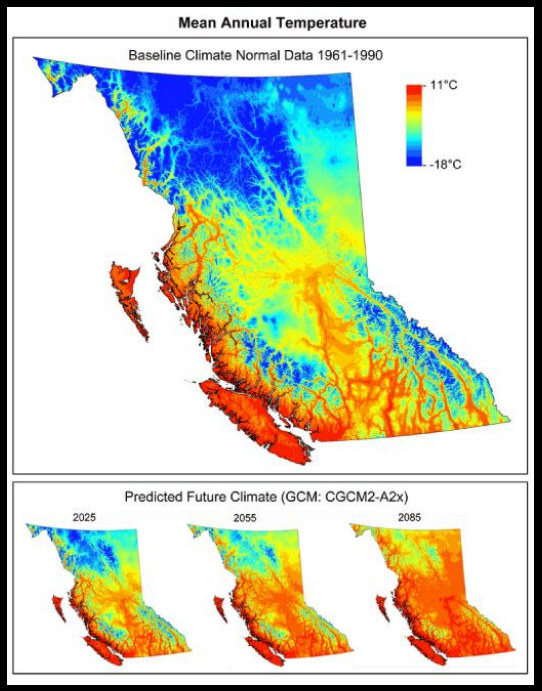
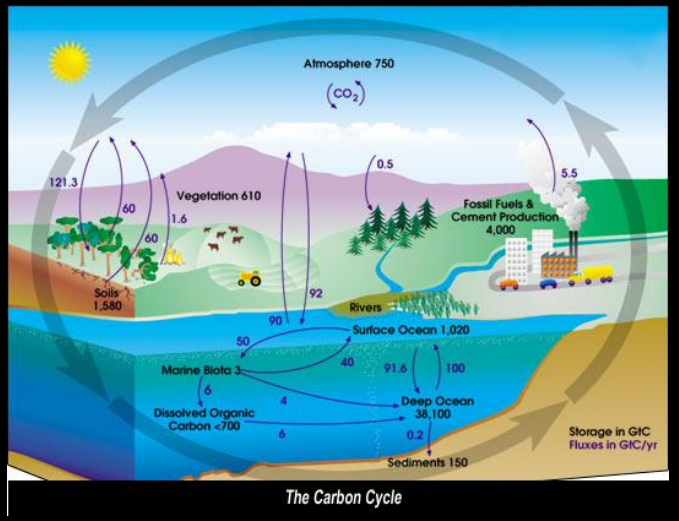
Don Gosnell
Ministry of Forests and Range
UNBC September 23rd, 2009

BIOENERGY, CARBON SEQUESTRATION AND BC'S FORESTS

What interests/concerns you?



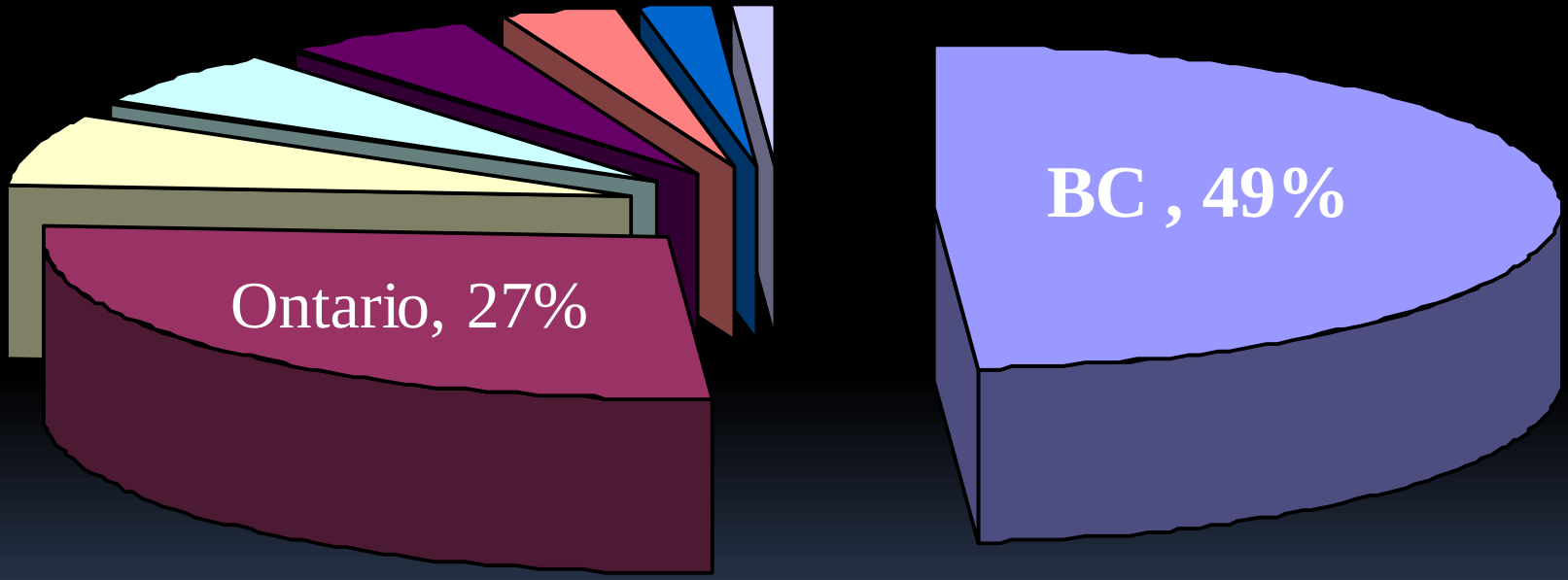


The Carbon Cycle

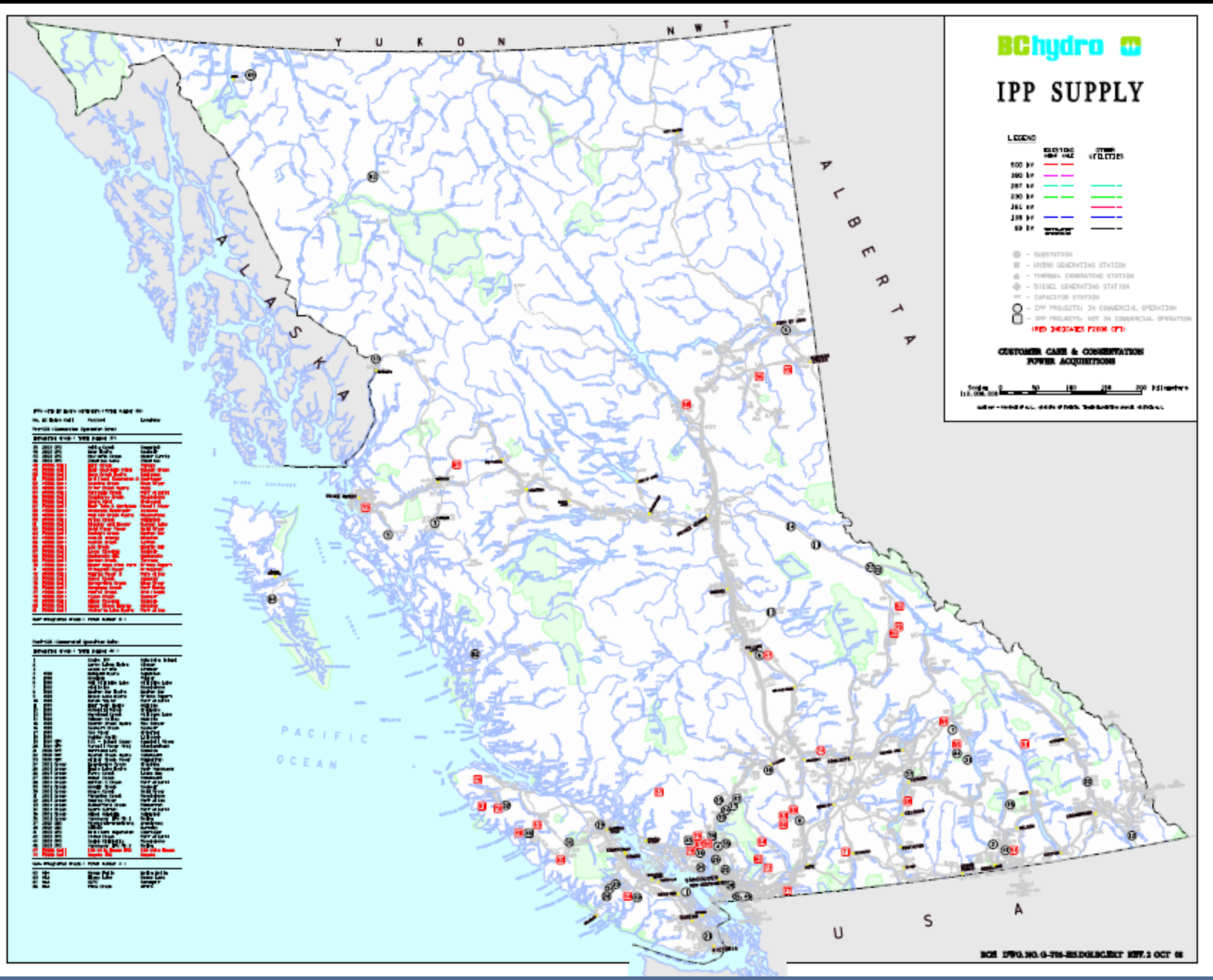
Social License for Change

- Who believes that Climate Change over the past 100 years has been primarily anthropogenic?
- Who believes we have only a few decades to prevent environmental, social and economic chaos?
- Who is willing to see the cost of almost everything we buy increase to reflect its true cost?
- Who is willing to fundamentally change the way we live our lives?

Bioenergy Already Big in BC



Nyboer et al 2004


BChydro
IPP SUPPLY
CUSTOMER CARE & CONSERVATION
POWER ACQUISITIONS
YUKON
N W T
ALASKA
ALBERTA
PACIFIC
OCEAN
U S A

Competition for wood fibre

1.5 million M3/yr consumed & growing

Bioenergy - Bioproducts

- Thermal & Electrical Energy
- Transportation fuels

- Chemicals
- Neutraceuticals
- Pharmaceuticals
- High quality cellulose
- High Quality lignin

Chemical Markets

KIRCHER_Manfred.pdf (SECURED) - Adobe Acrobat Standard

File Edit View Document Comments Forms Tools Advanced Window Help

Renewable Feedstocks are Competitive

CLIB 2021 CLUSTER INDUSTRIELLE BIOTECHNOLOGIE

Petrochemicals

		Production		Price	C	H	O	Carbon
Ethylene	C_2H_4	110	mio t/a	1597 $/t	86%	14%		1857 $/t C
Propylene	C_3H_6	75	mio t/a	1436 $/t	86%	14%		1670 $/t C
Benzene	C_6H_6	45	mio t/a	1330 $/t	92%	8%		1446 $/t C
Naphtha	C_nH_{2n}			1040 $/t	86%	14%		1209 $/t C

BioRenewables

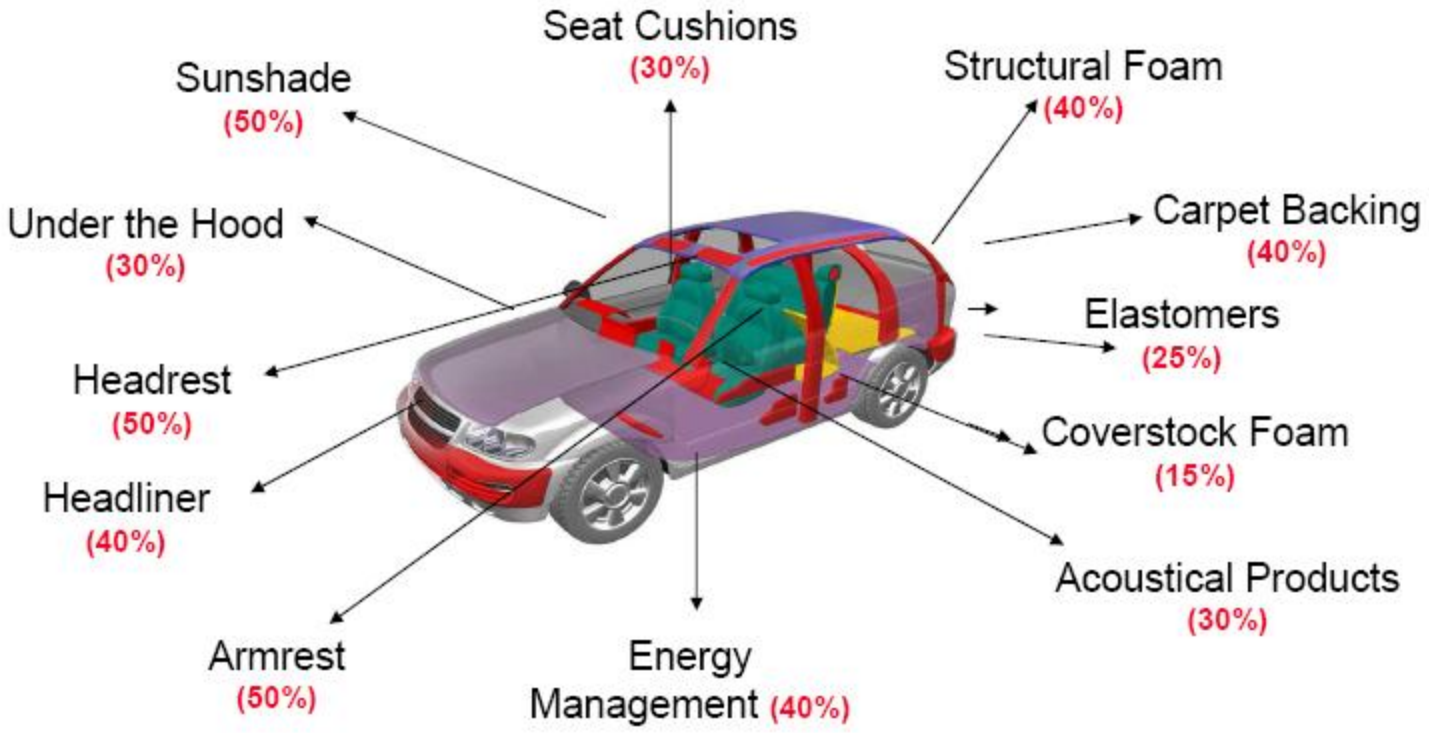
		Production		Price	C	H	O	Carbon
Sucrose	$C_{12}H_{22}O_{11}$	170	mio t/a	232 $/t	42%	6 %	52 %	552 $/t C
Corn-Glucose	$C_6H_{12}O_6$	330	mio t/a	268 $/t	40%	7%	53%	670 $/t C
Glycerin	$C_3H_8O_3$	0.8	mio t/a	465 $/t	39%	9%	52%	1192 $/t C

prices as of June, 2008, 1 € = 1.55 US$.
Sources: Naphtha Europe - ICIS; Propylene Europe Contract - ICIS; Ethene Europe Contract – ICIS; Benzene Europe – ICIS; Sugar # 11 – ICE; Glycerol Crude (80%) Europe – Oleoline; Glucose in Corn (65%) – CBOT.

start K...

THE WOODBRIDGE GROUP®

Target Automotive Parts for Bio-Transformation – In Two Years



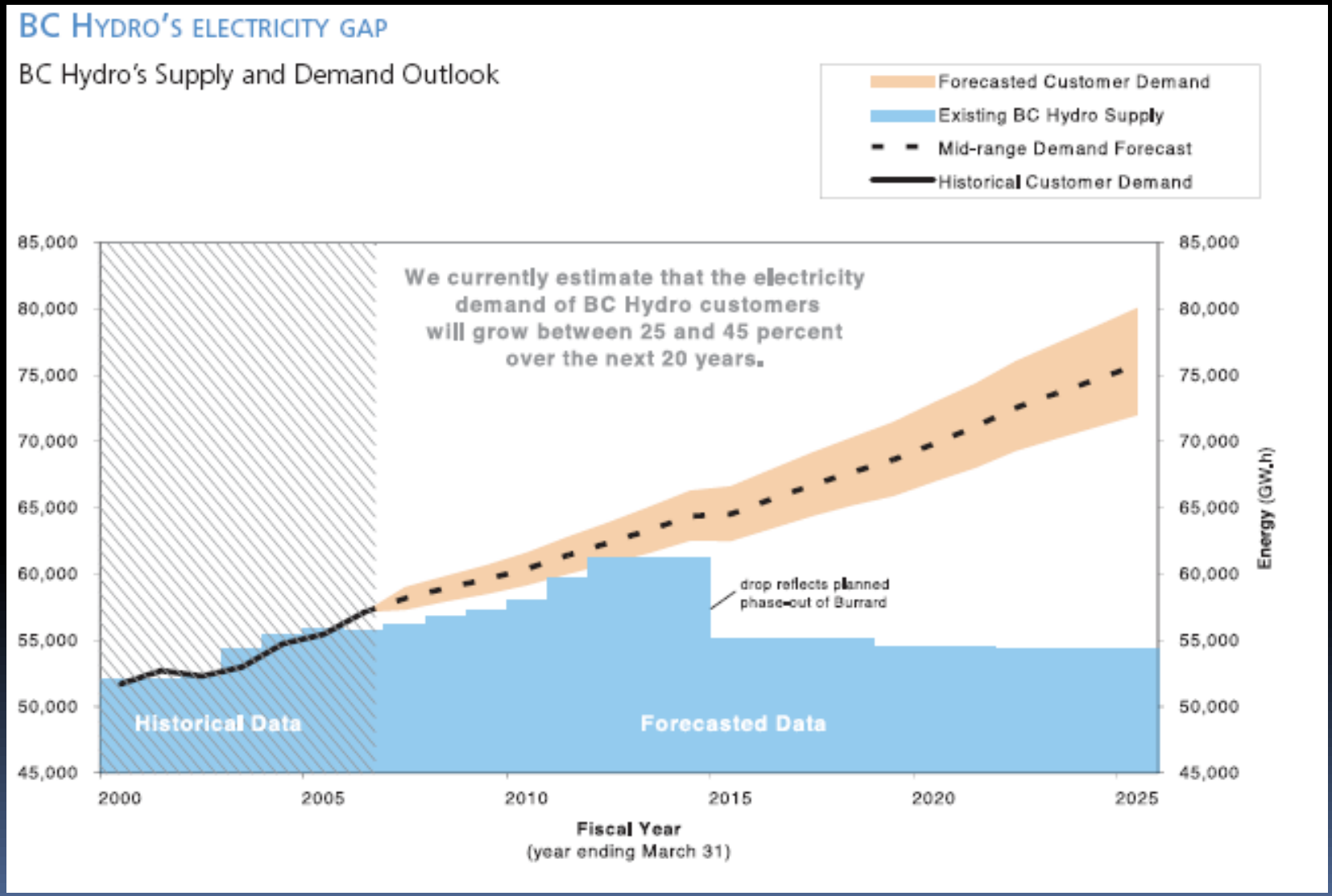
Di-Methyl Ether (wood➞ syngas ➞ methanol➞ DME)

Gasified Wood Fuelled Trooper:
(wood➞ syngas)

FLEX FUEL: (E85)

FFVs experience no loss in performance when operating on E85. However, since a gallon of ethanol contains less energy than a gallon of gasoline, FFVs typically get about 20-30% fewer miles per gallon when fuelled with E85

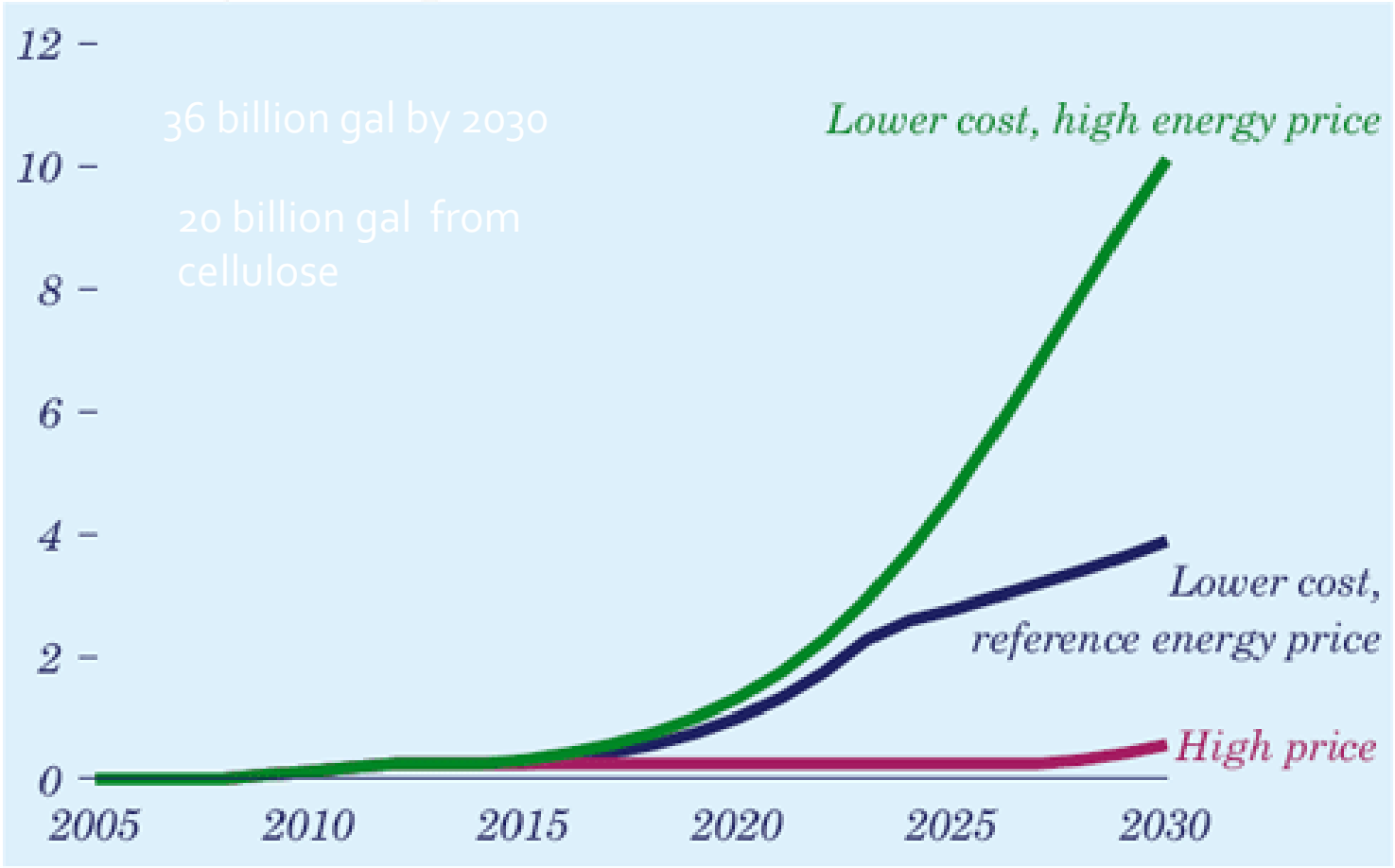
Market Drivers



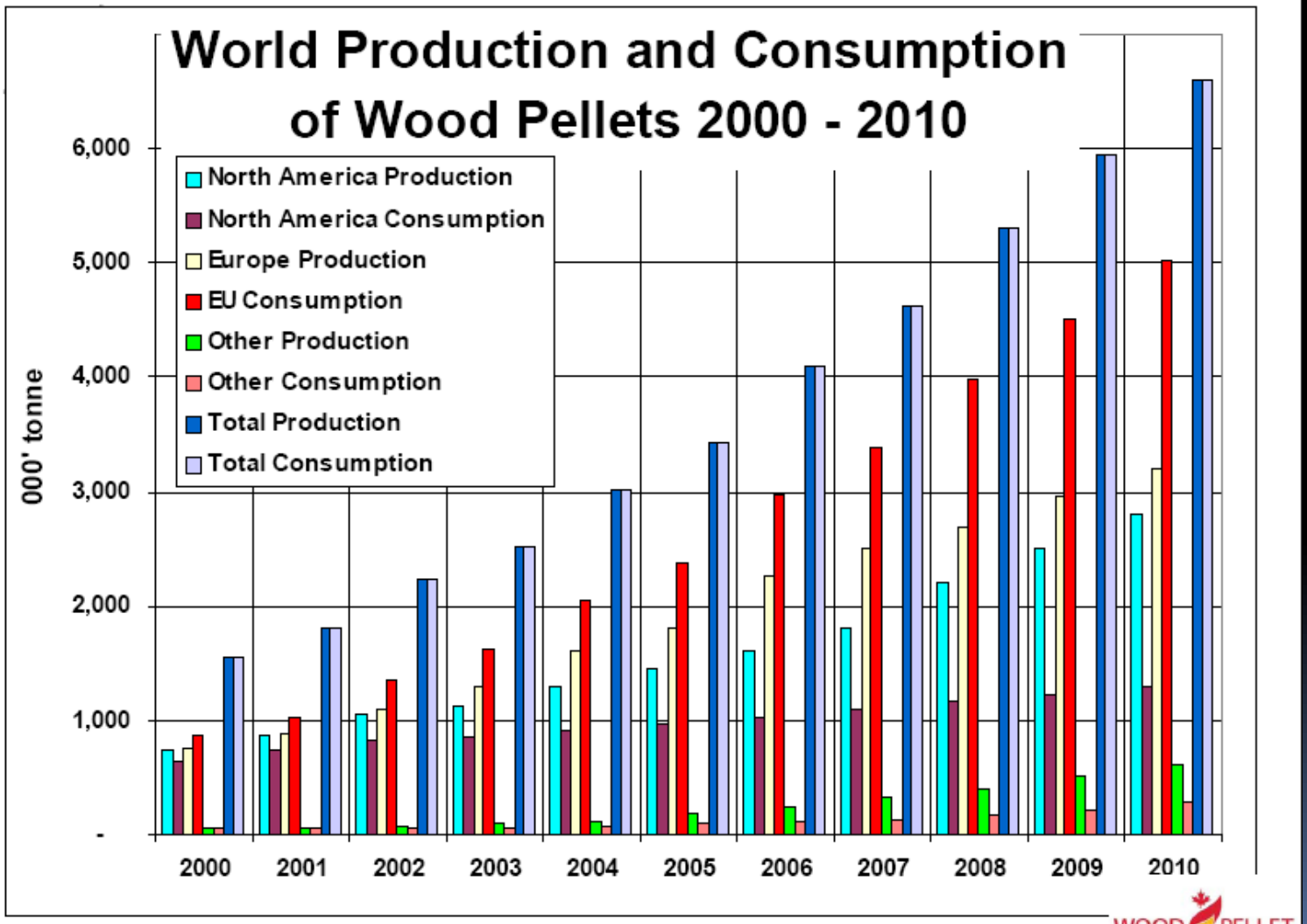
Source: BC Hydro 2008-2010 Service Plan

US Energy Policy

Figure 85. Cellulose ethanol production, 2005-2030 (billion gallons per year)



Biomass Markets Pellets



WOOD PELLET ASSOCIATION OF CANADA

Understanding True Costs

- Life Cycle Analysis:
  - Well to Wheel, Cradle to Grave
- Full Cost Accounting
  - What would happen to product prices if the manufacturer was responsible for recycling, climate change and pollution mitigation?
    - Packaging
    - Electronics
    - Automobiles
    - Food
    - Clothes
    - Fuels

Search for Cars that don't need gas - Windows Internet Explorer

http://www.fueleconomy.gov/feg/byfueltype.htm

Google Canada

Page | Tools

Site Map | Links | More Info | Search | Contacts | HOME

www.fueleconomy.gov

Find and Compare Cars | Gas Mileage Tips | Gasoline Prices | Your MPG Will Vary | Why is Fuel Economy Important? | Your MPG | Hybrids, Diesels, Alt Fuels, Etc. | Tax Incentives | Extreme MPG

U.S. Department of Energy | Print the Fuel Economy Guide | U.S. Environmental Protection Agency

- Find a Car
- Compare Side-by-Side
- Search by Class
- Search by Make
- Search by MPG
- Advanced Search
- Cars that don't need gasoline
- Best and Worst MPG

2010 Flexible Fueled Vehicles

Sorted by MPG (city), Click on column headings to resort

Select up to 4 models to compare

Compare!

Model	Estimated New MPG city	Estimated New MPG hwy	Annual Fuel Cost	Carbon Footprint (tons/yr of CO_2)	Air Pollution Score (All states except CA and NE states)
☑ Pontiac G6 4 cyl, 2.4 L, Automatic (S6), FFV, Gasoline or E85					
compare  Gas	22 city	33 hwy	$1490	7.1	NA
E85	15 city	23 hwy	$1776	6.2	
☐ Pontiac G6 4 cyl, 2.4 L, Automatic 4-spd, FFV, Gasoline or E85					
compare  Gas	22 city	30 hwy	$1548	7.3	NA
E85	16 city	23 hwy	$1776	6.2	
☐ Pontiac G6 6 cyl, 3.5 L, Automatic 4-spd, FFV, Gasoline or E85					
compare  Gas	19 city	29 hwy	$1683	8.0	NA

We have revised the 1985-2007 MPG estimates to make them comparable to the new 2008 estimates!

Learn More ▶

Personalize....

- Use your gas prices and Annual Miles
- Switch Units: Gallons/100 Miles Liters/100 km
- Show Air Pollution Scores for CA and Northeast States

Diesel 6.2 t/yr
NG 5.4 t/yr

Internet | Protected Mode: On

100%

BC Wood Pellet Plants - 2008

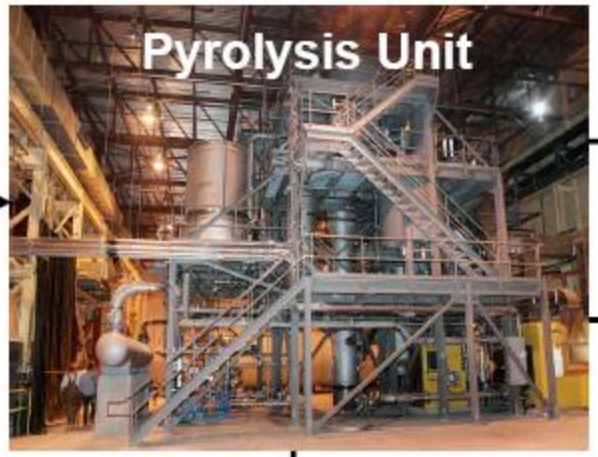
Production Capacity
1,200,000
Actual Production for 2008
950,000

Exports
Europe – 650,000
Asia – 75,000
USA – 210,000

Commercialization Plan

ENSYN CORP.

uop
A Honeywell Company



Biomass

'Green' Electricity

Fuel Oil

Available Now

Stage 1 Upgrader → Heating Oil, Marine Fuels

Stage 2 Upgrader → Transport Fuels

Timeline

2008

2009

2011

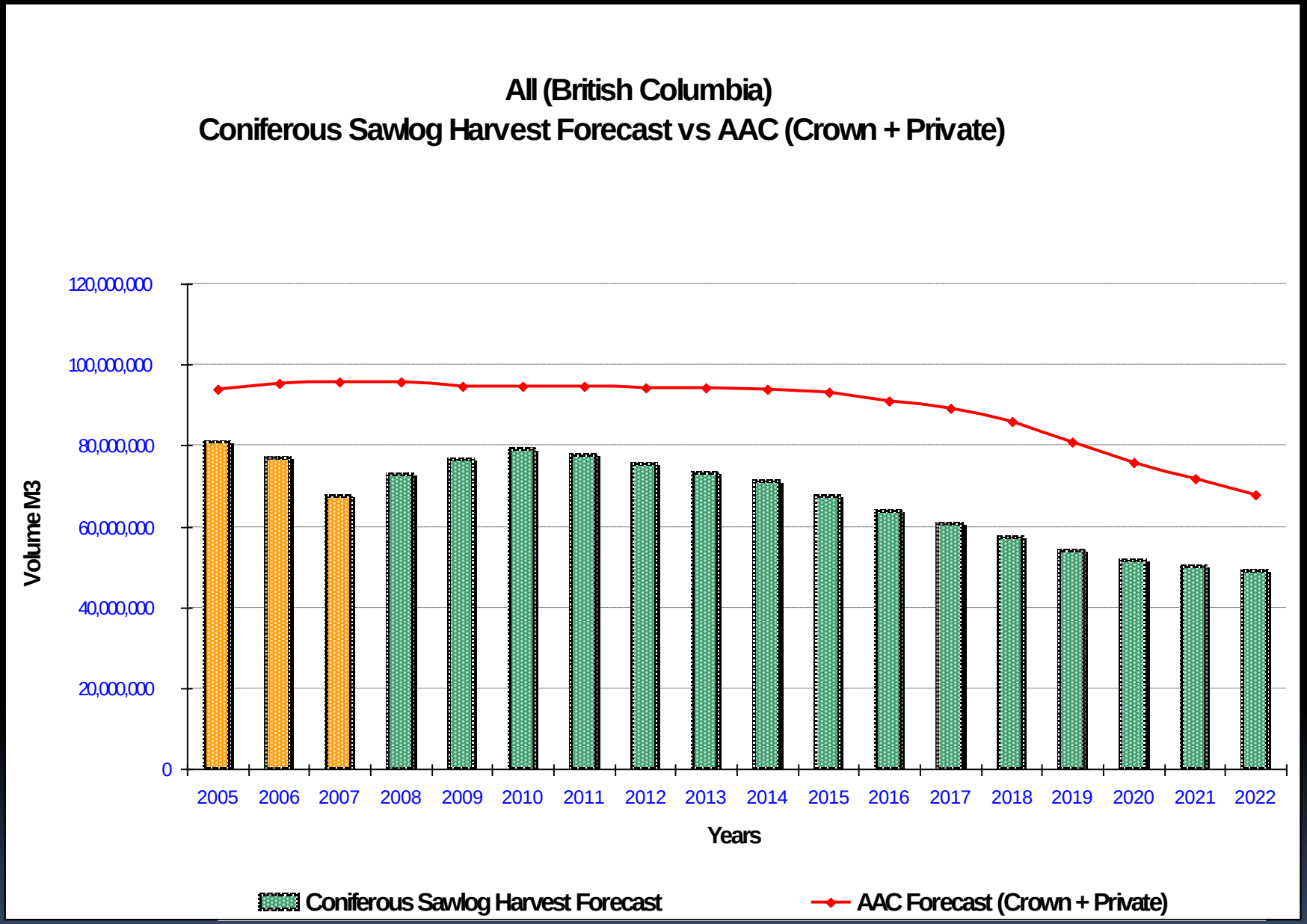
Rolling Deployment

Biomass Inventory

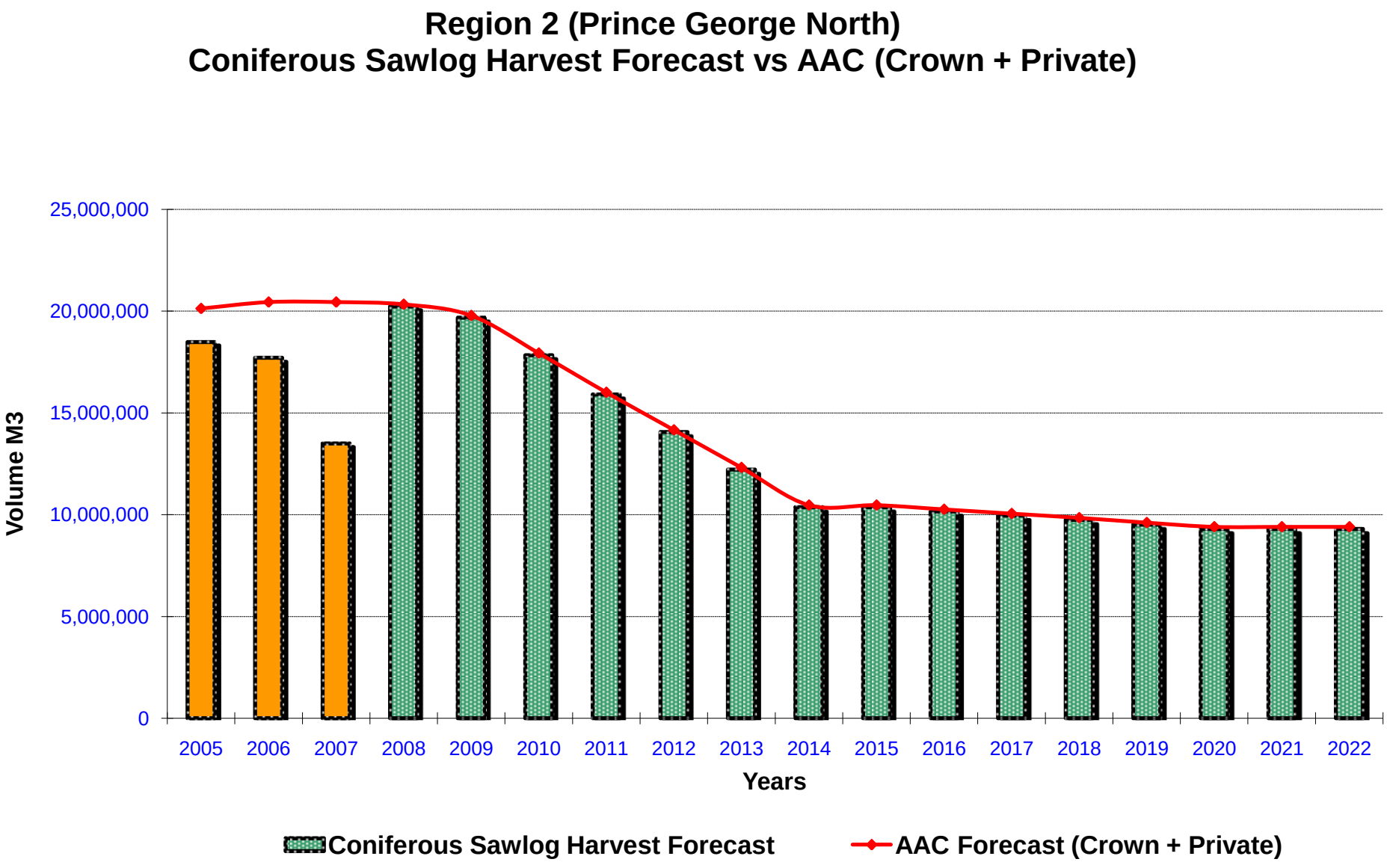
- Objective: to support investment decision making
- Assumption: existing data is not of sufficient accuracy nor currency to meet the objective.
- Treasury Board declined funding request

3 Pronged Approach to the Biomass Inventory Challenge

- Use the forest cover inventory to define the gross “insitu” biomass.
- Use a model of industry behaviour and consumption to predict mill and harvest residues and unutilized insitu biomass.
- Use a delivered biomass cost model to define supply side economics

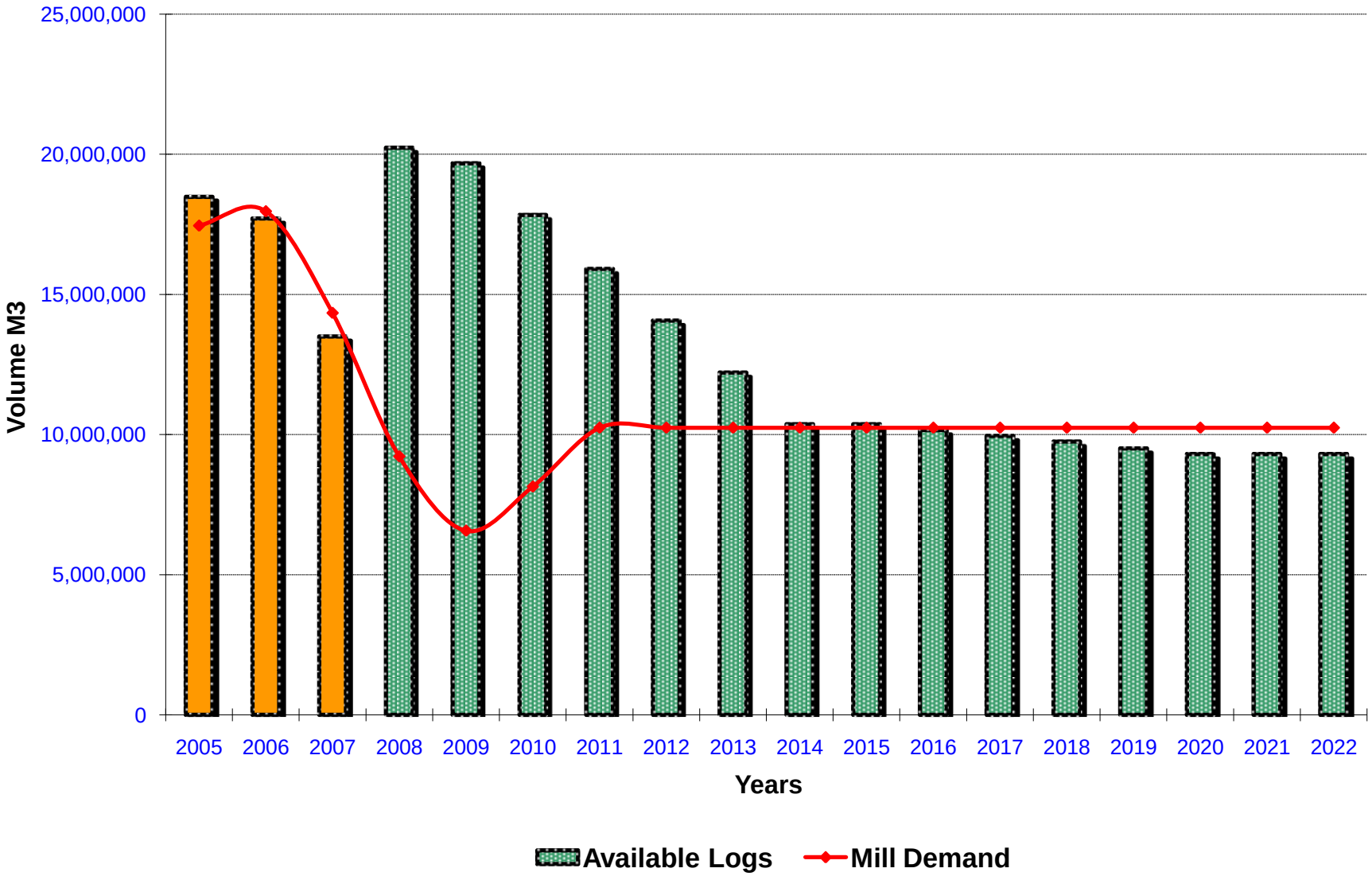


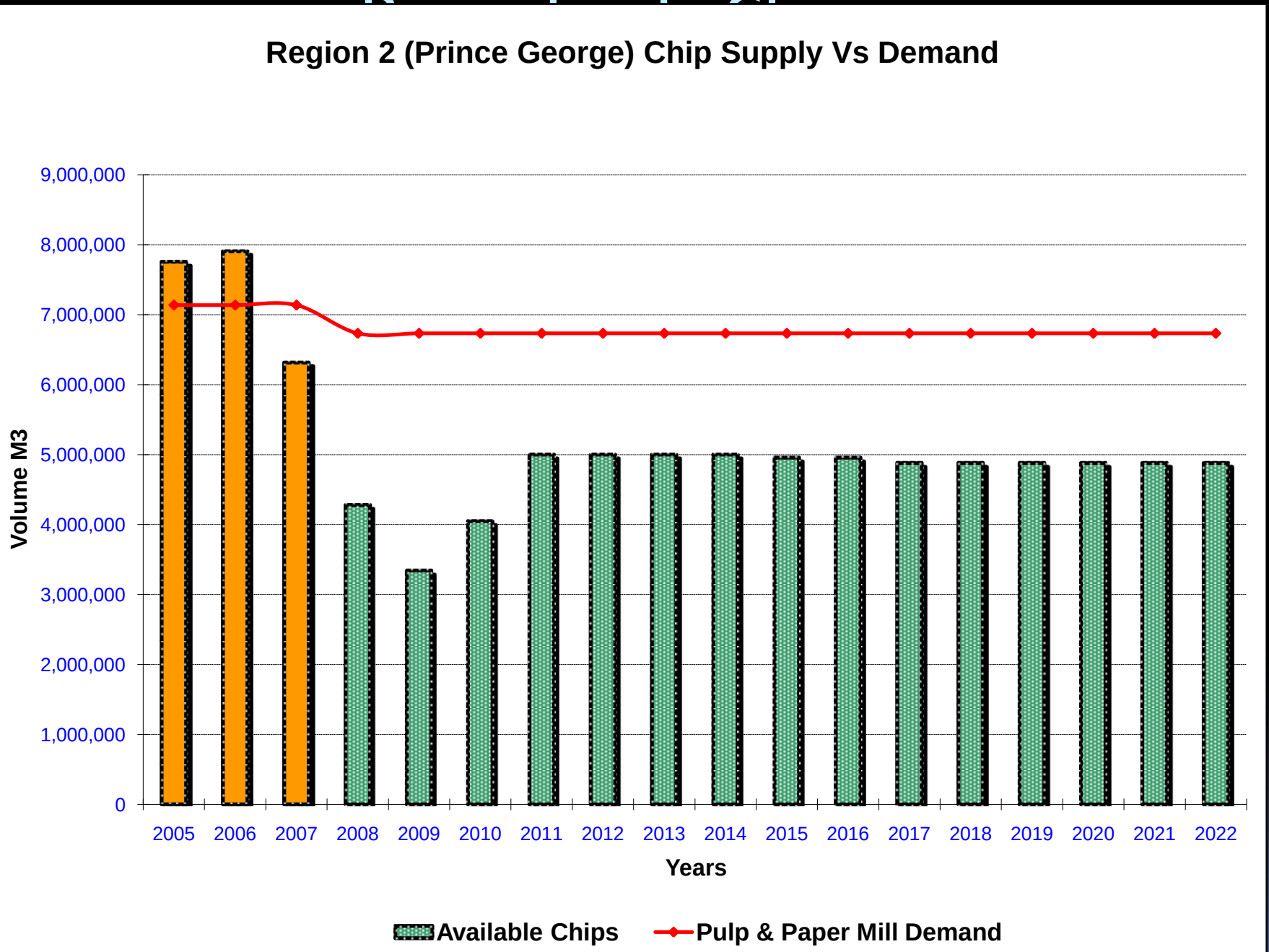
Girvan and Hall 2008

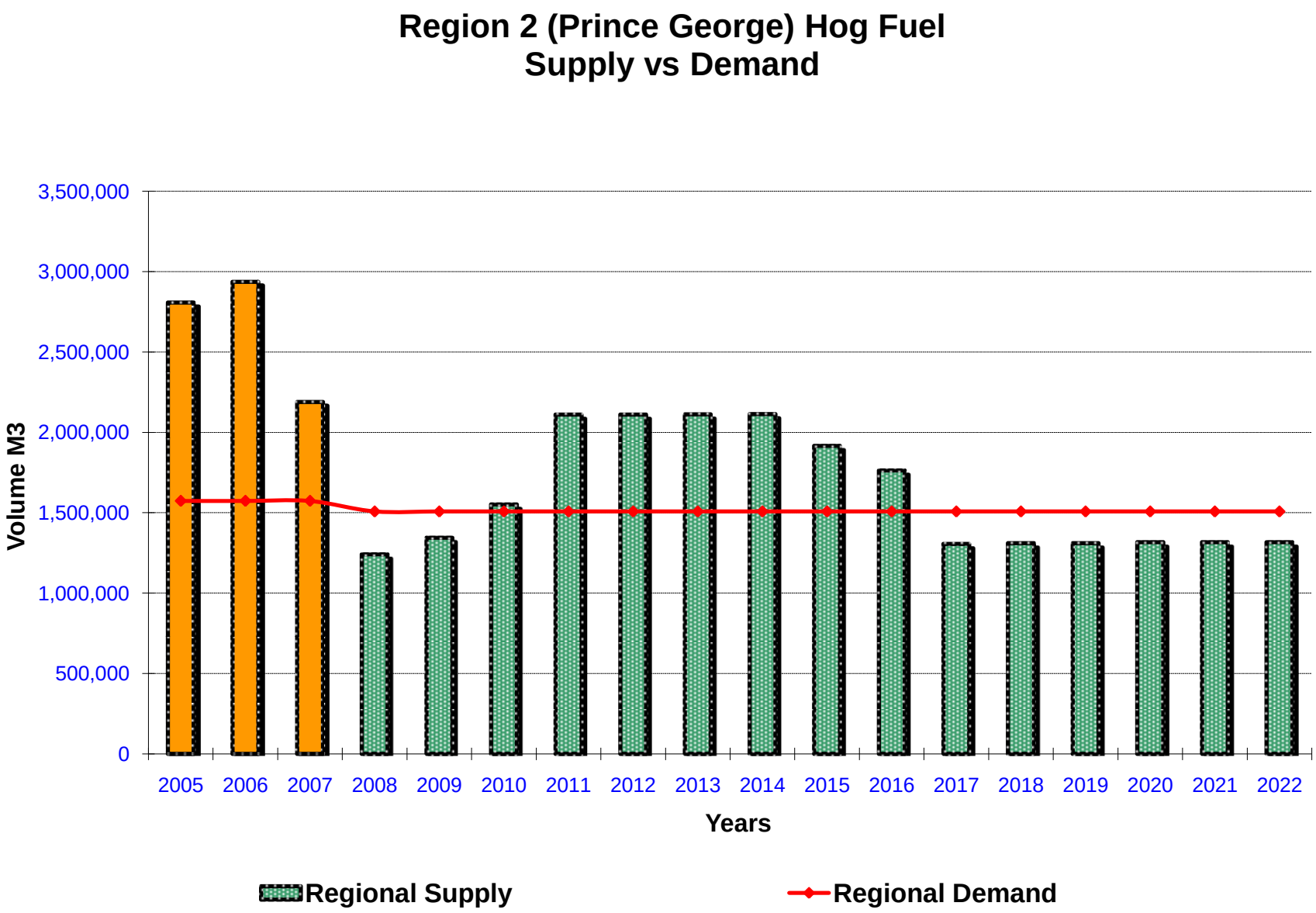


Girvan and Hall 2008

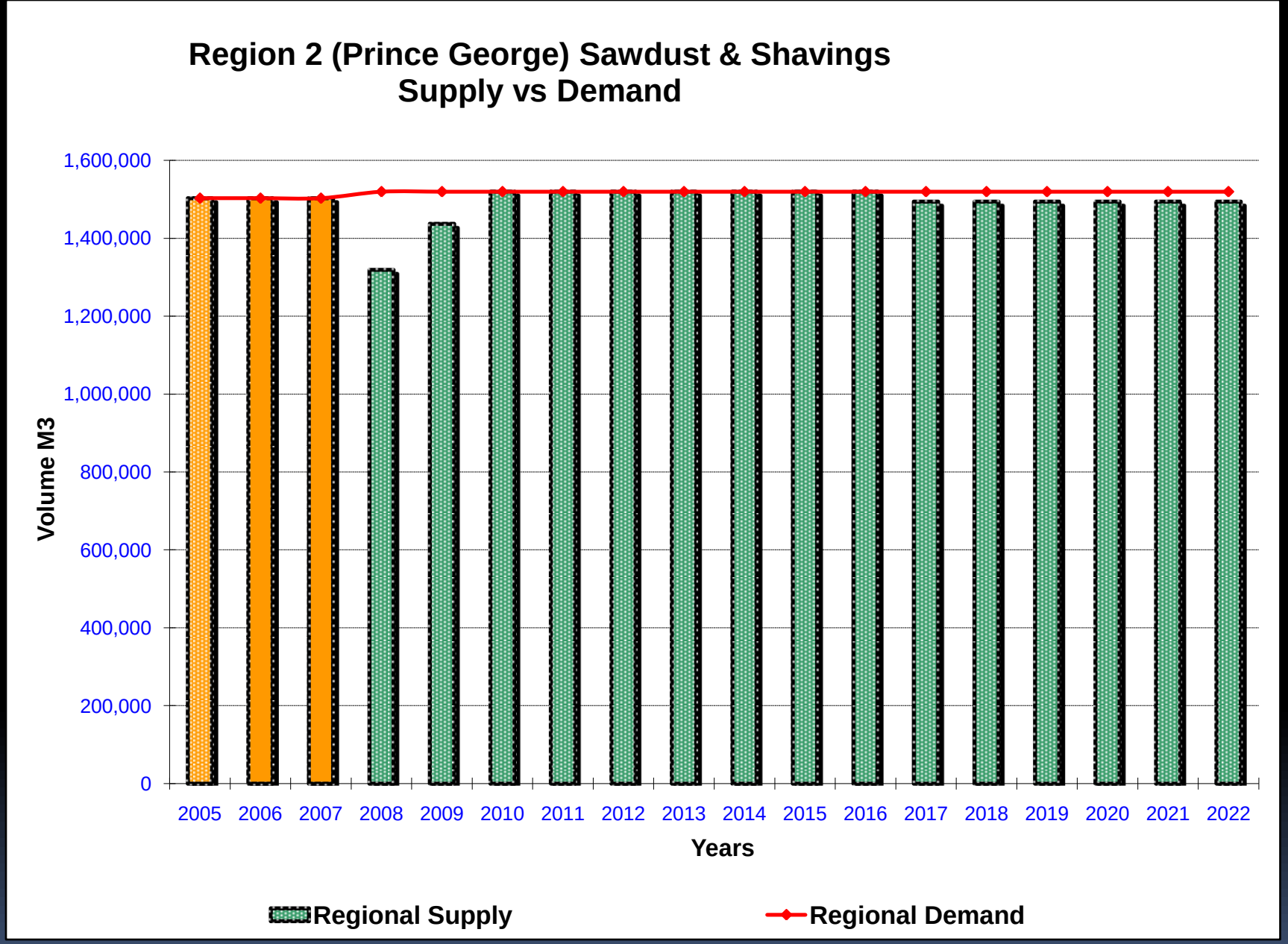
Region 2 (Prince George North) Potential Log Supply Vs Demand



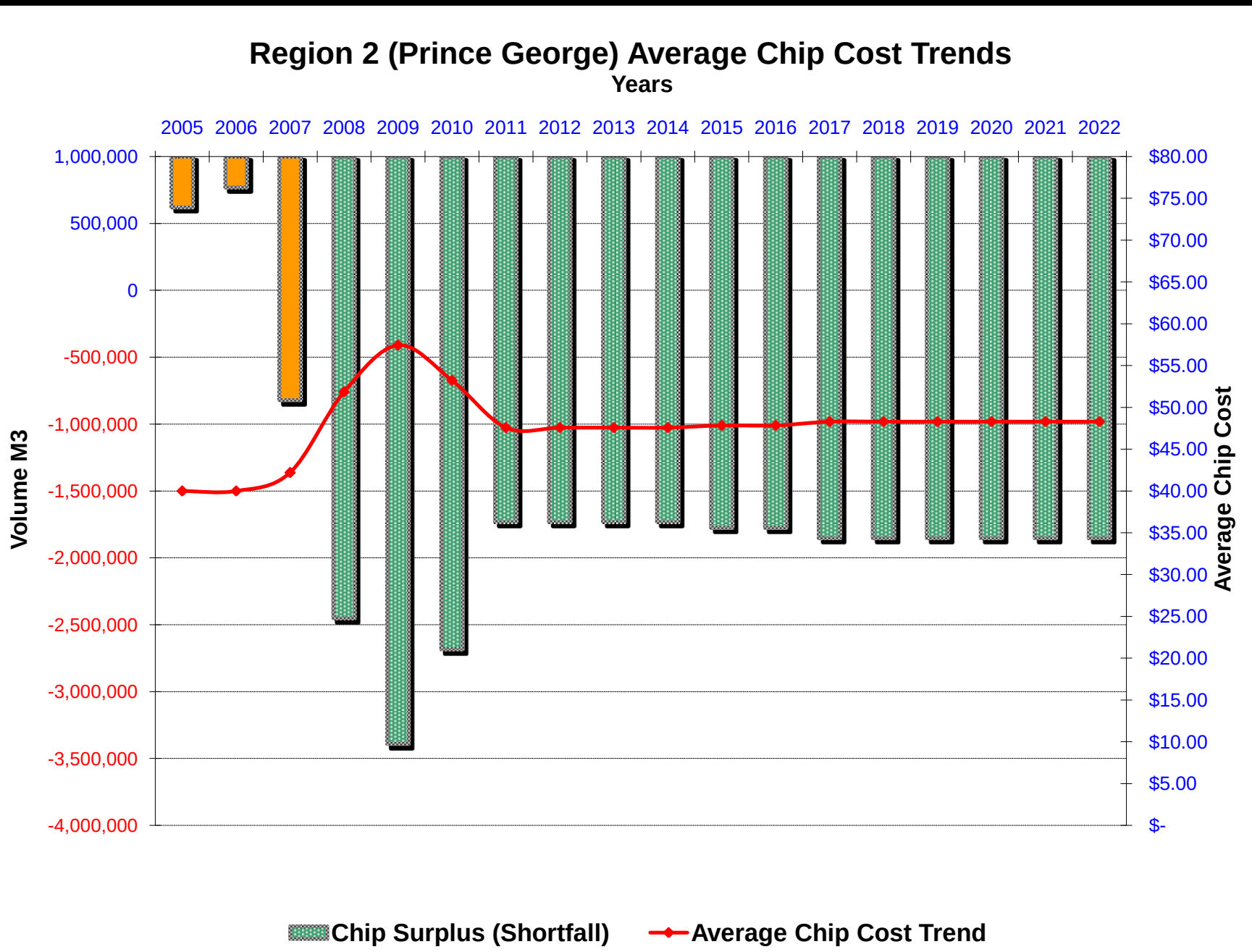

Region 2 (Prince George) Chip Supply Vs Demand
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Volume M3
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Years
Available Chips
Pulp & Paper Mill Demand



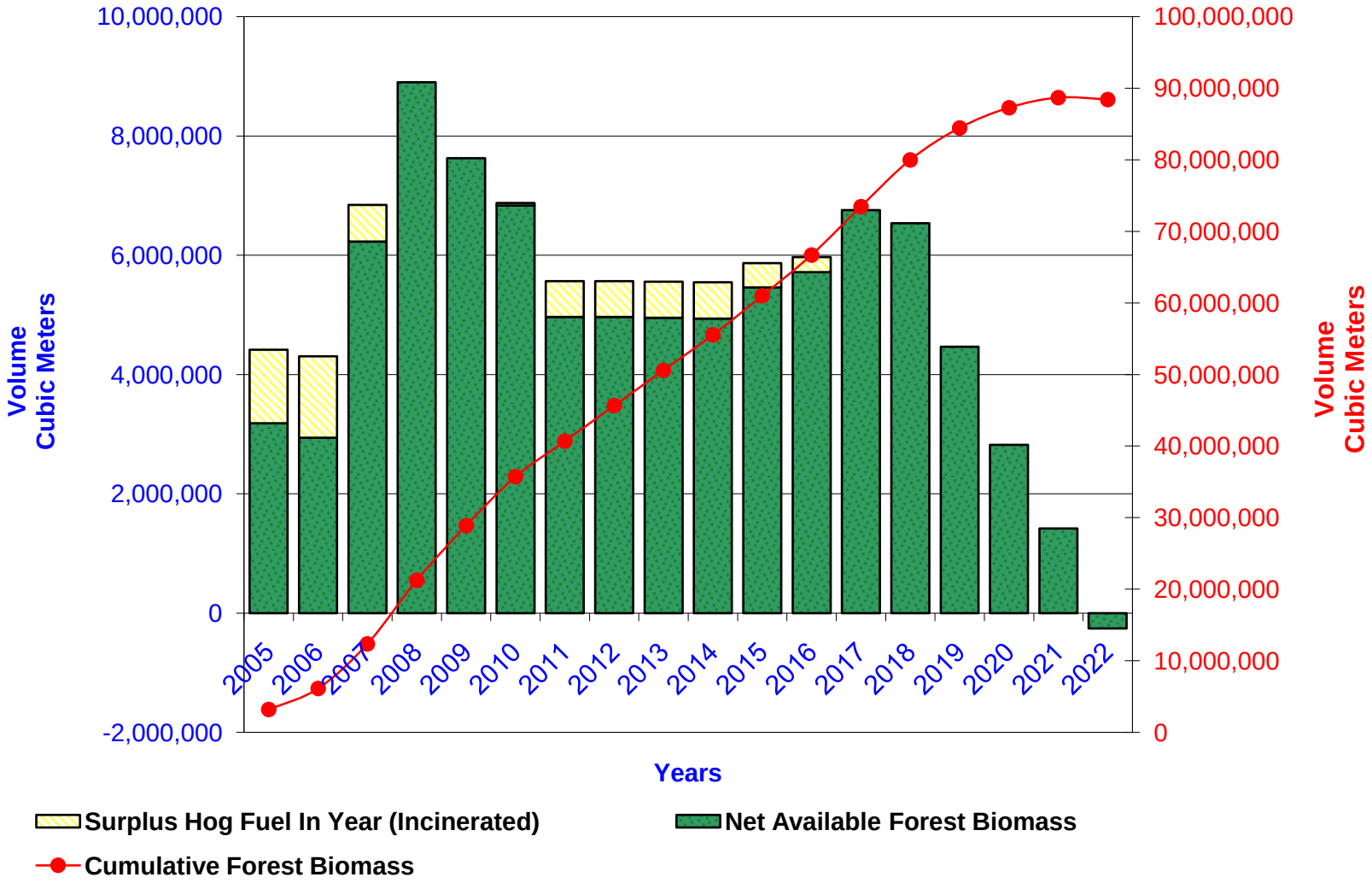
Girvan and Hall 2008



Girvan and Hall 2008


Region 2 (Prince George) Average Chip Cost Trends
Years
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
1,000,000
500,000
0
-500,000
-1,000,000
-1,500,000
-2,000,000
-2,500,000
-3,000,000
-3,500,000
-4,000,000
Volume M3
$80.00
$75.00
$70.00
$65.00
$60.00
$55.00
$50.00
$45.00
$40.00
$35.00
$30.00
$25.00
$20.00
$15.00
$10.00
$5.00
$-
Average Chip Cost
Chip Surplus (Shortfall)
Average Chip Cost Trend

Net Available Biomass Region (2) Prince George



Girvan and Hall 2008

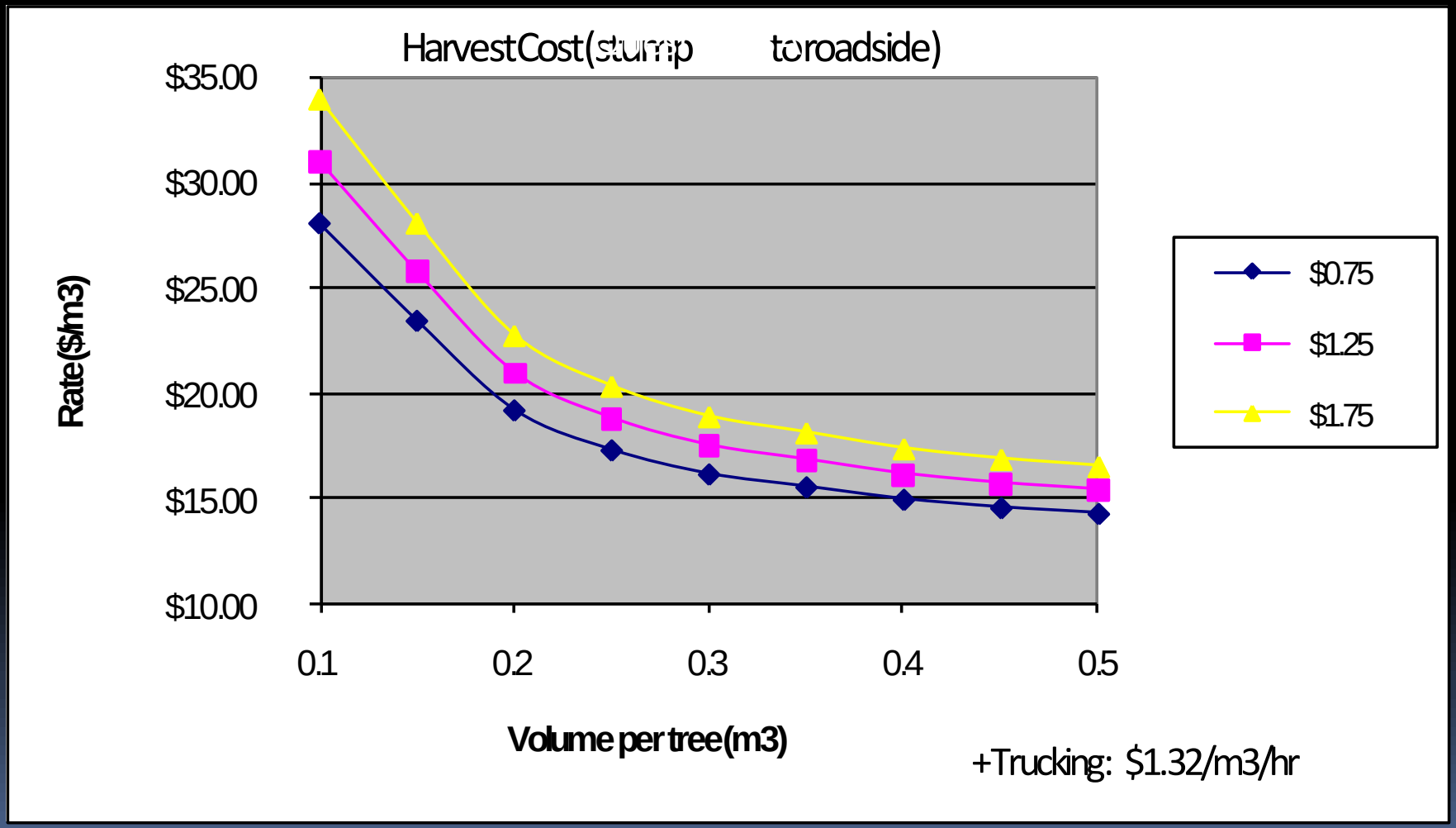
Eight-year-old hybrid poplar
(TxD) near Kilby, B.C. (Extension Note 47 BC Min. of Forests
Thomas, Comeau, Brown, 2000)

Economics 101

- What will motivate customers to buy from you?
  - Better price
  - Better product
  - Better for the environment, the community, the family (Mom or dad work there)
  - Great marketing
  - Social Pressure
  - No alternatives

Economic Models

Impact of fuel prices and piece size on delivered wood cost



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Forest Carbon

www.globalcarbonproject.org/news/ScienceHighl...

Acronyms and equivalents Forest Carbon

- Offset: carbon, sequestered due to actions that would not occur if a market for offsets did not exist.
- GHG Reduction: any action that has the net effect of reducing GHG release.
- 1 carbon offset unit = 1 tonne of CO_2e
- 1 credit = 1 carbon offset unit
  - Credits are issued under a Cap & Trade system to large emitters to encourage reduction of GHGs.
- 1 m3 pine = 210 kg carbon = .77 tonnes Co2e or 0.77 offset units.
- 1 tonne of carbon = 3.67 tonnes CO_2e
- CO_2e: Carbon dioxide equivalent
- PCT: Pacific Carbon Trust
- WCI: Western Climate Initiative

Forest Carbon Offsets on Crown Land

- Govt direction is to provide for third party sequestration and offset sales;
- Legal authority for this does not exist;
- PCT proceeding with a call this summer;
- Near term strategy:
  - Limit Crown land to that covered by a single forest tenure.
- Longer term:
  - New Legislation

Carbon Offset Demand

- **GHG REDUCTIONS:**
  - Western Climate Initiative
  - BC Government (Pacific Carbon Trust)
  - Voluntary Markets

Offset Market Requirements

- Common attributes to offset systems:
  - No Retroactivity
  - Incrementality / additionality
  - Validation and verification
  - Registry
  - Certified third party audits
  - Project approval by administrative body
  - Three independent players: administrator, buyer and seller

Crown Land Forest Offset Policy Challenges

- Conflicting land use objectives
- Conflicting rights
- Lack of good baseline data
- Risk associated with forest carbon
- What will be basis for awarding rights?
- Revenue objectives and system
- Obligations and;
- Enforcement.

Work currently underway

- Protocol development (lead: Tom Niemann, others: MFR, PCT, CAS, MoE)
- PCT Call documents lead PCT, others: Tom et al, Gosnell.
- Carbon Tenure Policy (lead: Gosnell)

One last poke….

- Its about social choice
- Economic fundamentals must not be ignored
- Beware of the snake oil salesman
- Drive change locally
- Integration is the key

Further Information

- Bioenergy Strategy http://www.energyplan.gov.bc.ca/bioenergy/
- BC Energy Plan http://www.energyplan.gov.bc.ca/
- Climate Action Plan http://www.livesmartbc.ca/government/plan.html
- Ensyn: http://www.ottawacleantech.com/media_lib/cleantech_talent_presentations/Goodfellow.pdf
- Pacific Carbon Trust: http://www.pacificcarbontrust.ca/
- Western Climate Initiative: http://www.westernclimateinitiative.org/