

THE FUTUREGEN 2.0 PROJECT'S PLAN FOR TRANSPORTING AND SEQUESTERING CO₂

I. Introduction

This document consolidates materials previously submitted to, reviewed by, and approved by the Illinois Commerce Commission (the “Commission”), into a comprehensive plan for transporting and sequestering CO₂. Supplemental references that were also previously provided to the Commission are included as attachments to the plan. This comprehensive plan is provided to the Commission for the purposes of final approval and fulfillment of the requirements of Section 5/9-220(h-7) of the Public Utilities Act (“PUA”). *See* 220 ILCS 5/9-220(h-7).

II. CO₂ Transportation Plan

As set forth more extensively in its application materials, testimony and exhibits filed in Docket No. 13-0252, the FutureGen Industrial Alliance, Inc. (the “FutureGen Alliance”) plans to construct and operate a 28-mile pipeline to transport carbon dioxide captured at the repowered and retrofitted Meredosia Energy Center to a Storage Facility located in eastern Morgan County (the “CO₂ Pipeline”). *See* Final Order, *FutureGen Industrial Alliance, Inc. Application for a Certificate Authorizing the Construction and Operation of a Carbon Dioxide Pipeline*, Docket No. 13-0252 (Feb. 20, 2014) (the “CO₂ Pipeline Final Order”), attached hereto as FGA Ex. 1.1. (The approved route for the CO₂ Pipeline is depicted in Ex. A to the CO₂ Pipeline Final Order.) As required by 220 ILCS 75/20(b)(2), as demonstrated in Docket No. 13-0252, and as the Commission found, the FutureGen Alliance is fit, willing and able to construct and operate a CO₂ Pipeline in compliance with the CO₂ Transportation and Storage Act (subject to obtaining other permits and approvals from applicable federal agencies). *See* FGA Ex. 1.1 at 18. Along similar lines, as required by 220 ILCS 75/20(b)(7), the FutureGen Alliance demonstrated in

Docket No. 13-0252 that it has the “financial, managerial, legal and technical qualifications necessary to construct and operate the proposed carbon dioxide pipeline.” *See id.*

The CO₂ Pipeline will be constructed safely in a manner that poses no undue risk to construction workers or the public, as described in greater detail below. The FutureGen Alliance will utilize only highly qualified and experienced contractors to do the actual construction and installation work. Employing qualified contractors ensures that the CO₂ Pipeline and related facilities will meet or exceed all applicable standards. The construction will comply with the terms of an applicable National Pipeline Agreement (a union labor agreement), the Davis-Bacon Act, and other applicable labor laws. *See Application, FutureGen Industrial Alliance, Inc.’s Application for a Certificate Authorizing the Construction and Operation of a Carbon Dioxide Pipeline*, Docket No. 13-0252 (March 29, 2013) (the “Application”), attached hereto as FGA Exhibit 1.2 at 14.

The construction and operation of the CO₂ Pipeline will meet the environmental impact and protection standards of the federal, state and local agencies that may have jurisdiction over environmental factors along the CO₂ Pipeline route. These include, among others, the U.S. Army Corps of Engineers, the U.S. Department of Transportation’s Pipeline and Hazardous Materials Safety Administration (“PHMSA”), the Illinois Departments of Agriculture and Natural Resources, and the Illinois Environmental Protection Agency. *See FGA Ex. 1.2 at 14.*

The CO₂ Pipeline will be built and maintained in accordance with industry and governmental requirements and standards, and often in excess thereof. *Id.* at 16. The CO₂ Pipeline will be constructed using steel pipe, with a diameter of 10 to 12 inches, manufactured by a qualified pipeline fabricator.¹ It will be designed to withstand pressures over and above its

¹ The CO₂ Pipeline will be API 5L – X70 PSL2, either double submerged, arc-welded or high frequency electric resistance welded pipe. It will be coated with a three layer fusion bonded epoxy to an average

normal operating pressure. *See* FGA Ex. 1.3 at 12:7-12:17. All of the pipe will be inspected and integrity-tested at the factory and transported in accordance with the applicable technical standards. *Id.* at 20:9-20:15. The pipe will also be plant-coated with a fusion-bonded epoxy coating to protect against corrosion. *Id.* at 10:23-11:2. Applying that coating in the controlled environment of a coating plant greatly enhances the efficacy of the coating. *Id.* The pipe will be installed at a minimum depth of four feet below grade except where paralleling existing lines or where greater depth may be required for particular conditions such as road and water body crossings and particularly sensitive areas. *Id.* at 13:12-13:16. The pipe will be installed at a minimum depth of 5 feet for cropland consistent with the Agricultural Impact Mitigation Agreement signed with the Illinois Department of Agriculture. *Id.* at 13:16-13:20.

In addition, the installation of the CO₂ Pipeline will be subject to regulatory inspection, including by PHMSA inspectors. *Id.* at 19:19-20:6. The FutureGen Alliance will employ third party construction, safety, and environmental inspectors to assure compliance with contract specifications for pipeline construction, which specifications incorporate all regulatory and industry requirements. The CO₂ Pipeline will go into service only after inspection to verify compliance with all construction standards and requirements. Once installed, the CO₂ Pipeline will be subjected to careful testing to verify its integrity and compliance with regulatory standards and contract specifications. Such testing will meet or exceed industry standards and will include checking coating integrity, X-ray examination of up to 100 percent of field welds, internally inspecting the entire length of the line by using an in-line inspection tool known as a

thickness of 16 thousandths of an inch (mils). *See* FutureGen Ex. 2, *FutureGen Industrial Alliance, Inc., Application for a Certificate Authorizing the Construction and Operation of a Carbon Dioxide Pipeline*, Docket No. 13-0252 (Direct Testimony of Mr. Chris Burger) (filed March 29, 2013) (“Chris Burger Testimony”), attached hereto as FGA Exhibit 1.3 at 10-11.

caliper pig and hydrostatically testing the line to qualify it to meet the pressure standards set for it. *Id.* at 20:9-20:15.

The FutureGen Alliance will fund construction of the CO₂ Pipeline in large part with federal funding from the DOE, financial support of FutureGen Alliance members, and potential third party grants that will cover 100 percent of the capital cost of the CO₂ Pipeline and Storage Facility. See FutureGen Exhibit 11, *FutureGen Industrial Alliance, Inc., Application for a Certificate Authorizing the Construction and Operation of a Carbon Dioxide Pipeline*, Docket No. 13-0252 (Supplemental Testimony of Kenneth Humphreys) (filed May 22, 2013), attached hereto as FGA Exhibit 1.4, at 2:17-3:2. The FutureGen Alliance does not anticipate any need for third-party debt or equity investments in the CO₂ Pipeline and Storage Facility components of the FutureGen 2.0 Project. *Id.* 5:14-5:16. The budget for the CO₂ Pipeline and Storage Facility is \$459 million. *Id.* at 4:5-4:9. The DOE will reimburse the FutureGen Alliance for up to 99% of the \$459 million, and that any remaining funds required will be paid by FutureGen Alliance contributions or potential third-part grants. *Id.* at 4:9-4:15. Of that, \$74 million will be devoted directly to construction of the CO₂ Pipeline. *Id.* It is estimated that the DOE will reimburse the FutureGen Alliance for 17.6% of the operating costs for the CO₂ Pipeline and Storage Facility through 2022. *Id.* at 4. In addition, a more detailed breakdown of the capital and operating costs associated with the CO₂ Pipeline and Storage Facility is located in Section 3 of the Pre-Approved Capital Cost Request and Updated Ratepayer Impact Analysis Report (the “Cost Report”), filed as FutureGen Ex. 14 in the Docket No. 13-0252 (filed Sept. 24, 2013), which is attached hereto as FGA Ex. 1.5. The same Cost Report was filed on February 19, 2013 in Docket No. 13-0034. See Submission and Request for Approval of Pre-Approved Total Capital Costs of the FutureGen Industrial Alliance, Inc., *Illinois Commerce Commission On Its Own Motion, Phase 2 of the*

Initial Approvals for FutureGen Industrial Alliance, Inc., Docket No. 13-0034 (Feb. 19, 2013). In Docket No. 13-0034, the Commission approved the costs associated with the CO₂ Pipeline. See Final Order, *Illinois Commerce Commission On Its Own Motion, Phase 2 of the Initial Approvals for FutureGen Industrial Alliance, Inc.*, Docket No. 13-0034 (June 26, 2013). The Commission also determined that the costs associated with the FutureGen 2.0 Project, including those associated with the CO₂ Pipeline, satisfies a cost benchmark prepared by an independent third party, Levitan and Associates. *Id.* at 17.

II. CO₂ Sequestration Plan

The CO₂ Pipeline begins at the Meredosia Energy Center and terminates at the Storage Facility for the FutureGen 2.0 Project. The location for the terminus of the CO₂ Pipeline, and beginning of the Storage Facility, is shown on Exhibit A to the CO₂ Pipeline Final Order (Docket No. 13-0252). See FGA Ex. 1.1, Ex. A, at 10. In addition, FutureGen Ex. 3 in Docket No. 13-0252 (attached hereto as FGA Ex. 1.6) shows the location of the Storage Facility as a “box” on the full pipeline route map, which is located in eastern Morgan County, near Illinois Route 123.

The Morgan County site was chosen following a site selection and evaluation process that considered, among other things, whether the site had sound geology for storage of carbon dioxide and whether the site had sufficient capacity to store the volume of carbon dioxide expected to be produced by the Power Plant. See FGA Ex. 1.2 (Application) at 6. The Morgan County site satisfies those criteria. Other factors considered included whether the site featured favorable environmental conditions, whether sufficient property rights were available and whether there was sufficient community support.² *Id.* Based on these and other factors

² Scientists have concluded that formations containing salt water, such as the Mount Simon geology in Illinois, are ideal for carbon dioxide storage because of their porosity and depth, and the presence of an impermeable caprock, which seals the carbon dioxide deposit. These formations are thousands of feet below the earth’s surface—far deeper than drinking water aquifers, and often much deeper than oil and

enumerated in the FutureGen Alliance's Request for Site Proposals issued on October 25, 2010, the FutureGen Alliance selected the Morgan County site as the best location to store carbon dioxide produced by the oxycombustion Power Plant at the nearby Meredosia Energy Center. *Id.*

The Storage Facility itself is described in general terms in the CO₂ Pipeline Application. *See* FGA Ex. 1.2 at 9-10. The carbon dioxide delivered to the Storage Facility will be injected and permanently stored in a deep saline aquifer, called the Mount Simon formation. The Storage Facility will be capable of accepting and storing at least 1.1 million metric tons of carbon dioxide annually for a period of at least 20 years. *Id.* In his Supplemental Testimony filed in Docket No. 13-0252, Mr. Humphreys also references the Cooperative Agreements between the FutureGen Alliance and the DOE. *See* FGA Ex. 1.4 at 3:4-19. The Cooperative Agreement which governs the funding for the CO₂ Pipeline and Storage Facility components of the FutureGen Project (the "CO₂ Pipeline and Storage Facility Cooperative Agreement") is attached as Exhibit A to Ken Humphreys' Supplemental Testimony in Docket No. 13-0252. *See* FutureGen Exhibit 12, *FutureGen Industrial Alliance, Inc., Application for a Certificate Authorizing the Construction and Operation of a Carbon Dioxide Pipeline*, Docket No. 13-0252 (CO₂ Pipeline and Storage Facility Cooperative Agreement) (filed May 22, 2013), attached hereto as FGA Ex. 1.7. The Statement of Project Objectives ("SOPO"), included as Attachment 2 to the CO₂ Pipeline and Storage Facility Cooperative Agreement, includes a detailed discussion of the development for the Storage Facility, including the following:

- The siting process for the Storage Facility (*Id.* at 47);
- A description of the surface facilities at the Storage Facility (*Id.* at 49-55);

gas deposits. In addition, they are the most abundant types of geologic formations that can be used to store carbon dioxide, so the lessons learned from the FutureGen 2.0 Project can be replicated at many other locations around the world. *See* FGA Ex. 1.2 at 6.

- A description of the land acquisition approach for both pore space and surface facilities (*Id.* at 21 and 54);
- A description of the Morgan County characterization well and related data modeling of results (*Id.* at 21); and
- A description of the monitoring plan to evaluate the subsurface behavior of the CO₂ injected and stored at the Storage Facility (*Id.* at 23-24).

In addition, the Economic Impacts of FutureGen 2.0 on Illinois and Local Economies Study, attached as FutureGen Exhibit 21 in Docket No. 13-0252, includes a description of the 4,000-acre Storage Facility, as well as a discussion about the results of the Morgan County characterization well, which took samples from the targeted geologic formation, known as the Mt. Simon Sandstone formation, beginning at approximately 4,000 feet below ground level. *See* FutureGen Ex. 21, *FutureGen Industrial Alliance, Inc., Application for a Certificate Authorizing the Construction and Operation of a Carbon Dioxide Pipeline*, Docket No. 13-0252 (Economic Impacts of FutureGen 2.0 on Illinois and Local Economies) (filed Sept. 24, 2013) (the “Economic Impact Study”), attached hereto as FGA Ex. 1.8. This study reports that the test drilling showed more than 500 feet worth of storage layer for the CO₂ in the Mt. Simon formation, and a primary seal on top with a thickness of 400 feet. *Id.* at ii.

The Economic Impact Study also references and relies upon the Draft Environmental Impact Statement (“Draft EIS”) prepared by the DOE pursuant to the National Environmental Policy Act (“NEPA”). *See* FGA 1.8 at iii, fn. 4 and 5. The final version of the EIS (“Final EIS”) was released by the DOE on October 25, 2013. Also, a record of decision for the FutureGen 2.0 Project was issued by the DOE on January 22, 2014. *See* DOE, *Record of Decision and Floodplain Statement of Findings for the FutureGen 2.0 Project*, 79 Fed. Reg. 3,577 (Jan. 22, 2014). The EIS includes a map of the Storage Facility footprint, and a map of the project CO₂ plume and monitoring well network. *See* Final EIS (Summary) (attached hereto as FGA Ex. 1.9)

at S-21 and S-32. The Final EIS also explains that the FutureGen 2.0 Project will involve a single-site injection area with a single well site containing four horizontal wells, and includes a depiction of the injection site with the location of the injection wells. *See id.* at S-24 and S-25. The Final EIS also shows the footprint and location of a site control and maintenance building that will be employed to monitor the injection and behavior of the CO₂. *Id.* at S-25 and S-27. The Final EIS also includes a depiction of the geological stratigraphic column for the vertical and horizontal injection wells. *Id.* at S-30 and S-31.

The Final EIS describes a comprehensive monitoring, verification and accounting (“MVA”) program that will be implemented by the FutureGen Alliance at the Storage Facility to monitor the injection of CO₂ and verify that it remains in the Mt. Simon formation. FGA Ex. 1.9 at S-29. The MVA program will include (a) injection system monitoring; (b) containment monitoring (via monitoring wells and mechanical integrity testing); (c) CO₂ plume tracking via multiple techniques; and (d) CO₂ injection simulation modeling. *Id.* The Final EIS indicates that the FutureGen Alliance intends to deploy approximately 12 monitoring wells as part of the MVA program. *Id.* The design for the monitoring network is shown in Figure S-16 of the Final EIS. *Id.* at S-32.

Appendix III to the IPA’s 2013 Procurement Plan also provides a depiction of the storage technology and plan for the FutureGen Project. *See* Docket No. 12-0544, IPA Plan, Appendix III at 13-14 (attached hereto as FGA Exhibit 1.10). Appendix III includes an illustration of the Power Plant, CO₂ Pipeline and CO₂ injection well and geological layers into which the CO₂ will be injected. *Id.* at 13. Appendix III also includes a photograph of the geologic characterization well and states that monitoring of the CO₂ will take place up to 50 years after Power Plant operations cease. *Id.* at 14. Appendix III also explains that the Storage Facility will be regulated

primarily under U.S. EPA's Underground Injection Control rules, and that the liability management approach for the project will include a combination of project resources, a CO₂ storage trust fund, liability insurance and potential "backstop" assistance from the State of Illinois provided pursuant to the Clean Coal FutureGen for Illinois Act of 2011. 20 ILCS 1108/1 *et seq.*

As with the CO₂ Pipeline, the FutureGen Alliance does not anticipate any need for third-party debt or equity investments in the CO₂ Pipeline and Storage Facility components of the FutureGen 2.0 Project; third party financing is only anticipated for the Power Plant. *See* FGA Ex. 1.4 at 5:14-5:16. The budget for the CO₂ Pipeline and Storage Facility is \$459 million. *Id.* at 4:5-4:9. The DOE will reimburse the FutureGen Alliance for up to 99% of the \$459 million, and that any remaining funds required will be paid by FutureGen Alliance contributions or potential third-part grants. *Id.* at 4:9-4:13. It is estimated that the DOE will reimburse the FutureGen Alliance for 17.6% of the operating costs for the CO₂ Pipeline and Storage Facility through 2022. *Id.* at 4:8-5:1. In addition, as discussed above in connection with the CO₂ Pipeline plan, a more detailed breakdown of the capital and operating costs associated with the CO₂ Pipeline and Storage Facility is located in Section 3 of the Cost Report. *See* FGA Ex. 1.5 at 29-31. The same Cost Report was filed in Docket No. 13-0034, in which the Commission approved the costs associated with the FutureGen 2.0 Project, and determined that the costs associated with the FutureGen 2.0 Project, including those associated with the CO₂ Pipeline and Storage Facility, satisfy a cost benchmark prepared by an independent third party, Levitan and Associates. *See* Final Order, *Illinois Commerce Commission On Its Own Motion, Phase 2 of the Initial Approvals for FutureGen Industrial Alliance, Inc.*, Docket No. 13-0034 (June 26, 2013), at 17.