Q&A: Clean Coal Technology

1. Why is Duke Energy considering building an IGCC plant?

As Indiana's economy grows, so too does the need for energy. Duke Energy customers have been setting records for electric usage. It is estimated that Duke Energy will need approximately 500-750 megawatts of new base load capacity by 2012. "Base load" is the power provided by Duke Energy to its customers continuously 365 days per year (without peaks and valleys). The IGCC plant will provide about 630 megawatts in total.

The project will be located at the Duke Energy 160-megawatt Edwardsport power plant and the existing coal and oil-fired units will be retired.

2. What is coal gasification?

The coal gasification process converts coal into a synthesis gas (syngas) and produces steam. The hot syngas is processed to remove sulfur compounds, mercury and particulate matter before it is used to fuel a combustion turbine generator. The heat in the exhaust gases from the combustion turbine is recovered to generate additional steam. This steam, along with that from the syngas process, then drives a steam turbine generator to produce electricity.

3. Is the technology proven?

Coal gasification has seen worldwide use in chemical plant applications since the early 1900s. Through U.S. Department of Energy clean coal programs, it was developed for applications on a wider scale in the 1980s and demonstrated in a commercial setting in the mid-1990s. Currently, there are 16 sites worldwide, four of which use coal/petroleum coke for the sole purpose of generating electricity. One of those sites is the Wabash River Station in West Terre Haute, Ind. This plant was part of a Department of Energy demonstration project.

4. What is the impact on air quality?

The proposed plant will be one of the cleanest, most efficient coal-fired plants in the world. It will emit less sulfur dioxide, nitrogen oxide and mercury than the plant it replaces, while at the same time providing more than 10 times the kilowatt-hours of electrical energy of the existing facility. A rough, preliminary comparison: The current 160-megawatt plant at Edwardsport emits approximately 13,000 tons of sulfur dioxide, nitrogen oxide and particulate emissions annually. It operates about 30 percent of the time. Preliminary data indicates a 630-megawatt IGCC plant operating 100 percent of the time will emit about 2,900 tons of those same pollutants (including mercury) annually. While some emissions increase because of the size and greater usage of the plant compared to the current, smaller facility, the rate of emission per megawatt-hour for all emissions will be significantly lower. In addition to lower emission rates, this plant will use less water, generate less solid waste, and be more efficient than a conventional pulverized coal plant.

Duke Energy
Corporate Headquarters
526 South Church Street
Charlotte, NC 28202-1802

www.duke-energy.com

5. Why should the project receive local tax incentives? What is the local benefit?

The plant will not be built without incentives that might make the IGCC technology a viable economic choice for Indiana customers. The benefits to the local/regional economy include:

- The plant will use 1.5 million tons of coal per year valued at about $40 million annually, a boost for local and state economies.
- A total investment of approximately $2.3 billion.
- Increases in state and local taxes paid.
- Estimated property taxes to be paid in years 1-10 are approximately $52.7 million.*
- Estimated property taxes in years 11-30 total $126.7 million.*

* Estimated property taxes reflect 2006 pay 2007 tax rates and current property tax laws in effect as of 12/31/07.

6. What approvals are needed for the project?

State and federal permits will be required before the project can be built. These include air, water and solid waste permits, and clearances for such things as endangered species, and historic and archeological sites. We have received approval from the Indiana Utility Regulatory Commission for "certificates of need" to build the plant. The Indiana Department of Environmental Management issued an air permit in January.

7. How much water will this plant use on a per day basis and where will you get the water?

The proposed IGCC plant will use an average of 11 million gallons of water per day as compared to the current plant that uses 188 million gallons per day. The plant will use well water.

8. It has been stated that the new plant could burn 3,500 to 5,000 tons of coal per day; how will the coal be delivered?

We are looking at the viability of both truck and rail deliveries.

9. If the coal is delivered by truck or rail, what is the expected number of truck or train deliveries on a per day basis?

At this time, no decision has been made on whether to transport coal or byproducts by train or truck to and from the plant. If trucks are used, we estimate 240 per day will be needed to deliver coal. An additional 40 trucks would be needed daily to transport plant byproducts from the facility. If trains are used, we estimate needing about three to four trains weekly with 75 to 100 railcars per train. If the rail spur is used to transport plant byproducts such as sulfur or slag out of the facility, we estimate needing about two to three railcars of sulfur daily and five to six railcars of slag per day. Whether or not we use the rail spur for these types of deliveries will depend mostly on the economics of train and truck transportaion at the time.

10. If Duke Energy constructs a 630-MW IGCC plant at Edwardsport, how much coal will be used on an annual basis; will this require the opening of a new mine in the Illinois Basin?

The plant should use between 1.5 and 1.7 million tons of coal per year. It is not known if a new mine will be required; however, the volumes are large enough to possibly warrant a new mine.

11. There are 37 current employees at Edwardsport; will all of the employees be retained? Where will they come from?

The plant will employ approximately 100 people. It is too early for us to determine what the exact mix of these employees will be or where they will come from.

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12. Does this plant still make sense if carbon dioxide is regulated in the future?

Duke Energy believes this technology makes sense in a future where there will be carbon dioxide regulations. While there are no cheap energy options, reduction of carbon emissions from this plant will be less difficult and costly than from other types of fossil fuel plants primarily because carbon dioxide will be removed from the syngas prior to combustion; whereas, with other fossil fuel plants, the carbon compounds will be removed from the much more voluminous exhaust gases. Subject to final approval by the Indiana Utility Regulatory Commission, we are planning to study the costs, plant impacts and a potential schedule related to capturing a portion of the carbon dioxide from the plant, and then compressing and piping the carbon dioxide deep underground for permanent geologic storage. This could be one of the first demonstrations of carbon capture and sequestration from a coal-fired plant.

13. What is carbon capture and sequestration?

Carbon capture includes a variety of methods for removing carbon dioxide from the emissions of industrial sources such as power plants, refineries, ethanol plants and other industrial facilities in order to help stabilize atmospheric levels of carbon dioxide. Carbon sequestration is the term used to describe a broad class of technologies that are just now being researched and developed for capturing and permanently sequestering, or storing, carbon dioxide. Once the carbon dioxide has been captured, it could possibly be stored safely in deep underground geologic formations (geologic sequestration). We have proposed studying the capture and sequestration of a portion of the plant's carbon dioxide emissions.

14. How much will the plant cost customers?

The plant will cost approximately $2.3 billion to construct. The rate impact of the construction costs will be partially reduced by more than $460 million in local, state and federal tax incentives. The plant will result in an average electric rate increase of approximately 18 percent phased in from 2008 through 2012.

15. What are the byproducts of this coal gasification process and what disposal methods will be used?

The main byproducts from the coal gasification process are elemental sulfur and vitrified slag (similar to gravel). These products are useful in other industries and will be stored in an environmentally safe manner with the intention to market them for sale. If they are not sold, disposal will be in an environmentally suitable, permitted landfill.

16. Please describe living next door to an IGCC power plant such as the one planned at Edwardsport?

The buildings will be larger than the existing ones, and there will be much more light associated with the new structures. The exterior lighting will be similar to a modern industrial plant (such as the GPC grain processing plant in Washington, Ind.), and more light will be visible to the surrounding area compared to the existing plant. The plant also will be equipped with a gas flare. The flare is a way of burning off the gas produced by the coal gasification process when the operation of the generating equipment is interrupted or if the gas is out of specification. The size and scale of this flare is very large. At times, when it is necessary to burn the flare, large quantities of light and heat will be created. Although the light may be very bright, especially at night, facility managers will do everything they can to prepare the community for these occasional events.

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