Oil Sands: Silicon Valley of the North? Recycling Liabilities into **ASSETS**

• opportunities for **conservation** + generating **clean green energy** now, in Alberta

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1.00) **Preface** (innovation only):

[1.01] This is an overview only, not an in-depth study. It is a position paper only of some ideas that may not currently be part of the debate about oil sands development. It highlights a few mandatory requirements, no different than any other business, and some very sustainable opportunities, if bundled together with the controls noted herein. It is a carrot and stick method to progress, with maximum optimization and minimal degradation, based on 30 years of professional work in sustainable development, familiarity with the site, and a good knowledge of emerging markets, free-market mechanics and legal instruments. This is a work-in-progress, as resources allow.

2.00) **Professional Background**: ACE-Inc. and its partners:

[2.01] have been in practice and business for 30 years undertaking sustainable development projects
[2.02] have done consulting to Suncor and are familiar with the oil sands having spent time there
[2.03] have worked with Fort McKay and Anzac First Nations
[2.04] are pragmatists active in the "real world", not hypothetical academics or theologians in dreamland
[2.05] Jorg Ostrowski was the first consultant that proposed an integrated, sustainable and pedestrian vision and urban design plan of the entire downtown Toronto waterfront in 1972-3 to recycle, covert and transform a 96 acre brownscape of industrial blight into a popular and vibrant destination point, where people and culture could thrive, a greenscape, now called "Harbourfront".

3.00) **Alberta's Precarious Economy** (the need + opportunity to diversify):

[3.01] Alberta's economy is totally dependent on only 2 industries: the oil patch and agriculture (thin ice)
[3.02] Alberta's economy is at the mercy of oil, a volatile, unstable and unpredictable marketplace
[3.03] oil and gas is a declining sunset industry with perhaps 5-10 years left in supply and demand
[3.04] annual growth rate for solar is about 40% [1-4]; oil and gas, <10% [5, 6]
[3.05] for every $1,000,000 invested:
a) energy efficiency creates 36.3 jobs [7, 8, 9]
b) renewable energy (PV) creates 12.2 jobs [7, 8, 9]
c) conventional energy creates 7.3 jobs [7, 8, 9]
[3.06] many oil firms have already diversified into "energy", some into renewable energy [10]
[3.07] Suncor seeks to be a "sustainable energy" company. It has invested $100 M into renewables.
[3.08] costs and complexity will drive oil and gas from below the ground, to above ground
[3.09] agriculture is a significant growth sector. Farmers will be the new oil barrons, based on canola.
[3.10] a government with vision would encourage Alberta oil and gas firms to diversify into solar
[3.11] the Alberta (and Canadian) government should not subsidize oil and gas corporations, or any fossil fueled utility any longer. The true free-market price must be allowed to establish itself. As everyone knows, high costs are the most cost-effective incentive for "real world" conservation.
[3.12] the Alberta (and Canadian) government should reward green clean energy and tax dirty energy that has a detrimental impact on the planet, people, business and the future

4.00) Political Winds (a quickly changing international political topography):

[4.01] The authours believe that the renewable energy sector will totally eclipse many times, all revenues, economic benefit and job creation of the oil patch, in a fraction of the time, with a far greater return-on-investment and global benefit, without the massive liabilities of fossil fuels, driven by:
1) free market opportunities (i.e. PERT/GERT [11]):
2) national security concerns (i.e. Middle East)
3) new economic realities (i.e. cost of extraction is too expensive, technology too complicated)
4) new economic incentives (i.e. tax breaks such as Class 43.1 [12])
5) regulations: carbon limits, CO_2 taxes, building codes, procurement policies, gasoline taxes
6) GHG caps (i.e. California)
7) public demand and shareholder pressure
If not done in a responsible and benign manner, some purchasers, users and governments may well boycott such energy or switch to the competition, based on precedent.

5.00) Challenge to be met:

[5.01] This project, like most challenges in life, is all about turning liabilities into assets. How can an application for development permit be granted for oil sands expansion? Can such a development be an asset rather than a liability to present and future generations? This project is no different than any other development elsewhere in the world. It should be a positive contribution and legacy to the people, planet, economy and future, not a negative impact, detrimental burden, economic white elephant, national embarrassment, environmental liability or ongoing curse.

6.00) Position of the Proponents (applications for development must be governed):

[6.01] Our position is grounded in convention. No business is run without control for the common good. Regulations and caveats are no different than the requirements of any of the following:
1) Alberta E.U.B.
2) the planning department of every city around the world (i.e. development/building permits)
3) *"Rules of Professional Conduct"*, or *"Code of Ethics"* that are mandatory for all members in good standing of any professional society: AAA, ALAA, ALS, AMA, APEGGA, CBA, etc.
4) any application before a court of law (*Alberta Rules of Court* have to be followed)

7.00) Proposed Mandatory Rules (The Quadruple Bottom Line):

[7.01] Any development must be positive for people, the planet, business, and the future (Quadruple Line). Six prerequisites for development permit are the following. Oil sands development must:
□ 1) be **sustainable** in the long run as defined by the performance requirements noted below
□ 2) establish an **EcoIndustrial Park** [13] (on-site synergistic and local economic relationships): The depleted parts of the tar sands area could operate as a demonstration "**Sustainable Technologies Park**", based on combining the principles of an EcoIndustrial Park [13] with a Centre for Alternative Technology as developed out of an abandoned quarry at Machynlleth Wales [14]. After 30 years, this centre is Europe's leading Eco-Centre.
□ 3) achieve **net zero** [15] **operations** re: consumption of:
a) fresh (but not reused) water
b) non-renewable energy
c) anthropogenic GHG emissions under the Kyoto protocol (CO_2 , CH_4, N_2O)
d) precursors (i.e. CO, NO_x, VOCs)
e) other pollutants and heavy metals (SO_2, particulates, HC, Hg, Cr, Cd, Pb, Ni, As, SO_x)
□ 4) meet "**energy plus**" requirements [16]:
a) "produced energy" must be greater than "embodied energy" + "operating energy" (more energy out than in), based on mixed-use architectural projects [16]
□ 5) achieve a benchmark **EcoFootprint**. This would be established upon consultation with Dr. Bill Rees of the University of British Columbia, based on his work on ecological footprints. [17]

□ 6) be a "net **Economic benefit**" (not drain), based on:
- a) Life Cycle Thinking (LCT) [18]
- b) Life Cycle Management (LCM) [18]
- c) Life Cycle Costing (LCC) [18]
- d) Life Cycle Assessment (LCA) [18]
- e) Total Cost Accounting (TCA) [18]
- f) Net Cost Benefit Analysis (NCBA)
- g) Cost Benefit Analysis (CBA) [18]
- h) Economic Input/Output Analysis [18]
- i) Energy & Environmental Accounting [18]

□ 7) have a v**alue-added requirement**:
- a) the people of Alberta, especially local First Nations, must be able to use the land after reclamation, in a useful and uplifting manner, contributing joy, learning, value and health
- b) the facilities must be left usable in other ways after all resources have been extracted

□ 8) take advantage of the **Photovoltaic Opportunity** (while minimizing risk and damages):
- a) to address the challenges and opportunities noted above, and to supply the growing world demand for low grade silicon [19] as sources for high grade silicon dwindle, the oil sands as a major source of low grade silicon for solar cell manufacturing (not semi-conductor) on the premises must be explored, based on the following reasons:
  - 01) an abundant supply of sand is readily available and extracted anyway
  - 02) infrastructure is already in place: mining, transportation, processing, expertise
  - 03) sand is now dumped as landfill after processing as part of reclamation, whereas,
  - 04) the same sand should be processed into silicon for on-site manufacture of PV
  - 05) high temperature processing already available and used on-site
  - 06) win-win scenario: Oil Sand Photovoltaics are totally a synergistic concept: the more bitumen that can be extracted out of the tar sands, the better it is for the oil companies and the better the grade of silicon will be available
  - 07) one of the major players, Suncor has been wanting to be a sustainable energy company for many years. Perhaps other partners would also be interested?
  - 08) hydrogen by-products should be marketed as a renewable currency or fuel
  - 09) CO_2 should become part of the feedstock for the manufacturing process

  "In the past, **low-grade silicon** was bought from semiconductor manufacturers for use in building solar cells. With improvements in the manufacturing process, silicon manufacturers are able to consistently produce the more profitable semiconductor-grade silicon. As a result, it is becoming difficult to buy **low-grade silicon**." [19d]

  PV manufacturing is an immense opportunity that must be explored for all Albertans.

In summary, these are the conditions that the authours feel are **imperative** before approving any further development of tars sands in Northern Alberta.

8.00) Precedent:

□ 01) If large architectural developments [15, 16] can comply with such requirements and achieve such exemplary performance for common good, this should be even easier for all tar sands partners.

9.00) Bibliography:

□ 01) re: annual growth rate for **solar**: according to TVC:
http://www.techventures.org/news/index.php?releaseID=052
"The global photovoltaic market, a robust $7.5B per year, has experienced annual growth rates of 30%, with last year's **rate** even higher at 54%. Global sales of modules exploded in 2004 exceeding 1 GW."

□ 02) re: annual growth rate for **solar**: according to "Seeking Alpha":
http://energy.seekingalpha.com/article/16341
"according to Solarbuzz, between 2001 and 2005, total annual solar power system installations increased globally from 345 MW to 1,460 MW, representing a compound annual growth rate of 43%, and global installations of solar power systems are expected to grow at a compound annual growth rate of 17% from 1,460 MW in 2005 to 3,250 MW by 2010. Solarbuzz forecasts continued strong growth globally, with sales increasing from $9.8 billion in 2005 to an estimated $18.6 billion by 2010, a 14% compound annual growth rate. "

□ 03) re: annual growth rate for **solar**: according to "Redding Herring":
http://www.seia.org/solarnews.php?id=108
"**solar** has been growing at a compound **annual growth rate** of 36 percent for six years, according to SEIA President Rhone Resch, who sees growth speeding up, if anything."

□ 04) re: annual growth rate for **solar**: according to JimPinto.com - Connections for Growth & Success™
http://www.jimpinto.com/enews/july22-2004.html
"The annual growth rate of solar power is highest in Japan (45%) and Europe (43%), where government programs help residents buy rooftop units."

□ 05) re: annual growth rate for **oil sands**:
Timilsina, G. R. , LeBlanc, N., Walden,T., *Economic Impacts of Alberta's Oil Sands,* Canadian Energy Research Institute, Volume I, Study No. 110, October 2005, p. 18
"The average growth rate of annual production for the 2005-2020 period, which is 9.7 percent in the potential case, decreases to 7.8 in this case."

□ 06) re: annual growth rate for **oil sands**: according to "Energy Bulletin":
http://www.energybulletin.net/479.html
"Demand for unconventional oil is expected to reach 10.31 million bbl in 2008, up from 8.59 million barrels in 2003 at an average annual growth rate (AAGR) of 3.7%, said Business Communications Co. Inc., Norwalk, Conn..... Unconventional oil includes extra-heavy oil (oil sands) and bitumen, syncrude, shale oil, and conventional heavy oil."

□ 07) re: job creation of solar **PV v. oil**: according to Community Energy Association (B.C.):
http://www.communityenergy.bc.ca/tk_i_local.htm
"Two decades of research have shown that there is almost no investment that creates fewer jobs per million dollars than large-scale energy supply. For every million dollars invested, an average 36.3 jobs are created in the energy efficiency sector, 12.2 jobs in the renewable energy sector, and only 7.3 jobs in the development of conventional energy", Pembina Institute for Appropriate Development

□ 08) re: job creation of **energy efficiency**: BC Sustainable Energy Association (BCSEA), "Huge" green power reserves can fuel jobs, economy, ...", November 21, 2005, http://www.bcsea.org/policy/taskforcereport.asp

□ 09) re: job creation of solar **PV v. oil**: Peter Lynch, Photovoltaics (PV) Primer, June 19, 2006
http://www.renewableenergystocks.com/PL/News/061906a.asp
"Job - Compared with fossil fuel energy technologies, the photovoltaic industry creates far more jobs per dollar invested. For example: investment in photovoltaics creates:
1) 8 times more jobs than oil and gas exploration
2) 5 times more jobs than the natural gas utilities
3) 2.5 times more jobs than the coal industry"

□ 10) re: oil companies which have expanded into solar PV:
1) Shell: http://www.shell.com/home/Framework?siteId=shellsolar
2) BP: http://www.bp.com/modularhome.do?categoryId=4260
3) Chevron: *Big Oil's Hedge Clean Edge*, Red Herring, June 2005

□ 11) re: PERT/GERT: http://www.ec.gc.ca/nopp/lfg/primer/en/primer.cfm?pg=5)

□ 12) re: Class 43.1 Tax Breaks: Government of Canada, *Tax Incentives for Business Investments in Energy Conservation and Renewable Energy,* Aug. 6, 1998, and the *Income Tax Act*, R.S.C. 1952, c. 148, s. 1.

□ 13) re: **Eco Industrial Parks**:
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b) Eco Industrial Solutions: www.ecoindustrial.ca/projects/service_4.html
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k) U.S. D.O.E., *Brownfields Assessment Pilot Fact Sheet*, Cape Charles/Northampton County, VA: http://www.epa.gov/swerosps/bf/html-doc/northam2.htm

l) Smart Communities Network, *Eco-Industrial Parks:* http://www.smartcommunities.ncat.org/business/ecoparks.shtml

m) Cote R.P., Cohen-Rosenthal E., *Designing Eco-Industrial Parks: A Synthesis of Some Experiences*, Journal of Cleaner Production, Volume 6, Number 3, September 1998, pp. 181-188(8)

□ 14) Centre for Alternative Technology, Machynlleth Wales: http://www.cat.org.uk/

□ 15) Net Zero Energy (architectural) projects:

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b) England: i) Autonomous House, Southwell (Nottinghamshire), 1993
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iii) BedZED (Beddington Zero Energy Development), Sutton (London), 2002

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□ 16) Energy Plus (architectural) projects:

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