

Susitna Hydroelectric Opportunities & Risks

Background Materials Prepared for
Mayor's Energy Task Force

By Mark A. Foster, P.E., MAFA

April 7, 2011

Caveats & Disclosures

- The reconnaissance level data and analysis presented herein, including the presentation of long run levelized cost of electricity and long run levelized cost of energy (CHP), are based on public information. The analysis is intended to illustrate concerns with the AEA's relatively opaque Railbelt Integrated Resource Plan (February 2010) and its subsequent representations that Susitna (low Watana) is a competitive and affordable generation resource in the Railbelt (6c/kWh). This reconnaissance level analysis of long run levelized cost of energy is not a substitute for an open, transparent and accessible detailed dispatch model analysis that has been the industry standard in prior electric utility planning in the Railbelt, both collectively (R.W. Beck Railbelt Energy Review, 2006) and individually (Chugach Generation Plan, ML&P Integrated Resource Plan, MEA Integrated Resource Plans over the prior decade).
- Mark A. Foster, P.E., Principal of Mark A. Foster & Associates (MAFA), has been an engineer, utility regulatory commissioner and independent economic and regulatory consultant covering energy, pipeline and utility sectors in Alaska for over 25 years.
- Mr. Foster currently sits on the board of directors of Alaska Power & Telephone and HydroWest International. Mr. Foster served on the Board of ML&P and was chair of the Finance and Audit Committee (2009).
- Current & recent clients include City of Palmer, UAF, State of Alaska & ASHNHA, Kuukpik Corporation
- The views presented have been independently developed and do not necessarily reflect the views any clients or affiliations
- Please direct comments regarding any errors of commission or omission that remain via e-mail to mafa@alaska.net

Relevant Experience

- Born and raised in Fairbanks
- B.S. Civil Engineering, Stanford University; Senior Report: Economic Analysis of Susitna Hydroelectric (1983)
- City of Fairbanks Model Energy Code Development, Building Inspector, Plans Examiner
- V.P., Ebenal General Construction, Interior Alaska Building Construction
- Engineer, Fairbanks Municipal Utility System, Chena Coal-fired Power Plant
- Commissioner, Alaska Public Utilities Commission (1990-1993); Opening of telecom markets to competition, TAPS, Healy Clean Coal
- Principal, MAFA; Economic and Regulatory Consultant (1994 to present)
 - President/COO, Anchorage Telephone Utility Long Distance (1997-2000)
 - VP Product /Network Development, Alaska Communications System (1999-2000)
 - Adjunct Professor, MBA Program, Danube University, Austria (2000-2006)
 - Adjunct Professor, Engineering Economics, UAA (2008)
 - Board of Directors, Alaska Power & Telephone (2004-present)
 - Board of Directors, HydroWest International (2004-present)
 - Board of Directors, Chair-Audit & Finance Committee, Anchorage Municipal Light & Power (2009)
 - Selected consulting engagements (1997-2011)
 - Agrium, IPPs – Railbelt Energy Markets (Natural Gas, CTL Opportunities)
 - U.S. Department of Agriculture/ISER/Denali Commission – Sustainability of Rural Utilities
 - North Slope Borough, Kuukpik – North Slope Utilities, Local Energy Markets, Oil & Gas Exploration & Development Opportunities in Cook Inlet, South America, North Slope
 - AEA – Rural Energy Plan; Regional energy plan advisory committees; Co-authorship of renewable economics; Long Term Oil Price Projections, Invited presentation on Railbelt Energy Overview, REGA and RIRP Advisory Committees
 - APA – Regionalization Opportunities: A Review of BC Hydro History
 - Native Corporations (Arctice Slope, BBNA, CIRI, Kuukpik) – Alaska Energy Opportunities
 - Lake & Peninsula Borough Regional Energy Plan
 - ANGDA – Railbelt Gas & Electric Utilities financial capacity; Strategic Overview of Alaska Energy Alternatives
 - NREL – Renewable/EE Opportunities in Alaska
 - IAEE – Invited presentations on Railbelt Energy Economics
 - City of Palmer – District Heat Energy System Opportunity
 - ISER – Peer Review of Energy Reports (CTL, Renewables)
 - UAF Cogen Plant Alternatives
 - Akutan Geothermal Project Analysis
 - State of Alaska Division of Energy – Economic Opportunities for Shallow Gas & Coal Bed Methane

Overview

- Susitna Hydroelectric Opportunity/Risk Profile
- Evolution of Susitna Hydro Narrative (2007-2011)
 - Interior Issues Council - Energy Issues Task Force (2007)
 - AEA Susitna Pitch: “Subsidies make Susitna, a good project, better”
 - AEA REGA (2008)
 - AEA GRETC (2009)
 - AEA Susitna Project Tech Memo (March 2009)
 - AEA RIRP (Feb 2010)
 - AEA Prelim Decision Documents (Nov 2010)
 - AEA Presentations to the Leg (2011)
- Recon Level Economic Analysis of Alternatives
 - AEA Railbelt Integrated Resource Plan – Review of Key Issues
 - Gas vs. Hydro; Gas vs. Hydro + Geothermal
 - Capital cost, fuel cost, environmental, GHG, project dev’t & permitting, financing
 - Industrial NG CC CHP vs. Hydro
 - Implications of Susitna Subsidy on:
 - Natural Gas Exploration & Development; Natural Gas supply options
 - North Pole Refinery; Diesel, home heating oil, gasoline
 - Economic multipliers (capital vs. fiscal reserves)
 - Oil & Gas investment climate; exploration and development

Susitna Hydro Opportunity/Risk Profile

Susitna Hydro Opportunity (LCOE, 16-21c/kWh, 2008\$)

1. \$10-12 billion 1880 MW Susitna Project, 10-14c/kWh, **may** be competitive alternative for long term large scale industrial development. Economies of scope using combined heat & power would push the *natural gas break-even* cost into the \$16-20/mmbtu range.

2. \$5-7 billion 600MW “low Watana” Susitna Project, 16-21c/kWh, is an **Interior electric utility** bet on hydro to avoid a continued rise in oil (naphtha, HAGO, diesel) , coal, GTL, CTL, natural gas and geothermal/tidal imports + Waxman/Markey GHG emission tax cost;
GVEA Avoided Cost of Naphtha, HAGO, Diesel at \$110/bbl oil = 16-18c/kWh
GVEA Avoided Cost of Naphtha, HAGO, Diesel at \$150/bbl oil = 20-22c/kWh

3, \$5-7 billion 600 MW “low Watana” Susitna Project, 16-21c/kWh, is a **Southcentral electric utility** bet on hydro to avoid a rapid rise in natural gas, geothermal, coal, tidal, GTL, CTL + Waxman/Markey GHG emission tax;
Southcentral avoided cost of natural gas at \$6/mmbtu; 5-6c/kWh
Southcentral avoided cost of natural gas at \$20/mmbtu; 15-16c/kWh

4. Roller compacted concrete *might* be an opportunity to reduce hydroelectric dam and structures construction cost [extreme freeze thaw cycles present some risk to RCC, esp. in cold wet remote rural field conditions]

5. Fisheries enhancement opportunities vs. permit & development challenges associated with habitat and archaeology issues that may be more prominent than they were 30 years ago as environmental science, engineering and mitigation standards have continued to evolve

Susitna Hydro Opportunity/Risk Profile

Susitna Hydro Risks [LCOE, 16-21c/kWh, 2008\$]

1. ~\$31,000 per Railbelt Household is a very large *bet against natural gas for heating and electricity; smaller unsubsidized diversification bets against oil and gas may be more prudent in light of current natural gas outlook for favorable pricing; if natural gas prices increase, prospects of development of natural gas likely to increase*
2. \$5-7 billion “small” Susitna options are a Mega-Project for the AEA/Railbelt Electric Utility Alliance - presenting high schedule, cost and performance risks throughout a highly political AEA development process . Who bears the risk; who gets the benefit?
3. Railbelt Electric Utility/AEA Alliance focus on 6c/kWh (levelized 2008\$) and <\$5billion total estimate (2008\$) appears to have lead to aggressive accounting between RIRP (2010) and Large Hydro Evaluation (2010) raising concerns about the REU/AEA’s ability to be forthright and set realistic expectations about benefits, costs and risks [see Slide 7]
4. Multi-billion dollar Susitna hydro subsidies undermine natural gas market opportunities, creating potential hyper-subsidy “death spiral” that requires billion dollar subsidies for natural gas to “level the playing field” between gas & hydro; draining fiscal reserves and raising pressure for ***even higher oil taxes*** [see Slide 16; Increase in natural gas pipeline tariff associated with decrease in natural gas for electric generation market]
5. Multi-billion dollar Susitna hydro subsidies undermine natural gas market opportunities that could help extend the life of oil field infrastructure and oil field exploration and development time horizons [Cook Inlet jack-up rig ventures in search of **oil and gas** opportunities]
6. Multi-billion dollar Susitna hydro subsidies undermine other renewables under development, e.g., Mt. Spurr Geothermal (10-12c/kWh), Cook Inlet Tidal (11-14c/kWh), other hydro , e.g., Glacier Fork (12-14c/kWh) [see Slide 11]
7. Multi-billion dollar Susitna hydro subsidies undermine other “new clean technology” opportunities using gas and coal, e.g., Gas to Liquids (GTL) & Coal-to-Liquids (CTL) Power Blocks (200MW Scale) (11-14c/kWh) [see Slide 11]
8. Multi-billion dollar Susitna hydro subsidies may have a capital multiplier of around 40c compared to fiscal reserves for PFD and Operating (teachers, troopers) of around \$1.20; a billion \$ subsidy to buy down Susitna hydro to what natural gas would have been results in no net gain for Southcentral Electric Ratepayers & a net loss of roughly \$800 million for each \$1 billion subsidy in overall Alaska economy [Economic Multiplier Reference: UAA ISER, The Alaska Citizen’s Guide to the Budget, \$2.8 “Economic Impact of Cash on the Street”]

Evolution of the Susitna Narrative

Report	Take-Aways
1. Interior Issues Council – Cost of Energy Task Force (2007)	Susitna Hydroelectric = 5.58¢/kWh (600MW) Coal Gasification = 7.2 to 7.7¢/kWh
2. AEA Road Show (2008+)	“Subsidies make Susitna, a good project, better”
3. AEA REGA (2008)	\$8 billion needed for hydro/renewable future; tax exempt debt is cheaper than taxable; zero interest loans are cheaper than tax exempt debt; grants are cheaper than zero interest loans [“let’s get together on subsidies and lower <i>our cost</i> ”]
4. AEA GRETC (2009)	Tax-exempt financing may provide a cost advantage for hydro/renewable future + large transmission build; Existing electric utility balance sheets <i>unable</i> to support large new debt w/o adjustments . AEA Interest in billion dollar subsidies from state; interest in postage stamp rates*
5. AEA Susitna Project Memo (2009)	Susitna Hydroelectric (1880MW) = 14¢/kWh; \$11.7 billion; \$6223/kW** Susitna Hydroelectric (600MW) = 20¢/kWh ; \$6.9 billion; <u>\$11,500/kW</u>
6. AEA B&V RIRP (2010)	“Forced 50% Renewables = Least Cost Plan <i>only if</i> a large hydroelectric project is built”; need \$1.5 Billion in Transmission to integrate renewables into grid Chakachamna = <u>\$5100/kW</u> ; Glacier Fork = \$4533/kW
7. AEA Large Hydro Evaluation (2010)	Susitna Hydroelectric (600MW) = 6c/kWh (50/50); \$4.5 billion; <u>\$7759/kW</u> ; Chakachamna (300MW) = 9-12c/kWh (50/50); \$2.9 billion; <u>\$9667/kW</u>
8. AEA Leg Presentations (2011)	Susitna Hydroelectric (600MW) = \$4.8 billion, <u>6c/kWh</u> [50/50 grant/subsidized loan]; could interconnect to industrial loads, \$7973/kW; <u>LW2RCC = \$6426</u>

A. Susitna: \$11,500/kW => \$7759/kW (-33%); \$6426/kW (-44%)

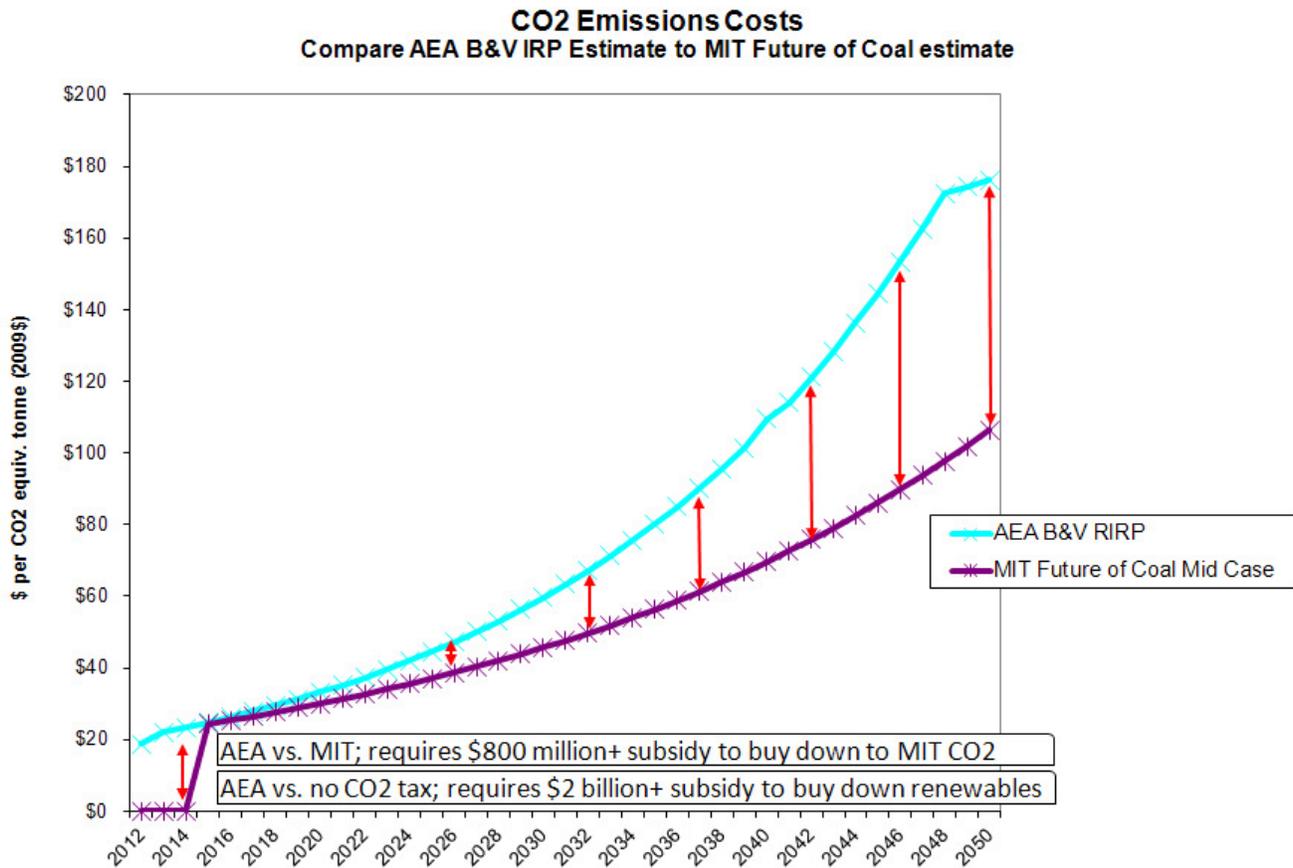
B. Chakachamna: \$5100/kW => \$9667/kW (+90%)

Review of AEA RIRP Cost Accounting

Issue	AEA B&V IRP	Concern
CO2 Emissions Cost	Base Case Assumes CO2 costs track Waxman-Markey trajectory	Adds large cost burden to natural gas, oil and coal in IRP. CO2 emissions cost assumption alone requires State of Alaska to take \$2 Billion out of State fiscal reserves (aka Alaska household pockets) to make it appear as if IRP Renewables (Susitna doesn't even make IRP cut) are competitive with natural gas. [IRP, Table 1-4] [Slide 9]
Hydro Capital Cost	Glacier Fork Chakachmana	RIRP uses low capital cost estimates for "paper" hydro that makes the IRP cut ; GF (5-6¢/kWh), Chaka1 (7-8¢/kWh) to make it appear as if renewables are competitive with natural gas + CO2 tax. [IRP, Table 1-4; p. 10-25]
Susitna Capital Cost	Low Watana Expandable \$4.9B	Cost estimates, especially mitigation, transmission, engineering, environment (permitting) and construction management appear low - on the order of 40%. [Slide 15] RIRP admits that even with their low Susitna estimates, Susitna is more expensive than their least cost renewable plan by 15%. [p. 1-36]
Optimal development of Susitna Basin	IRP includes individual sub-optimal expensive Susitna projects	Larger scale two-dam project scale economics begin to be competitive with natural gas; smaller scale projects are too expensive requiring subsidies to make them appear competitive with natural gas [Slides 11, 13]

Review of AEA RIRP

CO₂ Emissions Costs



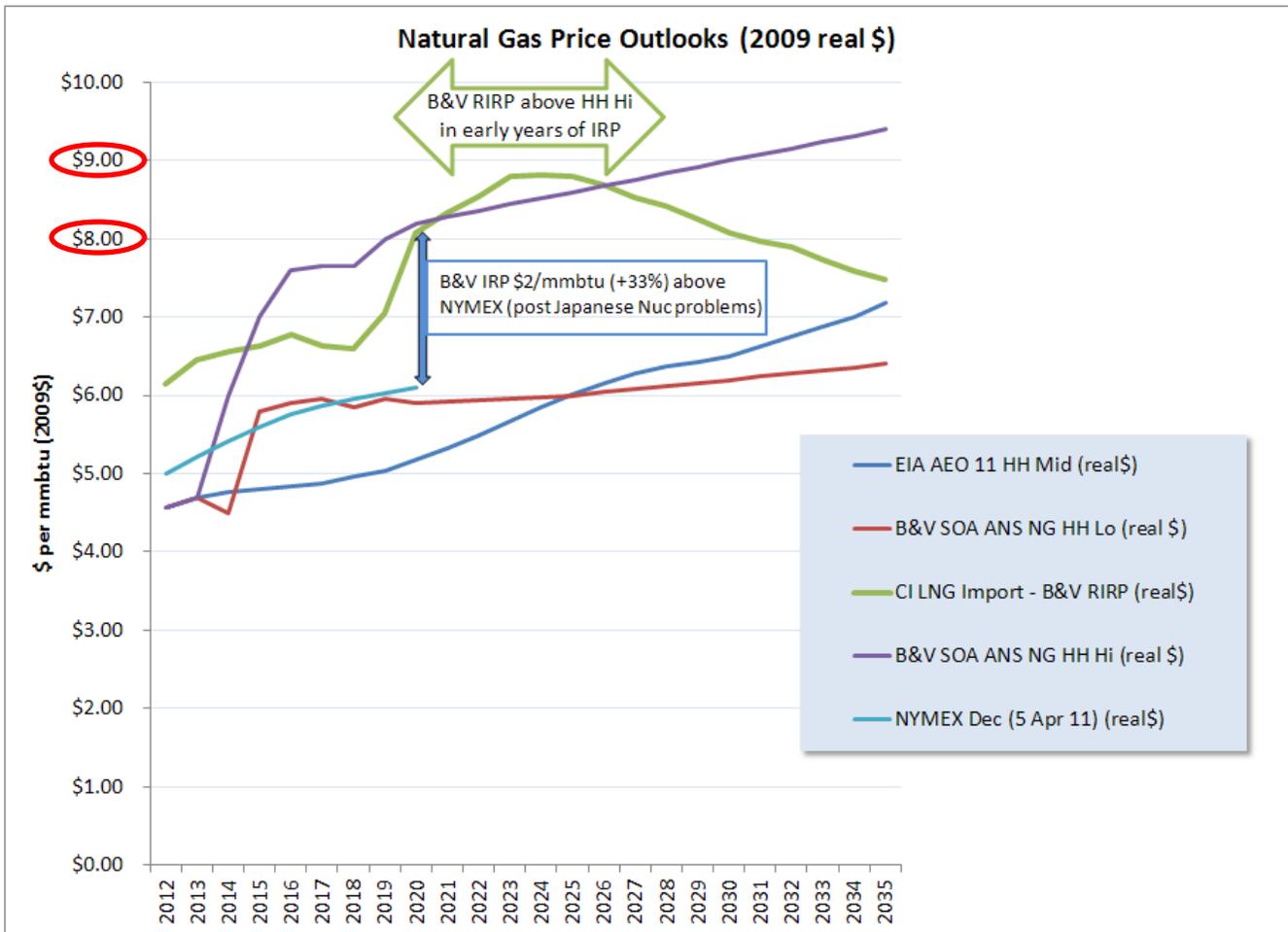
RIRP Table 1-4 Summary

CO2 emissions cost assumption adds \$2.4 billion (+21%) to Least Cost Plan [mostly natural gas].

Also note public concerns expressed by Steve Denton (Usibelli Coal) that well before CO2 emissions costs reach \$100/tonne, CO2 capture and sequestration may well become economical, putting an effective cap on the cost exposure under a cap and trade system from the perspective of electric utility generating resources

Review of AEA RIRP

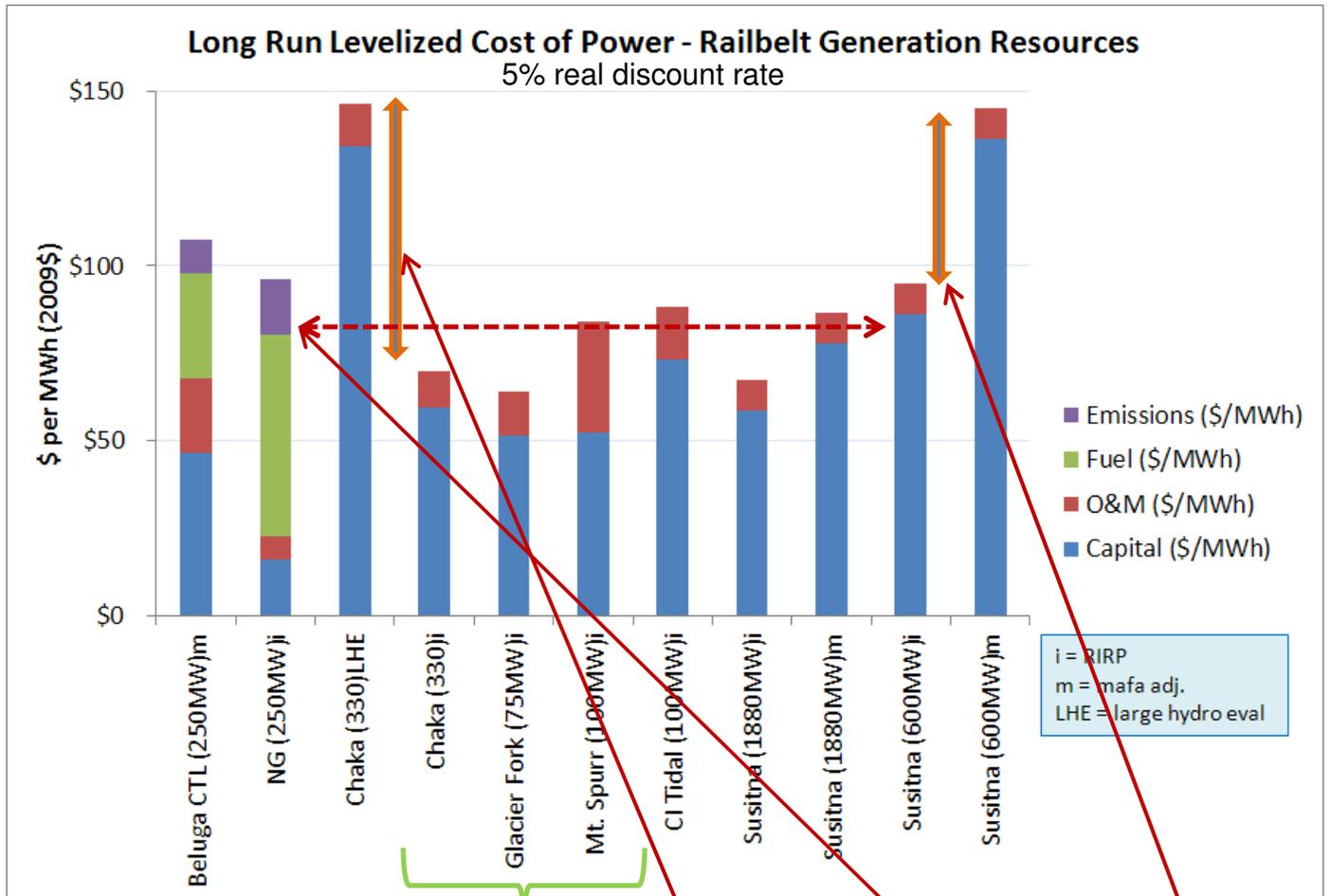
Natural Gas Price Outlook



1. AEA B&V IRP natural gas price outlook may be high relative to more current market projections (almost \$9/mmbtu in mid 2020s)
2. Use \$8/mmbtu (2009\$) as rough long run levelized Cook Inlet LNG Import benchmark

Review of AEA RIRP

RIRP vs. post RIRP swap of Su for Chaka



1) IRP (Feb 10)
 Renewables
 Appear
 competitive
 Vs. natural gas
 @\$8/mmbtu +
 CO2 emissions
 cost

Large Hydro Evaluation (Nov 10):
 2) Add 90% to Chakachamana cost; Declare
 expensive Susitna (600MW) as the only way to
 achieve 50% renewable goal; 3) Ignore natural
 gas vs. expensive Susitna competition issues; 4)
 Summary representations underestimate Susitna
 hydro costs; especially Transmission, Mitigation,
 Engineering, Environmental & Construction
 Management [AEA appears to continue to stretch
 to 6c & <\$5B]

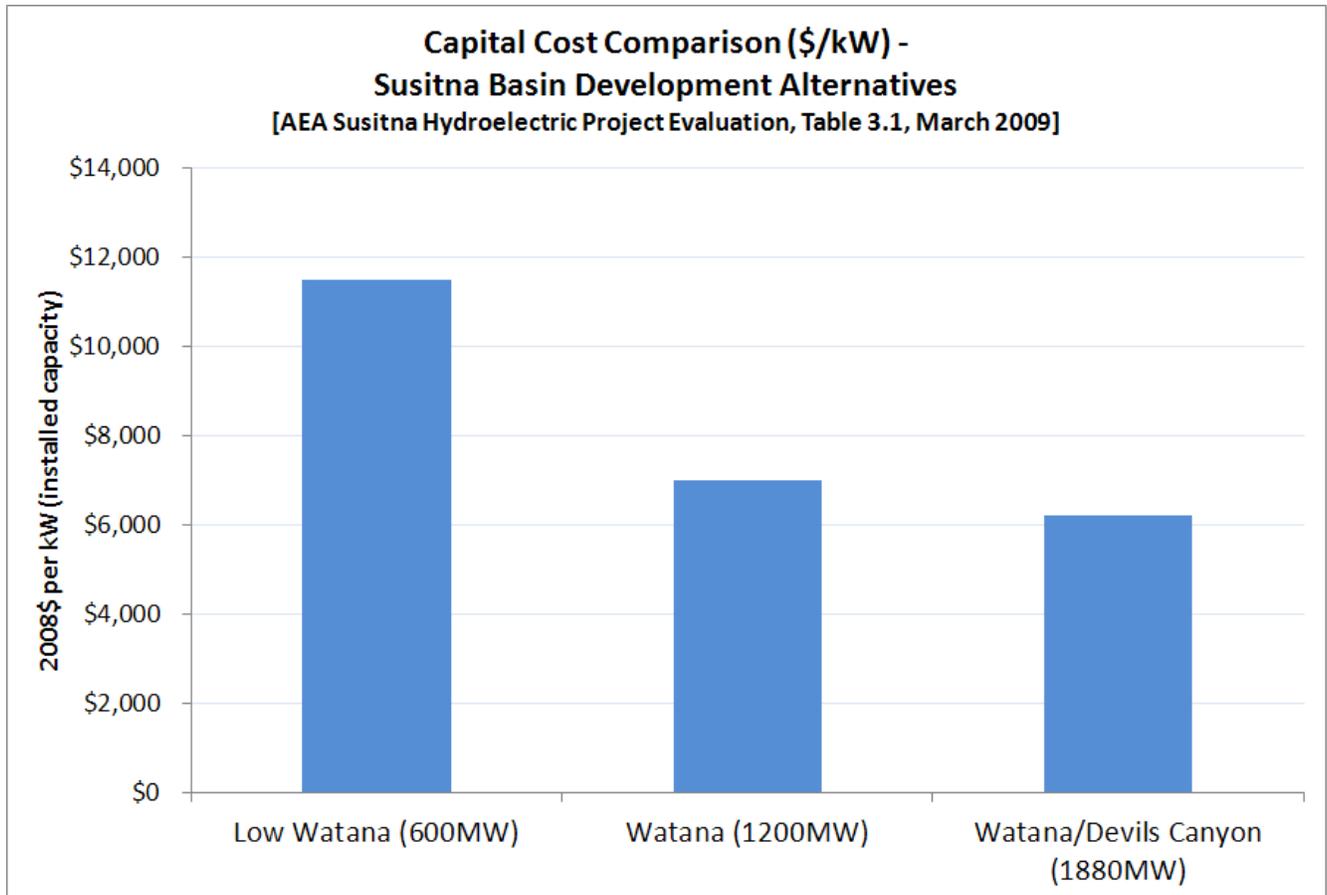
Review of AEA RIRP

Base Case Recon Economic Comparison Assumptions

Railbelt Long Run Levelized Cost of Electricity											
Initial Recon Estimates											
draft: 23-Mar-11											
q's to: mafa@alaska.net											
LEVELIZED COST OF ELECTRICITY											
Compare Base Load Generating Units											
Real 2009\$ unless otherwise noted											
Project =>	Beluga CTL (250MW)m	NG (250MW)i	Chaka (330)LHE	Chaka (330)j	Glacier Fork (75MW)i	Mt. Spurr (100MW)i	Cl Tidal (100MW)i	Susitna (1880MW)i	Susitna (1880MW)m	Susitna (600MW)i	Susitna (600MW)m
Capital (\$/MWh)	\$46.38	\$15.83	\$134.24	\$59.39	\$56.65	\$52.44	\$73.23	\$58.70	\$77.78	\$86.21	\$136.39
O&M (\$/MWh)	\$21.39	\$6.91	\$12.17	\$10.33	\$13.44	\$31.69	\$15.21	\$8.64	\$8.64	\$8.64	\$8.64
Fuel (\$/MWh)	\$30.00	\$57.60	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Emissions (\$/MWh)	\$9.73	\$15.80	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL (\$/MWh)	\$107.50	\$96.14	\$146.41	\$69.72	\$70.09	\$84.13	\$88.44	\$67.33	\$86.41	\$94.85	\$145.03
Capacity (MW)	250	252	330	330	75	100	100	1880	1880	600	600
Capital Cost (\$/kW)	\$5,000	\$1,600	\$9,667	\$5,228	\$4,533	\$6,360	\$6,000	\$5,106	\$6,223	\$7,500	\$10,913
less contributed capital	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Net Capital Cost (\$/kW)	\$5,000	\$1,600	\$9,667	\$5,228	\$4,533	\$6,360	\$6,000	\$5,106	\$6,223	\$7,500	\$10,913
Economic Life	30	30	50	50	50	30	20	100	50	100	50
5.0% Real Discount Rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Capital Recovery Factor	0.0651	0.0651	0.0548	0.0548	0.0548	0.0651	0.0802	0.0504	0.0548	0.0504	0.0548
Capital Recovery (\$/kW/yr)	\$325.26	\$104.08	\$529.53	\$286.35	\$248.30	\$413.73	\$481.46	\$257.28	\$340.90	\$377.87	\$597.80
Annual Capacity Factor	0.80	0.75	0.45	0.55	0.50	0.90	0.75	0.50	0.50	0.50	0.50
Annual Energy (MWh/yr)	1,753,200	1,656,774	1,301,751	1,591,029	328,725	788,940	657,450	8,240,040	8,240,040	2,629,800	2,629,800
Capital Cost (\$/MWh)	\$46.38	\$15.83	\$134.24	\$59.39	\$56.65	\$52.44	\$73.23	\$58.70	\$77.78	\$86.21	\$136.39
Fixed O&M Cost (\$/kW-year)	\$150.00	\$13.11	\$40.00	\$40.00	\$50.00	\$250.00	\$100.00	\$30.00	\$30.00	\$30.00	\$30.00
Variable O&M Cost (\$/MWh)	\$0.00	\$4.92	\$2.03	\$2.03	\$2.03	\$0.00	\$0.00	\$1.79	\$1.79	\$1.79	\$1.79
Total O&M Cost (\$/MWh)	\$21.39	\$6.91	\$12.17	\$10.33	\$13.44	\$31.69	\$15.21	\$8.64	\$8.64	\$8.64	\$8.64
\$/year (millions)	\$37.5	\$13.2	\$13.2	\$13.2	\$3.8	\$25.0	\$10.0	\$56.4	\$56.4	\$18.0	\$18.0
Fuel Supply											
Fuel Supply (\$/MMBtu)	\$3.00	\$8.00									
Heat Rate (Btu/kWh)	10,000	7,200									
Fuel Cost (\$/MWh)	\$30.00	\$57.60									
Environmental Costs											
GHG Emissions (lbs/MWh)	200	1100									
\$30 GHG Cost (\$/tonne)	\$30	\$30									
GHG Cost (\$/MWh)	\$2.73	\$15.00									
SOx, NOx (\$/MWh)	\$2.00	\$0.80									
Hg (\$/MWh)	\$5.00	\$0.00									

Susitna Basin Development Options

*Missed opportunity to exploit scale and encourage development without resorting to massive gov't subsidies
[Local utilities/AEA appear overly focused on opportunities for political subsidies vs. scale/scope economics to attract industry]*



If AEA's team can achieve around a 44% cost savings on Low Watana from their first 2009 estimate to get it down from \$11,500/kW to \$6500/kW*; imagine what they might be able to achieve if they focused on the scale and scope economics, including greater water storage and logistic support from Parks Highway corridor; taking W/DC from \$6220/kW to \$3,490/kW or ~6.5c/kWh (*without subsidy*)

Concerns with Susitna Capital Cost Estimates:

MAFA Notes on AEA Presentation of Low Watana Estimate to House Energy Committee

Susitna Estimate Comparisons							
draft:		6-Apr-11					
q's to:		mafa@alaska.net					
AEA ESTIMATES (February 23, 2011)							
Provided to Alaska House Energy Committee							
600 MW							
LOW WATANA 600 MW							
2008\$							
		Project Memo (March 2009)		Prelim Decision Document (November 2010)		Variance	
FERC Line #	Description	\$ Millions	\$/kW	\$ Millions	\$/kW	\$ Millions	\$/kW
AEA Explanation							
	Land and Land Rights	121	\$202	121	\$202	0	\$ -
	Power Plant Structure Improvements	159	\$265	159	\$265	0	\$ -
	Reservoir, Dams and Tunnels	2450	\$4,083	1718	\$2,863	(732)	\$ (1,220)
	Waterways	0	\$0	677	\$1,128	677	\$ 1,128
	Waterwheel, Turbines & Generators	325	\$542	297	\$495	(28)	\$ (47)
	Accessory Electrical Equipment	39	\$65	41	\$68	2	\$ 3
	Misc. Power Plant Equipment	28	\$47	32	\$53	4	\$ 7
	Roads	599	\$998	232	\$387	(367)	\$ (612)
	Transmission	648	\$1,080	224	\$373	(424)	\$ (707)
	Misc. Equipment	9	\$15	16	\$27	7	\$ 12
	Construction Camp	609	\$1,015	180	\$300	(429)	\$ (715)
	Mitigation	200	\$333	0	\$0	(200)	\$ (333)
	Subtotal	5,187	\$8,645	3,697	\$6,162	(1,490)	\$ (2,483)
20%	Contingency	1,037	\$1,729	739	\$1,232	(298)	\$ (497)
	Subtotal	6,224	\$10,374	4,436	\$7,394	(1,788)	\$ (2,980)
MAF Notes:							
11%	6%	Engineering, Environmental, Construction Management [11% internal documents; 6% presentation to the Leg]	685	\$1,141	266	\$444	(419) \$ (698)
		Mitigation			141	141	\$ -
		EECM + Mitigation Subtotal			407		
20%		Contingency on EE&CM	137	\$228	81	\$136	(56) \$ (93)
		TOTAL	7,046	\$11,743	4,784	\$7,973	(2,262) \$ (3,770)
				<i>AEA Promotional Estimate to LEG</i>			-32%
Project Memo to LEG Presentation							
<u>Notes</u>							
1 AEA Presentation to House Energy (23 Feb 2011) of the Project Memo (March 2009) did not include mitigation in its totals. While the figure is listed in the presentation, it is NOT included in the totals. The AEA's erroneous addition is corrected here to \$5.187 billion.							
2 The AEA Presentation to House Energy (23 Feb 2011) of the Project Memo (March 2009) misrepresents the subtotal for Engineering, Environmental, and Construction Management at roughly 6% of the Total Construction Cost. The Project Memo uses 11% for EE&CM.							

Concerns with Susitna Capital Cost Estimates:

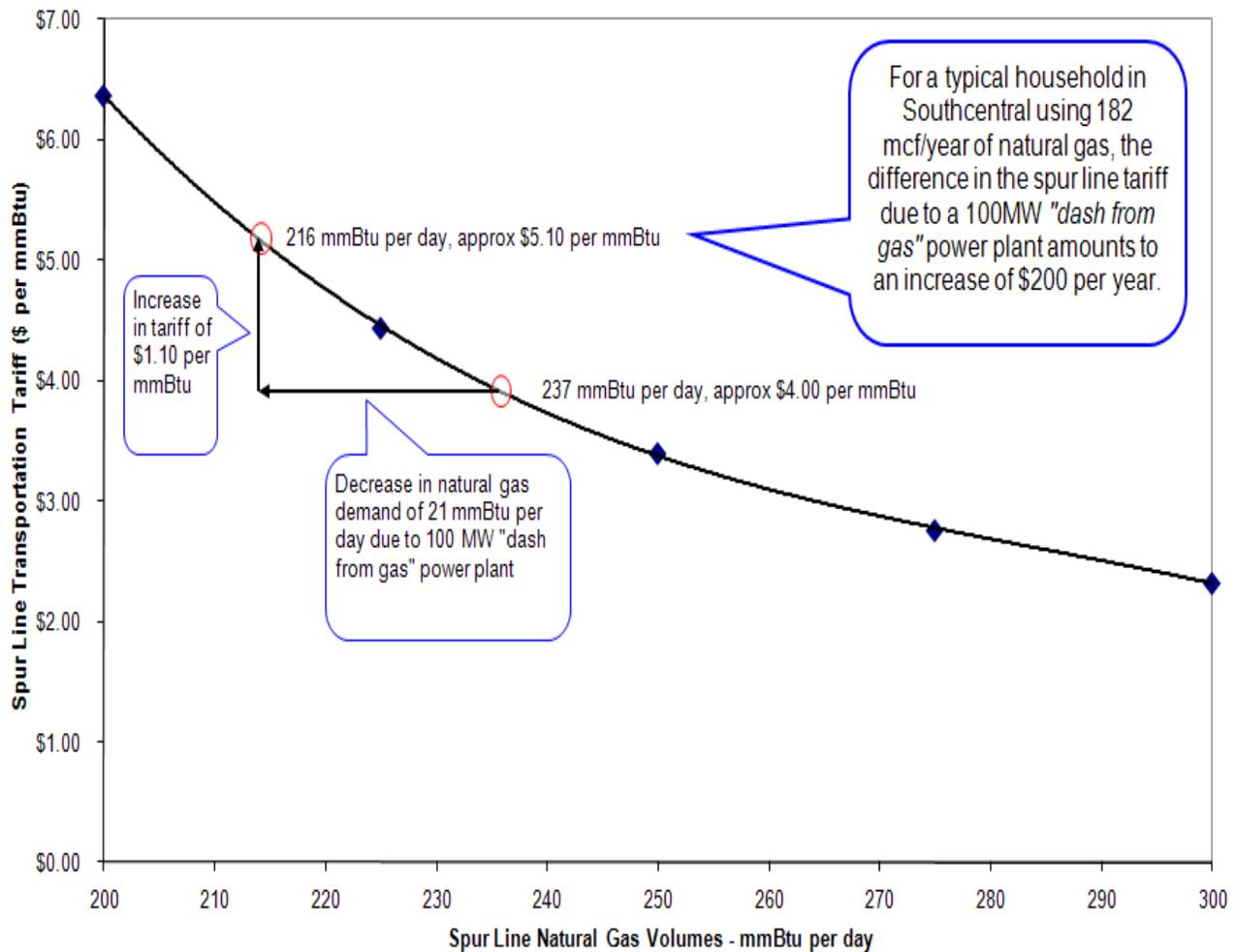
MAFA suggested math corrections and risk adjustments to Low Watana Estimate [Transmission, Rail Only Access, Construction Camp, Mitigation, apply appropriate EECM pct, correct addition errors in AEA presentation]

Susitna Estimate Comparisons								
draft:		6-Apr-11						
q's to:		mafa@alaska.net						
MAF PRELIMINARY NOTES								
600 MW								
LOW WATANA 600 MW								
2008\$								
		Project Memo (March 2009)		MAFA Suggested Risk Adjusted Estimate		Variance		
FERC Line #	Description	\$ Millions	\$/kW	\$ Millions	\$/kW	\$ Millions	\$/kW	
MAFA NOTES								
	Land and Land Rights	121	\$202	121	\$202	0	\$ -	
	Power Plant Structure Improvements	159	\$265	159	\$265	0	\$ -	
	Reservoir, Dams and Tunnels	2450	\$4,083	1718	\$2,863	(732)	\$ (1,220)	Accept AEA Adjustment (Nov 2010)
	Waterways	0	\$0	677	\$1,128	677	\$ 1,128	Accept AEA Adjustment (Nov 2010) Keep Avg. Quote during Pre Design/Pre Permit Phase
	Waterwheel, Turbines & Generators	325	\$542	325	\$542	0	\$ -	
	Accessory Electrical Equipment	39	\$65	41	\$68	2	\$ 3	Accept AEA Adjustment (Nov 2010)
	Misc. Power Plant Equipment	28	\$47	32	\$53	4	\$ 7	Accept AEA Adjustment (Nov 2010)
	Roads / Rail	599	\$998	255	\$425	(344)	\$ (573)	Accept Rail Only Access Est. (Nov 2010)
	Transmission	648	\$1,080	750	\$1,250	102	\$ 170	Keep transmission upgrades in estimate; the cost to connect and integrate Susitna into the grid should be included here under the cost causer = cost payer principle, not in off-balance sheet accounting; add first order costs to fully integrate Susitna with entire grid
	Misc. Equipment	9	\$15	16	\$27	7	\$ 12	Accept AEA Adjustment (Nov 2010)
	Construction Camp	609	\$1,015	288	\$480	(321)	\$ (535)	Accept 75% of AEA Adjustment (Nov 2010) Use 40% of Idaho National Lab U.S. Hydro Database Mitigation Estimate for Watana (25% of Construction Cost) in recognition of "smaller impact profile" of low Watana
10%	Mitigation	200	\$333	438	\$730	238	\$ 397	
	Subtotal	5,187	\$8,645	4,820	\$8,034	(367)	\$ (611)	Correct AEA Addition Error (note 1)
20%	Contingency	1,037	\$1,729	964	\$1,607	(73)	\$ (122)	
	Subtotal	6,224	\$10,374	5,784	\$9,640	(440)	\$ (734)	
11%	Engineering, Environmental, Construction Management	685	\$1,141	636	\$1,060	(48)	\$ (81)	Use Standard EE&CM Estimate Pct (note 2)
20%	Contingency	137	\$228	127	\$212	(10)	\$ (16)	
	Subtotal	7,046	\$11,743	6,548	\$10,913	(498)	\$ (830)	
				Millions \$	\$/kW			
	MAFA Adjusted Estimate			6,548	\$10,913			
	AEA Preliminary Decision Document Representation (23 Feb 2011)			4,784	\$7,973			
	AEA Underestimate (Amount)			1,764	\$2,940			
	AEA Underestimate (Pct)			37%				
Notes								
1	AEA Presentation (23 Feb 2011) of Project Memo from the IRP development time frame (March 2009) did not include mitigation in its totals. While a figure appeared to be included in the list, it was NOT included in the totals. The AEA's erroneous addition is corrected here to \$5.187 billion.							
2	The AEA Presentation (23 Feb 2011) of the Project Memo (March 2009) estimates misrepresents the subtotal for Engineering, Environmental, and Construction Management at roughly 6% of the Total Construction Cost. The Project Memo used 11% for EE&CM.							
3	AEA endorsement of "smaller footprint" of low Watana (in support of low cost estimate) while also promoting the project as a potential boost to industrial development (mining, metals processing) appears problematic. If the project is shrank down to a small footprint and its primary purpose is for industrial development it would seem that public support for large subsidy may be mixed at best and a permit process (and cost estimate) based on small footprint may be more vulnerable to challenge.							

Implications of Subsidized Susitna Hydro on Natural Gas Exploration and Development

“One subsidy leads to another and...”

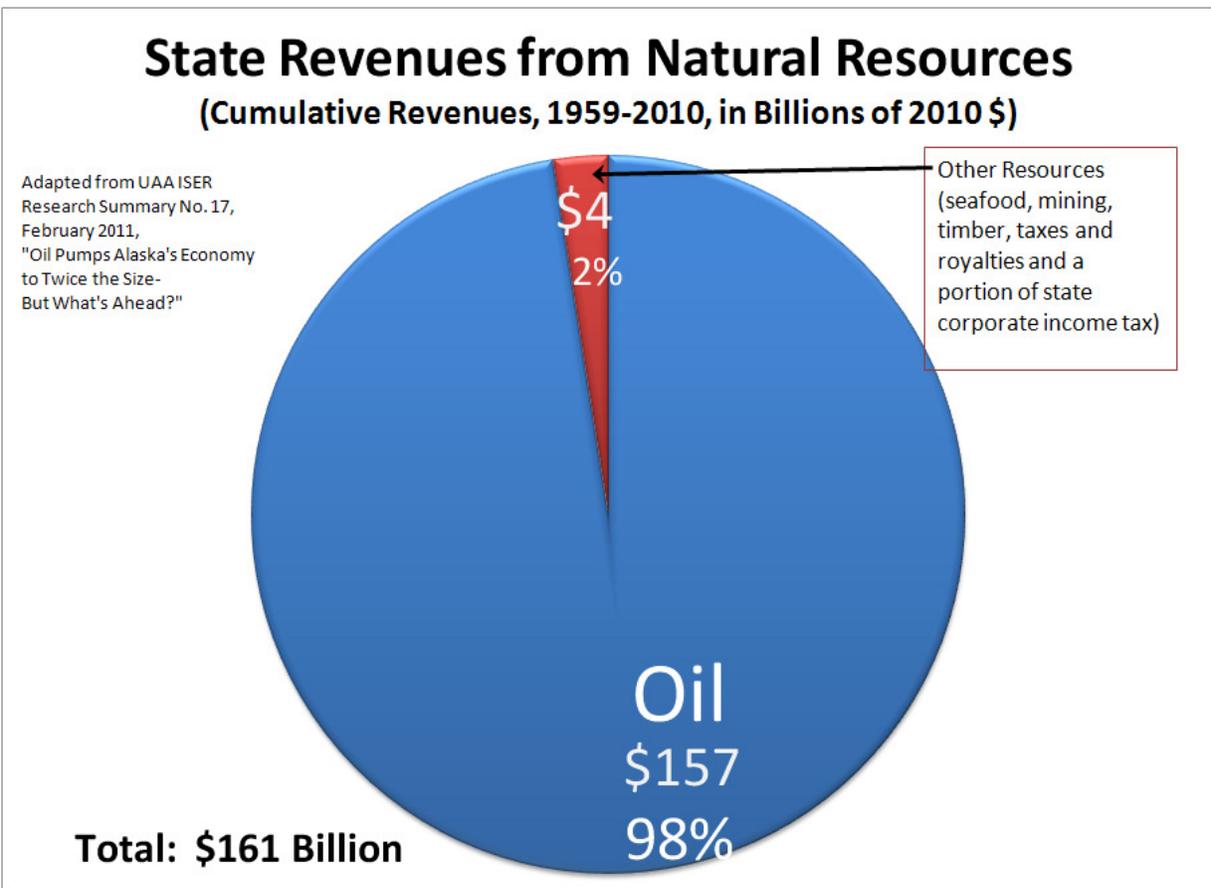
ANGDA Business Plan (Nov 06) - Estimated Tariff - Spur Line South
 (Spur Line Market: No LNG export, No Fertilizer export scenario)



A 600 MW subsidized Susitna; 6X\$200 per year = \$1200 per year per natural gas household subsidy may be required to hold harmless Spur Line customers; Bullet Line hold harmless subsidy may be roughly 2-3X larger (potentially higher volume, but still relatively steep unit cost curve due to distance & scale)

What about economic development opportunities?

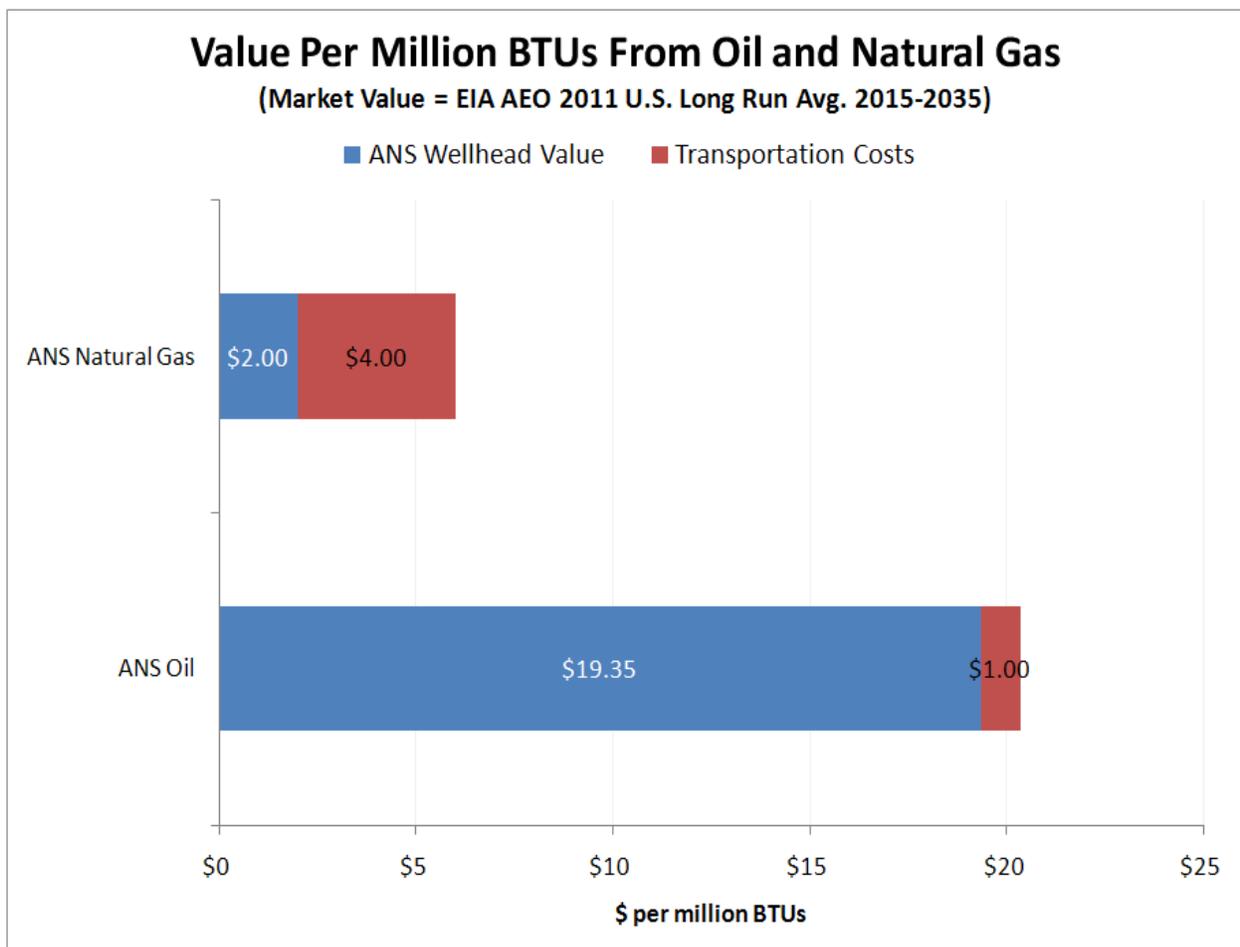
Oil has tremendous wellhead value potential; diversifying away from oil & gas is a very risky business – shifting from support of very robust margins to chasing after very narrow margins



Alaska's Economy Value Drivers

Oil has tremendous wellhead value potential; natural gas has some wellhead value potential & its infrastructure complements oil.

Be ***very careful*** spending fiscal reserves on hyper-subsidized capital projects that *undermine* oil and gas through direct competition or by draining fiscal reserves quickly on relatively low economic leverage projects – raising prospects of tax increases on oil and gas



Conclusions

- Oil is the principal value driver in the Alaska economy
- Large Government “hyper-subsidies” for *mega-projects* in the energy sector that do not enhance oil prospects present risks for the overall economy
 - Gov’t hyper-subsidized mega-projects are prone to a political process that frequently picks expensive locally popular projects over cost-effective projects, presenting a high risk of cost overruns and schedule delays, all the while creating uncertainty for free enterprise private sector initiative, innovation and opportunity. Policy makers may want to consider laser focus on rationale timely permit process and open market competition rather than encouraging long line of mega-project subsidy seekers
 - Gov’t hyper-subsidized mega-projects in Alaska have poor economic and job multipliers compared to basic government services (education, troopers) and PFD (0.3-0.5 vs. 1.2); net drag on economy
 - Gov’t hyper-subsidized mega-projects frequently strand free enterprise private sector investment, raising regulatory uncertainty and crowding out future private sector investment, creating a death spiral of subsidies
 - Gov’t hyper-subsidized mega-projects can quickly drain fiscal reserves and raise the prospects of TAX INCREASES ON OIL to support basic services
- In contrast narrowly targeted strategic investment in *basic infrastructure* (roads, harbors, energy transmission infrastructure, especially where State funds can be leveraged) to enhance oil and high value export industries might yield net benefits (Road to the Foothills, Road to Red Dog Mine, Transmission) to the economy