



Industrial Energy Alternatives

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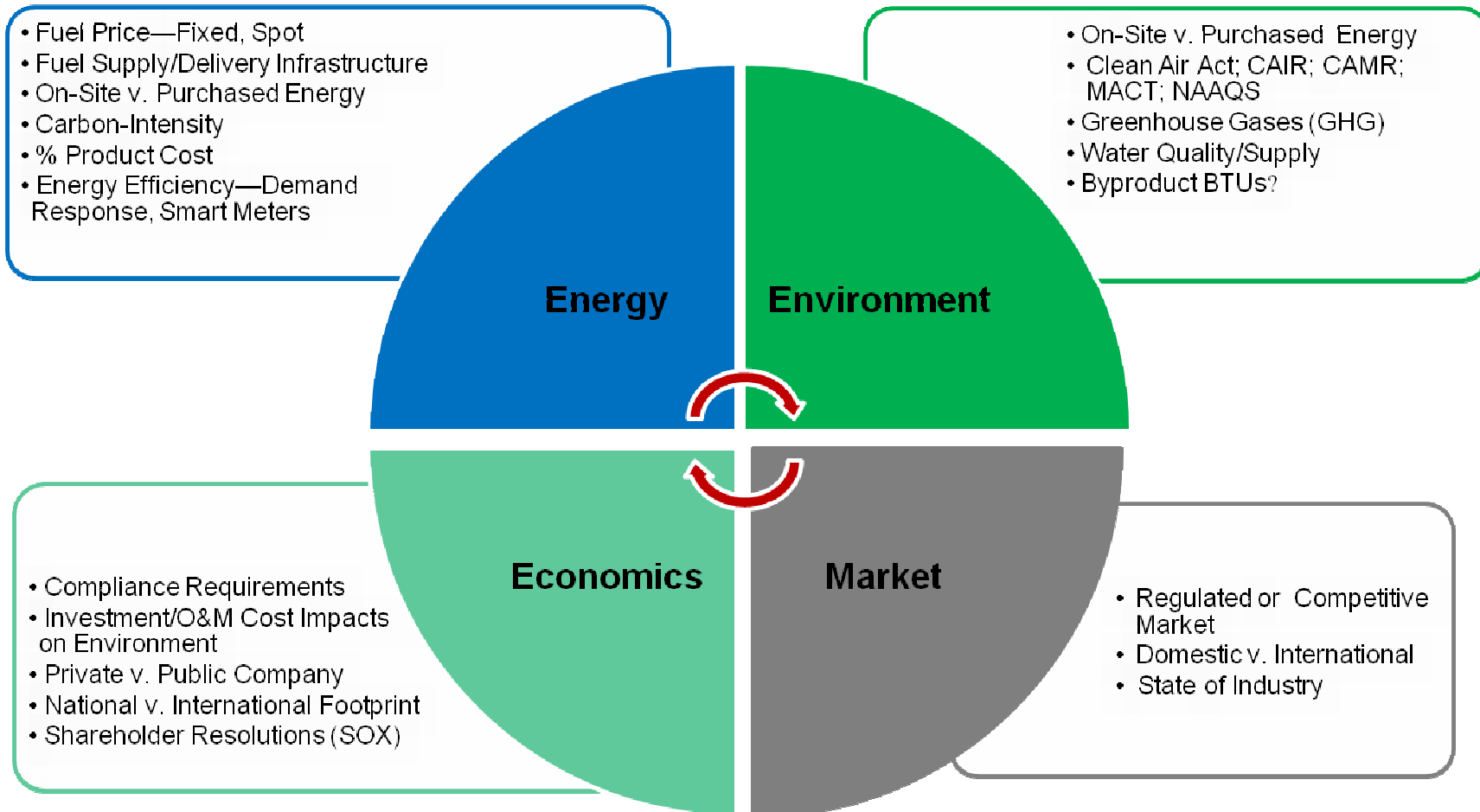
**EET and Project Applications, Development Panel
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Competing Challenges





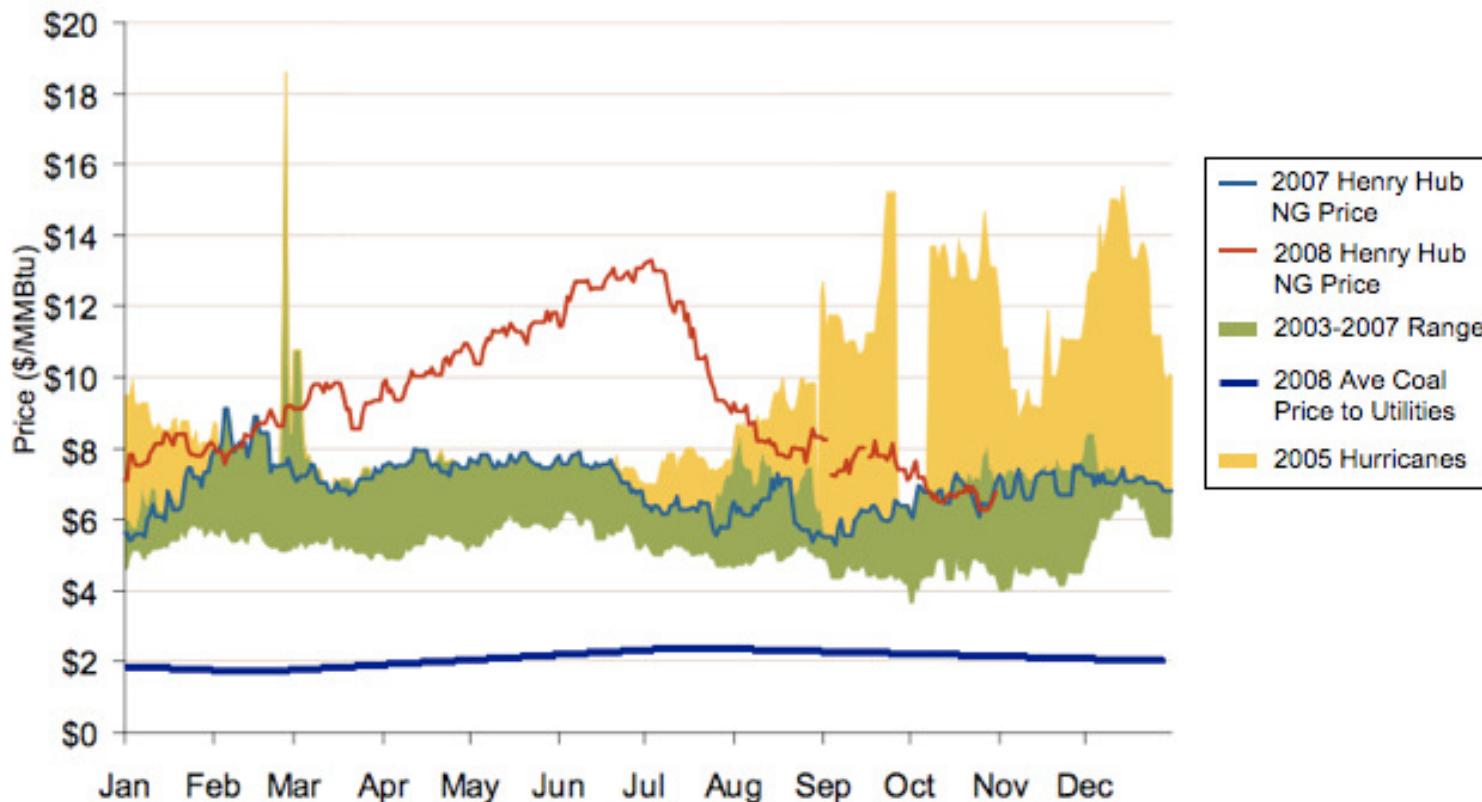
Energy Alternatives—Why?

Flexibility. Optionality.

- Fuel Price/Supply Risk; Leverage Opportunity
 - Avoid or Reduce: Costs, Regulatory & Legislative Obligations, Future Liabilities
 - Renewable Portfolio Standards (RPS)
 - Clean Air Act (CAA)
 - Greenhouse Gas (GHG)
 - Sarbanes-Oxley (SOX), Corporate Sustainability Reporting, etc.
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Fuel Price Risks

Hedging Good, Not Perfect



Source - Henry Hub: Extracted from *November 2008 Snapshot Report*, FERC.
Source - Coal: Energy Information Administration, Short-Term Energy Outlook Query System



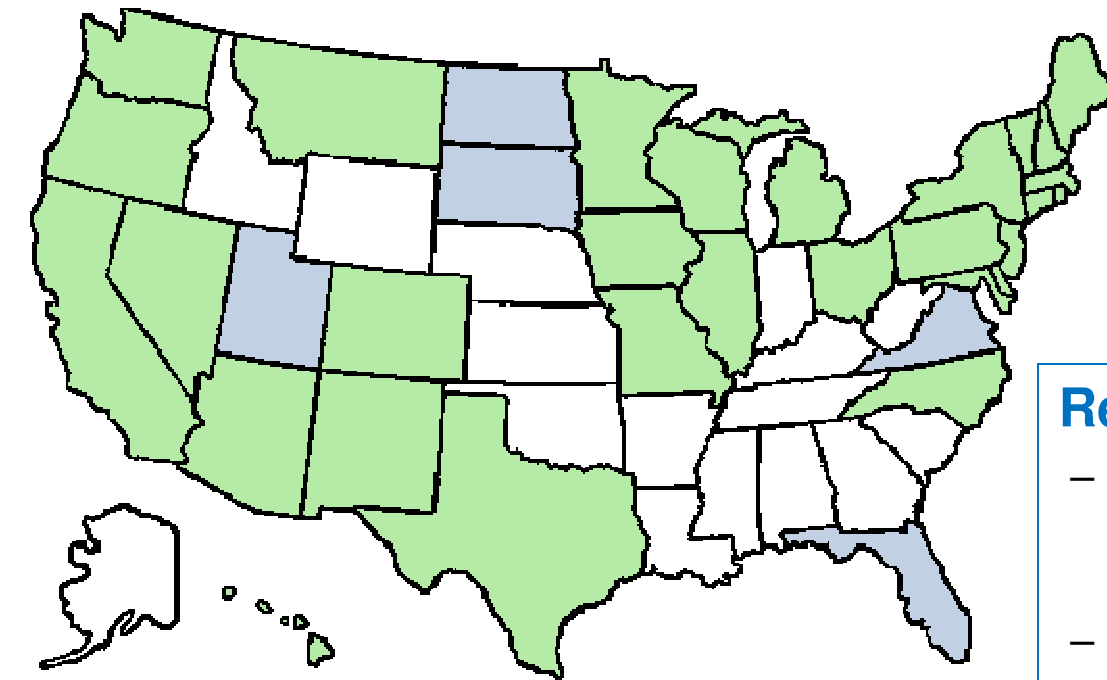
Fuel Supply Risks

Life Cycle/Supply Chain Effects

- Need: service provided by “BTUs” not fuel.
 - What is least expensive, most reliable/sustainable? Lowest impact means?
- Energy Challenges: not limited to fuel price, but “risk factors”— supply security, deliverable reliability, environmental impacts/cost adders → Supply Chain (LCA)
- Energy Efficiency: “avoided” Energy Supply...but also “avoided” Energy Delivery and Environmental Impacts
 - “Avoided” effects cannot always be “monetized” → societal benefits

Energy Type	Price	Supply	Delivery	Environmental Impacts		
				Extraction	Delivery	Use
Coal	Green	Green	Yellow	Yellow	Green	Red
Oil	Red	Yellow	Orange	Yellow	Yellow	Red
Natural Gas	Red	Yellow	Orange	Green	Yellow	Yellow
Electricity	Orange	Orange	Orange	White	Yellow	Green
Renewable	Orange	Green	Yellow	White	White	Green

RPS—Cost Pass-Through or Opt-in?



■ Mandatory RPS
■ State Renewable Goal

RPS—Challenge Traditional Utility Operations;
Conflicts w/Rate Design; Cost-Adder w/RPS;
Facilitates Environmental Compliance

Renewable Energy

- Renewable Portfolio Standards (RPS)—% of state generation or capacity
- Renewable Energy Credits (RECs)—meet RPS w/out RE energy (kWh)
- Wind/Solar—intermittent
- Biomass—base load; primarily on-site facility, avoids T&D; uses “byproducts” as feedstock, disposal fee becomes revenue

Energy Alternatives, Multiple Benefits



- Reduced/Avoided Emissions → CAIR, CAMR, NAAQS. No GHG liability.
- RPS → Avoid EU cost pass-through; revenue via REC sales.
- Facilitate Economic Growth → Local, Business.
- Reduce/Eliminate Waste Disposal, Truck Hauling → Tipping fee = revenue.
- Reduce T&D Load/Cost (Distributed Generation).



Energy Alternatives—How?

- Co-fire existing boilers w/biomass, industrial by-products.
 - 10%? Increase %—function of supply, cost, compliance requirement, etc.
 - New clean/renewable energy facilities
 - Industrial owned
 - 3rd Party BOO, BOT
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Energy Alternatives—Multiple Revenue Streams Make Economic

Technology	Resource Driver	Market Drivers—US	Market Drivers—State	Financial Credits	Grid Value
Solar-PV (Wafer)	Solar, Roof Space, Direction, Ownership	ITC, PTC	RPS, Offsets, CAIR, GHG	RECs	Depends on Scale-Up
Solar-PV (Thin Film)	Solar, Land	ITC, PTC	RPS, Offsets, CAIR, GHG	RECs	?
Solar-Thermal	Solar, New v. Retrofit		RPS, Offsets, CAIR, GHG	RECs	Depends on Scale-Up
Wind Turbine	Wind Speed, Land, Visibility	ITC, PTC	RPS, Offsets, CAIR, GHG	RECs	?
Geothermal	Location	ITC, PTC	RPS, Offsets, CAIR, GHG	Offset Credits--Air, GHG, RECs	Baseload
Biomass-Ag Residue	Location	ITC	RPS, Offsets, CAIR, GHG	Tipping Fee, Nutrient Credits, Offset Credits--Air, GHG, RECs	Avoided Supply, VAR/Reliability
Biomass-Wood, C&D	Location	ITC, PTC	RPS, Offsets, CAIR, GHG	Tipping Fee, Offset Credits--Air, GHG, RECs	Avoided Supply, VAR/Reliability
Solid Waste (MSW)	Location	ITC	RPS, Offsets, CAIR, GHG	Tipping Fee, Offset Credits--Air, GHG, RECs	Avoided Supply, VAR/Reliability
WWTP Sludge	Location	ITC	RPS, Offsets, CAIR, GHG	Tipping Fee, Nutrient Credits, Offset Credits--Air, GHG, RECs	Avoided Supply, VAR/Reliability
Animal Litter/Manure	Location	ITC	RPS, Offsets, CAIR, GHG	Tipping Fee, Nutrient Credits, Offset Credits--Air, GHG, RECs	Avoided Supply, VAR/Reliability



Debt/Equity \$
RE Funds, Hedge Funds
Investment Banks...



Project Pro Forma



PTCs
RECs
**ERCs/
GHGs**
**Nutrient
Credits**
**ITC/
Depreciation**



- **Renewable Portfolio Standards (RPS)**
- **Renewable Fuel Standards (RFS)**
- **Clean Air Act (CAIR/CAMR), GHG Compliance**





Energy Alternatives—When?

- Stimulus Funding (ARRA)—
 - Loan Guarantee (§1705)—”shovel ready” projects by 09/2011
 - Grant Funds (§1603)—convert PTC/ITC to cash
 - RPS deadlines approaching (~2012)—RE project costs will increase; transmission challenging/costly
 - Fuel Flexibility—provides supply, delivery, price leverage; options for CAA/GHG compliance
 - GHG Compliance—state/regional programs already in place; not displaced by Federal Bill!
 - State Stimuli—IL Finance Authority IFA), \$3B Moral Obligation Bonds
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