

# The Petra Nova Carbon Capture Project

## Project Overview

The world's largest post combustion CO<sub>2</sub> capture system will be located in Thompson Texas, in the U.S.A. It is currently under construction and is expected to be operational in the fourth quarter of 2016.

The project has been developed by Petra Nova, a 50/50 joint venture between NRG Energy and JX Nippon Oil & Gas Exploration.

The project uses MHI CO<sub>2</sub> capture technology to separate the CO<sub>2</sub> from flue gas for the purpose of enhanced oil recovery (EOR).



The capture system removes the carbon dioxide (CO<sub>2</sub>) from a slipstream of flue gas from an existing coal-fired power generation plant.

It has a CO<sub>2</sub> capture capacity of 4,776 metric tons per day (mtpd).

The system consists of a flue-gas cooler, absorber and regenerator, CO<sub>2</sub> compression unit, and associated utility facilities.

Capture efficiency of the process is 90%\*.

This project involves the separation and capture of CO<sub>2</sub> from a slipstream of flue gas otherwise emitted from NRG's WA Parish generation station, a coal-fired power generation plant, located approximately 60 kilometers southwest of Houston, Texas.

The captured CO<sub>2</sub> will be compressed and transported for injection into the West Ranch oil field to boost oil production.

Through EOR, it is expected that oil production will be increased from around 500 barrels per day to approximately 15,000 barrels per day.

EOR projects, including this project, are advanced solutions, which concurrently address issues in both the environment and energy fields.

MHI is the technology provider that will supply the CO<sub>2</sub> capture system supporting greenhouse gas reduction.

Going forward, MHI intends to continue its support of sustainable environment preservation and economic development through its aggressive involvement in this field.

Note: CO<sub>2</sub> capture efficiency indicates the ratio (percentage) of CO<sub>2</sub> Recovered from the flue gas by the process against total amount of CO<sub>2</sub> contained in the flue gas.



Our Technologies, Your Tomorrow

## The Game Changer

MITSUBISHI HEAVY INDUSTRIES' CARBON CAPTURE TECHNOLOGY

As a global leader in the fields of energy and the environment, Mitsubishi Heavy Industries believes we all shoulder the responsibility for a healthier next generation.

Mitsubishi Heavy Industries is proud to join NRG Energy and JX Nippon Oil & Gas Exploration in the groundbreaking Petra Nova Project near Houston, Texas. Beginning in 2016, Petra Nova will apply Mitsubishi Heavy Industries' game-changing, carbon capture technology to the world's largest post-combustion carbon capture facility on an existing coal fueled power plant.

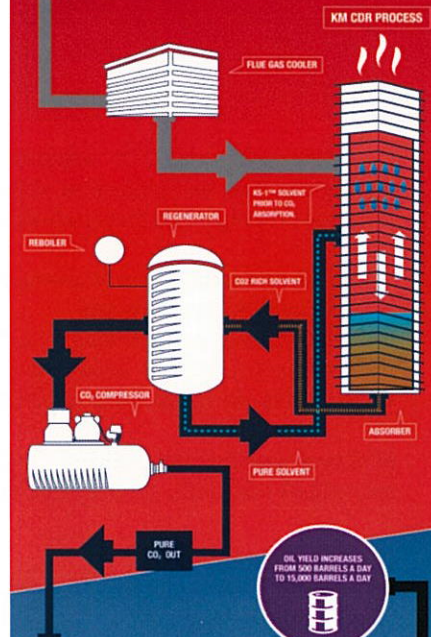
### 1 THE CARBON CAPTURE AND ENHANCED OIL RECOVERY PROJECT

With 90% carbon capture from this technology, America will be one step closer to reducing our carbon footprint, which means brighter skies for future generations.



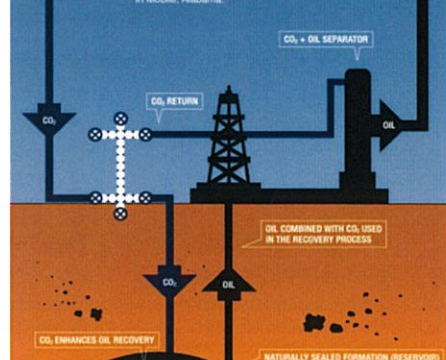
### 2 THE CO<sub>2</sub> CAPTURE PROCESS

Mitsubishi Heavy Industries, Ltd. is the supplier of CO<sub>2</sub> Capture System featured below. This process uses a proprietary KS-1™ high-performance solvent for CO<sub>2</sub> absorption and desorption that was jointly developed by MHI and the Kansai Electric Power Co. Compared with other CO<sub>2</sub> capture technologies, the KM-COR Process™ is optimized to use significantly less energy.



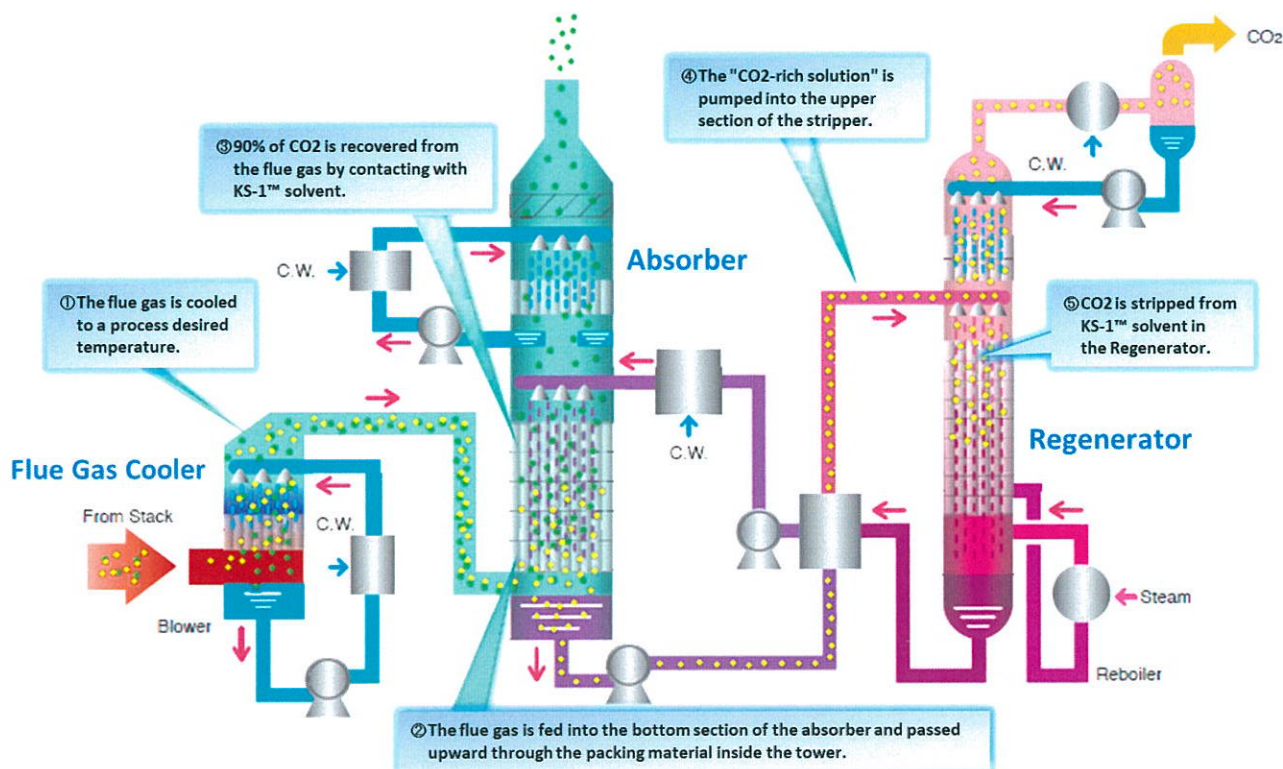
### 3 PROVEN TECHNOLOGY

Mitsubishi's technology will remove an estimated 1.6 million tons of carbon annually. MHI already has a proven record of success with carbon capture technology as seen through the MHI and Southern Company partnership on the Plant Barry demonstration project where we are capturing CO<sub>2</sub> from emissions at a coal-fired power plant in Mobile, Alabama.



# MHI CO<sub>2</sub> Capture Process (KM CDR Process®)

## Technology Overview



The MHI flue gas CO<sub>2</sub> capture technology, so called "KM CDR Process®" (Kansai Mitsubishi Carbon Dioxide Recovery) can be applied to either existing or new power plants.

This technology has been co-developed by MHI and the Kansai Electric Power Co., Inc. since 1990.

The process is built on proven, advanced flue gas CO<sub>2</sub> capture technologies with specific application for fossil fuel power generation facilities.

It utilizes the proprietary KS-1™ high-performance solvent that has improved absorption and regeneration properties while also lowering corrosiveness and degradation features, compared with normal amine applications. These aspects contribute to lower energy requirements, solvent consumption and emissions of waste products.

MHI is a world-leading flue gas CO<sub>2</sub> capture technology supplier and is strategically positioned to provide the most technically proven, environmentally friendly and economically robust CO<sub>2</sub> capture process.

## KM CDR Process®

- World's most energy efficient process with KS-1 trademark solvent – leading to reduced CAPEX & OPEX
- World's most advanced and comprehensive industrial R&D programs for more than 20 years – Deployment of multiple R&D pilot plants and research facilities led to significant process and technology improvements
- More than 207 patents pertaining to the KM CDR Process® all over the world (as of June, 2014)
- Worldwide commercial experience with large scale various Air Quality Control Systems (AQCS) plant

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