

### 3.1.3 NOVEL SEQUESTRATION SYSTEMS

<b>Technology Description</b>
<p>In the long term, CO<sub>2</sub> capture can be integrated with geologic storage and/or conversion. Many CO<sub>2</sub> conversion reactions are attractive but too slow for economic chemical processes.</p> <p><b>System Concepts</b></p> <ul style="list-style-type: none"> <li>• Using impurities in captured CO<sub>2</sub> (e.g., SO<sub>x</sub>, NO<sub>x</sub>) or additives enhances geologic storage. This is a possible opportunity to combine CO<sub>2</sub> emissions reduction and criteria pollutant-emissions reduction.</li> <li>• Conducting reactions on CO<sub>2</sub> while it is being stored underground can alleviate the problem with slow kinetics.</li> <li>• Rejected heat from electricity generation and CO<sub>2</sub> compression can help drive CO<sub>2</sub> conversion process.</li> </ul> <p><b>Representative Technologies</b></p> <ul style="list-style-type: none"> <li>• Capture of CO<sub>2</sub> from flue gas and algal conversion to biomass.</li> <li>• Capture of CO<sub>2</sub>, storage in a geologic formation, and in situ biological conversion to methane.</li> </ul> <p><b>Technology Status/Applications</b></p> <ul style="list-style-type: none"> <li>• Conceptual.</li> </ul>
<b>Current Research, Development, and Demonstration</b>
<p><b>RD&amp;D Goals</b></p> <ul style="list-style-type: none"> <li>• Demonstrate viable chemical or biological conversion approaches at the laboratory scale.</li> <li>• Develop robust conceptual designs for integrated capture, storage, and conversion systems.</li> </ul> <p><b>RD&amp;D Challenges</b></p> <ul style="list-style-type: none"> <li>• CO<sub>2</sub> conversion reaction kinetics are slow, energy requirements are high.</li> <li>• For biological in situ CO<sub>2</sub> conversion, must provide food and remove waste.</li> <li>• Truly novel concepts may be required to meet the ultimate “stretch” goals of the program. Technology breakthroughs could come from concepts associated with areas not normally related to traditional energy technologies (e.g., nanotechnology). Tapping areas where current researchers do not have an energy mindset will require new approaches for soliciting proposals for R&amp;D projects.</li> </ul> <p><b>RD&amp;D Activities</b></p> <ul style="list-style-type: none"> <li>• Laboratory and pilot-scale experiments with biological and chemical conversion.</li> <li>• Conceptual studies of integrated systems and in situ CO<sub>2</sub> conversion.</li> </ul>
<b>Recent Success</b>
<ul style="list-style-type: none"> <li>• Several cost-shared research projects have been initiated.</li> </ul>
<b>Commercialization and Deployment Activities</b>
<ul style="list-style-type: none"> <li>• None.</li> </ul>