Statistics and Supporting Information

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Coal Stats

Global Production

Coking Coal – World Coal Production (thousand tonnes)

	World	OECD	Non OECD	Europe	Former USSR	North America	Canada	Latin America	Asia	Aus. & NZ	Africa
2000	951,490	235,818	238,927	45,088	89,085	84,665		602	146,927	108,078	2,300
2004E	1,085,660	233,038	309,792	41,512	98,602	72,920	29,950	647	208,182	118,606	2,361

Thermal Coal – World Coal Production (thousand tonnes)

	World	OECD	Non OECD	Europe	Former USSR	North America	Canada	Latin America	Asia	Aus. & NZ	Africa
2000	6,306,342	1,158,635	1,994,536	163,309	196,758	854,455		52,702	1,520,402	136,994	228,551
2004E	8,172,752	1,215,740	2,870,636	144,449	256,758	900,172	38,320	70,416	2,301,862	171,486	241,233

Canadian Production

Province	Year	Metallurgical	Thermal	TOTAL
Alberta	2005	3,450,000	26,782,000	30,232,000
	2010	3,000,000		3,000,000
BC	2005	26,500,000	520,000	27,020,000
	2010	33,300,000	Unknown	33,300,000
Saskatchewan	2005	n/a	11,018,000	11,018,000
	2010	n/a		0

2005 TOTAL: 68,270,000 tonnes

NOTE THAT 2010 totals don't include estimates from some major producers

Luscar's Thermal Consumption and Export to Ontario

Province	Year	Produced	Consumed	Export to ON
Saskatchewan	2004			
	2005	11,018,000	9,618,000	1,400,000
Alberta	2004			1,651,000
	2005	26,782,000	25,282,000	1,500,000

Canadian Coal Energy Exports (2003)

734,947 terajoules

Canadian Coal Energy Imports (2003)

599,784 terajoules

Canadian Economics of Coal

Metallurgical (Elk Valley)

- **Elk Valley Coal**: 2700 direct jobs (9450 indirect jobs); $177 million in salaries & benefits; $900 million in expenditures ($400 million in the Elk Valley); $80 million (not including corp. taxes) in taxes; $7 million in property taxes.
- **Rest of BC: $**100 millions in Exports & Expenditures; new tax revenues; 1000s of jobs; new power generation; and stability at RTI

Coal Generating Capacity by Province and % of Installed Capacity

Province	Coal Capacity, MW	Generation, % of Total	Coal Type
Alberta	5,786	67	Sub-bituminous
Saskatchewan	1,624	57	Lignite
Manitoba	237	7	Bituminous
Ontario	7,561	29	Bituminous (imported)
New Brunswick	537	19	Bituminous
Nova Scotia	1,240	60	Bituminous
TOTAL	**16,985**	**18**	

[Source: Canadian Clean Power Coalition]

Clean Coal Technologies

International

14 current IGCC plants online globally. [Source: Eastman]

Carbon Sequestration Leadership Forum

An international climate change initiative that focuses on technology sharing and fostering innovation and cross-pollination of ideas between member countries' individual sequestration initiatives.

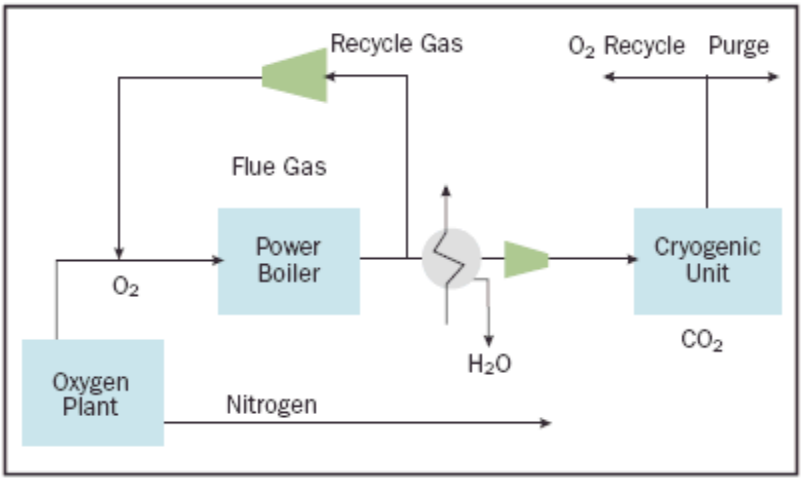
International Energy Agency

The IEA is currently researching conventional means of carbon sequestration, along with what it has dubbed "novel concepts" which include:

- **New Power Cycles**
  - CO2 use as working fluid of power cycle, fuel combusted in relatively pure O2 in an O2/CO2 environment)

- **Chemical Looping**
  - Metal oxide is used to transfer O2 to the fuel, eliminating direct contact with combustion air. Combustion occurs in 2 steps in 2 reactors, beginning in the reduction reactor, where the fuel is oxidized by the metal oxide and the metal oxide is reduced to a lower oxidation state in the reaction with the fuel. The metal oxide is then transported to the second reactor — the oxidation reactor — where it is re-oxidised by O2 in the air.

Figure 9
Chemical Looping Combustion



Source: IEA GHG R&D Programme

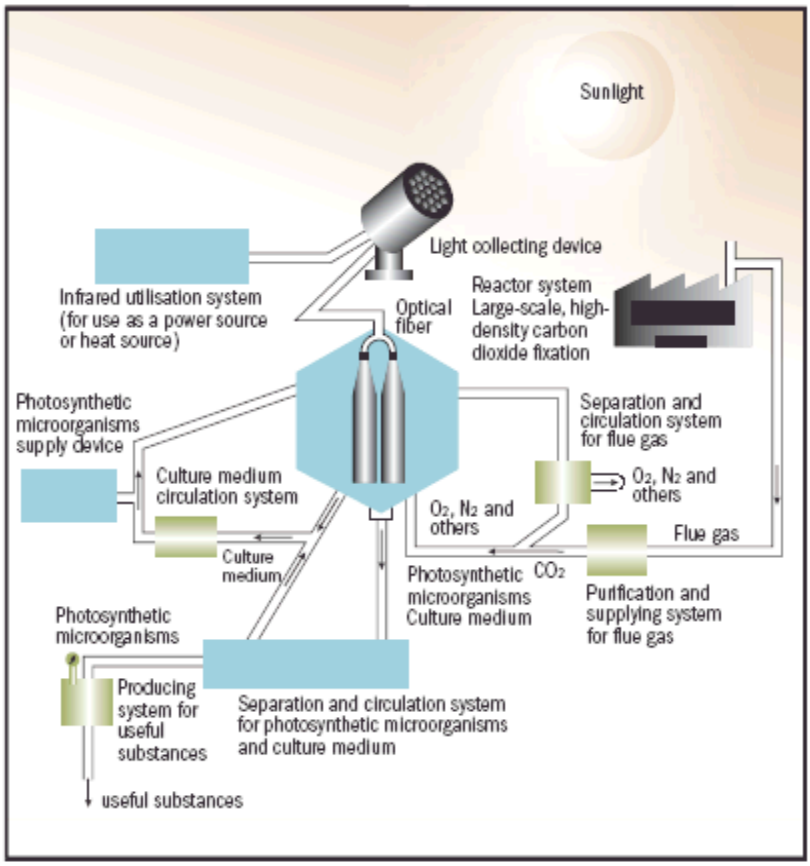
- **Dry Ice Co-Generation**
  - By expanding highly compressed CO2 from a quasi-combined cycle, solid CO2 (dry ice) can be produced. Sublimation of CO2 due to heat through thermal insulation is slow enough to delay emissions of an ordinary power plant over about a millennium. The dry ice could be used in the food industry or stored in large thermally insulated repositories.

- **Biological CO2 Fixation with Algae**
  - Biological fixation utilises algae that are optimised for high CO2 feeding and photosynthesis of organic matter. CO2 produced by ordinary fossil-fuel power plants is used to cultivate algae in large open ponds (a pond area of about 50–100 km2 would be needed for a 500 MW power station). The captured CO2 would be bubbled through the ponds. The algae can be

converted into either methane-gas or biodiesel, or alternately incorporated into building materials. Some algae might also be used as a biofuel at power plants.

Figure 10

Biological CO_2 Fixation



Source: National Institute of Advanced Industrial Science and Technology, Japan

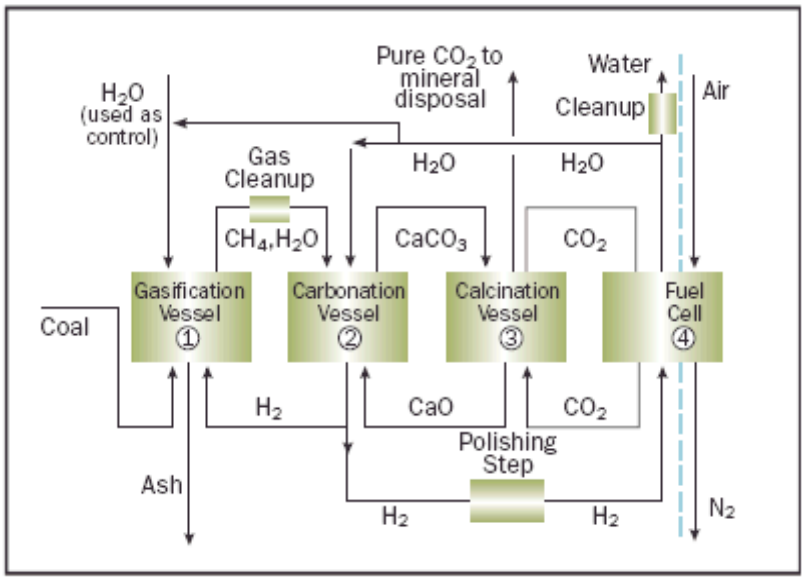
- **Hydrate Formation**
  - Under partial pressures and near-freezing temperatures, CO2 hydrates (an ice-like material) may be formed from synthesis gas (a mixture of mostly CO and H2). Before forming a hydrate, water is "nucleated" using high-pressure CO2 to form clusters of molecules that adhere onto additional CO2, which further purifies the H2 gas. Continued hydrate formation takes place in a venturi reactor. The hydrate can theoretically be decomposed by temperature swing using only one-fourth of the energy required for typical amine regeneration. It is proposed that the hydrates could be transported as a slurry in chilled pipelines at much lower pressures than supercritical CO2, reducing the costs of compression prior to entry into a pipeline system. The slurry might be sequestered directly in the ocean or in a deep aquifer. The purified H2 gas could then be used in an IGCC power plant or combined with a fuel cell to produce electricity.

This technology is in the early stages of development, and the costs associated with fuel gas compression remain high.

- **Direct Capture of CO2 from Air**
  - Ambient CO2 could be removed from the air and involves processing on the order of up to 1% of the earth's atmosphere each year. The low CO2 concentration in air limits the choice of collection methods and chemical or physical absorption appear to be the only viable options. As the air blows over an absorber surface, lime can be used as the capture agent. A slight pressure gradient must be maintained in order to keep the gas flowing through an absorption system, and the rate of absorption depends on the wind speed and efficiency of the absorber. While there are a number of possible design options, one example is to pump water to the top of a convection tower to cool the air, which causes a downdraft inside the tower. The air leaving at the bottom could drive wind turbines or flow over CO2 absorbers. Based on the volumes of airflow and the potential energy of the cold air generated at the top of the tower, the tower could generate electricity after pumping water to the top. The same airflow would carry CO2 through the tower for disposal. Large amounts of energy would be required for this process and many issues surrounding its viability require examination.

- **Zero Emissions Coal**
  - The zero emission coal (ZEC) power plant utilizes anaerobic H2 production to generate electricity. This process integrates coal gasification, H2 production ia calcium oxide carbonation, and limestone calcination, while incorporating a fuel cell system. The anaerobic H2 production process is an industrial, elevated-temperature process that requires no air (hence anaerobic), involves no combustion, and requires no heat input. Aside from coal, the process requires only water and CaO as inputs, the latter two being continuously recycled. ZEC technology features a mineral carbonation concept, but could employ other sequestration techniques to dispose of CO2.

Figure 11
Inside a ZEC Power Plant



Source: Zero Emissions Coal Alliance

Canada

Canadian Clean Power Coalition

Currently in the process of researching, designing and constructing an integrated gasification combined cycle (IGCC) demonstration plant powered by advanced coal technologies by 2012. The initial assessment of technology gaps has been completed, and based on identified gaps plans are being amended. Site selection is underway. The planned plant also include CO_2 sequestration technology. The review of available gasification processes is completed, and the CCPC is now working with a short list of 3 developers to evaluate benefits of projected gasification process upgrades to performance & costs.

Expected outcomes from Phase II include:

- Optimization of the 3 technology options for clean coal with CO2 capture.
- Refine the capital and operating cost estimates, price of power and cost of CO2 removal.
- Develop the business case to select site and technology for demo project.
- Will allow planning for the implementation phase to build and operate the demonstration plant to proceed.
- Completion by mid-2006.

Possible sites being considered for the plant are:

- Shand in SK and/or Keephills, AB
- Athabasca Oil Sands, Alberta

- Refinery applications in Alberta or Saskatchewan that need power, steam, hydrogen

The plan's timeline is as follows:

2000: Formation & planning
2001 - 2003: Phase I technology studies
2004: Results assessment and Phase II formation
2004 - 2006: Phase II optimization studies
2006: Status assessment & commitment to demo project
2007 - 2011: Design & construction
2012: Operation

[Source: CCPC, canadiancleanpowercoalition.com]

United States

FutureGen

In 2003, President Bush announced the US government was launching a 10 year, $1 billion initiative to create the world's first zero-emissions electricity and hydrogen plant.

The project will employ coal gasification technology integrated with combined cycle electricity generation and the sequestration of carbon dioxide emissions. The project will be supported by the ongoing coal research program, which will also be the principal source of technology for the prototype. The project will require 10 years to complete and will be led by an industrial consortium representing the coal and power industries, with the project results being shared among all participants, and industry as a whole.

In the operational phase, the project will generate revenue streams from the sales of electricity, hydrogen and carbon dioxide. The revenue will be shared among the project participants (including the U.S. Government) in proportion to their respective cost-sharing percentage.

Eastman Gasification

Eastman has achieved world-class success in coal gasification for over 20 years. In 1983 Eastman opened the first gasification facility in the United States, which has since been declared an ACS National Historic Chemical Landmark.

Contaminants are removed before combustion. More than 99.9% of sulphur is removed (using Rectisol), and Eastman uses a patented sulphur-free start up process. Rectisol also removes CO2.

Building on their successful track record operating a gasification plant, Eastman is seeking to sell their services to others looking to enter the gasification market, as consultants and equipment suppliers.
[Source: Eastman presentation]

Gasification Plants Currently Online

[Source: US Department of Energy]

Tampa Electric's Polk Station

The Polk Power Station near Mulberry, Florida, is the Nation's first "greenfield" (built as a brand new plant) commercial gasification combined cycle power station.

Capable of generating 313 megawatts of electricity - 250 megawatts of which are supplied to the electric grid - the power plant is one of the world's cleanest. The plant's gas cleaning technology removes more than 98 percent of the sulfur in coal, converting it to a commercial product. Nitrogen oxide emissions are reduced by more than 90 percent.

The Wabash River Repowering Project

The Wabash River Coal Gasification Repowering Project was the first full-size commercial gasification-combined cycle plant built in the United States. Located outside West Terre Haute, Indiana, the plant started full operations in November 1995.

The plant can generate 292 megawatts of electricity -- 262 megawatts of which are supplied to the electric grid -- making it one of the world's largest single train gasification combined cycle plants operating commercially.

In 2002 DOE approved plans to site the world's first clean coal technology-powered fuel cell at the Wabash River Plant. The installation of the two fuel cell modules is nearing completion and testing is expected to be conducted after shakedown.

Europe

AD 700 Power Project

The AD 700 Power Plant involves collaboration between the European Commission and industry and is one of the projects financed by the EU's Fifth Framework R, D&D Programme. The focus is on establishing ultrasupercritical steam conditions, while at the same time developing improved power plant designs to minimise capital investment. The project aims to raise efficiencies to 55%, resulting in lower fuel consumption and a reduction in CO_2 emissions of almost 15%. [Source: WCI, worldcoal.org]

Australia / New Zealand

Coal 21

COAL21 is a major initiative of the Australian Coal Association, involving key stakeholders across industry, government and researchers, working to develop and initiate a strategy to move Australia along the road towards near-zero emission electricity production from coal. The programme started in early 2003 with an extensive, 12 month consultative process. This culminated in the release in early 2004 of a zero-emissions coal technology roadmap and action plan for Australia focusing on the trial and

demonstration of key technologies. The first annual COAL21 conference was held in April 2005 to mark a year since the launch of the COAL21 National Action Plan.

Their CO2 Capture Project (CCP), a joint project funded by the European Commission, the US Department of Energy and Klimatek (Norway) has moved into Phase Two. "The second phase of the project, builds on the achievements of Phase 1 by developing a focused suite of capture technologies to be ready for pilot testing by the end of 2007." The focus is on both emission reduction and carbon capture/sequestration. Emission capture technologies being tested include: Post-Combustion Scrubbing, Pre-Combustion Decarbonization (Hydrogen), and Oxyfuel ("Oxygen is separated from air and then burned with hydrocarbons to produce an exhaust with a high concentration of CO_2 for storage").

Gasification Research

The CRC for Black Coal Utilisation and CSIRO Division of Energy Technology has established a research facility at CSIRO's Pinjarra Hills laboratories in Queensland which will be used to evaluate the performance of Australian coals at the high temperature, high pressure conditions of advanced power generation processes.

The CRC for Black Coal Utilisation and CSIRO Division of Energy Technology has established a research facility at CSIRO's Pinjarra Hills laboratories in Queensland which will be used to evaluate the performance of Australian coals at the high temperature, high pressure conditions of these advanced power generation processes.

Currently the facility is purely research-oriented, no generation for transmission occurs.

[Source: Science Spotlight, www.cat.csiro.au/3_4.htm]

Supercritical Plants Currently Online

Australia has four supercritical coal plants currently online:

- Callide Power Station (460 MW)
- Millmerran Coal Thermal Power Plant (840MW)
- Tarong North Power Station (450MW)
- Kogan Creek Power Project (750MW)

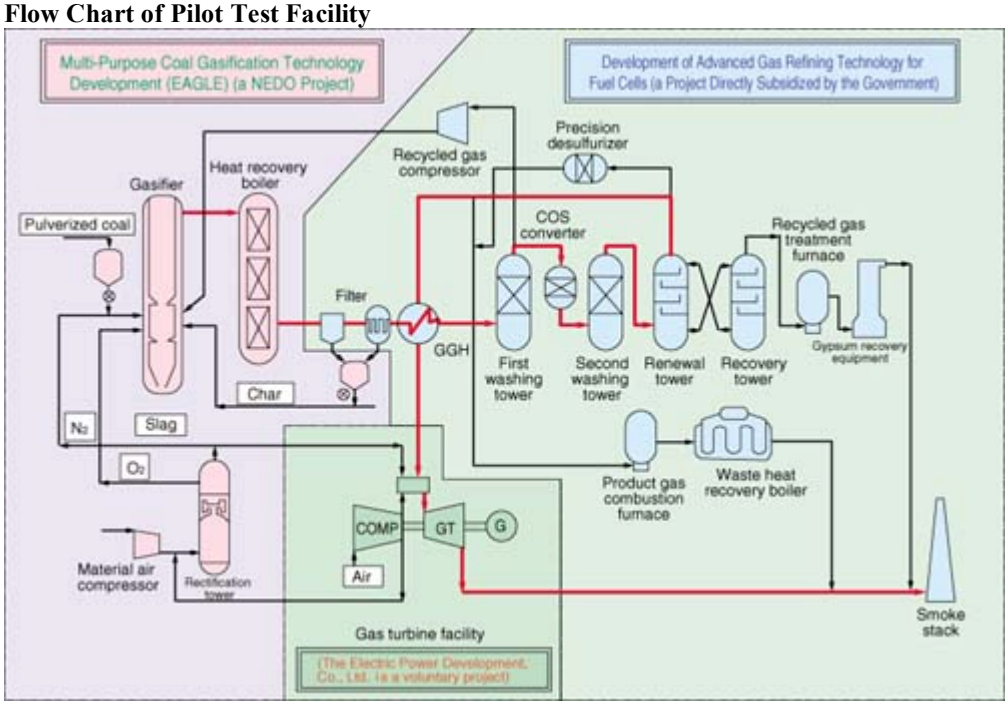
Japan

Multi-Purpose Coal Gasification Technology Development (EAGLE)

The Multi-Purpose Coal Gasification Technology Development (EAGLE) Project aims to develop the most advanced oxygen-blown, single-chamber, dual-stage, spiral-flow gasifier that can efficiently produce synthetic gas ($CO+H_2$). This will establish coal gasification technology that can be applied to a wide range of uses, such as for chemical materials, hydrogen production, synthetic liquid fuel, and electric power. Utilization of this type of a gasifier could be combined with gas turbines, steam turbines, and fuel cells, thereby achieving highly efficient power generation in which CO_2 emissions are decreased by up to 30% compared to existing thermal power plants.

With a budget of just 1 million Yen (approximately $10,000 CAD) it seems likely that this project will be seeking ways to utilize cutting edge research developed under other global initiatives rather than conducting any R&D itself.

Flow Chart of Pilot Test Facility



Company Profiles

<table>
<tr><th>Company Name</th><th>Mine Locations</th><th>Reserves</th><th>2005 Production</th><th>2010 Production</th><th>Issues / Concerns</th></tr>
<tr><td>Fortune Minerals Ltd.</td><td>Lost Fox, Mt. Klappan property, northwest BC, Canada</td><td>65,000,000 metric tons of product coal from Lost Fox deposit</td><td>0</td><td>1,500,000</td><td>• Transportation infrastructure
• Taxes & royalties
• Coal to oil conversion technology</td></tr>
<tr><td>Cline Mining Corporation</td><td>Sage & Cabin Creek, and Lodgepole in Southeatern BC closest town is Fernie

Lossan in Northeastern BC Closest town is Chetwynd</td><td>NI 43-101 Compliant Surface Mineable Coal Resources
<table><tr><th>Property</th><th>Measured</th><th>Indicated</th><th>Inferred</th><th>Total</th></tr><tr><td>Sage & Cabin Creek</td><td>84.4</td><td>70.4</td><td>-</td><td>154.8</td></tr><tr><td>Lossan</td><td>2.2</td><td>3.7</td><td>14.2</td><td></td></tr><tr><td>Lodgepole</td><td>49.6</td><td>22.5</td><td>10.4</td><td>82.5</td></tr><tr><td>Total</td><td>136.2</td><td>96.6</td><td>24.6</td><td>257.4</td></tr></table></td><td>0</td><td>2 to 3 million tonnes</td><td>Ensure the public is aware of the limited environmental impact associated with most Canadian coal mines and the solid record established by the industry</td></tr>
<tr><td>Western Canadian Coal Corp.</td><td>Dillon Mine</td><td>1 million tonnes</td><td>800,000 tonnes</td><td>5 million tonnes</td><td>• Transportation costs
• Mine permitting regulations and timelines.</td></tr>
<tr><td>Elk Valley Coal Corp.</td><td colspan="3"><table><tr><th>Mine</th><th>Location</th><th>Reserves (mmt)</th><th>2005 Prod</th><th>2010 Prod</th></tr><tr><td>Fording River</td><td>Elkford, BC</td><td>257</td><td>9.7</td><td>10.5</td></tr><tr><td>Greenhills</td><td>Elkford, BC</td><td>98</td><td>5.2</td><td>5.5</td></tr><tr><td>Line Creek</td><td>Sparwood, BC</td><td>28</td><td>2.7</td><td>2.5</td></tr><tr><td>Elkview</td><td>Sparwood, BC</td><td>249</td><td>5.7</td><td>7.0</td></tr><tr><td>Coal Mountain</td><td>Sparwood, BC</td><td>17</td><td>2.4</td><td>2.8</td></tr><tr><td>Cardinal River</td><td>Hinton, AB</td><td>61</td><td>1.8</td><td>3.0</td></tr><tr><td></td><td></td><td>710</td><td>27.5</td><td>31.3</td></tr></table></td><td></td><td></td><td>None mentioned</td></tr>
<tr><td>Hillsborough Resources Ltd.</td><td>Quinsam (BC) 520,000MT

Crossville (USA) 600,000</td><td>Quinsam (BC) 35,000,000
Bingay (BC) 20,000,000
Tumbler Ridge (BC) 230,000,000
Crossville (USA) 11,000,000</td><td>Quinsam 520,000 MT

Crossville 130,000 MT</td><td>6,500,000 (from USA and Canada)</td><td>• Coal-fired power production/generation in BC (This is an absolute priority!)
• Kyoto
• Land use
• Markets
• High Canadian dollar
• Taxes
• Permitting
• Skilled labor shortage
• Long delays on delivery of equipment purchases</td></tr>
<tr><td>Grande Cache Coal Corp.</td><td>No. 7 Underground Mine, Grande Cache, Alberta. (Monthly production approximately 0.1 million tonnes ROM.)

No. 12 South B2 Surface Mine, Grande Cache, Alberta. (Monthly production approximately 0.1 million tonnes ROM.)</td><td>• In-Place: 49.3 million tonnes
• Recoverable: 39.2 million tonnes
• Saleable: 29.5 million tonnes</td><td>Current fiscal year production is about 1.65 million saleable tonnes.</td><td><u>Total ROM tonnes:</u>

Oxydized: 110,000

Met: 3,330,000

TOTAL: 3,440,000

<u>Clean coal tonnes:</u>

Oxydized: 110,000

Met: 2,500,000

TOTAL: 2,610,000</td><td>• Regulatory reform: streamlining approvals process; federal involvement is inefficient and daunting
• Coal leasing: Alberta; Category 4 zoning should be respected.
• Selenium: industry-government collaboration is proceeding
• Kyoto: press for approach based on continuous improvement not legislated targets
• Transportation
• Provincial royalties: producers of export coal in Alberta must remain competitive with producers in British Columbia, as well as international producers from countries such as Australia, and not be disadvantaged due to taxation issues. Coal Royalty payments in Alberta can become a substantial portion of cash flows. Also, royalties must be applied fairly and consistently within the province, which currently does not appear to be the case. For example, rates applicable to subbituminous coal and bituminous coal differ, providing more favorable treatment to one segment.</td></tr>
</table>

Mining Overview

Top 3 Issues

- Taxes & royalties* (3 mentions)
- Mine permitting regulations and timelines (streamlining approvals process; federal involvement is inefficient and daunting) (3 mentions)
- Transportation costs & infrastructure (3 mentions)

Other Issues Cited by Members

- Skilled labor shortage
- Ensure the public is aware of the limited environmental impact associated with most Canadian coal mines and the solid record established by the industry
- Coal to oil conversion technology
- Kyoto
- Coal-fired power production/generation in BC (This is an **absolute** priority! - Hillsborough)
- Land use
- Markets
- High Canadian dollar
- Long delays on delivery of equipment purchases
- Coal leasing: Alberta; Category 4 zoning should be respected.
- Selenium: industry-government collaboration is proceeding
- Kyoto: press for approach based on continuous improvement not legislated targets

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* Producers of export coal in Alberta must remain competitive with producers in British Columbia, as well as international producers from countries such as Australia, and not be disadvantaged due to taxation issues. Coal Royalty payments in Alberta can become a substantial portion of cash flows. Also, royalties must be applied fairly and consistently within the province, which currently does not appear to be the case. For example, rates applicable to subbituminous coal and bituminous coal differ, providing more favorable treatment to one segment.