

## Leading the Way

# AEP and Carbon Dioxide Capture and Storage

AEP continues its heritage of advancing technology for the electric utility industry with leading-edge carbon dioxide (CO<sub>2</sub>) capture and storage initiatives.

As an industry leader in climate action, AEP recognized more than a decade ago that the emissions of its coal-fueled fleet of power plants – including CO<sub>2</sub>, a greenhouse gas emission associated with global climate change – would have a significant impact on the future of the company.

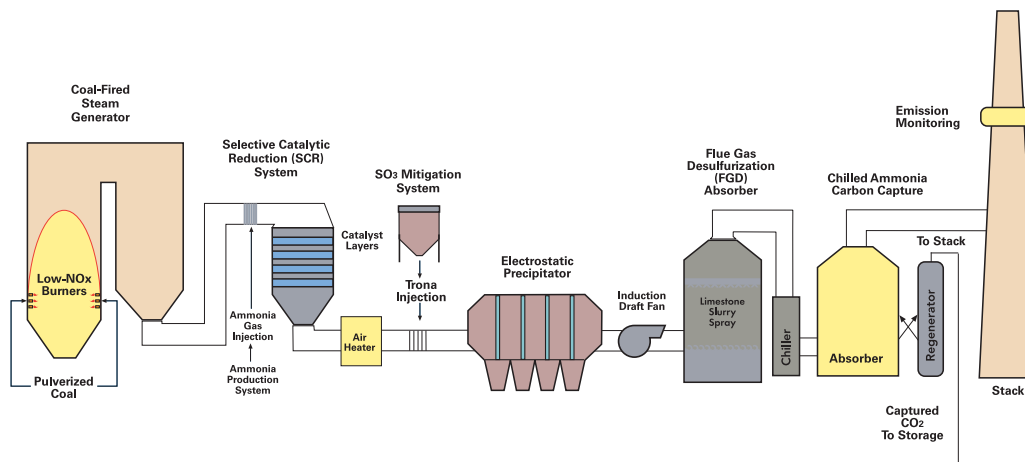
AEP has faced the challenge with innovative, first-of-a-kind approaches designed to allow the continued use of coal to generate electricity in a carbon-constrained world.

## AEP and CO<sub>2</sub> Capture and Storage

AEP's goal is to address the issue of climate change while maintaining a supply of affordable, reliable energy for customers that helps keep our economy and our nation secure and strong.

AEP and Alstom are validating the Chilled Ammonia Process, a post-combustion technology, at a 20-megawatt (electric) slipstream installation at Mountaineer Plant in West Virginia.

The CO<sub>2</sub> project at Mountaineer Plant began operation in fall of 2009. In addition, AEP is capturing, compressing and storing underground at least 100,000 metric tons of CO<sub>2</sub> per year in deep geologic layers. AEP's share of the project – which will run one to five years – is approximately \$73 million.



*CCS process occurs after the flue gas exits the FGD system and before it enters the stack.*

AEP has applied for Federal funding to scale up the project to a 235 MWe slipstream of flue gas. Alstom's Chilled Ammonia Process will capture approximately 1.5 million metric tons of CO<sub>2</sub> per year, which then will be permanently stored underground.

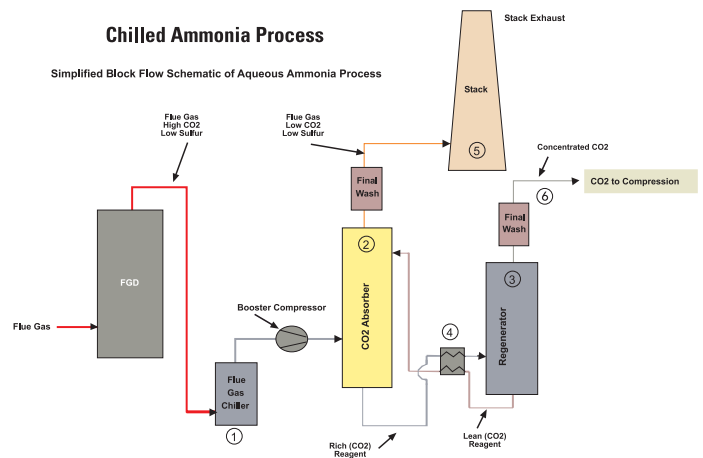
AEP is securing national and international partners to participate in the scale up project. Detailed engineering will begin once all funding requirements have been confirmed.

With these projects, AEP continues its leadership position with significant scale-up of technology to capture and store CO<sub>2</sub> emissions from a coal-fired plant.

## CO<sub>2</sub> Capture

With Alstom's Chilled Ammonia Process

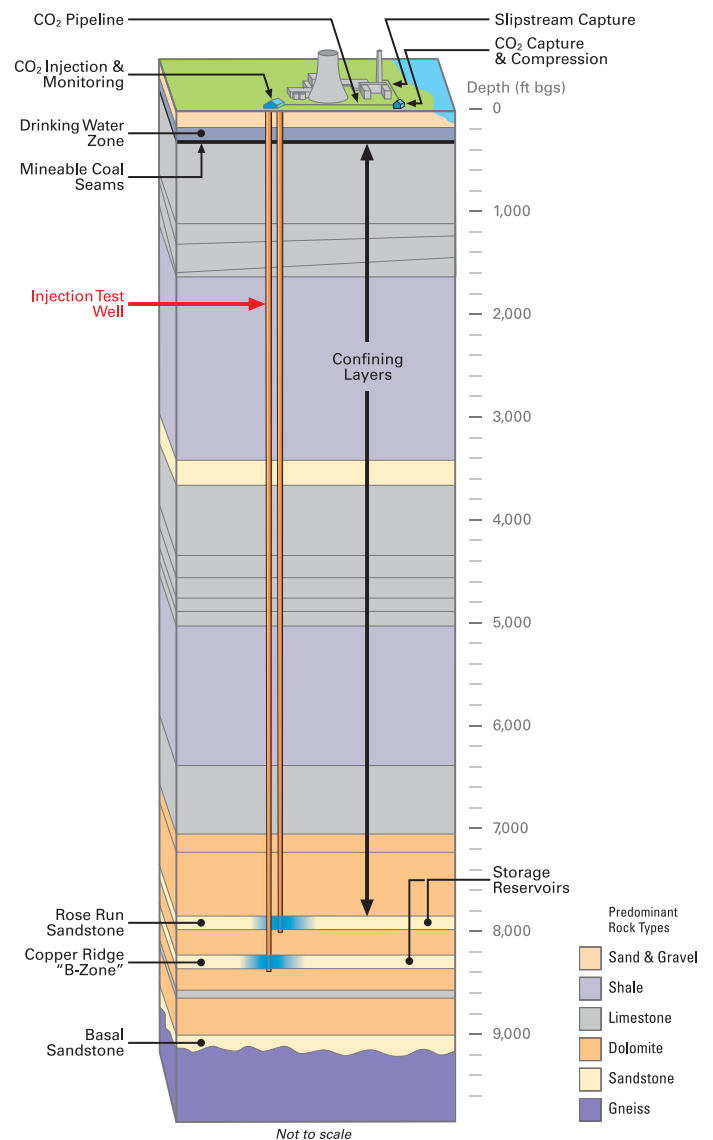
1. The flue gas is chilled to 35°F.
2. Ammonium carbonate, an ammonia based solvent, absorbs CO<sub>2</sub> to make ammonium bicarbonate.
3. Ammonium bicarbonate slurry is pumped to a regenerator for CO<sub>2</sub> removal, where the ammonium bicarbonate is converted back to ammonium carbonate and is reused to repeat the process.
4. Heat recovery ensures efficient operation of process.
5. The clean flue gas – containing mainly nitrogen, excess oxygen and low concentration of CO<sub>2</sub> – flows to the stack.
6. CO<sub>2</sub> is sent to geologic storage in deep saline reservoirs or EOR fields.



## CO<sub>2</sub> Storage

AEP is working with Battelle to store captured CO<sub>2</sub> in deep saline reservoirs beneath the Mountaineer Plant site. A characterization study conducted in 2003 - 04 indicated that two geologic layers in this area are favorable for CO<sub>2</sub> storage.

For storage, the captured CO<sub>2</sub> is compressed into a liquid-like state and injected into saline reservoirs in carefully chosen deep geologic layers of porous sandstone or dolomite. The CO<sub>2</sub> is injected more than a mile underground and spreads through the pore space in the rock where it is effectively trapped from moving upward by layers of impermeable rock above the porous rock, much like oil and gas deposits are trapped for millions of years.



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