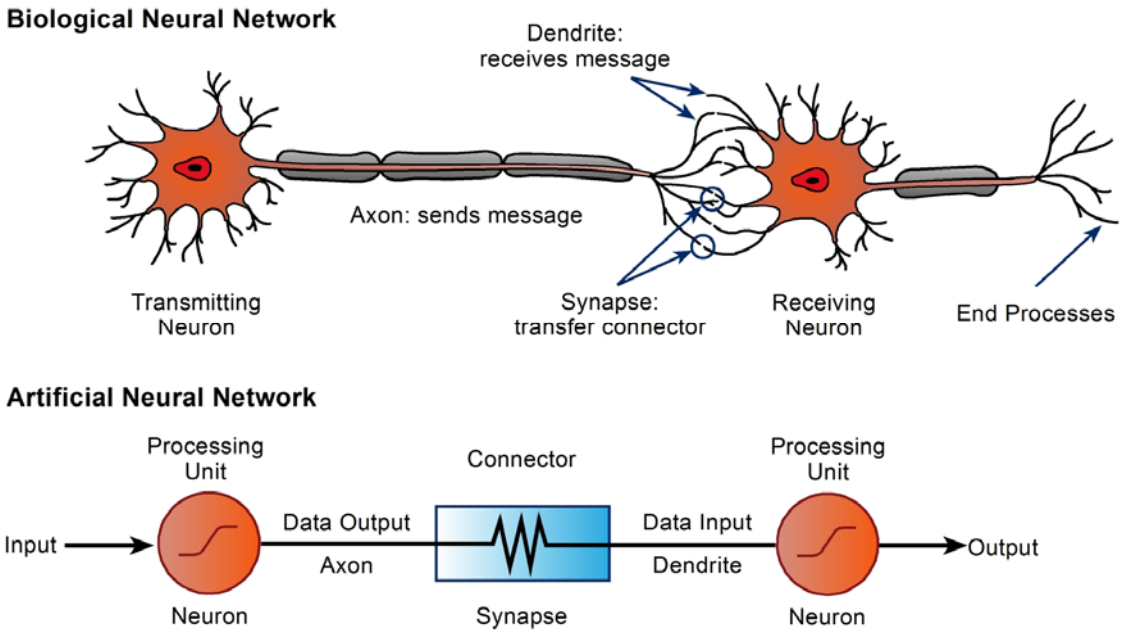
- **The unit is equipped with a cold-side electrostatic precipitator with 99.8% particulate nominal removal efficiency and a wet limestone flue gas desulphurization system with 90% SO_2 nominal removal efficiency**
- **NO_X reductions: 10% to 40%**
- **Reduced water usage**
- **The Pegasus Project will optimize the Hg speciation, resulting in greater capture of Hg**
  - Hg occurs as different species: a pure element, as part of a gaseous compound, or bound to particulates (fly ash) in the flue gas
  - Hg adsorbed onto fly ash is relatively easy to remove from the flue gas
  - By adjusting certain parameters during combustion, speciation is optimized, maximizing the mercury captured in particle bonds
  - The Hg can then be captured and removed from the system

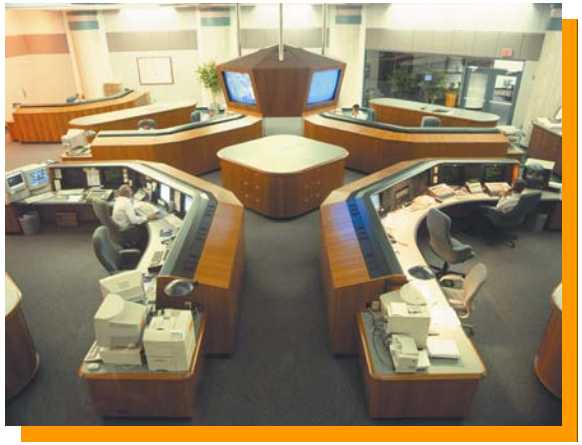
Unique Technology Aspects

- Artificial intelligence and simulation technologies will be used to control and optimize all of the major facets of the power plant
- Critical sensing devices will be added to the unit to monitor inputs and emissions from the plant. Data from these sensors will be analyzed by the neural network to optimize the use of raw materials, while simultaneously minimizing Hg emissions
- This project will demonstrate how integrating sensors, controls, and advanced analysis techniques into multiple facets of plant operation can lead to improved economics and environmental compliance

Unique Technology Aspects (continued)

- **The technology will utilize state-of-the-art sensors and neural network-based optimization and control technologies to maximize the proportion of Hg species, which are easy to remove from the boiler flue**





Project Schedule

- **Start**
  - 2005
- **NEPA Process**
  - NEPA Categorical Exclusion completed 2005
- **Design**
  - 2005 to 2007
- **Construction**
  - 2007 to 2008

Project Schedule (continued)

- **Operation**
  - 2008 to 2011
- **Completion**
  - 2011

Conclusions

- The Pegasus project will help to meet the nation's growing demand for electricity, provide a secure and low-cost coal-based energy source, and protect the environment
- The project demonstrates plant-wide advanced control and optimization systems on a coal-fired steam electric power plant that will minimize emissions of Hg and other pollutants into the atmosphere
- The improved control and knowledge of plant conditions from the installed sensors, software, and neural network will also provide the capability to maximize plant efficiency for electricity production by adjustments to the input and usage of raw materials

Conclusions (continued)

- **The technology will have widespread application since it can be directly retrofitted to existing coal-fired power plants or integrated into future new plant designs**
  - capability to increase plant efficiency and reduce harmful emissions of Hg
  - increased control of SO_2, NO_x, and particulate emissions
  - reduced water usage