



CIV E 240

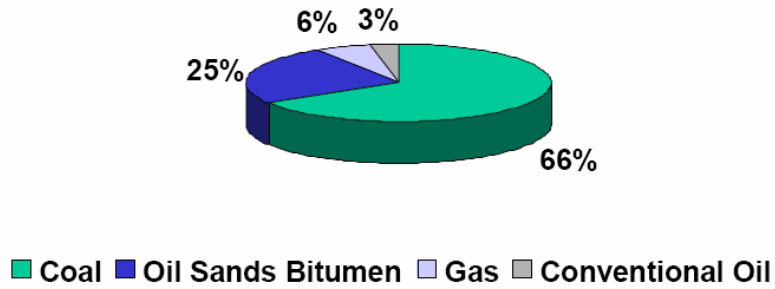
Technical Communications

EPCOR Genesee Generating Station Phase 3
Project Background
Tuesday, January 9, 2007
Dr. Warren Kindzierski
Dept. Civil & Environmental Engineering

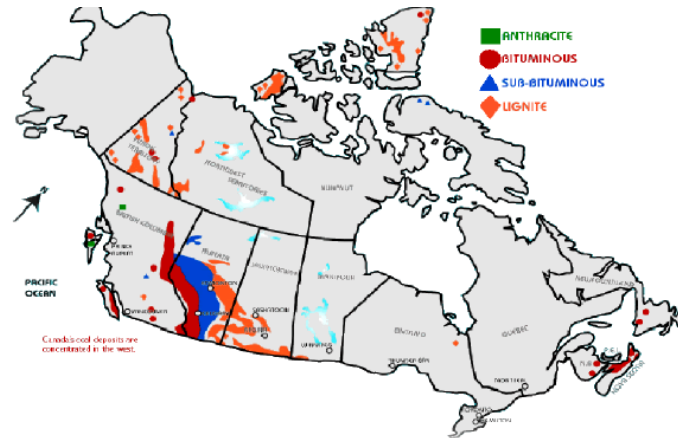
Presentation Resources

- EPCOR Generating Station Phase 3 EIA Application. EPCOR, Edmonton, AB. July 2001.
 - EPCOR website (www.epcor.ca/) accessed December 2006.
 - Alberta Electric System Operator website (www.aeso.ca) accessed December 2006.
 - Canadian Clean Power Coalition website (www.canadiancleanpowercoalition.ca) accessed December 2006.
-

Breakdown of Canada's Fossil Fuel Energy Reserves



Canadian Coal Distribution



Estimated Quantities of Coal in Alberta (GT)

		Production	Remaining Reserves	Ultimate Potential	Ultimate in place
Low and Medium Bituminous	Surface	0.2	0.6	1.2	2.7
	Underground	0.1	0.6	2.0	18.0
High Volume Bituminous	Surface	0.1	1.8	7.5	10.0
	Underground	0.0	0.9	150.0	490.0
Subbituminous	Surface	0.7	8.3	9.3	14.0
	Underground	0.1	21.1	460.0	1,400.0
Total		1.2	33.3	630.0	1,934.7

Alberta Electricity Generation Capacity

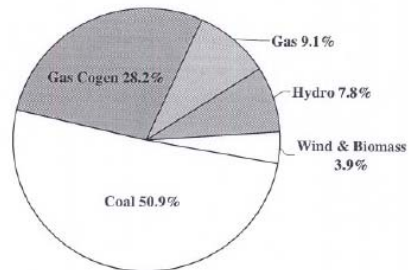
Alberta Generating Capacity [MW]

Coal	5,840
Gas	4,277
Hydro	900
Wind	275
Biomass	178
Fuel Oil	8
Subtotal	11,477

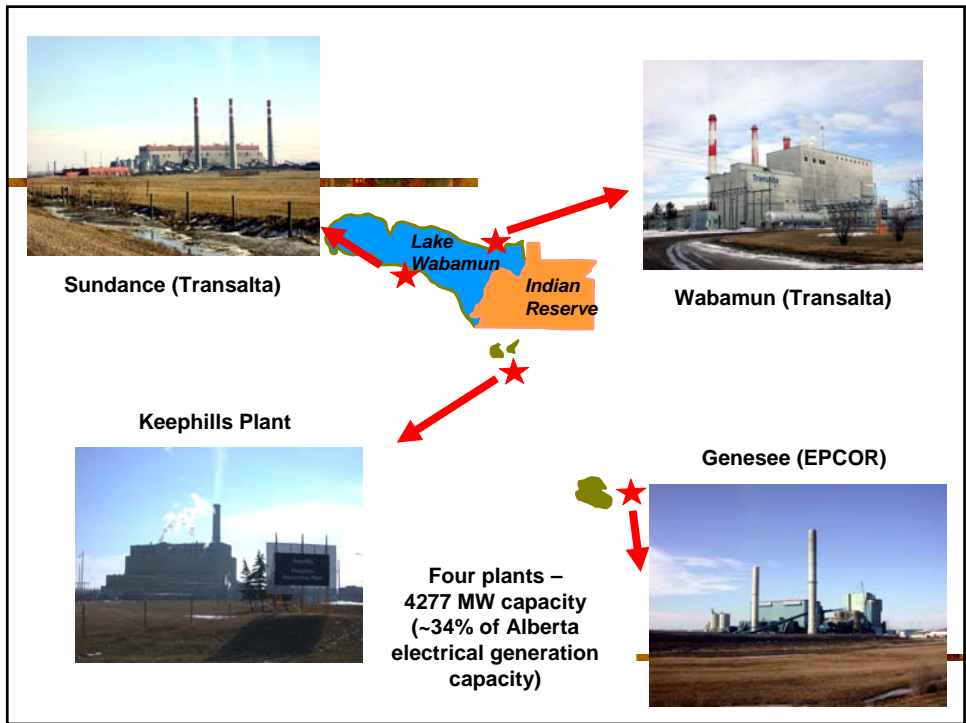
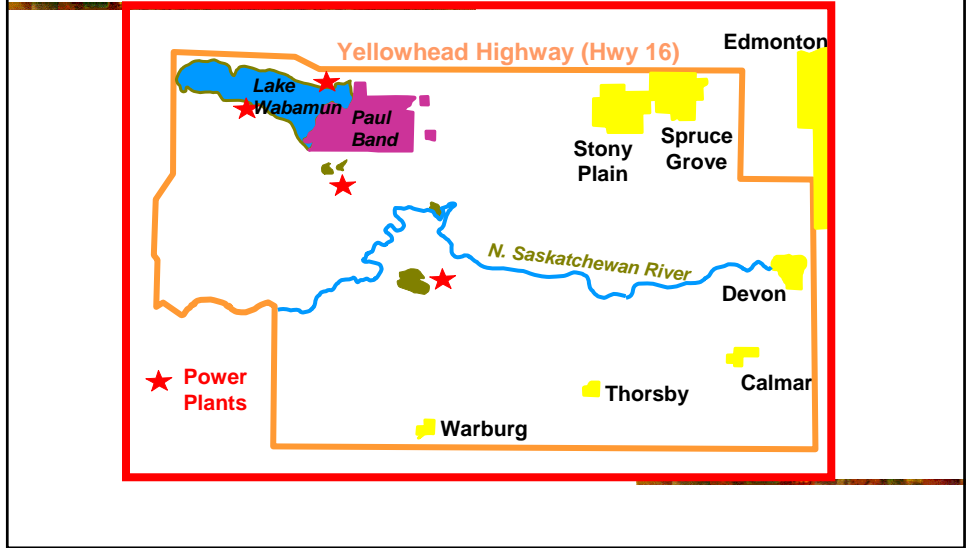
Interconnections

British Columbia	800
Saskatchewan	150
Subtotal	950

Grand Total 12,427



Development of Wetaskiwin Surface Coal Deposits – Four Coal Fired Power Plants



Genesee Generating Station



Genesee Generating Station (con't)

- EPCOR coal-fired power plant providing power to province.
- Three generating units:
 - units G1 & G2 – each 381 MW net/410 MW gross (built in 1989 and 1994, respectively)
 - unit G3 – 450 MW net/490 MW gross (\$695 M unit recently completed in 2005)*
- Large surface mine adjacent to station.

Genesee Generating Station (con't)

- Located 60 minutes southwest of Edmonton.
 - Operating design parameters for G1 & G2:
 - each unit has net annual production ~3,150 GWh
 - each unit requires ~1.7 million tonnes of coal annually
 - each unit produces 39 tonnes of ash per hour
-

Genesee Generating Station (con't)

- Operating design parameters for G3:
 - typical net annual production – 3,745 GWh
 - requires 1.8 million tonnes of coal annually
 - ash production ~41 tonnes per hour
 - G1/2/3 coal requirements – 5.2 to 5.4 million tonnes annually
 - G1/2/3 ash production – 119 tonnes per hour
 - G 1/2/3 uptimes ~92%
-

Genesee Mine Site

- Joint venture of EPCOR and Fording Coal Ltd.
- Operated using draglines, loaders, trucks, bulldozers.
- Coal seams exposed by two draglines (50.5 m³ and 81 m³ buckets) and world's longest boom – 128 m length.
- Mining parameters:
 - 170 million tonnes, sub-bituminous B coal – 40-yr supply
 - depth of overburden range – 3 to 60 metres
 - mining rate for G1/2/3 – 5.2 to 5.4 million tonnes per year

Genesee Mine Site



Genesee Mine Dragline Operations



Genesee Coal Handling Facility & Settling Ponds

Settling
Ponds



Coal
Handling
Facility

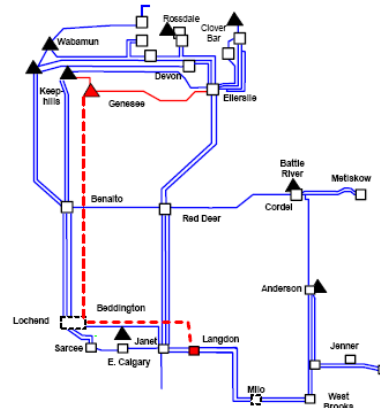
Genesee Cooling Pond

- Artificial pond covering 735 hectares.
- Contains 34 million cubic metres (m³) of water.
- Can provide cooling water for up to four 400 MW units (1,600 MW combined).
- Water level in pond maintained by pumping water from North Saskatchewan River and supplemented with local runoff.

Satellite View of Genesee Generating Station Project Components



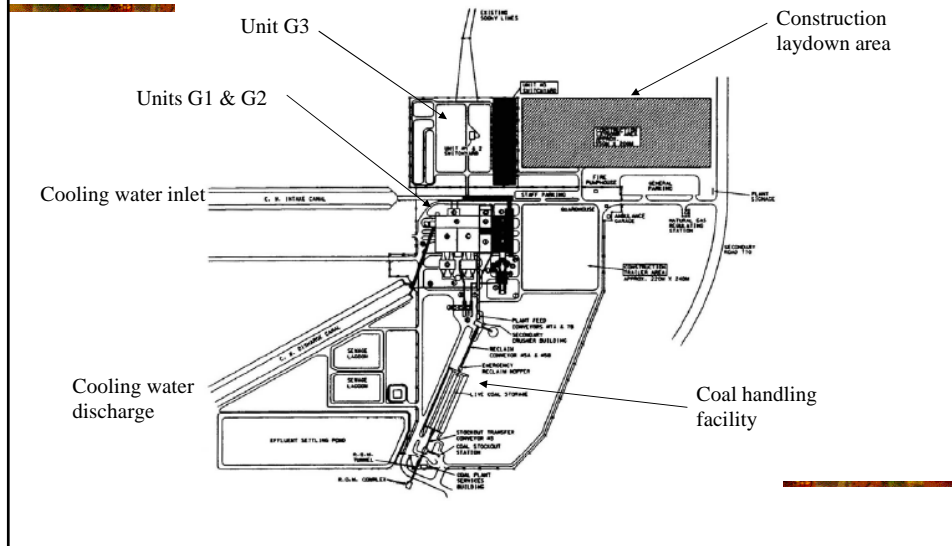
Edmonton-Calgary 500 kV Transmission Line Development



G3 Supercritical Boiler Technology

- Higher temperatures and steam pressures together with high efficiency steam turbine create a more efficient process for converting thermal energy into electricity.
- Process uses less coal per MW hour of electrical energy than conventional subcritical process, thereby reducing emissions.
- Furnace temperatures of supercritical pressure boiler reaches 1,400°Celsius.
- G3 boiler produces steam at 26 Megapascals - ~50% higher than G1 & G2.

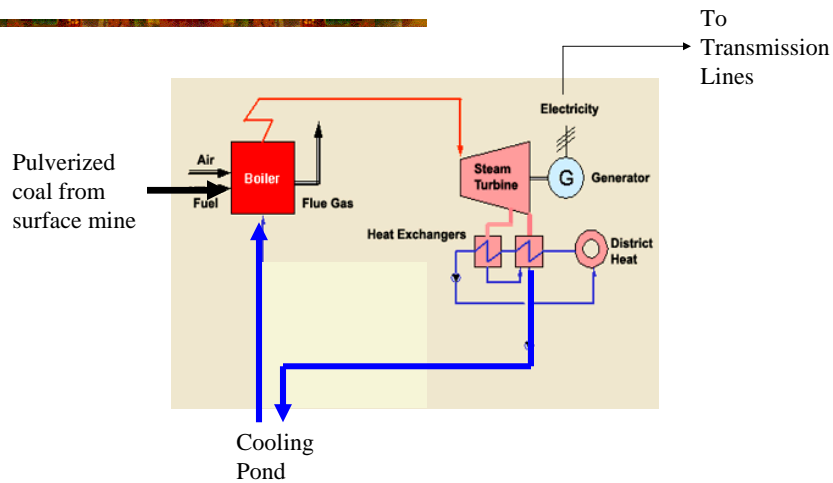
Layout of Genesee Generating Station



Electricity Production at Coal Fired Power Plants

- Coal is burned to produce heat to boil water from cooling pond.
- Pressurized steam from boiling water spins a large fan (turbine).
- Turbine rotates large magnet to create an electrical charge (generator).

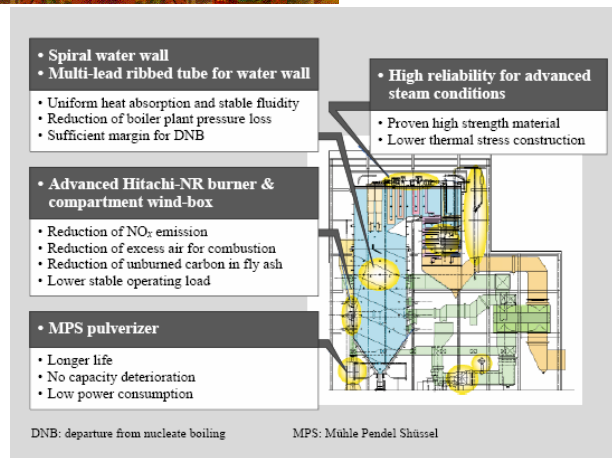
G3 Process



G3 Project Components

- Boiler Island
 - boiler (burner, super heater, etc.)
 - induced draft/primarily air/forced draft fan
 - coal handling system
 - ash handling system
 - flue gas desulphurization (FGD) unit and fabric filter baghouse

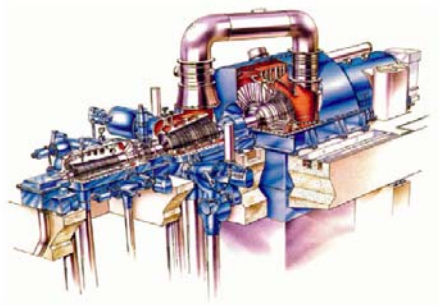
Selected Features of G3 Boiler Island



G3 Project Components (con't)

- Turbine Island
 - turbine-generator
 - condensate system (condenser, extraction pumps, etc.)
 - circulating water system (pump, screen, and auxiliary equipment)
 - feedwater heating system (pumps, feedheaters, etc.)
 - auxiliary systems (instrument air compressor, chemical dosing equipment, etc.)

G3 Steam Turbine



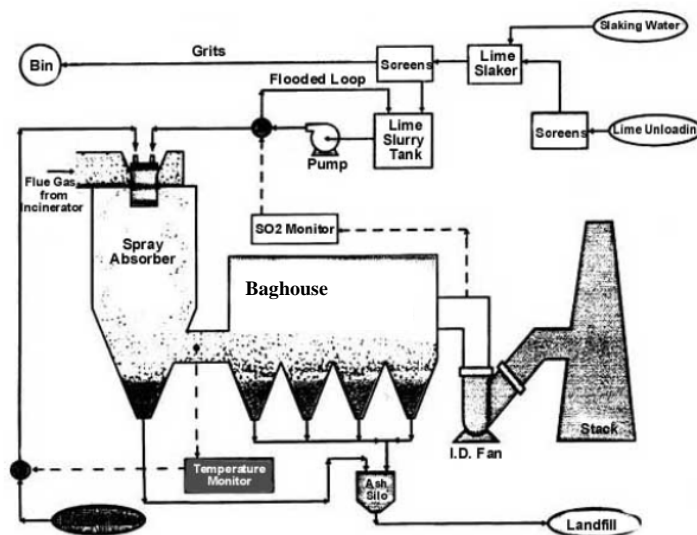
Other G3 Project Components

- Electrical Instrument and Control
 - 600-V motor control center
 - distribution control system
- Civil Engineering and Architecture
 - boiler-turbine building
 - turbine-generator pedestal
 - heating and ventilation system
- Elevator and lift devices
- Lighting and services

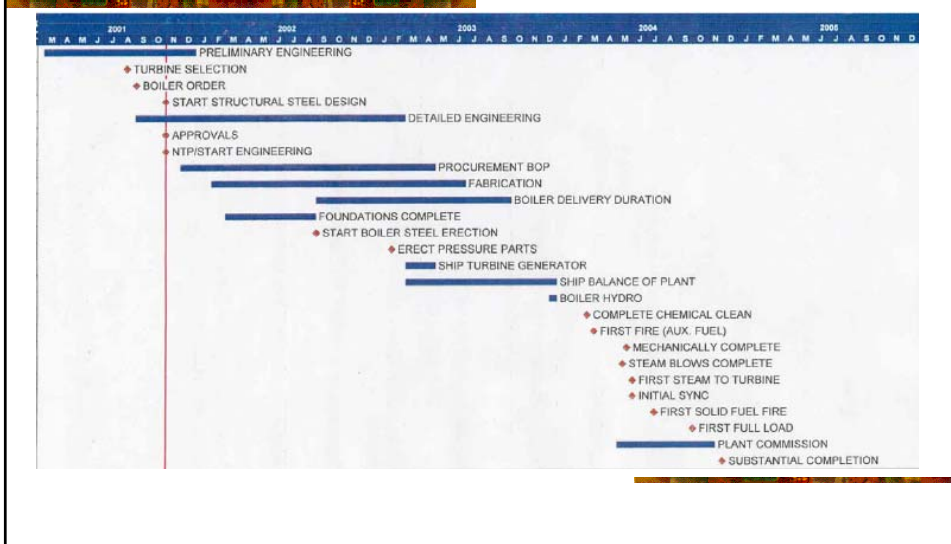
G3 Project Components (con't)

- Sulphur removal – a dry lime system is used as Genesee coal has low sulphur content.
- Particulate removal – fabric filter (baghouse) system is used.
- Bottom ash (flyash) is returned to mined area with haul trucks where it is used for fill and disposal.

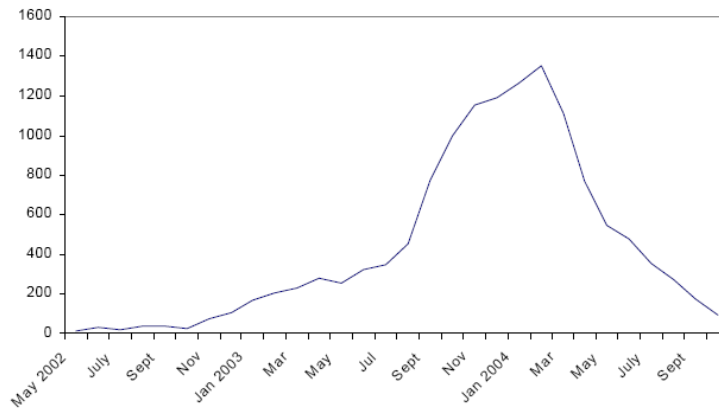
G3 Dry Lime FGD/Baghouse System for SO₂ Removal



G3 Development Schedule



G3 – Manpower Forecast



G3 Construction Details

- Construction of \$695 million facility completed on-time and on-budget.
 - 36-month construction period began in late 2001.
 - Number of workers on-site peaked at 2,100; with 42 contractors and 16 unions.
 - Work-site reached two million hours without a lost time injury in 2004.
 - EPCOR responsible for overall construction management.
 - Hitachi Canada (Calgary) lead contractor for construction of boiler house.
 - Colt Engineering (Edmonton) led construction and engineering for balance of plant.
-

G3 Construction Details (con't)

- Installation of 256-tonne turbine generator.
 - Four million kilograms of steel.
 - 311 km of pressure piping for boiler systems and superstructure.
 - Excavation of 360 thousand tonnes of soil.
 - 50,000 cubic meters of concrete.
 - Construction of a 138-meter tall stack.
 - Development of sophisticated switchyards, emissions management units, and electrical distribution systems.
-

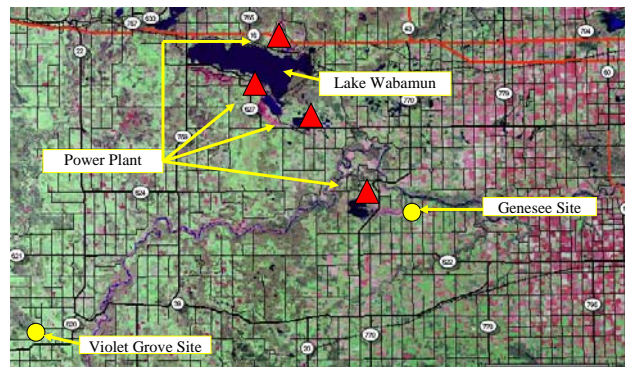
G3 Environmental Performance

- CO₂ emissions:
 - 8 to 10% lower than existing G1 & G2 units
 - 18% lower than average Alberta coal generation
 - SO₂ emissions:
 - 57% below Alberta standards
 - FGD unit captures up to 77% of SO₂ emissions
 - meets US EPA emissions standards
 - NO_x emissions:
 - 20% reduction, meets Alberta standards
 - Particulate Matter emissions: >99.8% capture efficiency
-

Power Plant Air Monitoring Programs

- Regional ambient air monitoring (continuous and passive)
 - Acid deposition assessment program
 - Mercury deposition assessment program
 - EPCOR/TAU Stack Emissions Monitoring Program:
 - Wabamun – 1 stack
 - Sundance – 3 stacks
 - Keephills – 2 stacks
 - Genesee – 2 stacks
-

Air Monitoring Program – Acid Deposition Monitoring (two sites)



Air Monitoring Program – Mercury Deposition Monitoring

