Interior Issues Council
Cost-of-Energy Taskforce

- Fairbanks pulling together and asking the tough questions to find an energy solution.
- Partnering with: FEDCO, utility, industry, environmental community, University of Alaska – Fairbanks, CCHRC, government
- Finding common ground in a diverse group.

Energy Taskforce Process

- Recharge Existing Taskforce and add new impassioned members
- Identify Issues to be addressed
- Form workgroups
- Create Business Plan

IIC Energy Taskforce Members

Chair: Steven Haagenson

Frank Abegg
Henry Cole
Ryan Colgan
John Davies
Jim Dodson
Mark Elliot
Hugh Fate
Lori Fickus
Jack Hebert
Dave Hoffman
Gwen Holdman
Sue Hull
Bernie Karl
Kate Lamal
Carol Lewis
Eric Lidji
Karl Monetti
Paul Morgan
Mike Musick
Paul Parks
Cassie Pinkel
William Sackinger
Rick Solie
Jomo Stewart
David Van Den Berg
Jeff Werner
Dan White

Issues to be Resolved

Issue	
PM2.5	Particulate matter under 2.5 microns
Municipal Waste	Paper, plastics, tires, wood and metals
Cost of Energy	Our original goal: “Reduce the cost of energy”
Sustainability	Fuel for the 100 year plus timeframe
Global Warming	CO2 reduction
Green Energy	Helping ourselves and others meet an RPS
Economic Development	Local jobs, economic diversification and growth
Wildfire Mitigation	Fire buffers around populated areas
Fuel Supply	Fuel that is vertically integrated, economic, long-term stable priced and sustainable

Looming Energy Issues

Scenario	Issue
TAPS	Pipeline could shut down by 2014 – low volume
Anchorage Gas Supply	Anchorage could run out of gas by 2011
Bullet Line	Line not built till 2011
Natural Gas Pipeline	Line not built till 2017-2022
Kenai gas supply	No additional gas found
Aging Generation	1,000 MW to be replaced in next 10 years
Cost of crude oil	Crushing the economy throughout Alaska
Joint Utility Planning	Multiple directions and goals

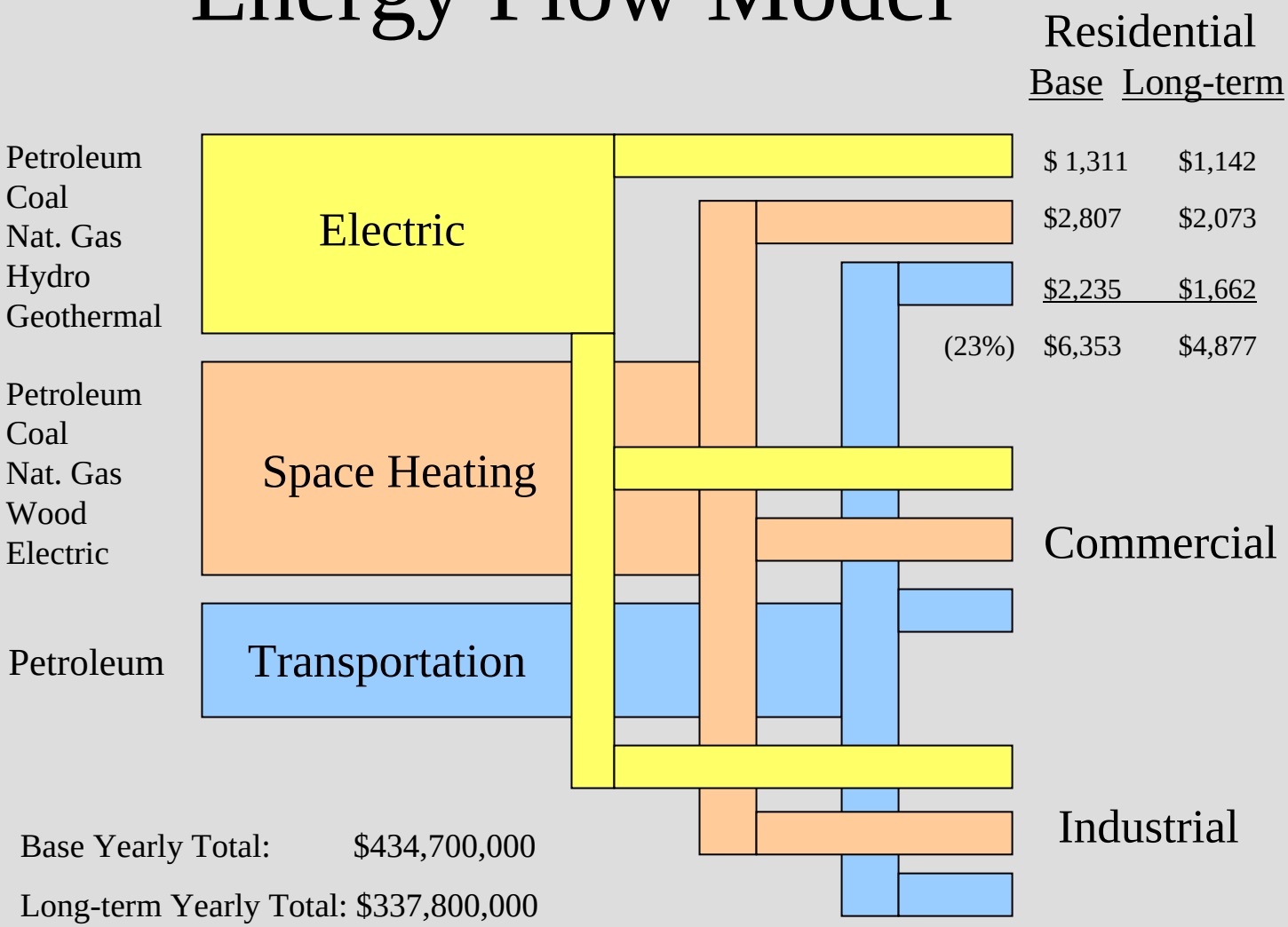
Workgroups

ALTERNATIVE	Chair
Waste-to-Energy	Ryan Colgen
Biomass	Gwen Holdmann
Gasification	Dave Hoffman
Fischer-Tropsch	Paul Park
Hydroelectric	John Davies
Geothermal	Dan White
Distributed Generation	Jack Hebert
Conservation/ Efficiencies	Rich Seifert
Modeling	Henry Cole

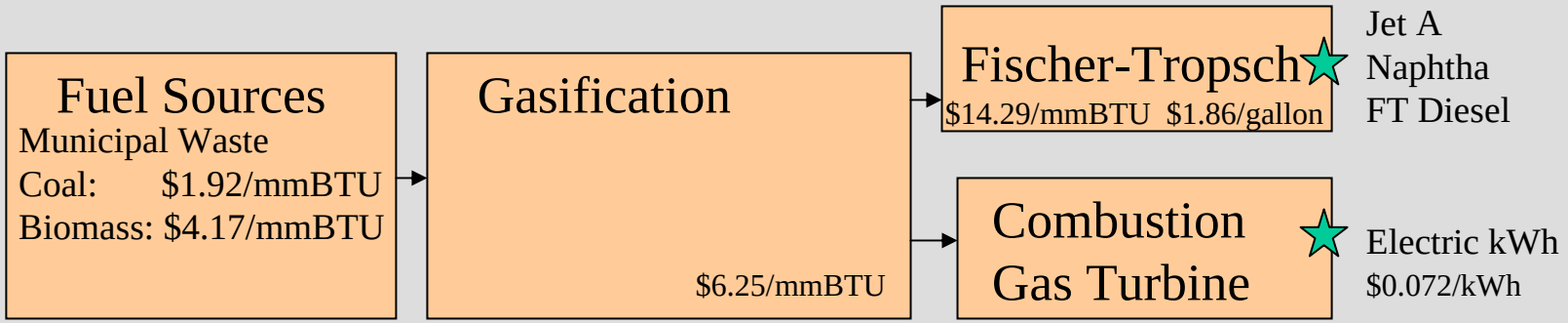
Business Planning

Business Plan Components	Status
Executive Summary	Last product- not complete
Marketing Plan	Lower cost of total energy strategy
SWOT Analysis	Completed in draft
Services and Products	Syngas, electricity, FT fuels
Structure and Organization	Non-profit or low profit
Financials	High level to verify lower costs
Contingencies	Not started
Exit Strategy	Not started

Energy Flow Model

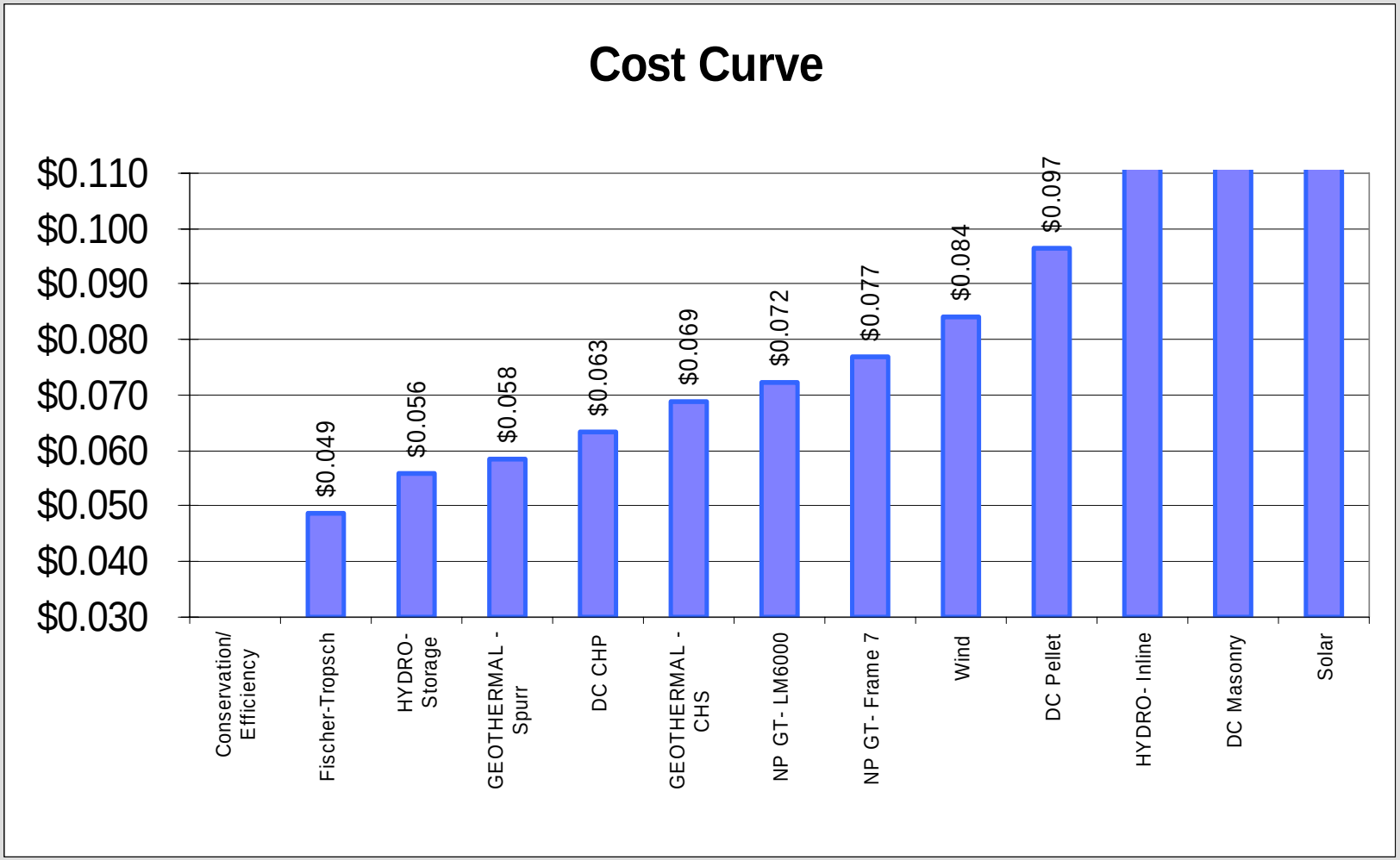


Financial Model



Natural Gas	$9.00/mmBTU	
Diesel	$20.90/mmBTU	
Solar	$204.25/mmBTU	$0.6971/kWh
Direct Combustion- CHP	$18.56/mmBTU	$0.0633/kWh
Wind	$24.61/mmBTU	$0.0840/kWh
Geothermal	$17.10/mmBTU	$0.0584/kWh
Hydroelectric:	$16.36/mmBTU	$0.0558/kWh
Conservation/ efficiency improvements	$(5.93)/mmBTU	($0.0203)/kWh

Options Sorted by Price



Energy Cost Model

Active

Renewable Flow 10-07

Draft Recommendations:
Short, Mid, & Long Term

Short-term	Conservation of energy through weatherization and efficiency increases
Mid-term	Gasification for existing Gas Turbines 5,000 bpd Fischer-Tropsch Plant
Long-term	600 MW Susitna Hydro Project + Interties 100 MW Mt. Spurr Geothermal Project

Does this plan achieve our goals?

Issue	
PM2.5	Significantly reduced due to ultra-low sulfur FT fuel
Municipal Waste	Resolved waste-to-energy by gasification
Cost of Energy	Significant reduction
Sustainability	Long-term with coal, sustainable with aspen/willows
Global Warming	Zero from hydro, carbon neutral with aspen/willows
Green Energy	Yes with hydro, geothermal and aspen/willows
Economic Development	Yes, local jobs, economic diversification and growth, increase in disposable income
Wildfire Mitigation	Yes, with strategically harvested aspen/willows
Fuel Supply	Fuel that is vertically integrated, economic, long-term stable-priced and sustainable

Planning to reduce the impact

Scenario	Results
TAPS	Shutdown would not impact energy costs
Anchorage Gas Supply	No impact to energy costs in Fairbanks
Bullet Line	No impact to energy costs in Fairbanks
Natural Gas Pipeline	No impact to energy costs in Fairbanks
Kenai gas supply	No impact to energy costs in Fairbanks
Aging Generation	Resolved, hydroelectric has a 100+ year life
Cost of crude oil	No impact to energy costs in Fairbanks
Joint Utility Planning	All Railbelt utilities purchase from hydro project
Unified System Operation	Utilities have no issues to disagree on.

Dreaming together to Power Alaska

- Fuel delivery to rural Alaska
- Return Ballast
- Freight
- People

Questions ???

Waste-to-Energy

STRENGTHS

- Waste to Energy is an accepted technology.
- Large waste stream w/ support for doing something with waste stream other than landfill.
- Stable pricing for up to 5 MW.
- Some portion is carbon neutral.
- Human resources (Henrick Wessel, etc.)

OPPORTUNITIES

- Landfill lasts longer / does not expand as rapidly.
- Waste will likely increase over time.
- May create jobs.
- Ability to utilize existing infrastructure.
- Large producers of waste may be able to utilize waste in their own facilities (University, City, School District, etc.)
- Landfill mining and reclamation.
- Combine with recycling or other projects which utilize waste stream.
- Most people in this community care about the environment and will encourage these efforts

WEAKNESSES

- Economies of Scale
- Not separating the waste stream raises the question of how what happens to hazardous materials mixed in with regular waste.

THREATS

- Questions relating to air quality / emissions need answers.
- Questions relating to what happens when hazardous materials (batteries etc) are combusted need answers.
- Answers to other questions relating to environmental impact.
- May cost more than existing landfill operation.

Conservation

STRENGTHS

- Immediate action possible
- Technology available
- Fairbanks community full of creativity
- Fairbanks community has an understanding of conservation
- Informed and educated small groups
  - builders
- GVEA promotion
- Lower PM 2.5
  - pollution
  - gas
  - emissions

OPPORTUNITIES

- Retro-fit
- Energy Star products
- Re-market and re-phrase
- Conservation
- “green” subdivision on college road
- Educate community on “next best steps”
- Spawn businesses
  - energy audits
  - engineers with understanding
  - ARDOR program
- State funding
- 5 star appliances (buck for buck)
- Before and after audits
- Federal Farm Bill grants
- AEA/ AIDEA/ AHFC programs
  - financing
- Get politicians to pitch conservation as a positive
- Palin promotion
  - florescent lights
- Scalable to demand
- Energy Audits

Messages on bills- “You could save $__ by …”

WEAKNESSES

- No architectural school
- Knowledgeable community
- No codes/mandates for bldg. (UPC)
- Hard sell
- Not enough contractors
  - skill base for retro fit
- Lack of infrastructure
- Traps comm. members might get sucked into without being informed properly
- Large shift needed to see difference
- Not working in general population

THREATS

- Low interest loans
  - financing
- Cost vs. Payback
- Low cost of energy
- Population increase
  - educate more
- Fast growth

Gasification

STRENGTHS

- Abundant local feedstock in Fairbanks
  - coal
  - biomass (willow, lumber waste, paper waste)
  - tires
- Minimal environmental impact; reduce emissions. No sulfur or mercury
- Proven technology w/ coal, oil and NG
- Potential CO2 offset (reduction)
- Use waste stream that is a lower cost fuel source
- Meet various needs of fuel type
- Go GREEN
- Front end to existing plant
- Low onsite construction
- Off market of volatility
- IGCC creates less ash, less CO2 and is more efficient than direct-fired coal combustion
- Combining electrical generation and liquid fuel production provides flexibility for electrical load following
- Continuous or plug type process
- Reduced PM 2.5

OPPORTUNITIES

- Liquid fuels from SYN gas
- Lower cost, emerging technologies (mcf-$7.00) utilize biomass
- Get rid of waste
  - all streams
- $$$ from FEDs for CO2 reduction to support
- Better combustion efficiency
- Lower fuel and energy cost
- Utilize non-0normal fuels to create gas
- Creation of low sulfur fuels
- Make diesel fuel locally from low sulfur fuels
- Utilize existing infrastructure
  - trucks
  - roads
  - turbines
  - boilers
  - rail transportation system?
- Various types of fuel can be produced to consider utilizing
- Ethanol and methanol
- 30,000(10,000 bbld more realistic) barrels a day (output). Modular technology can start small and expand
- Burn waste coal
- Landfill waste
- Need variable plant size for BA plan; build to fit
- SYN gas from coal (known tech.)
- Reduce CO2
  - global warming
- Create higher value product; can you compete with oil?
- Space to grow
- Portable plant (??)
- Low grade heat (district home heating?)
  - Purchase Syngas from owner of gas plant, avoid capital costs
- TAPS could provide routs for future coal to liquids export

Gasification Continued

WEAKNESSES

- Ash
- Multiple materials handling/collecting
- Large real estate needed
- Continuous flow—can it load follow?
- Does it operate at a high enough temp to result with methane and no DiSulfate
- Blended fuel stock
  - don't switch
  - costly
  - maintain sustainability
- Internal
  - volume of feedstock
- Economies of scale
- Catalyst use: high cost
- Proprietary technology
  - consumables
- Weakness in SYN gas (110btu), lower value of SYN gas
- Tapping AK's resources
- Won't affect transportation unless you make fuel out of it.
- Load following capability
- Turbine tripping flare of excess gas

THREATS

- Coal
- High heat rate
- Energy input = to energy output
- Cost
- Utilize existing infrastructure
  - capital upgrades
  - depends on return
- High cost of conversion/use of infrastructure
- Can't meet feedstock
- PM 2.5 etc. created to gather fuel
  - material handling
- Burning biomass
  - competition
- Plant construction cost
- Permission to utilize certain fuel sources
- CO2 emission
  - coal level
  - scrubbers
- Gas line
- Changing economics: potentially lower cost supply
  - Long lead time for design, procurement, and construction
  - Public perception of using coal and new technology (HCCP)

Biomass Overall/Gasification

STRENGTHS

- Plentiful local fuel sources
- Plentiful land
- Sustainable harvest conducive to healthy forests & habitat management
- Carbon neutral
- Successful short rotation crops grown elsewhere in similar climate
- Community development through employment opportunities
- Capture biomass from municipal waste stream
- Power generation facility could be modular to spread out infrastructure costs and match facility with available fuel
- Can successfully be co-fire in existing coal plants
- Would help remove methane produced from dead trees in forests
- Global Warming could make 'silvaculture' easier
- Energy ratios are favorable (14:1

OPPORTUNITIES

- Could make use of biomass harvested during power line maintenance
- Fire mitigation and reducing fuel load of burned standing trees could provide near-term fuel source
- Potential for carbon sequestration associated with willow production
- Cost of energy high and climbing
- Fairbanks could export technology/expertise to rural communities, developing industry locally
- Potential for collaboration between UA and industry in addressing challenges
- Opportunity to demonstrate sustainable husbandry
- Re-distribution of farm subsidies
- Potential to engage Usibelli (could willows be grown on their re-vegation plots?)
- Willows could be used for phytoremidiation of urban wastewaters, landfill leachate, industrial wastewaters and sewage sludge
- Develops local economy and potentially raises land values in areas suitable for willow crop production
- Waste heat from biomass power production can spawns other business opportunities (cooling, drying)
- Increased employment (new; revive local farming)
- Specialized equipment might need to be developed which could be done locally and exported to other parts of the state
- Expertise could be exported
- Modular plants could be built located near fuel sources
- Ash byproduct could be used for fertilizer
- There are existing models existing to draw from (Europe, NY)
- New funding sources are available (State, Federal)
- Qualifies for Green Tags sales
- New opportunities for revenue (carbon trading)

Biomass Overall/Gasification Continued

WEAKNESSES	THREATS
• Gathering/transportation of fuels – dispersed resource • Specialized equipment needed for harvest/collection • Green biomass has high moisture content – may require drying • Farm subsidies may discourage biomass crops • Materials handling – relatively low energy content per pound • High particulates (potentially) • May not be economical/profitable • High infrastructure costs • Chicken and egg scenario – need power plant and fuel • Green power can't be purchased at a premium locally	• Land ownership may be an issue – large tracks could be needed • Single crop biomass farming may be susceptibility to pests • High particulates (potentially) • Biomass undercut by other cheap fuel sources such as NG (timing) • Subsidies that encourage fallow fields • Corps of Engineers could be resistant to farming if wetlands are involved • Could hurt Usibelli

Biomass Extraction

STRENGTHS

- Could be used in new GVEA turbine in North Pole (19,000 acres in production could meet fuel requirements for turbine)
- Clean
- Renewable
- Carbon neutral

OPPORTUNITIES

- Could convert Fairbanks vehicles to ethanol
- Potential for 'no' sulfur fuel, range of fuel production
- Need to do demonstrate pilot project
- Military could be customer and source of energy for modular biomass plant
- Now is the right time
- Opportunity to coordinate with other players worldwide
- Funding is available for viable projects
- Re-evaluate currently discounted crops in Alaska for biomass fuel potential rather than feedstock
- Jack Spafford/Dr Posner

WEAKNESSES

- Alaskan biomass is lower quality in terms of oil content
- Undemonstrated technology
- Byproduct associated with production
- Local ambient temps could pose challenges
- Competing w/ NG (cheaper), economics?

THREATS

- Need to be aware of biomass 'charlatans' tooting unproven technology
- Cost of labor increases (NG Pipeline?) may change economics

Geothermal

STRENGTHS

- Distributed power
- Significant potential in Aleutians
- Non green-house gas producing
- Nearly all of resource undeveloped
- Wide range of opportunity scales
- Much off-the-shelf technology available
- Good cooling resources in Alaska
- Could take advantage of popularity
- Statewide distribution of resource

OPPORTUNITIES

- Convert geothermal into alternative fuels
- Co-locate with minerals extraction
- Power for refining minerals
  Red Dog mine ore refining
- Ground source heat pumps
- Volcanoes offer opportunities
- Opportunities for heating (local/district)
- Mt. Spur as a source nearby Beluga
- Geothermal for refrigeration

WEAKNESSES

- Limited knowledge of resource
- Source not near urban centers,
- Not transportable
- Hazards/volcanoes
- Lack of performance data
- No documented super-sized source
- Issues with transmission of power

THREATS

- Potential for transience, natural events
- Sustainability
- Potential for depletion
- Public and policy inertia
- Land ownership
- Permitting

Hydroelectric- Run of River

STRENGTHS (internal)	OPPORTUNITIES (external)
•Low to moderate capital required •No fossil fuel •Moderately abundant resource •Source for rural homes/villages •Resource available across Railbelt •Possible ties into grid •Ease of remote construction •Short development time	•Tanana, Yukon, Susitna, Nenana. etc. •Many communities along these rivers •Eagle project funded by Denali Commission •Local industry potential •High cost of fossil fuels •Global warming issue •Possibly portable, or mass produced •New ARRC bridge over the Tanana River •Previously State purchased Harbin turbines
WEAKNESSES (internal)	**THREATS (external)**
•Limited capacity •Limited season? •Variable output, existing generation must be maintained •Potential for damage by ice/silt/trees •Requires some distribution lines •Possible channel changes (loss of current)	•Fish issues (spawning areas) •Navigation impacts •Flooding

Hydroelectric-Storage: Chakachamna

STRENGTHS (internal)	OPPORTUNITIES (external)
• Some design and EIS work done (Chris Rose, REAP, Beluga Triangle – hydro, wind, tidal) • Relatively low environmental impact • Abundant power (order of 100s of MW) • Located centrally within the Railbelt	• High cost of fossil fuels • High level of concern about global warming • Good fit with wind systems • Hydrogen production potential
WEAKNESSES (internal)	**THREATS (external)**
• Cost to connect to grid • Environmental impacts • Large capital needs ($1 billion) • Long lead time for construction • Potential for lake to fill with silt • Need for EIS	• Negative public opinion about large dams • Seismic, volcanic potential of region • Fish impacts? • Concern over loss of habitat, recreational areas, or historical sites • TDX has applied for the FERC site license

Hydroelectric-Storage: Susitna

STRENGTHS (internal)	OPPORTUNITIES (external)
• Lots of design and EIS work done • Relatively low environmental impact compared to present alternatives • Abundant power (order of 500s of MW) • Located centrally within the Railbelt • Production of hydrogen possible • Long life time (100 yrs)	• High cost of fossil fuels • High level of concern about global warming • Good fit with wind systems • Creation of recreation areas • Possible benign industry (data center, hydrogen production, etc.)
WEAKNESSES (internal)	**THREATS (external)**
• Cost to connect to grid • Environmental impacts • Large capital needs ($5-10 billion) • Long lead time for construction • Potential for lake to fill with silt	• Negative public opinion about large dams • Seismic potential of region • Fish impacts • Concern over loss of habitat, recreational areas, or historical sites • Possible large industry impacts

Hydroelectric- Tidal

STRENGTHS (internal)	OPPORTUNITIES (external)
• Regular tides, predictable generation • High capacity • Located in Railbelt • Second highest tidal range in world	• Co-locate with wind sites • Located in Railbelt • Coastal villages • Attach to bridges, platforms
WEAKNESSES (internal)	**THREATS (external)**
• Immature technology • Impact of ice/silt? • Interconnection costs high • Slack tide – need two sites? • High maintenance costs • Electrical system operating impacts from cyclic generation	• Shipping (low) • Fish, whale issues • Seismic design issues

Distributed Generation

STRENGTHS

- Produce energy greater than use; Ideal
- Net zero energy use; Practical
- Sustainable building systems and infrastructure
- Environmentally friendly
- Long term cost savings
- Increase disposable income by reducing bills generates greater economic growth in community
- Incremental approach one step at a time, one house at a time. Using a community wide approach

OPPORTUNITIES

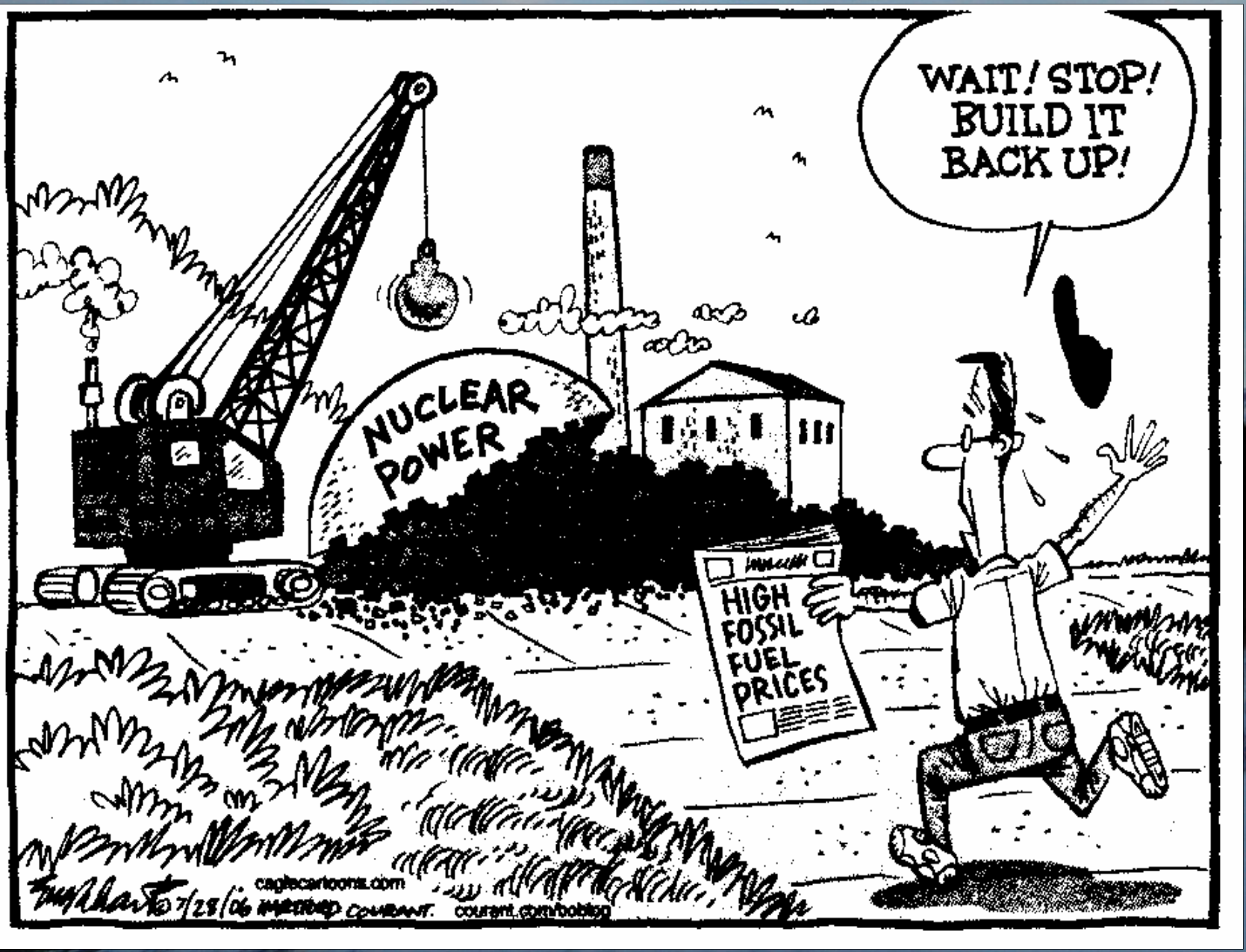
- Turn weaknesses into strengths by education of public:
  - Cost analysis of different energy reduction options available.
  - Easy access to cost analysis information web-sites.
- Reduce cost of energy
- Reduce amount of energy use in homes
- Reduce the detrimental effects of wasted energy on the environment
- Provide positive long term effects from green building
- Reduce reliance on fossil fuels from unstable countries (and underdeveloped wilderness areas).
- Reduce / Eliminate greenhouse gas emissions
- Not add to Global Warming
- Lesson need for new power plants from any source by using energy more efficiently and producing energy cleanly
- Incentives: tax breaks, direct rebates, snap program
- Energy detectives, kilowatts (devices used to show how much energy is being used in total or by a single appliance at any given moment). Could be used to educate public
- Education in schools at all levels on energy production and green building
- Demonstration projects
- National funding for projects
- EPA PM 2.5 reduction
- Change out programs could be used for specific types of appliances or light bulbs
- Local focus in media: newspaper, TV, other press
- Public Service Announcements about energy saving options
- Reality show / energy retrofit one house a month for 1 year
- 30 sec. spots on news, energy tip of the week
- Replace street lights with LEDs.
- Energy tip of the month on GVEA bill - savings per month and savings per year so consumers can see.

Distributed Generation Continued

WEAKNESSES	THREATS
• Initial cost investment is higher • Lack of public education / awareness / lack of perception of benefits • Overcoming the desire for the familiar and making a change	• Non tangible • Lack of commitment on the part of the public and lending institutions that finance buildings

Sorted Overall Ranking (Best=0, Worst=90)

Evaluation Matrix Sorted by Ranking	Overall Rank	Energy Service	Success Hurdles	Start-up Date	Capital Needed	Cost Reduction	Monthly Bill	Uncer-tainty	Natural Systems	Alaskan Citizens
Truck North Slope Gas	10	0.0	2	0	0	0	0	3	2	3
Enriched Gas Pipeline*	24	0	6	6	2	0	0	7	2	1
Bullet Gas Pipeline	24	0	5	3	10	0	0	3	2	1
Spur Gas Pipeline**	27	0	9	10	0	0	0	5	2	1
Other AK Gas	28	0	7	8	1	0	0	7	2	3
Conservation	32	8	1	0	1	9	8.6	2	1	2
Wind Power	38	6	2	3	0	9.2	9.7	2	2	4
Coal Bed Methane	39	0	8	6	3	0	0	8	7	7
Coal Power Production	42	5	4	1	2	8.3	9.2	5	5	3
Solar	43	9.9	2	1	0	10	10	4	2	4
Biomass – Combustion	46	9.7	3	3	0	9.7	9.9	3	4	3
Public Transportation	46	9.9	5	2	0	9.2	9.2	7	1	3
Biomass – Extraction	48	9.7	4	4	0	10	9.4	4	4	3
Geothermal	53	9.9	5	4	0	9.8	10	7	2	5
Hydro – Instream	55	9.9	5	5	0	9.8	9.9	8	2	5
Hydro – Storage	55	6	6	6	6	8.8	9.4	6	4	3
Coal Gasification	57	9	8	4	2	9.9	10	8	4	3
Bike Paths & Lanes	58	9.9	8	8	1	9.6	9.7	7	1	4
Nuclear	60	6	9	5	1	8.6	9.3	9	8	5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