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Vol: XII, Issue: 11  
May 27, 2009

## Making Oil-Sands 'Green' Will Cost More; Big CO<sub>2</sub> Tax Could Push Gasification

A new study by the Canadian Energy Research Institute (CERI) shows that making "greener," lower-CO<sub>2</sub> synthetic crude oil (SCO) from oil-sands bitumen could push per-barrel costs into the C\$70-90/barrel range.

However, a stiff CO<sub>2</sub> tax (hitting all crude types) likely would spur higher tech investment in oil sands – especially when global oil prices eventually resume an expected path toward (U.S.) \$100/barrel and above, following economic recovery from today's recession.

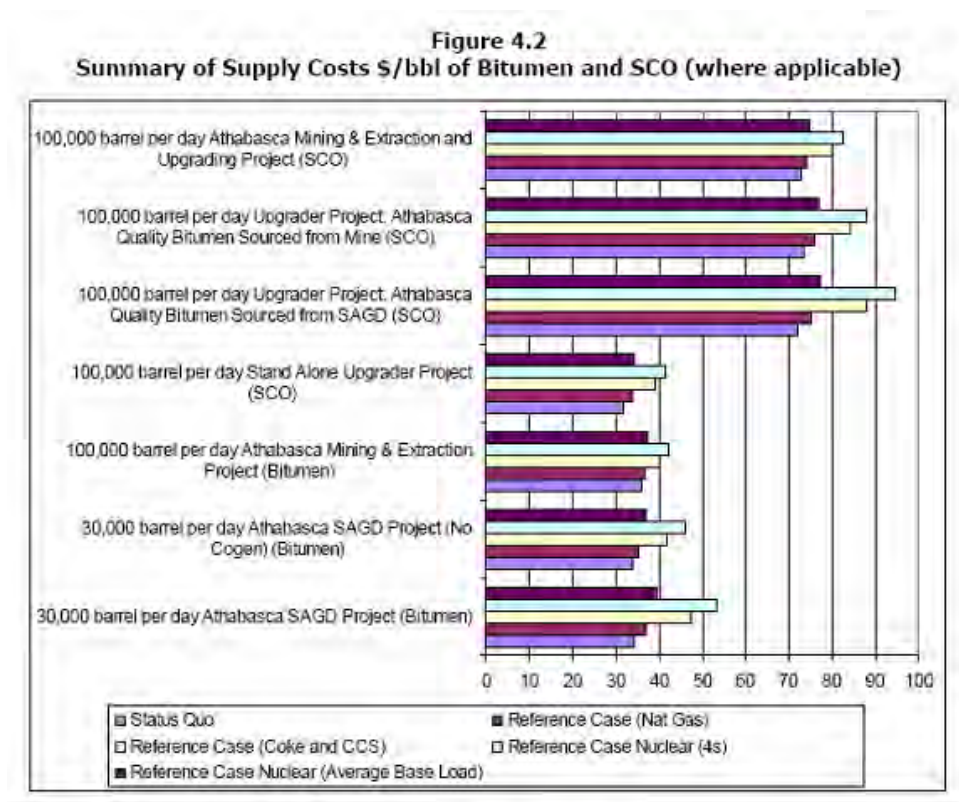
The [study](#), *Green Bitumen: The Role of Nuclear, Gasification and CCS in Alberta's Oil Sands*, shows that if CO<sub>2</sub> taxes are only around C\$15/ton, then there's no incentive to adopt alternative technologies investigated by CERI, including oil-sands petcoke gasification with CO<sub>2</sub> capture & storage (CCS), or else natural gas/CCS, or nuclear-powered upgrading.

The cheapest option would be to just pay the CO<sub>2</sub> tax, the study shows.

However, study author David McColl of CERI told *Gasification News* that it's highly unlikely that CO<sub>2</sub> taxes in future will be only \$15/ton. What's more, global oil prices are likely to rebound in future years, helping to restore investor confidence for oil-sands developers, he pointed out.

If CO<sub>2</sub> taxes rise to somewhere between C\$65-\$120 ton, then oil-sands producers are more likely to invest in CCS or CO<sub>2</sub>-avoidance schemes (as for example nuclear-fired upgrading), he explained.

The chart below shows CERI's studied options to cut CO<sub>2</sub> enough to make synthetic crude oil (SCO) as "green" as or better than conventional oil, compared to a "status quo" case where oil-sands producers just paid a \$15/ton CO<sub>2</sub> tax. The yellow bars are for the coke gasification/CCS cases:



The chart shows that the costliest option for a presumably typical project (100,000 b/d upgrading of oil-sands produced from steam assisted gravity drainage, SAGD) would be to install a non-CO<sub>2</sub>-emitting, Toshiba 4-S nuclear reactor.

Doing nothing would be cheapest; petcoke gasification with CCS would be second-most expensive; tapping baseload nuclear power would be third-most-expensive and using natural gas would be fourth-most expensive.

“With CCS, coke gasification still remains an expensive option, based upon our assumptions for the gasification facilities and the average price of natural gas over the 20 year operating life for the gasification facilities,” the study says.

However, McColl pointed out to us that integrated gasification-upgrading-production projects could enjoy cost, CO<sub>2</sub> and energy efficiencies not readily apparent in the CERI study. Having the gasifier right next to the oil-sands production and the petcoke production plant will enable heat and energy integration, for example.

The Opti-Nexen gasification-based oil-sands project, for instance, enjoys several efficiency advantages from integration. But the actual cost/energy/CO<sub>2</sub> savings wouldn’t necessarily be apparent (and may be kept proprietary for competitive reasons), he pointed out.

Likewise, other oil-sands projects such as Northern Lights (taking bitumen all the way to ultra-low sulfur diesel, also tapping gasification) could enjoy efficiencies that weren’t studied nor accounted-for in the CERI study. While the extra processing for making finished products (as in Northern Lights) will yield extra CO<sub>2</sub> emissions, the same CO<sub>2</sub> emissions would happen anyway at an oil refinery converting SCO to finished products, he pointed out.

For the study, CERI assumed a C\$65/ton cost for CCS, with most of that (C\$55/ton) for CO<sub>2</sub> capture. However, CCS costs likely have increased since the CERI study made its calculations last year – and could be double the initial estimate, he warned.

If CCS were to cost around \$130/ton of CO<sub>2</sub>, then that would add another \$4-8/barrel to the cost of making “green bitumen,” McColl warns.

Until the U.S. Congress decides how to regulate and price CO<sub>2</sub> – and then Canada decides how to react to its neighbor – only then will Alberta oil-sands developers be able to calculate what they can do in response, McColl pointed out. -- [Jack Peckham](#)

## **Waste Management, InEnTec Team-Up on Plasma Gasification WTE; Exclusive Interview**

U.S.-based waste-hauling and landfill giant Waste Management and Oregon-based plasma gasification technology developer InEnTec announced May 21 that they're creating an "S4 Energy Solutions" joint venture to gasify medical and other segregated commercial and industrial waste streams for distributed energy production.

Waste Management (WM) also has another long-standing waste-to-energy (WTE) venture, Wheelabrator, which focuses on relatively large-scale, centralized municipal solid waste (MSW) mass-burn WTE projects.

WM's mass-burn WTE unit stands in contrast to S4's new plan to focus on relatively smaller-scale, special-purpose, localized gasification-energy projects.

The new S4 venture not only would generate electricity but also "renewable energy and environmentally beneficial fuels and industrial products," the partners said.

"The company's future commercialization plans may also include the processing of municipal solid waste once the technology has been demonstrated to be economical and scalable for such use," they added.

InEnTec's "PEM" (plasma enhanced melter) gasification process super-heats feedstocks to temperatures of between 10,000 and 20,000 degrees Fahrenheit using an electricity-conducting plasma.

The PEM "rearranges the molecular structure of the waste, transforming organic materials into an ultra-clean synthesis gas (syngas)," the partners explained.

InEnTec was formed by engineers formerly at MIT, Battelle and GE.

"The clean syngas [from waste gasification] could be converted to transportation fuels such as ethanol and diesel, industrial products like hydrogen and methanol or used as a substitute for natural gas for heating or electricity generation," the partners explained.

"In a secondary stage of the PEM process, inorganic (non-carbon-based) materials are transformed into environmentally beneficial products," they said.

### **Top Execs from InEnTec, Wheelabrator**

The newly appointed CEO of S4 is Jeff Surma, former CEO of InEnTec and a former researcher at U.S. Dept. of Energy's Pacific Northwest National Lab.

"Waste Management will provide much of the process knowledge that will help make our joint venture successful," Surma said. "The PEM technology has demonstrated its ability to process a number of waste streams, and we are looking forward to developing more projects that sustainably manage waste while recovering valuable energy and resources."

S4's new senior VP is Joseph Vaillancourt, a former director of WM's Wheelabrator WTE division. WM founded Wheelabrator more than 30 years ago.

WM now says it aims to double its current renewable energy production by 2020, enabling power output equivalent to the demand of 2 million homes.

"Clean renewable energy is also generated from Waste Management's landfill gas-to-energy projects, which minimize emissions of greenhouse gases as well as generate enough energy to power 160,000 homes each day – the equivalent of nearly 5 million barrels of oil per year," WM pointed out.

WM also is "engaged in a cooperative research and development agreement (CRADA), a joint research effort with the EPA to determine which practices best promote the safe operation of large-scale bioreactor landfills.

"Through our Maplewood and King George County Landfills, we are also participating in the EPA's Project XL, an initiative that uses pilot projects for achieving superior environmental performance from bioreactor landfill technology. Our goal is to make Waste Management's many landfill gas-to-energy programs even more efficient - while making landfills last longer for our communities."

### **How 'PEM' Differs**

InEnTec says its PEM utilizes a plasma arc design and incorporates both auto-thermal gasification and plasma assisted gasification of feedstock materials.

"By coupling these two processes, the PEM system maximizes the conversion of organic materials in the waste feedstock into clean, usable syngas," InEnTec says.

“The PEM system actually breaks down the chemical bonds in waste material. Organic components of the waste are converted into a clean syngas, a flexible source of energy that can be used by a number of industrial and commercial customers.”

The scheme has a net power output (beyond parasitic power requirements) of 50-70%, depending upon feedstocks. An “environmentally benign glass-like byproduct” is a secondary yield.

The design is “modular and compact” with “potential to locate at various commercial and industrial sites” and “emissions meet and/or exceed EPA and state standards,” the company said.

“In addition to the specific plasma degradation of waste, the venture has the opportunity to provide a total waste solution, not yet seen in other vendor solutions.

“Waste Management will assist in the development of an entire waste degradation and recomposition solution including: handling and processing of the waste in preparation for feed into the PEM; identifying and creating feed blends for optimum efficiency and syngas production; gas clean-up systems; and end use systems such as hydrogen, methanol/ethanol, liquid fuels, and electricity.”

InEnTec claims that its system has a higher energy efficiency than a conventional plasma-torch system.

“In addition, torch systems tend to be more maintenance intensive, and therefore more costly to operate,” InEnTec said. “Finally, the plasma torch systems are complex and require highly skilled operators, which can also result in higher operating costs.”

The PEM system also has advantages over conventional pyrolysis, the company says. “Systems incorporating only a pyrolysis process typically do so to produce a medium-energy-value gas for direct combustion in a boiler or possibly a reciprocating engine generator,” InEnTec says.

“The primary differences between the PEM and pyrolysis is that pyrolysis tends to produce a very ‘dirty’ synthesis gas which requires substantial conditioning prior to use as a fuel, whereas the PEM tends to produce a very clean synthesis gas. Pyrolysis also produces ash, which may contain potentially hazardous organic compounds. Finally, pyrolysis tends to have low conversion efficiency for creating useful energy from the waste feed.”

### **Exclusive Interview**

In an interview with S4 CEO Surma and Senior Vice President Joe Vaillancourt, the execs cited various business niches seen for their plasma-enhanced waste gasification scheme.

One example: A hospital cluster-center currently ships medical wastes to a relatively long-distance, specialized disposal site, at relatively high cost. It gets nothing in return – and may have concerns about long-term liability.

In contrast, S4 could build a relatively small-scale gasification/energy conversion plant, relatively near the hospital center, hence with a lower hauling cost. S4 in turn could provide the center a new, competitive supply of electricity – and permanently eliminate any lingering worries about long-term disposal liability, since the wastes will have been converted to clean energy, with ultra-low stack emissions at the plant site.

Another example: an auto shredder residue (ASR) company currently may have relatively high costs for energy for metals recovery. Installing a PEM at such a site not only could make good use of relatively low-value auto waste materials as feedstock, but also provide a competitive source of fuel (syngas) to fire the metals recovery system.

Yet another potential customer could be a liquid fuels blender or end-user. The PEM system can be used in the process to make hydrogen, methanol, ethanol or even diesel fuel, which could be used by a local fleet.

“We’d customize the energy for the host,” Vaillancourt said. That could include both electricity and steam, at a competitive price to alternative supplies.

By targeting relatively small-scale electric production (in the 1 to 5 MW range), and using clean syngas feed, air emissions would be very low. Hence permitting would be relatively easy compared to larger-scale power plants, S4 figures.

Another potential advantage: Using WM’s numerous, existing landfill and waste-transfer sites to install PEM waste-to-energy plants.

WM is the U.S.’s largest owner-operator of landfills, with 277 sites. In addition, “we’ve got myriad transfer stations and recycling centers” that also could make for good candidates for PEM WTE plants, Vaillancourt said.

Bonus: "It's a lot easier to do permitting at landfill and transfer stations" than in "greenfield" sites that might come into conflict with neighbors, he added.

It may also be possible to install a PEM WTE plant at an existing Wheelabrator WTE site or a landfill-gas/energy production site. Such a co-located scheme could enable broader energy conversion of materials such as sludges that can't be handled well by mass-burn technology, he added.

The typically larger-scale Wheelabrator WTE plants also may offer an adjacent PEM WTE plant the advantage of being able to tie into an existing grid power connection already set up by Wheelabrator, or to an adjacent landfill-gas energy conversion site, he added.

Besides medical or industrial waste conversion, InEnTec also has validated MSW plasma-assisted energy conversion at a 25 tons/day MSW unit in Richland, Wash., Surma said. So, "we're looking at a number of possibilities" to expand beyond just medical or industrial wastes for PEM-WTE. The first priority, however, is to prove the commerciality of medical/industrial waste to energy projects.

While many proposed MSW projects have suffered "bad press" and protests from neighbors and environmental groups over claims of dangerous emissions, this wouldn't be likely with the proposed PEM WTE projects, he added.

"We're not proposing gigantic projects" that tend to get much more public attention, Surma pointed out.

"It's much easier to get permitted with small projects, as we have found with InEnTec," Vaillancourt added. "We had a 250 tons/day facility and that permit went through easily," he said. "We have a lot of data showing we have very low emissions, but we never claim 'zero' emissions" especially since latest detection methods are now capable of spotting some emissions in parts-per-trillion, he added.

For one plasma-gasification plant in Japan, technicians found that background, ambient-air dioxins were actually higher than the plant's stack dioxin emissions in all but one sample, Surma said.

If liquid fuels rather than electric power are produced from a PEM WTE plant, then stack emissions would be even lower, he pointed out. That would make permitting even easier, he added.

InEnTec earlier found that permitting a PEM-WTE ethanol plant in Reno, Nev., didn't generate public opposition, Surma added.

Some MSW WTE projects have faced public criticism because the project proponents lacked deep pockets and commercial-scale experience. But WM can stand on its reputation as a Fortune 500 company with long experience in WTE, Vaillancourt pointed out.

S4 will be privately held (rather than publicly traded) and will have both a U.S. and international focus, he added.

Bonus: S4 doesn't have to raise vast amounts of money to get new projects going today. That's a big advantage over many companies trying to finance new energy projects in today's global credit crisis, he added.

– [Jack Peckham](#)

## **Four BTL-FT Companies Cited by EPA for Progress in 'Cellulosic Diesel'**

In its "RFS-2" biofuels proposed regulation earlier this month, the U.S. EPA singled out four companies for moving toward commercialization of biomass-to-liquids (BTL) Fischer-Tropsch "cellulosic diesel" production.

Here is what EPA said in its draft "regulatory impact analysis (RIA) report on the proposed biofuels rule:

"There are several other companies planning on building cellulosic diesel fuel plants in the U.S. Flambeau River Biofuels, Beard Energy and NewPage/Chemrec are all biomass to liquids technologies which primarily produce diesel fuel through the thermochemical/Fischer Tropsch (FT) route [but Chemrec contradicts EPA's claim on FT involvement]. The earliest of these is Flambeau River Biofuels, which is planning on starting up their plant in 2010."

Beard Energy isn't seeking any U.S. federal funding support for its project, unlike Flambeau River and NewPage/Chemrec. A fourth company, Choren, also is seeking U.S. Dept. of Energy financial incentives for a proposed BTL-FT plant.

Here is what EPA said about cellulosic plants and U.S. federal funding support:

Table 1.5-35.  
Cellulosic Biofuel Plants Receiving DOE or USDA Support<sup>DDD</sup>

Company/Plant Name	Location	Feedstocks	Prod Cap (MGY)	Est. Op. Date <sup>a</sup>	Conv. Tech. <sup>b</sup>	DOE Funding	Fed. Loan Guarantee
<b>Cellulosic Ethanol</b>							
Abengoa Bioenergy Corp. <sup>c</sup>	Hugoton, KS	Corn stover, wheat straw, milo stubble, switchgrass	11.4	2012	Bio	\$76MM	
BlueFire Mecca, LLC	El Sobrante, CA	Woodchips, grass cuttings, and other yard waste	17.0	TBD	Bio	\$40MM	DOE
Ecofin / Alltech	Springfield, KY	Corn cobs	1.3	2010	Bio	\$30MM	
ICM Inc. <sup>d</sup>	St. Joseph, MO	Corn fiber/stover, sorghum, switchgrass	1.5	2010	Bio	\$30MM	
Mascoma Corporation	Kinzross, MI <sup>e</sup>	Wood fiber	40.0	2012	Bio	\$26MM	
Pacific Ethanol <sup>f</sup>	Boardman, OR	Wheat straw, wood chips, corn stover	2.7	TBD	Bio	\$24MM	
POET Project Liberty <sup>g</sup>	Emmettsburg, IA	Corn cobs & fiber	25.0	2011	Bio	\$80MM	DOE
Range Fuels <sup>h</sup>	Soperton, GA	Wood waste, switchgrass	40.0	2011	Therm	\$76MM	USDA
RSE Pulp & Chemical	Old Town, ME	Woody biomass	2.2	2010	Bio	\$30MM	
Veridium Corp.	Jennings, LA	Sugarcane bagasse, wood, emergycane	1.5	Online	Bio	\$103MM <sup>i</sup>	
<b>Cellulosic Diesel</b>							
Choren U.S.A.	TBD (Southeast U.S.)	Ag residues, forestry biomass, biogenic waste	TBD	TBD	FT		DOE
Flambeau River Biofuels	Park Falls, WI	Forestry residues	6.0	2010	FT	\$30MM	
New Page Corporation <sup>j</sup>	Wisconsin Rapids, WI	Woody biomass, mill residues	5.5	2012	FT	\$30MM	

<sup>a</sup>Based on current production plans. In many cases, these estimated production dates are further out than the originally-announced construction timeline.  
<sup>b</sup>Bio = biochemical cellulosic ethanol technology, Therm = thermochemical cellulosic ethanol technology, FT = Fischer-Tropsch biomass-to-liquids diesel technology.  
<sup>c</sup>Cellulosic ethanol plant will be collocated with a corn ethanol plant.  
<sup>d</sup>Mascoma was originally issued a DOE grant to help build a demonstration-level plant in Vonore, TN. However, that location has since been rescinded and Mascoma plans to use the DOE funding towards their planned commercial-level plant in Kinross, MI. This project, a joint venture between Mascoma and JM Longyear, is also known as Frontier Renewable Resources.  
<sup>e</sup>The first 10 MGY phase is currently under construction.  
<sup>f</sup>Estimated DOE funding.  
<sup>g</sup>Project formerly owned by Stora Enso.

*Hart Energy Publishing* has updated the EPA report with clarifying information, as follows:

**Flambeau River Biofuels:** “Our projected plant is now sized to produce 7.7 million gallons per year of Fischer-Tropsch ‘green diesel’ and 9.8 million gallons of F-T waxes,” company president Bob Byrne told us.

“Currently, integrated pilot testing has just started at the Southern Research Institute's Biomass to Liquids research facility in Durham, NC.

“Project engineering and engineering to support NEPA [National Energy Policy Act environmental permit] work and Wisconsin air and water permitting are ongoing. “After a successful integrated pilot run, we expect to break ground in spring 2010 and start production in 2012. The project's expected capital cost is now \$267 million. We have recently submitted a USDA loan guarantee application for \$124.5 million to facilitate project funding.”

At the Wisconsin plant site (*see Gasification News 7/23/08*), Flambeau River would employ Fischer-Tropsch technology developed by former Syntroleum chief Ken Agee (now with Oklahoma-based Emerging Fuels Technology, EFT LLC), plus gasification technology from ThermoChem Recovery International (TRI, probably better known for pulp-mill black liquor gasification rather than woody biomass gasification).

Murphy Oil Co. “has expressed interest in an off-take agreement to purchase the [FT diesel] product for their nearby Superior, Wisconsin, refinery,” Flambeau River said in a recent project summary.

Flambeau River has done a “significant amount of [research] work” with the U.S. Dept. of Agriculture on the nearby availability of wood biomass for the proposed project, Byrne told us.

Collecting and cracking tars from biomass gasification is a crucial issue, he acknowledged. The pilot plant work at SRI in North Carolina aims to demonstrate integration of the various pieces of the BTL scheme, including syngas cleanup and tar capture/cracking, he said.

Citigroup continues to lead the project financing, Byrne confirmed.

**NewPage/Chemrec:** Chemrec's vice president of marketing and sales, Patrik Löwnertz, told *Hart Energy Publishing* that contrary to what EPA indicated in its RIA report, “the table [above] associated with the EPA text refers to NewPage, Wisconsin Rapids, a direct biomass gasification project in which Chemrec is not involved.

“Our project with NewPage is located at the Escanaba, Mich., mill. Easy to confuse these projects and that is obviously what the EPA has done. Our project concept for Escanaba does not include any F-T liquids production.”

NewPage public relations manager Shannon Semmerling likewise confirmed to *Hart Energy Publishing* that the Wisconsin Rapids project would involve TRI gasification (as with the Flambeau River project) rather than Chemrec gasification. EFT, the FT company involved in the Flambeau River project, also will provide the NewPage project with FT technology.

TRI meantime said that both the Wisconsin Rapids project (with NewPage) and the separate Flambeau River project, both designed to gasify wood to make Fischer-Tropsch diesel, each qualified last year for \$30 million in federal funding incentives.

The Michigan project, in contrast, would produce DME rather than FT diesel, New Page's Semmerling told us.

Meantime, DOE late last year announced a \$300,000 grant to help pay for a \$1.2 million feasibility study on this proposed BTL-DME project at the NewPage pulp-paper mill in Escanaba, Mich.

"If determined to be economically viable and subsequently implemented, this gasification system will lead to large scale production of second generation biofuels, increasing revenue and return of capital at the pulp and paper mill," Chemrec said in a press release.

Chemrec focuses upon pulp-mill black liquor gasification for production of dimethyl ether (DME) rather than FT diesel. DME can be blended into LP-gas (up to 20%) for cooking and heating fuel, and it can be used in specially-modified diesel engines as a substitute for diesel fuel (although requiring an entirely new refueling infrastructure as DME isn't compatible with diesel fuel).

**Baard Energy/Ohio River Clean Fuels:** This proposed 53,000 barrels/day Fischer-Tropsch plant would tap both coal and biomass (CBTL),

Baard recently withdrew a loan guarantee application to U.S. Dept. of Energy for this project because of lawsuits brought by Natural Resources Defense Council and Sierra Club (*see GN 4/1/09*).

Rather than pursue federal dollars, Beard instead will continue plans for private financing of the project.

**Choren:** Germany-based BTL-FT developer Choren, which has equity partners including Shell, VW and Daimler, would build a biofuels plant somewhere in the U.S. Southeast, tapping U.S. Dept. of Energy (DOE) loan guarantees, EPA said.

Choren revealed at National Petrochemical & Refiners Association (NPRA) conference earlier this year that prospects for BTL-FT plants look to be moving faster in Canada and South America than in the U.S., at least for the moment (*see Gasification News 4/15/09*). – [Jack Peckham](#)

## **G4G/AFC Unveil Waste-to-Fuels, Chemicals Project in Sarnia, Ontario**

Vancouver, B.C.-based G4G Resources subsidiary Alternative Fuels Corp. (AFC) announced May 19 a plan to build a 1,900 barrels/day Fischer-Tropsch fuels, waxes and chemicals plant in Sarnia, Ontario, tapping gasification of 400 tons/day of waste plastics, paper and tires.

The plant, with an estimated U.S. \$150 million-\$160 million capital cost, potentially could wind up supplying chemical intermediates and fuels to neighboring Sarnia refiners including Suncor, Shell, Esso and Nova Chemicals.

G4G/AFC is still seeking funds for the project. It may eventually qualify for government "green" energy funds and CO<sub>2</sub> credits, as well as a Canadian private industry fund that would pay \$100/ton for recycling old tires.

If the tire-gasification portion of the scheme enables (as expected) production of chemical intermediates useful for tire manufacture, then this could put to rest a common industry belief that old tires cannot be turned into new tires.

Feedstocks would come from local trash recycler, Turtle Island Recycling Corporation, which would pay a reduced tipping fee to AFC for ridding itself of the wastes.

Given the methane and noxious air emissions as well as water-contamination from landfills, turning these landfill wastes into valuable fuels and chemicals would make this a "green" project, as G4G and AFC spokesmen said.

“Landfills are toxic zones when one considers the amount of poison effluents and phenols that leak into our river systems from these sites,” said Basil Botha, President and CEO of G4G Resources. “The conversion of landfill waste into value added products is a carbon neutral initiative when the right technology is used.”

G4G Resources earlier signed a technology memorandum of understanding (MOU) with South Africa’s University of Witwatersrand-Centre of Materials and Process Synthesis (Wits-COMPS), which will enable AFC to commercialize syngas to liquids production in the Americas.

Wits-COMPS has already developed syngas-to-liquids demonstration and pilot plants in Australia and China (starting from coal gasification) and it’s in discussions with the owners of these plants to construct commercial scale facilities in both countries (*see Gasification News 11/26/08*).

The Sarnia plant would be a first for North America and the first utilizing waste feedstocks rather than coal.

The front end of the proposed Sarnia plant would employ a Russian Academies of Science plasma gasification technology and would be built by Swedish technology/aircraft maker Saab, AFC’s Michael Hepworth, vice president of business development, told us.

This technology has been used for “quite a number of years” in former Soviet Union countries for waste destruction, he said.

Waste-to-energy (WTE) project proposals have been snowballing, especially in the last 18 months. But almost all of them focus on electric power. WTE for liquid fuels and chemicals is less well-known, probably because Fischer-Tropsch isn’t widely known, Hepworth said.

Even those who are familiar with FT view it as “very capital intensive and requiring huge volumes” in order to make a project commercially viable, he said.

But the Wits-COMPS scheme has several advantages over traditional, large-scale FT projects, he said. One key: A “once-through” process flow whereby unreacted syngas from FT reactor gets burned in a downstream gas turbine for electric power rather than being recycled back to FT reactor.

Waste heat recovery from the gas turbine can enable raising steam for a downstream steam turbine, yielding highly efficient combined-cycle electric power.

AFC hasn’t yet decided whether it will install combined-cycle power at the Sarnia plant, Hepworth said. But the company figures it will be able to generate not only plant power requirements, but also at least some surplus power for sale to the grid, he said.

Another factor favoring the economics of the scheme is a relatively simple, low-cost fixed-bed FT reactor technology that would be employed, he said.

Yet another factor is the unusual combination of both iron and cobalt FT catalysts, in a three-stage reactor process. Iron catalyst, being cheaper and less sensitive to sulfur contamination – and having the benefit of boosting hydrogen/CO ratio via a shift reaction – is put at the front end, with cobalt (a higher-activity but more sulfur-sensitive catalyst) put behind.

Pilot plants in China and Australia are showing good results for this novel scheme, Hepworth said.

While the Sarnia plant likely would produce about 70% chemicals, about 30% of the plant output would be ultra-clean FT diesel that could be sold to “environmentally conscious fleet operators at a premium to regular diesel,” AFC figures.

The FT diesel fuel also would have far superior cold-flow properties compared to fatty acid methyl ester (FAME) biodiesel, AFC says.

AFC added that, in conjunction with Hawk Partners, it will “seek capital funding and business development opportunities. In addition, AFC is currently looking for investors and is in discussion with several large multi-nationals who have expressed interest in becoming strategic partners in the Sarnia opportunity.” – [Jack Peckham](#)

## **Profitable ‘Green’ Fuel Maker N-Viro Sees Emerging Gasification Opportunity**

Ohio-based sewage-sludge energy technology developer N-Viro is starting to see more-profitable results from “green” electric power– and gasification could offer a new and especially favorable route, according to the company’s CEO.



N-Viro owns three patented technologies to treat, recycle and turn wastewater sludge and other bio-organic wastes into a type of renewable fuel that resembles coal – and as a result can be blended with coal.

For nearly a decade, the company has operated the city of Toledo, Ohio's, N-Viro Process facility, treating approximately 150 wet tons of sewage sludge per day, or approximately 40,000 tons annually. That deal was followed by another contract for the city of Daytona, Fla. – and some two dozen licensed facilities have followed in the eastern U.S.

Asked by *Gasification News* about whether the company is considering its “N-Viro Fuel” (NVF) as feedstock for integrated gasification combined cycle (IGCC) power, here’s what N-Viro CEO Timothy Kasmoch told us:

“Yes we have. In fact you are touching on what I see to be the future of N-Viro Fuel. What we have found through full-scale testing of NVF in gasification process is that NVF gasifies better than coal, MSW pellets, and wood waste.

“The testing of NVF as a coal substitute has been equally successful allowing NVF to be utilized in both combustion and or gasification.

“Currently our R&D is constructing a full scale demonstration unit to show the results obtained from gasification. We hope to have this online within the next few months.”

### **Future Strategy**

The company explains that its future objective is focused on cutting CO<sub>2</sub> emissions from coal-fired electric plants via co-generation of coal and NVF, with recent tests at Michigan State University showing positive results.

The company also aims to pursue a design-build-operate (DBO) business model for future plants.

“N-Viro will completely design and construct a state-of-art facility within the project timeframe,” the company says. “Afterward, N-Viro will operate and manage the process including handling the biosolids from end to end.”

For example, a notional N-Viro DBO plant would mix 250 tons of biosolids and 25 tons of admixtures to deliver 120 tons of NVF to nearby coal-fired power plants.

“The fully integrated approach relieves the municipality from managing the biosolids disposal and contributes to the goal of each state to cut down on greenhouse gas emissions and to utilize renewable energy resources such as biosolids,” N-Viro explains.

“A non-conventional contracting mechanism – Design-Build-Operate (DBO) structure – successfully combines the benefits of private sector business efficiency while minimizing the cost of involvement for publically owned entities.”

NVF fuel has characteristics similar to that of coal, the company says.

“The main differences are comparable fuel value, higher ash (20-40 %), and lower sulfur (~ 1 %). Heavy metal values are similar although organic wastes [in NVF] are somewhat higher in metallic elements like copper and zinc, [whereas] coals are higher in metals like arsenic and selenium.

“N-Viro Fuel is a dry, granular material with density comparable to coal. Particle size distribution varies with moisture content; material less than 70 % solids is uniformly granular, while material much above 75-80 % solids is more powdery. This provides the opportunity to vary the consistency of the fuel to meet the handling requirements of the power plant.”

NVF is “completely disinfected and permitted by state and federal law to be used for a wide range of beneficial uses,” the company said.

“Organic wastes like sewage sludge and animal manure contain a significant amount of ammonia. In the N-Viro Fuel process, ammonia is generated from the organic wastes under alkaline conditions. The ammonia is entrained in the exhaust gases, and there is the potential, for facilities located next to the power plant, to conduct gaseous ammonia to the boiler to offset ammonia that is injected into the boiler for NO<sub>x</sub> reduction.

“If the power plant uses limestone injection for SO<sub>x</sub> removal, the resulting fly ash can be used as an alkaline additive in the N-Viro Fuel process. The power plant can also provide a source of energy to fuel the dryer.

“The N-Viro Fuel process consumes ash from the power plant, and provides ammonia for NO<sub>x</sub> removal, and renewable biomass fuel.”

Since the NVF process captures wastes that otherwise would be land filled, the net reduction in CO<sub>2</sub> emissions is dramatic, N-Viro says.

“In the case of land application, greater than 95% of the carbon in the organic waste is converted to carbon dioxide by biological decomposition in the soil. Land filled waste organics undergo biological decomposition and carbon is converted to carbon dioxide and methane. Few landfills recover this biogas for energy generation.

“Sludge incinerators burn wet sludge cake with natural gas and are net energy consumers. N-Viro Fuel will be converted to carbon dioxide when burned, but with energy generation as compared to the alternatives described above. Likewise, N-Viro Fuel generates net carbon credits through the avoided burning of coal.”

The company notes that renewable power generation in the U.S. is expected to grow from 8.5% in 2007 to 14.1% by 2030. But this could be much greater under pending “greenhouse” CO<sub>2</sub> legislation in the U.S. Congress (*see related story, this issue*).

“The coal industry has huge market potential for [NVF] primarily because N-Viro Fuel has a net calorific value of 6,000-8,000 Btu/lb and is completely compatible with coal,” the company says. “In addition, N-Viro Fuel has demonstrated a net positive energy balance when burned with coal.”

As for capital costs: “Based on research, reported by the U.S. EPA in 2006, the capital cost for thermal drying of biosolids for a 24,000 wet tons facility would be in the region of \$18.5 - \$25 million.

“The capital cost for an N-Viro Fuel facility are considerably less due to the simplistic yet rugged design of the process. The company can capitalize a processing facility capable of annually treating 200,000 wet tons of biosolids for approximately \$8 million.

“The positive net present value of cash flows yields a gross operating revenue of 25%.”

-- [\*Jack Peckham\*](#)

## **Syntroleum Discloses \$20 Million Payment from Sinopec**

Syntroleum disclosed in an amended 8-K filing with U.S. Securities & Exchange Commission (SEC) that Sinopec will pay a total \$20 million for certain technology rights for Syntroleum’s Fischer-Tropsch technology.

Syntroleum earlier had tried to conceal the total amount of Sinopec payments for competitive reasons (*see Gasification News 4/15/09*), but the SEC later told Syntroleum that it had to disclose the total.

The revised 8-K points out that Sinopec gets non-exclusive rights to use the FT technology for FT synthesis from coal, petcoke, asphalt and related feedstock gasification, and for coal-derived FT in all areas except North and South America, Australia, New Zealand and India.

“As part of the agreement, Sinopec will establish a pilot plant in China based on Syntroleum’s Catoosa [Okla.] demonstration equipment for joint technology demonstration, development and commercialization,” Syntroleum said.

“Both companies will share the profits from the licensing of improved technology in China.”

Sinopec has already paid \$8 million of the \$20 million, while \$6 million has been invoiced for technology documentation. The other \$6 million “is due in payments associated with the relocation to China by Sinopec of, among other things, the Fischer-Tropsch reactors, catalyst filtration equipment and catalyst regeneration sections” of the Catoosa plant. – [\*Jack Peckham\*](#)

## **Linc Acquires PRB Coal, Announces UCG-CTL Plan for U.S.**

Australia’s Linc Energy announced May 14 that it paid \$5 million for a 100% interest in more than 92,000 acres of coal tenement lease areas in the Power River Basin in Wyoming from Casper-based GasTech Inc.

The deal would help accelerate Linc’s plan to employ underground coal gasification (UCG) for coal-to-liquids (CTL) diesel and jet fuel for the U.S. market, Linc said.

“The 92,059 acres being acquired have a coal deposit exploration target range of 7 to 8 billion metric tons (non-JORC Code standard) based on existing drilling data,” Linc said.

The area being acquired contains multiple sub-bituminous coal seams ranging from 6 to 15 metres thick and occurring at depths in excess of 150 meters, “making them excellent targets for Underground Coal Gasification (UCG) operations,” Linc said.

The latest deal follows a “letter of intent” between Linc and GasTech last December and “completes the first phase of the proposed GasTech purchase, with the remaining area subject to a further transaction pending resolution of pre-emptive rights held by a major petroleum company.”

Linc didn’t say which company that was, but *Gasification News* revealed that this is in fact BP (*see GN 10/15/08, 3/15/07*).

Immediately following final closure of the latest acquisition, “Linc Energy will commence the permit and approval process required in order to undertake a UCG pilot program to produce syngas, which it has committed to completing within 24 months of the acquisition,” Linc said.

Linc CEO Peter Bond said: “Linc will now have access to several billion tons of coal in the state of Wyoming, one of [North] America's key energy producing areas, which will allow the company to move quickly to commercialization of UCG to produce GTL fuels like ultra clean diesel and Jet A1. As such, I believe that the tenements being acquired are well placed and exceptional coal assets which will provide the company with an excellent stepping stone into the USA clean fuels market.”

Linc said it will establish an office in Wyoming not only to oversee the UCG pilot program but also to support its planned commercialization of UCG/coal to liquids in the U.S. – [Jack Peckham](#)

## **DTE Energy Wins OK for Gasification WTE Feasibility Study**

Detroit-based electric utility giant DTE Energy this month won approval from the Montmorency-Oscoda-Alpena (MOA) Solid Waste Authority for a feasibility study on a proposed gasification-based waste-to-energy (WTE) project in Michigan.

According to a report from *The Alpena (Mich.) News*, DTE will carry out a study on what is estimated to be \$25 million WTE project in Atlanta, Mich.

The waste authority also simultaneously approved hiring legal council to analyze the potential financial or operating impacts on the area governments involved.

“If DTE finds producing alternate energy in Atlanta is a worthwhile investment, [then] it will pay the tab on the project,” the report said. “It also is trying to acquire funds from other outside sources. If all goes right the plant could be up and running in about a year.”

The proposed project would involve Virginia-based WTE project developer Recovered Energy Resources (RER) and the gasification technology of Michigan-based Heat Transfer International (*see Gasification News 3/4/09, 2/18/09*).

As RER CEO Brad Schneider explained to *Gasification News* last week, “I actually brought DTE in as a development partner. We initially discussed with them purchasing the power and the RECs [renewable energy credits, created by a new Michigan law] that would be created.

“As we progressed, it became obvious that they had a lot to offer and are taking the lead role in the development as they will fund the development. As RER is a smaller company, it would have been difficult to find the financial commitments to get the project off the ground. DTE resolves all of that for us.

“Our next step is that we are going to begin detailed engineering and cost analysis for the project, then return to the MOA with our findings and give them the option to approve our proceeding with the actual construction. We are going to have a pretty aggressive project effort to make the timelines needed for credits and tax incentives, but we are confident they can be met.”

Michigan is one of several U.S. states pushing electric utilities to adopt “renewable” power generation, of which WTE is one type specified in the state legislation. – [Jack Peckham](#)

## East Coast Minerals Buys 51% Stake in UCG Company; Wyo. Target

Australia's East Coast Minerals announced May 19 that it has acquired 51% of Energy Future, a company focused on underground coal gasification (UCG).

Energy Future has mineral exploration license applications covering more than 6,000 square kilometers of offshore area stretching from Wollongong to Newcastle, New South Wales, underlain by an estimated 28 billion tons of coal, East Coast said.

The acquisition also opens "a partnership opportunity with the world leaders in UCG and gas to liquids technology" as well as "a development opportunity for an advanced onshore UCG project in Wyoming," East Coast said.

The acquisition of the interest in Energy Future will require the issue of 1 million East Coast shares to Energy Future principals and the obligation for East Coast to fund \$1.5 million of Energy Future's costs.

"Energy Future has signed an MOU to enter into a partnership with a world leader in gas to liquids technology, Energy Technology Partners, who will license Energy Future with their Fischer Tropsch technology exclusively for Australia, and Raven Ridge Resources, a firm that has to its name more UCG trials than anyone else in the western world," East Coast said.

"It is anticipated that both Energy Technology Partners and Raven Ridge Resources will through their joint venture company InSitu Energy, acquire as part of the transaction a significant equity interest in Energy Future which will ensure that Energy Future maintains access to the required technology and UCG expertise.

"InSitu Energy also brings with it an opportunity for Energy Future to acquire an exceptional UCG opportunity in Wyoming. This project is well advanced and has the ability to be the first integrated UCG/Fischer Tropsch project in commercial production in the western world." – [Jack Peckham](#)

## Gas to Liquids News

### Brunei Launches 'Methanol Super Converter' Plant

Brunei Methanol Company (BMC) last week officially launched the installation of its Methanol Super Converter plant, as noted in a report from the *Borneo Bulletin*.

Besides a host of government ministers at the event, Mitsubishi Heavy Industries and PetroluemBrunei also attended.

The methanol super converter "is a simple heat exchanger type reactor. Its main function is to accommodate for the synthesis reaction, converting reformed gas into crude methanol," the report said.

"This synthesis reaction itself is generated by the Mitsubishi Gas Chemical Company licensed catalyst, which is partially filled up in the annular space between the [converter's] inner and outer tubes. The design of the unit allows for a relatively higher methanol yield compared to most other types of methanol converters due to its optimized operation temperature profile which progresses closely to the maximum reaction rate of the methanol synthesis reaction."

The unit also "recovers the heat generated in the methanol synthesis reaction by transferring this energy to heat up water, thus creating medium pressure steam which is then used in the reforming reaction upstream of the unit. Such heat recovery through steam production is beneficial for the plant and environment as it means that the load on the boilers can be reduced thus less fuel gas is used and less emissions are produced."

The launch event "marked another milestone in the construction of Brunei Darussalam Methanol Plant," the report said. "The two units of the Methanol Super Converter, which weigh approximately 490 tons each, were fabricated in Japan, shipped by sea and arrived at Sungai Liang Industrial Park by way of beach landing which took place on May 6.

"BMC will start with its pre-commissioning activities soon as the Brunei Darussalam Methanol Plant mechanical completion is due at the end of 2009."

## Methanol Fuel Cell Packaging Deal Emerges

Gas-to-liquids methanol proponents long have pushed their product for use in direct fuel cell applications. But methanol product packaging always remained an issue.

Now, California-based Viaspace last week announced a “memo of understanding” (MOU) deal with U.K.-based Hayman Specialty Products for packaging methanol for applications including methanol fuel cartridges for fuel cells.

“Under the MOU, Hayman Speciality Products will provide methanol filling and distribution services to Direct Methanol Fuel Cell Corporation (DMFCC), Viaspace’s alternative energy subsidiary engaged in manufacturing disposable fuel cartridges for direct methanol fuel cell powered electronics such as notebook computers, mobile phones and military equipment,” Viaspace said.

For the last 50 years, Hayman Specialty Products has developed a global business as a supplier of ethanol, methanol and isopropanol and other high quality solvents to the pharmaceutical, flavor, fragrance, personal care industries and research laboratories, Viaspace said.

Viaspace CEO Carl Kukkonen said: “Automated cartridge filling is a crucial element in the large-scale manufacturing and distribution infrastructure we are building for our fuel cell cartridge business.”

DMFCC is a cartridge partner with Samsung and other companies engaged in developing fuel cells as alternative power sources for a range of consumer, military and other applications.

## Coal to Liquids News

### Alaska Worries that US Air Force May Misuse CTL Study Funds

Alaska’s Fairbanks Economic Development Corporation (FEDC) is worried that the U.S. Air Force (USAF) might waste a big portion of a special \$10 million U.S. Congress appropriation designed to fund further studies of a proposed coal-to-liquids (CTL) Fischer-Tropsch (FT) jet fuel plant that could supply Eielson Air Force Base near Fairbanks.

U.S. Sen. Lisa Murkowski (R-Ak.) is worried as well, issuing a press statement last week urging the USAF to coordinate better with local officials on best use of the \$10 million.

Former U.S. Sen. Ted Stevens (R-Ak.) included the funds into the Air Force budget for a phase-two study of the proposed CTL project.

A Phase I preliminary study by engineering consultant Hatch Ltd. (*see Gasification News 11/26/08*) for Fairbanks Economic Development Corporation (FEDC) indicated that the proposed CTL plant would need to be able to sell FT kero-jet for around \$3/gallon just to break even.

The study estimated that a 40,000 barrels/day CTL plant built in Alaska at a selected site probably would have a capital cost of around \$7.45 billion.

The preliminary estimates were plus or minus 40%, the study says, as much more detailed engineering would be required to establish a firmer estimate.

Doing a much more detailed study would cost millions of dollars.

In a press statement last week, Sen. Murkowski pointed out that she had told an Air Force deputy assistant secretary that Fairbanks North Star Borough officials do not believe that project feasibility studies are on the right track.

“The community leaders don’t feel that the Air Force has been listening to their concerns, and the concern is that they will go forward, spend \$10 million on studies that may have very little value,” Murkowski said.

FEDC is worried that USAF will spend the money on a non-germane “enhanced leasing” study of property adjacent to the Eielson aircraft landing strip – a site unsuitable for the proposed CTL plant in any case.

As FEDC official Jomo Stewart explained to *Gasification News* in an interview, the Air Force is making an odd interpretation of a sentence, split by a comma, in the appropriations bill. Splitting the sentence in this way potentially could justify spending about half of the \$10 million on the non-germane “enhanced leasing” study, he said.

The USAF earlier killed another proposed CTL project at an air base in Montana, supposedly because the plant might pose safety risks at the base (*see Gasification News 2/4/09*).

“My response is that if they want ‘enhanced leasing,’ then let’s identify a pipeline corridor [on the air base property] for blended FT jet fuel and crude-based jet fuel,” Stewart told us.

Any CTL plant built in Alaska would have to blend its FT jet fuel at no more than 50% with petroleum jet fuel at one of two nearby refineries, in order to meet minimum Air Force requirements for jet fuel.

The FEDC believes it was supposed to be the “coordinating entity” mentioned in the legislation to oversee the \$10 million for follow-up CTL plant studies, he said. “But the Air Force wants to be the coordinating entity” and thus could bypass what Alaska thinks is best for spending the \$10 million on follow-up CTL studies, he said.

After all the money is spent, “we don’t know if we’ll have a body of work useful for our project,” he said.

Among the issues: Figuring out how much it might cost to build a CO<sub>2</sub> pipeline to the oil fields on the North Slope, as part of a CO<sub>2</sub> mitigation plan for the proposed CTL plant.

Instead, the Air Force wants FEDC to “bid-in” to request a portion of the funds for the CTL study, in conjunction with a university study.

However, a proposed University of Alaska-Fairbanks study, asking for a part of the USAF study funds, instead aims to look at coal-handling environmental impacts of the plant. Yet the front-end engineering design (FEED) work hasn’t even been done yet on the plant, making such a study premature, Stewart pointed out to us.

For example, the plant might tap both coal and natural gas feedstock. If so, then the size of the coal-handling facilities might be smaller than what U-Alaska might presume, making their study conclusions wander off the mark.

Also, depending upon the reformer configuration, plant CO<sub>2</sub> might change, making any study conclusions of plant CO<sub>2</sub> premature, he said.

Bottom line: FEDC is “concerned that \$10 million could be spent on studies that only wind up gathering dust on a shelf,” he said.

Since Sen. Stevens was defeated in his re-election bid last fall (on the heels of unrelated corruption allegations later dismissed by the new U.S. Attorney General), speculation is that the Air Force meantime might have gotten other ideas about how to spend the money, he said.

But in any case, rather than spending large sums on an “enhanced leasing” study on air-base land that cannot possibly accommodate a CTL plant, the Air Force instead ought to be considering using the funds for a more practical CTL plant study located next to one of the two nearby, existing oil refineries, he said.

The current Air Force plan for spending the money could be viewed as “off-track, but we don’t know what their track is,” Stewart said. “There’s no full, detailed game plan from them. In absence of a road map, we don’t know what they’re planning.” – [Jack Peckham](#)

## **Peabody, White Energy Ink Deal; Could Spur CTL, SNG Projects**

U.S. coal giant Peabody Energy announced May 13 the signing of a deal with Australia’s White Energy to develop a coal upgrading plant in the U.S. Powder River Basin (PRB).

Peabody also gets first right to participate in new coal upgrading development projects that White Energy undertakes in North America and China. Peabody further has a right to acquire a nearly 15% equity interest in White Energy.

The coal upgrading plant would utilize White Energy’s patented coal briquetting technology, a mechanical process that upgrades lower-Btu coals.

“The process increases the coal’s overall energy content by approximately 35%,” Peabody said.

“The resulting product is higher quality, more efficient and cleaner, with lower carbon and other emissions. The upgraded coal can be used interchangeably with high rank thermal coal for a number of applications, including power generation, industrial processes and Btu Conversion, such as coal-to-gas and coal-to-liquids.”

Peabody President Richard Navarre said of the deal: “We view this technology as a way to unlock further value in our reserves in the Powder River Basin and at other locations to create new marketing opportunities for U.S. or export customers.”

Peabody and White Energy are proceeding with engineering design and permitting activities for the first plant that are expected to require up to 24 months. The plant would be built in phases, with the first phase expected to produce more than 1 million tons of upgraded coal per year.

Subsequent phases could increase plant capacity ultimately to more than 20 million tons annually.

“Peabody expects substantial global growth opportunities using this technology that will initially focus on applications in North America and China,” Peabody said.

Asked whether the first PRB project might involve further conversion to coal-to-liquids (CTL) or synthetic natural gas (SNG), Peabody spokesperson Beth Sutton told *Gasification News* that this isn’t part of the plan.

Rather, this first plant would tap White Energy’s upgrading technology, with the resulting coal shipped to power generators, industrial customers or others.

As for possible China projects, “it’s too early to discuss specific project plans,” she said.

-- [Jack Peckham](#)

## Carbon Storage

### Electric Power Distributors get 30% of GHG Allowances in Revised U.S. House Bill

The U.S. House Energy & Commerce Committee last week voted 33-25 (all but 4 Democrats for, all but 1 Republican against) to approve a revised version of H.R. 2454, the “American Clean Energy and Security Act of 2009,” backed by committee chair Henry Waxman (D-Cal.) and subcommittee chair Ed Markey (D-Mass.)

The latest revision, unlike the original “discussion draft,” now includes greenhouse gas (GHG) credit “allowance” provisions for certain industries, as well as a CO<sub>2</sub> cap-and-trade scheme.

The National Mining Association called the bill’s CO<sub>2</sub> reductions requirements for coal-fired electric utilities “onerous,” pointing out that coal-fired plants permitted after Jan. 1, 2009 must reduce CO<sub>2</sub> emissions by 50%, while coal plants permitted after Jan. 1, 2020, would have to slash CO<sub>2</sub> emissions by 65%.

The amended bill, unlike the original “discussion draft,” now excludes a “low carbon fuel standard” (LCFS) that would have replaced the current ethanol-gasoline blending mandates in the U.S. EPA’s “renewable fuel standard” program with something more akin to the new LCFS rule adopted earlier this month by California Air Resources Board (CARB).

The CARB LCFS scheme is seen by some industry analysts as an electric-car mandate in disguise (*see Gasification News 5/13/09*), potentially opening doors to low-CO<sub>2</sub> power generation schemes including integrated gasification combined cycle (IGCC) if combined with CO<sub>2</sub> capture and storage (CCS).

Under the just-passed U.S. House Energy bill, 15% of GHG allowances would be auctioned every year.

Some environmental groups (but not all) flatly opposed any “free” allowances, while many industry groups maintained that such allowances would be crucial at least during a transition period, to minimize energy cost increases for consumers.

The 932-page bill includes a provision giving electric power distributors 30% of GHG (CO<sub>2</sub>) allowances, local natural gas distribution companies 9% of allowances and oil refiners just 2%.

### Industry Reaction

The American Petroleum Institute pointed out that U.S. oil refiners would have to pay for more than 33% (possibly up to 44%) of the U.S.’s GHG emissions, but would only get 2% of the allowances, thus dumping tens of billions of dollars of new GHG trading costs on domestic refiners each year.

The National Petrochemical & Refiners Association (NPRA) likewise pointed out that this could put U.S. refiners at a huge cost disadvantage to foreign refiners not facing the same GHG limits.

“The whole notion of capping carbon dioxide emissions, issuing allowances disproportionately to favored industries, and hoping that the false promise of ‘green jobs’ could gloss over the current and real jobs that will be lost should H.R. 2454 become law belies the complexity of fairly balancing energy and environmental policy,” NPRA charged.

NPRA member ConocoPhillips – a member of the industry/environmental-group U.S. Climate Action Partnership (USCAP) coalition that largely endorsed the bill – pointed out that “under the provisions of the proposed bill, U.S. refiners will have a legal compliance obligation to purchase allowances for GHG emission from their manufacturing facilities, as well as allowances for consumer GHG emissions associated with using refined petroleum products, such as transportation fuels.

“It is likely that refiners will not be able to pass along 100% of the costs of securing allowances, and they should be provided an allowance allocation for unrecovered costs,” ConocoPhillips said.

The allowances in the bill would phase-out over five-years (2026 through 2030), except for the refinery allowances, which would phase out completely in 2026.

In 2014, 15% of allowances would be distributed to U.S. manufacturers in energy-intensive, trade-exposed industries, with this amount gradually decreasing until 2025, when the U.S. President would decide if free allocations should continue.

The scheme also would extend allowances for carbon capture and sequestration, renewable energy and efficiency, advanced automobile technology and research and development; preventing tropical deforestation; clean technology transfer; and worker assistance and job training.

A revised “renewable electricity standard” in the bill now calls for 17% renewable energy and energy efficiency standard by 2020, with utilities required to get most of that electricity from renewable energy sources and the remainder from energy efficiency measures.

However, if a governor determines that utilities in the state cannot meet the renewable requirement, then the renewable requirement can be cut while the efficiency requirement would rise.

The bill now goes for hearings and possible amendments in the U.S. Ways and Means, Agriculture, Science, Transportation and Infrastructure, Financial Services, Foreign Affairs, Natural Resources, and Labor committees.

The chairman of the Agriculture committee is already threatening to include an amendment banning the U.S. EPA from including “indirect land use change” (ILUC) CO<sub>2</sub> impacts of biofuels including corn-ethanol and soybean-biodiesel.

Under EPA proposed “RFG-2” renewable fuels rules released earlier this month, neither corn-ethanol nor soybean-biodiesel come anywhere close to meeting future requirements for CO<sub>2</sub> reductions under the rules. However, 15 billion gallons/year of corn-ethanol is “grandfathered” (exempted) from the CO<sub>2</sub> rules under an earlier U.S. law. – [Jack Peckham](#)

## **Australian Research Center Probes Solvent, Membrane, Adsorbent CO<sub>2</sub> Capture**

Australia’s government/industry joint CO<sub>2</sub> capture and storage research project (Cooperative Research Centre for Greenhouse Gas Technologies, CO<sub>2</sub>CRC) officially launched May 20 with the commissioning of three gasification-based CO<sub>2</sub> capture research rigs.

Victorian Minister for Energy and Resources Peter Batchelor officially launched the CO<sub>2</sub>CRC/HRL Mulgrave Capture Project at HRL’s gasifier research facility at Mulgrave in Melbourne, Victoria.

CO<sub>2</sub>CRC aims to pioneer CCS from coal gasification power stations.

“The CO<sub>2</sub>CRC rigs will capture CO<sub>2</sub> from syngas, the product of the brown coal gasifier, using three innovative new technologies,” said Barry Hooper, Chief Technologist of the CO<sub>2</sub>CRC. “These capture technologies are equally applicable to syngas from brown and black coal, gas or biomass fuels.”

Advanced gasifier technologies are especially suitable for CCS capture as they produce a concentrated stream of CO<sub>2</sub>, the group noted.

During the project, researchers will evaluate solvent, membrane and adsorbent technologies for efficiency and cost-effectiveness.

For an overview, technology fact sheets and images of the project, see [www.co2crc.com.au](http://www.co2crc.com.au).

Organizations participating in CO<sub>2</sub>CRC research include CSIRO, Geoscience Australia, the Universities of Adelaide, Curtin, Melbourne, Monash, New South Wales, the Alberta Research Council of Canada and the U.S. Lawrence Berkeley National Laboratory.



Industry and state core partners supporting CO<sub>2</sub>CRC include ACARP, Anglo American, BHP Billiton, BP Australia, Chevron, ConocoPhillips, Inpex, KIGAM, Mitsui, NSW Department of Primary Industries, NZ Resource Consortium, Origin, QER, Rio Tinto, Sasol, Schlumberger, Shell, Foundation for Research Science and Technology (NZ), Solid Energy, Stanwell, the Victorian Department of Primary Industries, Queensland Department of Mines and Energy, Western Australia Department of Mines and Petroleum, Woodside and Xstrata.

### **Capture Project Goals**

The CO<sub>2</sub>CRC Mulgrave Capture Project aims to:

- trial a potassium carbonate-promoted solvent system and compare its performance to the traditional amine solvent (MEA);
- reduce the energy required to heat the solvent to release the CO<sub>2</sub> and to cool the lean solvent and the CO<sub>2</sub>;
- control or prevent the solvent degrading or corroding equipment;
- improve the amount of CO<sub>2</sub> captured/released by the solvent through the use of novel packing material in the columns;
- understand the interaction between the solvent system and impurities present in the syngas, including H<sub>2</sub>S, CH<sub>4</sub> and CO; and
- reduce the cost of carbon capture and make solvent absorption technologies more commercially viable.

### **Membrane Separation**

For the membrane separation research, CO<sub>2</sub>CRC trials will use a hollow fiber membrane module to:

- test a range of membrane materials with a range of solvents; and
  - evaluate the performance of each configuration.
- second);
- test a number of gas separation membrane strategies (for example, removing H<sub>2</sub> first, then the CO<sub>2</sub>);
  - investigate the influence syngas and minor gas components have on membrane performance and plasticization; and
  - investigate the separation performance of a number of molecular sieving membranes at high temperatures.

Adsorption technologies researcher will focus on testing Pressure Swing Adsorption (PSA) at about 250°C, a much higher feed gas temperature than is possible for other gas separation technologies.

This ability may lower the capture cost by reducing the need to cool the gas for capture and then reheat it for entry into the gas turbine in a power plant.

### **Current Trials**

Current CO<sub>2</sub>CRC trials aim to:

- identify and test suitable adsorbents and process conditions over a range of temperature and pressure conditions; and
- investigate the performance of adsorbents at higher temperatures. -- [\*Jack Peckham\*](#)

## **Southern Co., Mitsubishi, DOE Team Up on CCS Demonstration**

U.S.-based electric utility Southern Company, Mitsubishi Heavy Industries (MHI), the Electric Power Research Institute and the U.S. Dept. of Energy (DOE) on May 21 announced joint plans to demonstrate carbon capture and storage (CCS) on a coal-fired power plant.

An amine-based CO<sub>2</sub> capture scheme will be installed at Southern subsidiary Alabama Power's Plant Barry site, near Mobile, Ala.

"Beginning in 2011, between 100,000 and 150,000 tons of CO<sub>2</sub> per year -- the equivalent of emissions from 25 megawatts of the plant's generating capacity -- would be captured for permanent underground storage in a deep saline geologic formation," Southern said.

“The CO<sub>2</sub> will be supplied to the DOE's Southeast Regional Carbon Sequestration Partnership (SECARB), which will transport it by pipeline from the plant and store it underground at a site within the area of the Citronelle Oil Field, about 10 miles from the plant, operated by Denbury Resources.”

Southern States Energy Board is leading the SECARB effort.

CO<sub>2</sub> capture technology to be used in this project, called “KM-CDR,” was jointly developed by MHI and the Kansai Electric Power Company. “It deploys an advanced amine-based solvent that reacts readily with CO<sub>2</sub> in flue gas before being separated and compressed so that it is ready for pipeline transport,” Southern said.

The MHI process offers “improved performance and lower cost than other existing capture technologies,” MHI said. “The process has been demonstrated at smaller scale at a coal-fired generating station in Japan, and is currently being deployed commercially on natural gas-fired systems around the world. This project represents the largest coal-fired demonstration of the technology.” -- [Jack Peckham](#)

## Texas Utility Praises CO<sub>2</sub> Capture Incentives Legislation

American Electric Power's Southwestern Electric Power Co. (SWEPCO) unit is praising an amended bill moving through the Texas legislature that would provide incentives for clean-coal plants installing CO<sub>2</sub> capture for enhanced oil recovery (EOR).

The bill originally was designed to authorize a franchise tax credit capped at \$100 million for each clean-coal project that captures and sequesters at least 70% of its CO<sub>2</sub>, for EOR.

Integrated gasification combined cycle (IGCC) technology as proposed by Summit Power would be one potential beneficiary from the legislation. But so would non-IGCC clean-coal plants, as SWEPCO explained to *Gasification News*.

“SWEPCO is not considering IGCC at this time,” AEP corporate media relations director Pat Hemlepp told us.

“As far as I know, the only vendor to offer production guarantees on an IGCC technology is GE and that technology doesn't work well on the higher-moisture, lower-BTU coals used in the [U.S.] West.

“American Electric Power, parent company of SWEPCO, is pursuing carbon capture and storage technology commercialization for retrofit on existing coal-fired plants (the first use will be in operation this September at one of our plants in West Virginia). We see the legislation in Texas as providing a boost to this retrofit technology as well as for other carbon-capture technologies.”

The bill, originally sponsored by Texas Sen. Kel Seliger, R-Amarillo, and House Rep. Phil King, R-Weatherford, could boost prospects for a proposed Summit Power IGCC plant, as well as other proposed plants (*see Gasification News 1/21/09*). -- [Jack Peckham](#)

## U.S. DOE Announces \$2.4 Billion for CCS

U.S. Energy Secretary Steven Chu on May 15 announced that \$2.4 billion will be made available from the recently passed “American Recovery and Reinvestment Act” to expand and accelerate the commercial deployment of carbon capture and storage (CCS) technology.

DOE is posting Notices of Intent for the funds, including:

-- **Clean Coal Power Initiative:** \$800 million of DOE funds will co-finance new coal technologies that can help utilities cut sulfur, nitrogen and mercury pollutants from power plants. “The new funding will allow researchers broader CCS commercial-scale experience by expanding the range of technologies, applications, fuels, and geologic formations that are tested,” DOE said.

-- **Industrial Carbon Capture and Storage:** \$1.52 billion is allotted for a two-part competitive solicitation for large-scale CCS from industrial sources including cement plants, chemical plants, refineries, steel and aluminum plants, manufacturing facilities, petroleum coke-fired power and “other” power plants.

The second part of the solicitation will subsidize “innovative concepts for beneficial CO<sub>2</sub> reuse (CO<sub>2</sub> mineralization, algae production, etc.) and CO<sub>2</sub> capture from the atmosphere,” DOE said.

-- **Ramgen modification** (\$20 million): This funding will allow the industrial-sized scale-up and testing of an existing advanced CO<sub>2</sub> compression project with the objective of reducing time to commercialization, technology risk, and cost. [Ramgen](#) is a private entity that manufactures a CO<sub>2</sub> compressor.

DOE also will put \$50 million into a "geologic sequestration site characterization: \$50 million" characterization study for a minimum of 10 geologic formations throughout the U.S. – [Jack Peckham](#)

## U.S. CO<sub>2</sub> Storage Capacity: Massive Potential

The U.S. Dept. of Energy (DOE) on May 14 released a new study, "Storage of Captured Carbon Dioxide beneath Federal Lands," indicating massive CO<sub>2</sub> capture and storage (CCS) potential.

The study (see: [link to source document](#) ) complements an earlier CO<sub>2</sub> sequestration atlas for the U.S. and Canada issued last November.

"Estimated at between 126 to 375 billion metric tons of CO<sub>2</sub>, the majority of this storage potential (about 85%) is located west of the Mississippi River, where most of the leasable Federal acreage (92%) is found," DOE said.

According to Victor Der, Acting Assistant Secretary for Fossil Energy, "the availability of Federal lands, in addition to private sites, could provide enormous potential resources to sequester carbon dioxide in the future."

The report addresses issues such as Federal control, location of emission sources, and pipeline rights-of-way, as well as laws and regulations relevant to Federal leasing. Last year's atlas addressed similar issues regarding privately owned acreage capable of storing an estimated 3,500 billion metric tons of carbon dioxide.

## Integrated Gasification Combined Cycle News

### Arizona Public Service Wins \$70MM for Coal Gasification/Algae CO<sub>2</sub> R&D

The U.S. Dept. of Energy announced May 15 that the Arizona Public Service (APS) CO<sub>2</sub>-algae project (previously tapping natural-gas-fired combustion CO<sub>2</sub>) won a \$70.6 million grant to enable further R&D – this time with coal-gasification sourced CO<sub>2</sub>.

"This funding will permit the existing algae-based carbon mitigation project to expand testing with a coal-based gasification system," DOE said. "The goal is to produce [algae-derived] fuels from domestic resources while reducing atmospheric CO<sub>2</sub> emissions.

"The overall process will minimize production of carbon dioxide in the gasification process to produce a substitute natural gas (SNG) from coal. The host facility for this project is the Cholla Power Plant located in Holbrook, Ariz."

APS announced last fall (*see GN 10/29/08*) that it was awaiting delivery of a 40-foot-tall hydrogasification test reactor being built at Canton, Ohio, for research & development.

Tests with the new reactor would support R&D for synthetic substitute natural gas (SNG). CO<sub>2</sub> byproduct would be used to aid biofuels production.

APS already enjoys notoriety for a 2005-2007 test program that produced biodiesel and ethanol from algae, tapping CO<sub>2</sub> in flue gas from an APS natural-gas-fired power plant.

APS and biofuels partner GreenFuels earlier grew algae at APS' Redhawk natural gas power plant "at levels 37 times higher than corn and 140 times higher than soybeans – the two primary crops used for biofuel," APS boasted.

"The results provide evidence of the financial viability of using the emissions of a power plant to grow algae for the exclusive purpose of creating biofuels."

However, its earlier partner, GreenFuels, no longer exists, APS told us. So, APS is looking for a new partner on its latest project.

As for the in-development coal hydrogasification scheme for SNG, this draws upon technology R&D funded in part by U.S. Dept. of Energy's National Energy Technology Laboratory (NETL), APS researcher Ray Hobbs explained in a recent technical paper.

"The proposed system uses hydrogen instead of air or oxygen in the gasification process, an approach that offers higher operating efficiencies, lower water consumption, and a gas product that is richer in methane than other gasification processes," as explained by APS's Hobbs, consultant Nexant and Gas Technology Institute (GTI) in a recent paper

While the project is "still in the very early stages," the APS/Nexant/GTI researchers had analyzed the proposed feedstock (Fruitland sub-bituminous coal already used by APS for pulverized coal power generation), developed test plans, calculated equilibrium yields of major process materials, and started simulation modeling, the technical paper explained.

"Hydrogasification was conceived and developed in part to take advantage of LRC [low rank coal] high reactivity," they explained.

"The APS hydrogasification concept still will encounter the high moisture and ash conditions that make gasification of LRC relatively difficult. Part of the R&D program will be to test systems that feed the coal solids to the pressurized reactor in a way that optimizes the gasifier chemistry without requiring that the gasifier internals are so complex that the commercial version becomes impractical."

Here is what APS told *Gasification News* about the latest project:

*Gasification News: When would APS start building this SNG/coal gasification plant, and where? When would it start operating?*

**APS:** The project will be constructed at APS' Cholla Power Plant in Joseph City, Ariz. Start of construction will depend attaining permits and other factors, but our goal would be to begin construction in the fourth quarter of this year.

*Gasification News: Do you have a rough capital cost estimate for this project?*

**APS:** The anticipated cost of the project is \$90 million. This will be financed with an 80/20 split between the U.S. Department of Energy and an APS team that will be comprised of APS and potential customers of this project.

*Gasification News: How many million cubic feet/year of SNG would you produce? And would you consume the SNG for your own power plant(s) or sell it to others?*

**APS:** The plant is expected to produce two tons a day, and it still has not been determined who will ultimately use the SNG.

*Gasification News: How many thousand tons of CO<sub>2</sub>/year would be captured by the algae in your scheme?*

**APS:** The annual average CO<sub>2</sub> recycle rate is 70 metric tons per acre at 75% capture.

*Gasification News: What type of coal gasification technology would you use?*

**APS:** The technology we're using uses hydrogen to produce the fuel, and it is proprietary to APS. We are patenting this technology.

*Gasification News: Whose SNG technology (methanation catalyst) would you use?*

**APS:** Proprietary to APS.

*Gasification News: What product would be produced from the algae-CO<sub>2</sub> conversion? Biodiesel? Something else?*

**APS:** The plant will produce what we call green diesel, which has the same properties as diesel.

– [Jack Peckham](#)

## Energy Northwest Officially Kills IGCC Proposal

Washington-based power producer Energy Northwest this month officially withdrew an earlier request for permission to build a 680 MW integrated gasification combined cycle (IGCC) plant in the state.

The plant at Port of Kalama would have tapped Washington's ample petcoke supplies from area refiners. But a law passed by the state legislature (SB 6001) requiring a proven scheme for capturing and storing CO<sub>2</sub> made the IGCC project problematic, Energy Northwest said.

The project first stalled in late 2007 when the state's Energy Facility Site Evaluation Council (EFSEC) decided the Energy Northwest application didn't meet carbon sequestration requirements.

Then, EFSEC this month officially voted to accept Energy Northwest's subsequent petition to withdraw the project proposal.

Up until last year, Energy Northwest had been considering a natural gas combined cycle plant as a substitute for the IGCC project at the same site, but the global economic downturn has scotched that plan as well.

Unless and until there's a proven, legal and commercial scheme for CO<sub>2</sub> disposal in Washington state, then Energy Northwest won't be considering another IGCC project, a company spokesman told us.

– [Jack Peckham](#)

## In Other Sectors

### Enerkem Wins Permit for Gasification-based Waste-to-Ethanol in Alberta

Montreal-based Enerkem announced May 20 that it won a permit to build what it calls the "world's first commercial municipal waste to biofuels facility" in Edmonton, Alberta.

The plant will gasify 100,000 tons of sorted municipal solid waste per year, from which 9.5 million gallons/year of ethanol will be produced.

Plant construction is expected to begin by the end of 2009, at an estimated cost of C\$70 million. The city of Edmonton and the Province of Alberta, through the Alberta Energy Research Institute (AERI), are contributing a combined C\$20 million.

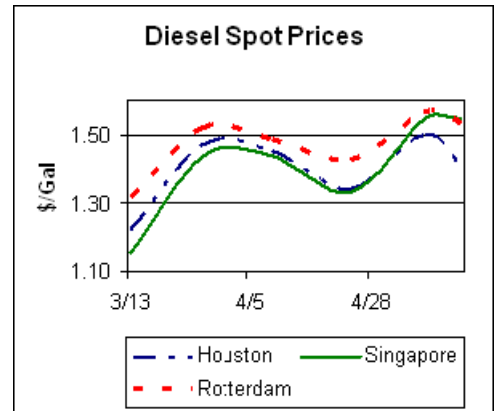
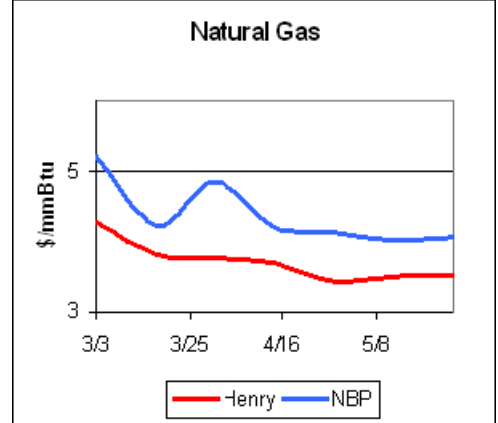
Enerkem employs gasification, sequential gas conditioning and a catalysis technology platform capable of using a mix of feedstock such as sorted municipal solid waste, forest biomass and agricultural residues. Its first commercial-scale plant was built in Westbury, Quebec.

Beyond the Edmonton plant, it recently announced development of a second-generation biofuels production facility in Pontotoc, Mississippi.

The company counts among its financial backers the U.S. venture capital firms Rho Ventures and Braemar Energy Ventures and the Canadian investment fund BDR Capital.

In an interview with *Hart Energy Publishing*, here is what Enerkem's Marie-Hélène Labrie, vice president of government affairs, told us about the scheme:

## Market Snapshot



**Coal Futures June 2009-Nov. 2009**

Changes from Prior Report 05/13/09  
Average Price of Futures Strips in \$/MT

Central Appalachia	40.63	-10%
Newcastle	66.81	6%
Rotterdam	66.54	5%
Richards Bay	60.75	0%

*Hart: What is your cost of production compared to corn-distilled ethanol, sugar-cane ethanol, enzymatic cellulosic ethanol, and ordinary gasoline?*

**Labrie:** For competitive reasons we do not provide information about the cost of our process and our plants.

However, we can say that we are competitive against other fuel producers for the following reasons:

- 1) Our feedstock is not a commodity and is not a cost. We are paid what is called in the waste industry a tipping fee for the municipal solid waste we convert into ethanol. It is a stable source of revenue;
- 2) On the output side, our technology platform allows to produce an array of high-value products such as methanol, ethanol, acetates. We have the flexibility to select the end-product we produce based on market conditions;
- 3) We have a standardized modular plant model with scalable units, which brings cost-efficiency;
- 4) Our extensive gas conditioning makes it possible to use established off-the-shelf industrial catalysts to convert the syngas into alcohols (methanol, ethanol).

*Hart: Do you need government subsidies to make your scheme viable, and if so, then how much?*

**Labrie:** As for any new emerging industry, the government support is key for the commercial deployment of new technologies. This support can be in the form of loan guarantees, grants, production incentives, etc.

-- [\*Jack Peckham\*](#)

## **Air Products, EPRI Ink 'ITM' R&D Deal for IGCC, Oxy-Combustion**

Industrial gas technology provider Air Products and the Electric Power Research Institute (EPRI) on May 21 announced a deal to collaborate on development of the ion-transport membrane (ITM) technology that could slash the cost of oxygen.

The collaborative "will help advance Air Products' on-going ITM project with the U.S. Department of Energy (DOE) to develop this new oxygen production technology, which could significantly increase the efficiency and reduce the costs of advanced coal-fired power plants, both with and without carbon dioxide (CO<sub>2</sub>) capture and storage systems," the new partners said in a joint press statement.

"EPRI's global collaborative efforts will focus on power industry-relevant design cases and features, and specific tests to help advance the overall ITM program toward successful deployment in the power industry."

Ted Foster, director, business development for Advanced Gas Separation at Air Products, said: "EPRI's involvement with this technology is important as EPRI will directly involve the electric utility industry in helping to guide scale-up and integration of ITM technology for clean energy."

ITM employs a ceramic material which, under pressure and temperature, ionizes and separates oxygen molecules from air. No external source of electrical power is required in this process, Air Products said.

"The technology would be an alternative to traditional cryogenic air separation units, the conventional means of producing the large quantities of oxygen required by an IGCC plant and by any oxyfuel combustion power system. ITM technology would typically decrease internal power demand by as much as 30% and capital costs by approximately 30% in the oxygen supply systems at these power plants.

Bryan Hannegan, vice president of environment and generation at EPRI, said: "By reducing the cost of coal gasification and oxy-fuel combustion, ITM technology will help enable a future generation of coal-fired power plants that will capture and store their CO<sub>2</sub> emissions while using less of the world's limited land and water resources."

EPRI estimates the current U.S. power generation industry share of the oxygen market is about 4%, but it could become the dominating market driver, accounting for more than 60% of the future market, or approximately 2 million tons-per-day (TPD) of oxygen by 2040.

Air Products and EPRI will "examine the scale-up of the process and equipment, and the integration of ITM technology with other operations in advanced coal power systems . . .

“Air Products, which has been developing ITM technology since 1988, and the U.S. DOE already are collecting data from the operation of a five tons per day oxygen pilot plant unit near Baltimore, Md. This Baltimore facility leads to the next step of designing, building, and testing a 150 TPD unit, and integrating it with a 5-to-15 megawatt industrial turbo-machinery device. Completion of the 150 TPD intermediate scale test unit is expected in 2010.” -- [Jack Peckham](#)

## Cyclamax Files Application for U.K. WTE Plant

U.K.-based Cyclamax announced this month the filing of a planning application for its third gasification-based waste-to-energy (WTE) plant, this time in Raynesway, Derby.

The 10 MW plant would cost £48 million, Cyclamax said.

The facility would have a 30,000 tons/year processing capacity and would “ensure any waste streams that have not already been subject to recycling are stripped of any materials that can be recovered to ensure the business model adheres to the sustainability principles of the waste hierarchy,” the company said..

Rick Twomey, Cyclamax technical director, said: “We are already in discussions with a number of parties about the exciting possibilities relating to the use of the syngas produced in the gasification process” at Raynesway Resource Park.

Asked to elaborate, Twomey told *Gasification News* that “the Resource Park has an area of some 80,000 square feet that we have set aside for new technology providers.” Such companies might tap syngas from “a new design of super-efficient gasifier,” he said. A company might for instance want to employ “fuel cells that can take relatively dirty gas,” he said. “To help them commercialize their technologies we can provide syngas, waste, heat, etcetera . . .

“The 10 MW of electric [already planned for the site] will use pretty much all of the syngas, but we will be able to turn this down to tap gas off if required.”

More info on the project is at this website: [www.rayneswayresourcepark.co.uk](http://www.rayneswayresourcepark.co.uk) .

-- [Jack Peckham](#)

## SynGest CEO Explains New Corn Cob Gasification-to-Ammonia Scheme

San Francisco-based start-up SynGest recently announced that its first plant to manufacture anhydrous ammonia fertilizer from corn-cob biomass will be built near Des Moines, Iowa.

The company inked an agreement to purchase 75 acres in Menlo in Guthrie County for the plant, with ready access to road and rail transportation.

“The SynGest Menlo plant will use 150,000 tons of locally supplied corn cobs per year to manufacture 50,000 tons of bio-ammonia annually, enough to fertilize 500,000 acres of nearby Iowa farmland under corn,” the company said.

In an exclusive interview following the announcement, here’s what SynGest CEO Jack Oswald told *Gasification News* about the new project:

*Gasification News: What gasification technology will you employ and has it been commercially proven elsewhere?*

**Oswald:** We are using an oxy-blown direct flame gasifier that is in many ways similar to the U-Gas [Gas Technologies Institute] coal gasifier. This will be the first full scale implementation. Nevertheless, it is still a mini-scale gasifier which is sized to the economic biomass collection radius surrounding the facility. We are working with world class gasifier designers to assure success.

*Gasification News: Will your product – ammonia – be produced at lower cost than the conventional natural-gas-to-ammonia product? If so, then why?*

Oswald: Yes. But that partly depends on the price of natural gas. At present with the 'relatively' depressed natural gas pricing we can produce head to head. As natural gas prices rise again with improved economic activity, we will be able to produce and deliver ammonia at a much reduced cost.

The reason for this is that we have a fixed cost of production and our feedstock sources do not rise and fall with the price of energy. Hence, as energy prices rise and stay high we will continually have a cost/price advantage

*Gasification News: How will farmers deliver corn cobs to your plant? Will they remove the kernels first?*

**Oswald:** Standard practice in the industry is to harvest the corn and strip the kernels into a bin with each pass through the field. Currently, the stover and cobs are just put back on the field to degrade naturally.

Each of the major harvesting equipment manufacturers, as well as some startups, have developed a variety of options for simultaneous collection of cobs, stover or both. The equipment add-on or upgrade cost is reasonable given the expected new revenue to be derived from collection of a waste product.

We are likely to enter into contract with a large agribusiness that will collect (or arrange to collect) and deliver the cobs to our facility. In the event that a 'just-in-time' delivery model does not emerge as we begin production, we have acquired sufficient land to store an entire year's worth of supply as needed.

Within a few years, we expect simultaneous corn kernel and corn cob collection to be the norm and a robust commodity exchange and deliver business will emerge to satisfy our needs as well as other business converting cellulose into high value products.

In the U.S. 2008 Farm Bill, there is a provision for incentives to entice farmers to do just this. In addition to a per ton subsidy for a 2 year period, there is a provision to defray some of the startup equipment expenses.

Applying this provision to corn cobs will require the USDA to agree with our interpretation that the corn plant is in fact creating two crops at the same time: (1) corn kernels and (2) biomass. We think this is reasonable and will provide an enormous supply of valuable biomass for energy conversion more quickly than any other approach.

*Gasification News: What is the estimated capital cost of this plant, and do you have financing?*

**Oswald:** We have a budget of \$80 million. We have arranged for financing. More to come on that.

*Gasification News: When would your plant begin producing ammonia?*

**Oswald:** We will likely begin construction in early 2010 and be in full scale production about 18 months later, meaning by the end of 2011. -- [Jack Peckham](#)

## Railroad Tie Gasification Scheme Unveiled

University of North Dakota's Energy & Environmental Research Center (EERC) last week announced a new deal to gasify used railroad ties for heat and power.

The deal would tap the same technology originally developed at EERC's pilot-scale advanced gasification system, which produces clean syngas for combustion generator systems.

"The primary feedstock at this time is wood biomass, including railroad ties," EERC spokesman Derek Walters told *Gasification News*.

"The gasifier system is a downdraft technology that is completely automated for biomass feeding and producer gas cleanup. The system is equipped with online gas analyzers that measure all major gas components.

"Initial tests have shown that a clean, sustainable syngas is being produced on railroad ties, achieving a high rate of gasification reaction and carbon conversion. The gas cleanup system is designed to control particulate matter and residual tar per the specifications of engine or turbine generators."

EERC is working with Aboriginal Cogeneration Corporation (ACC), based in Winnipeg, Manitoba, Canada, to convert biomass to energy in environmentally friendly ways. ACC is working to install two 1 MW commercial clean power systems at its demonstration site northeast of Vancouver at Kamloops, British Columbia, Canada.

"This is a real breakthrough in technology," said Nikhil Patel, Project Manager and Research Scientist at the EERC. "Railroad ties treated with creosote are some of the most difficult biomass feedstocks to process safely



because they contain significant amounts of coal tar. The U.S. Environmental Protection Agency has placed severe restrictions on the disposal of the railroad ties because the tar can be harmful to humans."

EERC's gasifier will meet the stringent environmental regulations of British Columbia and well below U.S. federal regulations, UND said.

"With 25 million used railway ties a year being disposed of in North America, an environmentally challenged material can now be converted into clean green energy," commented Maurice Hladik, CEO of ACC.

"Another priority opportunity exists for the 100 plus native communities on diesel-powered generators. Sustainable quantities of locally harvested wood can be utilized to replace the very costly diesel at a substantial savings in energy costs, plus provide meaningful employment opportunities. In addition, the heat generated could be used in a variety of value-added commercial applications."

EERC Director Gerald Groenewold added: "The potential applications for this technology are endless. This is going to open a lot of doors for the clean utilization of many other renewable fuels and waste products for the production of heat and power throughout the world."

EERC's system, which has been under construction for about 2 months, can process about 35-40 pounds of fuel an hour. The railroad ties are chipped before being fed into the system.

"The system operates at a much lower pressure and flow rate compared to other systems of this type, making it much easier to operate and integrate with other commercially available technologies for generating heat and power," EERC said. – [Jack Peckham](#)

## **‘Chalcogel’ Claims Stake as Better Desulfurization, CO<sub>2</sub>-Separation Catalyst**

Northwestern University chemical researchers claim they've discovered a better hydrodesulfurization and CO<sub>2</sub>-separation catalyst employing a freeze-dried "chalcogel" design.

As described in a *ScienceDaily* report last week, the material offers an improvement over traditional hydrodesulfurization catalysts for diesel and gasoline.

"The Northwestern researchers, in collaboration with colleagues at Western Washington University, report that their material is twice as active as the conventional catalyst used in HDS while at the same time being made of the same parts.

"The material, cobalt-molybdenum-sulfur, is a new class of chalcogels, a family of material discovered only a few years ago at Northwestern. Chalcogels are random networks of metal-sulfur atoms with very high surface areas. The new chalcogel is made from common elements, is stable when exposed to air or water and can be used as a powder."

Details of the chalcogel were to be published in the latest edition of the journal, *Nature Chemistry*.

Mercouri G. Kanatzidis, the paper's senior author, was quoted as saying: "In principle, our catalyst could process and desulfurize twice as much crude oil as the same amount of conventional catalyst. We currently are conducting studies to see how the catalyst operates under more commercial conditions."

The researchers also found that the chalcogel can easily remove carbon dioxide from hydrogen, which could prove useful in syngas cleanup.

## **Gazprom Inks UCG Deal with Vietnam**

Russian natural gas monopoly Gazprom reportedly inked a deal to supply underground coal gasification (UCG) technology with Vietnam's Dong Duong Co.

Vietnam's Ministry of Natural Resources and Environment announced the deal May 15, according to a *Dow Jones* report.

Dong Duong would produce syngas from UCG in the Red River coal basin, the report said. It wasn't explained whether the syngas would be used for power generation.

Elsewhere on the Vietnam UCG front, Vinacomin (a state-owned corporation) has been in talks with Japan's Marubeni and Australia's Linc Energy on a proposed UCG project in the Red River Delta (*Gasification News 3/18/2009*).

Linc said that the first phase of the project would present "an opportunity to develop portable, skid-mounted production units that will provide Linc Energy with a set of tools to routinely and cost effectively undertake trial UCG projects in any location in the future."

The project would aim to "provide syngas for much needed power generation in Vietnam," Linc said.

## **Sasol Nitro Price-Fixing Fine Increases**

Sasol on May 19 announced that price-fixing violations in its fertilizer business were even worse than originally believed, which led the company to agree to pay an even bigger fine to the South African Competition Commission.

"In the course of Sasol's ongoing investigation into anti-competitive behavior within its fertilizer and phosphoric acid business, additional and relevant information was uncovered last week, after intensive and repeated interviews with employees and ex-employees," Sasol said.

"In light of the new information, Sasol tendered an amendment to the previously announced settlement agreement, to expand the scope of the admissions that Sasol made in respect of the anti-competitive conduct in the fertilizer industry.

"The Competition Commission agreed to the amendments but indicated that the amendment would require an increase in the administrative fine, that Sasol agrees to pay in terms of the settlement agreement," Sasol said. Result: the fine increased from R188,01 million [U.S.\$22.3 million] originally, to R250,68 million [U.S.\$29.7 million] as amended.

"Sasol has committed itself to root out any form of anti-competitive behavior and the proactive investigations into this will continue," the company said. – *Jack Peckham*

## **News briefs**

### **MaxWest Touts Start-up of Manure Gasification in Florida**

Houston-based MaxWest Environmental System announced that Sanford, Fla., debuted its wastewater sludge gasification system on May 21.

"The unique MaxWest system will gasify Sanford's treated wastewater sludge to provide renewable 'green' thermal energy to replace energy from natural gas for the City's sludge dryer," MaxWest said.

"Because it is scalable, the gasification facility has sufficient capacity to meet Sanford's expected growth over coming decades and also to serve as a disposal site for other nearby cities and private waste haulers.

"This first of its kind, industry-changing technology will provide Sanford with a long-term, green solution for sludge disposal while saving millions of dollars in natural gas fuel costs. Sanford's 20-year contract with MaxWest also provides long-term energy price stability. And, as the system grows, the opportunity to produce renewable green electricity is available."

Paul Moore, Sanford's Utility Director, said: "We're pleased to be leading the country in using waste to energy technology by being the first to utilize the MaxWest gasification system to convert our biosolids into green energy."

MaxWest gasification systems are also in commercial operation for animal and industrial waste. The company has several projects in design or under development in Florida and other states, including plans to gasify horse "muck" in Ocala/Marion County, Florida, the "horse capital of the world."

## **Metallica Unit Completes New Queensland UCG Drilling Project**

Australia's Metallica Limited announced this month that its 84%-owned MetroCoal unit completed a second drilling program on MetroCoal's wholly owned underground coal gasification (UCG) project in the Surat Basin, northwest of Brisbane.

The targeted coal resource "has no overlapping petroleum tenure issued under the P&G Act and, in accordance with the recently announced State policy regarding overlapping tenure, MetroCoal will be granted exclusive tenure over the MDLA 406 area," Metallica said.

The targeted coal seam "could be capable of supporting a coal gas-to-liquids (GTL) plant producing 20,000 barrels of liquid fuels per day for more than 20 years and is expected to increase as the drilling program expands," Metallica said.

## **Cougar Targets 2<sup>nd</sup> Queensland UCG Project with New Drilling Campaign**

Australia's Cougar Energy announced this month that it has begun a new drilling campaign on its Wandoan lease in the Surat Basin, designed to establish a JORC-compliant coal resource estimated at between 200-300 million tons.

The Wandoan project is separate from Cougar's other UCG and power-station project at Kingaroy, also in Queensland. That project is in "first-stage" development of what eventually would include a 400-MW power plant tapping UCG syngas.

Cougar managing director Len Walker said of the latest campaign: "We understand the seam's respond to the UCG process and would have great confidence in being able to rapidly develop a large project on our lease, which would use the UCG gas for a variety of applications."

## **Florida's Jackson County Funds WTE Gasification Study**

According to a report from the *Jackson County (Fl.) Floridan*, Jackson County Commissioners voted this month to approve a \$25,000 study on possible gasification of municipal solid waste at the old East Landfill, "a long-closed facility with lingering issues."

"The county had previously set aside \$25,000 to pay a company to design a pump-and-treat program, meant to reduce contamination of groundwater at the old landfill to levels deemed acceptable by the Florida Department of Environmental Protection," the report said.

"In March, the state gave the county 90 days to develop a remedial action plan, and initially had green-lighted exploration of the pump-and-treat approach."

But later, DEP changed its mind about pump-and-treat and instead encouraged the county to look for other options.

"The county's response was to offer the alternative of gasification, a high-temperature process that introduces oxygen and steam into the landfill in order to convert the material to a synthetic gas," the report said.

"The county commission approved a change order to its contract with Jones Edmunds and Associates, the company it initially hired to do the pump-and-treat study.

"Instead, the firm will use the \$25,000 to do work associated with determining whether a gasification system would be workable. The money will help pay for initial costs such as the development of monitoring wells, analysis of water samples and creation of proposals associated with this new option."

## **U.S. NREL Analyzes Proposed 'Renewable Electricity Standards'**

U.S. Department of Energy's National Renewable Energy Laboratory this month completed a study comparing three proposed U.S. federal renewable electricity standards, also known as renewable portfolio standards.

None of the proposals includes a specific credit or assumption for the expansion of gasification-based waste-to-energy (WTE) projects. But coal/biomass co-firing for electric power is expected, under all the legislative proposals.

The NREL analysts used the lab's "Regional Energy Deployment System," a detailed least-cost optimization model capable of simulating the special attributes of variable sources like wind and solar power.

The NREL report, "A Comparative Analysis of Three Proposed Federal Renewable Electricity Standards," is available [here](#).

Lawmakers in some U.S. 28 states and the District of Columbia have established schedules that mandate minimum uses of renewable energy, typically within the next two decades.

The three proposed federal laws examined in the NREL assessment are under consideration by committees of the U.S. House of Representatives and the U.S. Senate. The three proposals were compared against a baseline in which only currently enacted laws are considered.

Douglas Arent, director of NREL's Strategic Energy Analysis and Applications Center, said the modeling study "provides a useful picture of how the electricity sector might develop in the next several decades under various policy scenarios."

## Global Hotspots In This Issue



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