

*World Energy Interviews*  
*Dennis Cossey, CEO and Chairman,*  
*ThermoEnergy Corporation.*



**World Energy:** We hear that ThermoEnergy is currently developing a new process that turns coal into energy with no air emissions. Is this really true?

**Cossey:** Yes, our ThermoEnergy Integrated Power System, or TIPS process, can convert coal to energy with no air emissions. However, it can do the same thing for other fossil fuels, such as natural gas or oil, biomass and "opportunity fuels" such as tank bottoms, bitumen and coal fines.

**World Energy:** What exactly is TIPS and how does it work?

**Cossey:** TIPS represents a totally different thermodynamic approach in power plant design. Based on reliable oxy-fuel chemistry, it combines the combustion of carbonaceous fuels with essentially complete recovery of all by-products, including carbon dioxide. The key element that differentiates TIPS from conventional oxy-fuel designs is that combustion takes place at pressures between 700 psi and 1,300 psi. Increasing the pressure of combustion shifts the temperatures at which water, CO<sub>2</sub>, mercury and acid gases condense. We then use gas-to-liquid nucleate condensation physics to collect and remove the pollutants, while CO<sub>2</sub> is recovered as a liquid through direct condensation. Harmful air emissions of acid gases, mercury, soot and CO<sub>2</sub> will become a thing of the past.

**World Energy:** TIPS sounds like a pretty exotic system. How would you ever build one?

**Cossey:** Actually, the only thing exotic about TIPS is its economic and environmental performance. Every TIPS process component is comprised of off-the-shelf equipment currently being used in other industrial applications worldwide. We simply combined these components to form a power plant and added a couple of proprietary twists, resulting in our patented TIPS process. Any engineering/construction firm capable of building conventional coal-fired power plants can build a TIPS plant.

**World Energy:** The environmental aspects of TIPS are obvious, but what about its economics?

**Cossey:** ThermoEnergy, with the help of consultants within the power-generation industry, has conducted preliminary economic modeling based on coal as the primary source of energy.

Eighty percent of a TIPS coal-fired power plant is essentially the same as that of a conventional pulverized coal plant. Based on reliable cost figures of TIPS' process components and factoring in standard power plant costs, we are confident that the installed cost for a TIPS plant will be about the same as a conventional pulverized coal plant outfitted with the necessary air-scrubbing systems.

However, with TIPS, the utility now owns a power plant that not only eliminates the atmospheric discharge of all pollutants, but allows the capture of NO<sub>x</sub>, SO<sub>x</sub> and CO<sub>2</sub> in the form of commodity products. If you factor in the future value of air-emission credits, the economic sales tilt even further in favor of TIPS. For example, TIPS removes and captures three tons of liquid CO<sub>2</sub> for every one ton of coal burned at a cost of approximately \$10 per ton.

**World Energy:** If TIPS can achieve what you've just described, it could completely alter people's views about the use of fossil fuels to generate energy. But the search for clean coal technology has been around for decades. What about the competition?



*"TIPS will allow industrialized nations a seamless and economically stable pathway from almost total dependence on fossil fuels to renewable and green energy technologies of the future."*

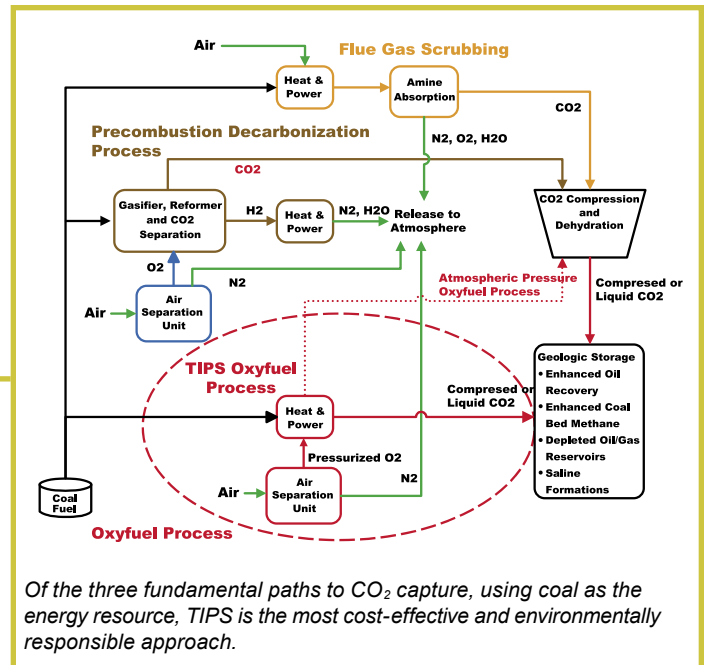
**Cossey:** Coal is a relatively cheap and abundant resource, and a significant amount of money and effort has been expended to find a way to mitigate the terrible environmental price we all pay for its use. While there are various research programs underway in this area, both government and industry research has, over the past 20 years, mainly focused on developing IGCC as the answer. So far, it hasn't happened.

**World Energy:** Why? Doesn't it work?

**Cossey:** IGCC isn't a new concept. Its basic flow sheet has been around for 30 years, long before mercury and CO<sub>2</sub> became issues and few people knew what a particle precursor was. If your end goal is to make chemicals, such as Eastman, or gasoline and/or diesel like SASOL, it works very well. However, it has yet to gain commercial acceptance as a power plant design. The variable co-dependents of economics and reliability just don't match up to conventional alternatives. Nor are they as reliable. From an air-emissions standpoint, IGCC plants are not as clean as gas and only marginally cleaner than conventional coal plants, and they cost twice as much to build as natural-gas plants and 50 percent more than conventional coal plants. If you were running a utility, which would you choose?

**World Energy:** OK. You've convinced us that TIPS might be the answer to clean coal technology. Why haven't you convinced others within the power generation industry?

**Cossey:** Let me address the question first from the basic research and development viewpoint. The Clean Coal program got its start under Jimmy Carter. Since that time, billions of dollars have been invested in this effort, the last 10 years of which were focused primarily on one technology. When this much time and money get invested in one direction, it becomes very difficult for new technologies or concepts that run counter to that direction, no matter how promising, to get taken seriously – much less funded.



Of the three fundamental paths to CO<sub>2</sub> capture, using coal as the energy resource, TIPS is the most cost-effective and environmentally responsible approach.

As for the commercial side of the power generation industry, utilities have historically been users of new technology but rarely innovators. That has been left to government agencies and/or OEM suppliers. At the appropriate time, we will actively seek corporate partners that have both the technical skill and market presence to expedite the commercialization of the TIPS process.

**World Energy:** So what's next?

**Cossey:** We see this technology as an excellent transition from a world dominated by fossil energy to a future when the world can rely solely on clean energy sources such as wind or solar. We are pursuing the commercialization of TIPS through an active development program. As we discussed earlier in the interview, all of the TIPS process components are existing off-the-shelf items. This will significantly reduce the typical development time between concept and pilot plant operation. In fact, our current timetable puts us on course to design, build and operate a large-scale TIPS pilot plant in 2005.



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