IPRO 302-CO_2 Mitigation: A Techno Economic Assessment

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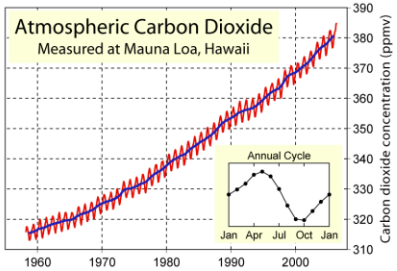
Objective

The objective of this IPRO was to research and compile information on potential future CO_2 environmental regulations, current CO_2 mitigation technology, and CO_2 sequestration techniques.



Since 1910, the Earth's temperature has been rising at a considerable rate. According to the World Meteorological Organization, the Earth's maximum temperature was attained in the 90's. This increase is believed to come from carbon dioxide (CO_2) emissions.

Key Tasks

- Research CO_2 mitigation technology for PC and IGCC power plants
- Learn about the current and future regulations and sequestration options
- Perform a technological and economic comparison of these mitigation strategies.

Results

- Research on various methods of CO_2 mitigation, including different vendors and technologies
- Techno-economic comparison of these methods
- Information located on regulations and sequestration options

Obstacles

- Large amount of information on CO_2 mitigation available
- Team members had various amounts of background knowledge on the subject.

Next Steps

Next semester's IPRO will use this information to design a power plant that includes CO_2 mitigation technology.

Team

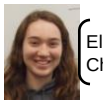
Presentation Team

Vernell Robinson
Business Administration
Team Leader

John Enverga
Physics

Martin Kolodziej
Electrical Engineering

Written Report Team



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Chemical Engineering

Jarrod Godfrey
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Ethics Team

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Biomedical Engineering

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Chemical Engineering

George Vrana
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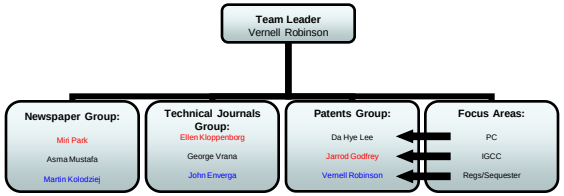
Team Structure



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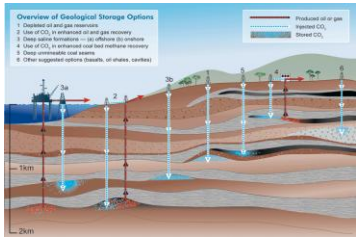
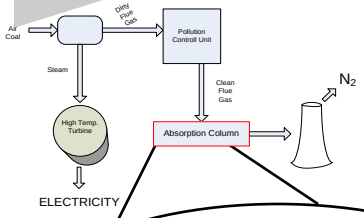
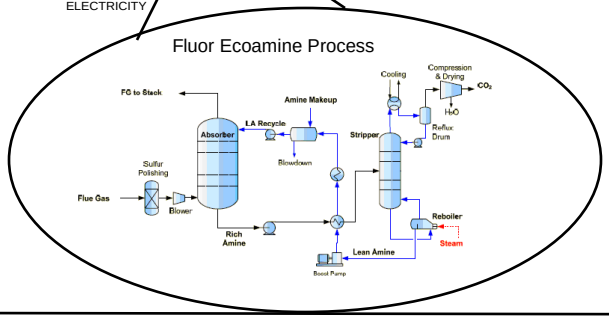
Sequestration

- There are three main types of sequestration: terrestrial, geologic, and oceanic.
- Geologic sequestration – CO_2 is injected into saline aquifers and depleted oil and natural gas fields or used for Enhanced Oil Recovery.
- Terrestrial sequestration – Forests and other vegetation are used to absorb CO_2.
- Oceanic – CO_2 is injected into the ocean floor or absorbed into the water.

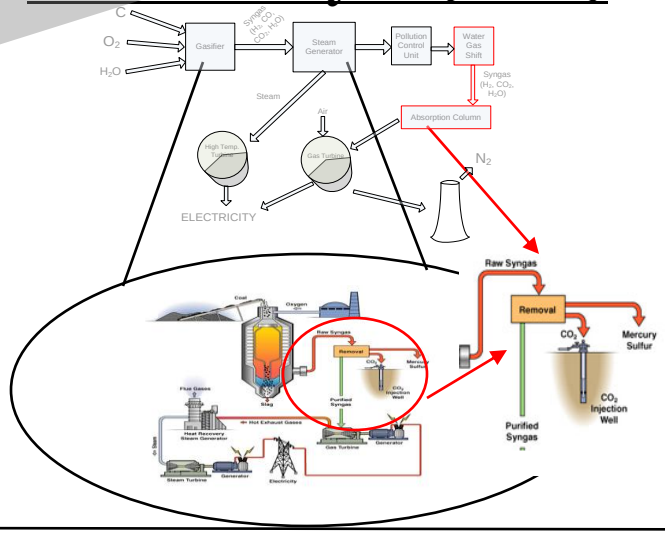


Pulverized Coal (PC)





Integrated Gasification/ Combined Cycle (IGCC)



Regulations

- Currently there are no federal regulations on CO_2 containment.
- California, New York, New Jersey, and Hawaii have made laws limiting emissions in future years.
- State laws often require a cut to 1990 levels by 2020.

Major Vendors

- PC Plants
  - Alstom
  - Fluor
  - MHI
  - Powerspan
- IGCC Power Plants
  - General Electric
  - Shell
  - Conoco/Phillips
  - MHI

Recommendations

PC - Fluor
- 90 % CO2 Capture
- 27.2 % Efficiency – Supercritical
- $68/ton CO2 avoided
- Uses Mono Ethanol Amine solution

IGCC - General Electric
- 90 % CO2 Capture
- 32.5 % Efficiency
- $39/ton CO2 avoided
- Uses Selexol