Renewable Fuels, a Critical Part of a Sustainable Energy Policy

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Angelo’s Story

Regular Person

• 40 years old
• Married
• Father of three
• Sole wage earner
• Trying to make ends meet
Facing His Bills

- An increase was expected
- December and January surprise
- $959 each month (payments overdue)
- Two more months of winter remaining
Angelo’s Story
Growing Home Heating Costs

• Between 2005 and 2006
  • 27% increase in home heating oil prices
  • 17% increase in natural gas home heating prices

• Between 2001 and 2006
  • 53% increase in home heating oil prices
  • 78% increase in natural gas home heating prices

Angelo’s Story

Growing Electricity Costs

• 55% increase in five years
• 37% increase in one year
  • From $.17 a Kwh in 2005 to $.24 a Kwh in 2006
Angelo’s Story
Growing Gasoline Costs (Fueling Two Cars)

- $2.90/gallon for premium grade
- 40 gallons/week consumed
- $116/ week and $464/month
- Current projections of $ .30 increase by summer

Source: Energy Information Association, Weekly Retail Gasoline and Diesel Prices, Annual Report
Angelo’s Story

Total Monthly Energy Expenditures

• Pretax monthly energy tab is $959 ($11,508/year)

• Angelo’s shop charges $20 a haircut

• Assuming Angelo’s share is $10

• It will take 96 haircuts to pay the bill each month
Angelo’s Story
Energy Has Changed Angelo’s Life!

• Drastic changes around his household
  • Checking for drafts and leaks
  • Shrink wrapping his windows
  • Reducing the temperature of his house
  • Unscrewing light bulbs
  • Angelo’s not paying his bills on time
  • Sold his boat
  • No vacation this year
Angelo’s Story

Energy Costs Are Impacting Most Households

- Angelo has an elderly father
- His in-laws live on a small pension and social security
- His fuel costs compete with expenditures for food and medications

How different is Angelo from you or me?
What Got Him To This Point?

A Nation Dependent on Fossil Fuels – In 2004 the US used 99.74 Quadrillion Btu of Energy

- 86 Quadrillion Btu From Fossil Fuels (84% of the total energy consumed)
- 8% From Nuclear Electric Power
- 6% From Renewable Energy

Source: Diagram 1. Energy Flow, 2004 Energy Information Administration
Energy Policy 2001

The National Energy Policy Development Group (NEPD) – 100 Recommendations

- Modernize & increase conservation
- Modernize expand our energy infrastructure
- Diversify energy supplies
- Improve & accelerate environmental protection
- Strengthen America's energy security

A Controversial Plan Anchored In Fossil Fuels

“Conservation may be a sign of personal virtue, but it is not a sufficient basis for a sound, comprehensive energy policy.”

- Speech given by Dick Cheney, in Toronto at the end of April, concerning the National Energy Policy of 2001

### Energy Policy Matters

#### Increase In World-wide Oil Demand (million barrels/day)

<table>
<thead>
<tr>
<th>Year</th>
<th>World demand</th>
<th>China’s demand</th>
<th>US demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>77.66</td>
<td>4.92</td>
<td>19.64</td>
</tr>
<tr>
<td>2004</td>
<td>82.49</td>
<td>6.52 (32.5% increase)</td>
<td>20.73 (5.4% increase)</td>
</tr>
<tr>
<td>2005*</td>
<td>83.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*3rd quarter

Source: International Petroleum Monthly, EIA, January 2006
Energy Policy Matters

World Oil Crisis (million barrels/day)

2001  World supply  =  77.73
      World demand =  77.66

2004  World supply  =  83.04
      World demand =  82.49

2005* World supply  =  83.79
      World demand =  83.08

*3rd quarter

Source: International Petroleum Monthly, EIA, January 2006
Post Katrina Implications

- Gulf of Mexico oil production reduced by over 1.5 Mb/day¹
  (100% of daily Gulf production)

- 10 Bcf/day of natural gas production shut down¹
  (95% of daily Gulf production)

- Oil prices briefly spiked to $70+/per barrel¹

- Gasoline prices spiked to $3.15/gallon²

Source: ¹Minerals Management Services (MMS), Press Release: #3418, Date: January 19, 2006, ²Energy Information Administration, Gasoline and Diesel Historical Data
Energy Policy Act of 2005
Four Years & Major National Disasters later…

August 8th new legislation signed
• Promoting efficiency
• Reducing government energy usage
• Modernizing energy infrastructure
• Diversifying energy supply
• Supporting energy-efficient vehicles

Source: Office of the Press Secretary, August 8, 2005, President Bush Signs Into Law a National Energy Plan
**Energy Policy Act of 2005**

**Energy Efficiency**

- Improve consumers tax credits\(^1\)
- Improve energy efficiency\(^2\) standards
- Enact federal energy management goals
  - Reduce energy use
  - Expand use of renewable energy
  - Install 20,000 solar energy systems
  - Implement best management practices
  - Reduce GHG emissions

Energy Policy Act of 2005
Research & Development

- Clean coal technologies
  - Provides funding

- Studies & program support
  - Authorizes oil and gas programs
  - Authorizes conservation activities
  - Provides funding for renewable and fossil fuel efforts

Energy Policy Act of 2005

Provisions For Renewable Energy

- Renewable energy production incentives
- Goal of using 7.5% of total energy consumed from renewables or more by 2013
- DOE rebate program
- Renewable fuel standard
- Expands hydrogen research
- Provide vehicle tax credits

Energy Policy Act of 2005

Emphasis On Cellulose Ethanol Production

• Every gallon = 2.5 gallons of fuel
• By 2013, 250 million gallons should be in use
• Loan guarantee program (subject to funding)
• Creates an Advanced Biofuels Technologies Program (subject to funding)

Source: 2005 Renewable Fuels Association, Renewable Fuel Standards
Energy Policy Act of 2005

Emphasis On Hydrogen

- Hydrogen Fuel Initiative and FreedomCar® Budget
  - 2005 = $310 million
  - 2006 = $342 million
  - 2007 = $400 million

Source: US Department of Energy, Hydrogen Program, Budget
In 2006, 2.78% of the gasoline sold must be renewable fuel.

Ethanol and biodiesel can be used to meet the requirements.

Refineries, blenders and importers are responsible for meeting 2006 requirements.

By 2012, double the use of fuels produced from American crops.

Source: Environmental Protection Agency Issues New Domestic Renewable Fuel Standards, Posted: 01/05/2006
Energy Policy Matters

Federal Government Defines Renewables as …

- Wood and other wood waste
- MSW, landfill gas, sludge waste, tires, agricultural by products, and other biomass
- Ethanol blended into motor gasoline
- Geothermal
- Solar and photovoltaic
- Wind
- Not Included: Hydroelectricity generated by pumped storage

“Some of the nations we rely on for oil have unstable governments or fundamental differences with the United States. These countries know we need their oil and that reduces our influence. It creates a national security issue when we’re held hostage for energy by foreign nations that may not like us.” - President Bush, Monday February 20, 2006
Energy Policy Matters

Recent Events

Feb. 27, 2006, Saudi Arabia, the largest oil exporter, thwarted an attack on one of its processing plants, but concern about future attacks led to an immediate $2 (£1.15) rise in the price of a barrel of oil on the New York Mercantile Exchange.¹

January 1, Russia temporarily cuts natural gas supplies to Ukraine over a pricing dispute. The incident prompts a discussion in Europe over its future energy security, with many countries calling for concerted action by the European Union (EU) to reduce reliance upon Russian natural gas.²

Sources: ¹ Bush steps up rhetoric on oil dependency, By Caroline Daniel in Washington, February 27 2006 21:16; ² (DJ, Reuters, Eurostat)
Fuel Crisis

The New Bet

• Google “energy crisis” - 73,300,000 hits
• Significant debate
• Energy production is not the issue
• Lack of fuel
• By 2020, our already voracious appetite for energy is projected to increase by about 32%

Source: www.whitehouse.gov, National Energy Policy
Fuel Crisis

Current Consumption Of Energy – (quadrillion Btu)

- 2003
  - World supply = 417
  - World demand = 421
  - US supply = 70.52
  - US demand = 98.05

- 2005
  - US supply = 70.72
  - US demand = 100.49

Fuel Crisis

Crude Oil – (Million Barrels per Day)

- 2004
  - World supply = 83.04
  - World demand = 82.49
  - US supply = 7.6
  - US demand = 20.7
    (25% of world total)

- US top consuming country
- Japan & China second at 7%
- Saudi Arabia is top producing country at 9.10MB/day

Source: Energy Information Administration: 1. Energy INFOcard, US (2004); 2. Table 2.4 World Oil Demand, 2001-2005; 3. Table 11.5 World Crude Oil Production, 1960-2004
Fuel Crisis

Coal – (million short tons)

- 2003
  - US supply = 1,069.50
  - US demand = 1,094.13
  - China supply = 1,634.97
  - China demand = 1,531.09
  - India supply = 403.12
  - India demand = 430.62
  - World demand = 5,439.33

Source: Energy Information Administration, Table 1.4 World Coal Production and Table 2.5 World Coal Consumption, 1980-2003
**Fuel Crisis**

**Natural Gas**

- US and Russia are the top NG producers and consumers world-wide

- In 2003
  - US supply = 19.04 tcf*
  - US demand = 22.4 tcf
  - World supply = 95.2 tcf
  - World demand = 95.5 tcf

- In 2004
  - US supply = 18.76 tcf
  - US demand = 22.43 tcf

* trillion cubic feet

Source: Energy Information Administration, Table 1.1 Natural Gas Balances in OECD Regions and Countries, November 2005; Table 6.1 Natural Gas Overview, 1949-2004
• In 2002, US government committed to reduce the greenhouse gas emissions per unit of economic activity by 18 percent, by 2012

• Increased Budget for Climate Change Activities
  • FY 2006 = proposed $5.5 billion for climate-change programs and energy tax incentives

Source: Environmental Protection Agency Climate Change Action Plans, May 2004
Customers can choose a percentage of their electricity come from renewable energy

600 utilities have either implemented or announced plans to offer a green pricing option

35 states offer green pricing

Emerging Voice At The State Level – Public Benefit Funds

- A fund created by levying a small fee or surcharge on customers’ electricity rates
- This fee can be used by states to invest in clean energy supply
- 23 states have funds dedicated to supporting energy efficiency and renewable energy projects

Source: Pew Center on Global Climate Change, updated March 2006
Fuel Crisis

Emerging Voice At The State Level – Renewable Portfolio Standards (RPS)

- Electric utilities must use a percentage of renewables
- 22 states & District of Columbia

Benefits

- Reduced emissions
- Increased diversity & security
- Reduced price volatility
- Economic development
- New jobs

Source: Environmental Protection Agency Combined Heat and Power Partnership website, State Resources homepage
Emerging Voice At The State Level – Climate Change Action Plans

- As of May 2004, 28 states and Puerto Rico have voluntarily completed state action plans.
- By taking a proactive approach to planning GHG emissions reductions, states can lower their GHG emissions, reduce their energy costs, protect air quality and public health, and improve the economy and environment.

Source: Environmental Protection Agency, Climate Change Action Plans, May 2004
Energy Policy Matters

States & Renewables

- Biomass = wood and wood waste, methane emissions, and energy crops
- A few states include MSW, animal wastes & landfill gases as biomass
- New York, Rhode Island, & Wisconsin exclude MSW
- Maine requires recyclable before incinerating of MSW
- New Mexico refers to MSW as anaerobically digested waste

<table>
<thead>
<tr>
<th>Renewable Type</th>
<th>Number of States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Photovoltaic</td>
<td>13</td>
</tr>
<tr>
<td>Solar</td>
<td>18</td>
</tr>
<tr>
<td>Wind</td>
<td>21</td>
</tr>
<tr>
<td>Biomass</td>
<td>22</td>
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<tr>
<td>Large Scale Hydropower</td>
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<tr>
<td>Small Hydro-Electric</td>
<td>16</td>
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<tr>
<td>MSW</td>
<td>12</td>
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<tr>
<td>Bio Gases</td>
<td>2</td>
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<tr>
<td>Landfill Gas</td>
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<tr>
<td>Geothermal</td>
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<tr>
<td>Waste Tire</td>
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<td>Digester Gas</td>
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<tr>
<td>Fuel Cells</td>
<td>13</td>
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<tr>
<td>Animal Wastes</td>
<td>5</td>
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<tr>
<td>Ethanol</td>
<td>3</td>
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<tr>
<td>Ocean Tides &amp; Waves</td>
<td>9</td>
</tr>
</tbody>
</table>

Renewable Fuels

- Ethanol
- MSW
- Hydrogen
- Wind
- Solar
- Biomass
Renewable Fuels

Ethanol

- 95 refineries located in 19 states
- Produced 4 billion gallons (increase of 17% from 2004 & 126% since 2001)
- In 2005 alone - 29 new refineries and 9 in construction with an annual capacity of more than 1.5 billion gallons

Source: Renewable Fuels Association, From Niche to Nation, Ethanol Industry Outlook 2006

U.S. ETHANOL PRODUCTION CAPACITY BY STATE

<table>
<thead>
<tr>
<th>State</th>
<th>Online</th>
<th>Expansion</th>
<th>Under Construction</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>IA</td>
<td>1134.5</td>
<td>95</td>
<td>470</td>
<td>1699.5</td>
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<tr>
<td>NE</td>
<td>543</td>
<td>14.5</td>
<td>491</td>
<td>1048.5</td>
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<tr>
<td>IL</td>
<td>780</td>
<td>57</td>
<td>50</td>
<td>897</td>
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<tr>
<td>SD</td>
<td>475</td>
<td>18</td>
<td>110</td>
<td>603</td>
</tr>
<tr>
<td>MN</td>
<td>495.6</td>
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<td>90</td>
<td>593.8</td>
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<td>IN</td>
<td>102</td>
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<td>180</td>
<td>282</td>
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<td>WA</td>
<td>188</td>
<td>40</td>
<td>228</td>
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<td>KS</td>
<td>172.5</td>
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<td>212.5</td>
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<td>MI</td>
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<td>CO</td>
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<td>ND</td>
<td>33.5</td>
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<td>83.5</td>
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<tr>
<td>CA</td>
<td>33</td>
<td>35</td>
<td>68</td>
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<td>TN</td>
<td>67</td>
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<td>67</td>
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<td>KY</td>
<td>26.4</td>
<td>9</td>
<td>35.4</td>
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<tr>
<td>NM</td>
<td>30</td>
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<tr>
<td>TX</td>
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<td>30</td>
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<tr>
<td>VA</td>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
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<tr>
<td>WI</td>
<td>3</td>
<td></td>
<td>3</td>
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</tr>
<tr>
<td>GA</td>
<td>0.4</td>
<td></td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>

Source: Renewable Fuels Association, From Niche to Nation, Ethanol Industry Outlook 2006
Renewable Fuels

Ethanol

In 2005

- 34+ countries produced 12.15 billion gallons
- US produced 4.3 million gallons
- Brazil is second producing country at 4.2 million gallons

ETHANOL PROGRAMS WORLDWIDE

<table>
<thead>
<tr>
<th>Country</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Requires 25% ethanol blends; provides preferential tax treatment</td>
</tr>
<tr>
<td>Argentina</td>
<td>Requires use of 5% ethanol blends over the next five years</td>
</tr>
<tr>
<td>Thailand</td>
<td>All gasoline sold in Bangkok must be 10% ethanol</td>
</tr>
<tr>
<td>India</td>
<td>Requires 5% ethanol in all gasoline</td>
</tr>
<tr>
<td>Australia</td>
<td>Voluntary blending of up to 10% ethanol</td>
</tr>
<tr>
<td>Great Britain</td>
<td>Provides incentives for ethanol production at 36 cents per liter</td>
</tr>
<tr>
<td>European Union</td>
<td>2% (energy content) biofuels target by 2005, increasing to 5.75% by 2010</td>
</tr>
<tr>
<td>Canada</td>
<td>Tax benefits for ethanol since 1992 (provincial mandates)</td>
</tr>
</tbody>
</table>

Source: Renewable Fuels Association, From Niche to Nation, Ethanol Industry Outlook 2006
Renewable Fuels

Ethanol

- 8+ countries have RPS that include Ethanol
- Brazil requires 25% ethanol blend in fuels
- In Thailand all gasoline sold in Bangkok must be 10% ethanol
- Brazil, Great Britain, and Canada provide tax benefits
Renewable Fuels

Ethanol’s Contribution To The US Economy In 2005

• Added $32.2 billion to gross output
• Spent almost $5.1 billion on raw materials & goods and services
• Created 153,725 jobs
• Increased household income by an additional $5.7 billion
• Added tax revenue for the Federal and state government

Source: “Contribution of the Ethanol Industry to the Economy of the United States,” LECG, LLC, December 2005
Renewable Fuels

Impact Of The Renewable Fuel Standard By 2012

- Reduce crude oil imports
- Reduce the outflow of dollars
- Create new jobs
- Increase U.S. household income
- Increase GDP
- Create new investment
- Result in spending on goods and services

Source: LECG, LLC, May, 2005
Renewable Fuels

Waste-To-Energy

• 89 facilities in 27 states producing electricity

• Reducing landfill volumes

• Collecting ferrous & non ferrous metals for recycling

One ton rsf = 1.5 barrels of oil

US annual rsf = 236 million tons

236 million tons = 354 million barrels of oil

That is $22.3 billion dollars worth of oil poured down the drain

Enough energy to power over 12 million American households
Power Generation Capacity: 2500 Mw
Annual Power Generation: 6 million Mw-hours
Homes served: 1.98 million
% of Total National Generation: 0.4%
% of Total Renewable Energy¹: 18%

¹excludes hydropower
# Renewable Fuels

## WTE – Worldwide

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Facilities</th>
<th>Amount of MSW Managed as a % of Total MSW Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>89</td>
<td>8 - 15% based on MSW reported by EPA and Biocycle data</td>
</tr>
<tr>
<td>Europe</td>
<td>400</td>
<td>varies from country to country</td>
</tr>
<tr>
<td>Japan</td>
<td>&gt;100</td>
<td>70 to 80%</td>
</tr>
<tr>
<td>Other nations (Taiwan, Singapore, China, etc.)</td>
<td>70</td>
<td>varies from country to country</td>
</tr>
</tbody>
</table>

Source: Integrated Waste Services Association
Reduce volume of landfills

In 2003, U.S. produced more than 236 million tons of MSW\(^1\)
(4.5 pounds/person/day)

Reduce dependency

Fuel diversity

Reduce use of transportation fuels

Source: Integrated Waste Services Association, \(^1\)Environmental Protection Agency. Basic Facts about Municipal Solid Waste (MSW)
Renewable Fuels

Hydrogen Is Produced Using……

• Natural Gas
• Coal
• Nuclear Power
  • Produce in large quantities
  • Low cost
  • Low emission of GHG
• Renewable Resources
  • No emissions

Renewable Fuels

Why Hydrogen

- Highest energy content per unit of weight of any known fuel
- Produced from abundant domestic energy resources including fossil, nuclear, and renewables

Source: US Department of Energy, Presidents Hydrogen Fuel Initiative
Renewable Fuels

Hydrogen Technology Challenges

• Lowering the cost of hydrogen
• Creating effective hydrogen storage
• Creating affordable hydrogen fuel cells

Source: US Department of Energy, Presidents Hydrogen Fuel Initiative
Renewable Fuels

Wind

- 2005
  - 30 states = 9,149 Mw
  - 22 states = 2,500 Mw
    (additional installed)
  - US facilities produce electricity for 2.3 million households

- 2006
  - New capacity = 3,000 Mw

Source: US Department of Energy, National Renewable Energy Laboratory, 2005
Wind – Additional Benefits & Concerns

Renewable Fuels

Why Use Wind Power?

- Current facilities will displace 15 million tons of CO\textsuperscript{2}
- In 2006 wind power will reduce natural gas use for power generation by approximately 5%
- Land Lease Payments & Local property tax revenues to land owners
- 100-200 new jobs/100 Mw
Renewable Fuels

Solar Energy Historical Statistics

- 2003
  - Total US demand = 0.064 Quadrillion BTu
  - Used by residential and electrical utilities

- 2004*
  - Total demand = 0.063 Quadrillion BTu

* Preliminary Data

Source: Energy Information Administration
## Renewable Fuels

### Solar Energy Projects World-Wide

<table>
<thead>
<tr>
<th>Country</th>
<th>Type Of Plant</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Algeria</td>
<td>ISCC Plant</td>
<td>35 Mw</td>
</tr>
<tr>
<td>Australia</td>
<td>Compact Linear Fresnel Reflector (CLFR)</td>
<td>35 Mw</td>
</tr>
<tr>
<td>Egypt</td>
<td>ISCC Plan</td>
<td>29 Mw</td>
</tr>
<tr>
<td>Greece</td>
<td>Steam Cycle</td>
<td>50 Mw</td>
</tr>
<tr>
<td>India</td>
<td>ISCC Plant</td>
<td>35 Mw</td>
</tr>
<tr>
<td>Israel</td>
<td>Solar Hybrid Operation</td>
<td>Not Available</td>
</tr>
<tr>
<td>Italy</td>
<td>Steam Cycle</td>
<td>40 Mw</td>
</tr>
<tr>
<td>Mexico</td>
<td>ISCC Plant</td>
<td>29 Mw</td>
</tr>
<tr>
<td>Morocco</td>
<td>ISCC Plant</td>
<td>26 Mw</td>
</tr>
<tr>
<td>Spain</td>
<td>Steam Cycle</td>
<td>Two, 50 Mw</td>
</tr>
<tr>
<td>US</td>
<td>Steam Cycle</td>
<td>50 Mw</td>
</tr>
<tr>
<td>US</td>
<td>Organic Rankine Cycle (ORC) Engine</td>
<td>1 Mw</td>
</tr>
</tbody>
</table>

Source: Ruralserv.com 2006
**Renewable Fuels**

*Why Use Solar Energy*

- Highly reliable
- Minimal maintenance
- Costs efficient
- Virtually no environmental impact
- Produced domestically
- Flexible in terms of size and applications
- Demand and capacity challenges

Biomass Facts

• Worldwide, biomass is the fourth largest energy resource after coal, oil, and natural gas.

• There are estimates of about 35,000 Mw of installed capacity using biomass worldwide, with about 7,000 of that in the United States.

• Most of this capacity is in the pulp and paper industry in combined heat and power systems.

Source: Copyright 2000, Sustainable Energy Coalition
Renewable Fuels

Why Use Biomass

- The largest US renewable energy source
- Ethanol and biodiesel are alternative for liquid fuel
- Biomass use strengthens rural economies
- Decreases dependence on imported oil
- Reduces greenhouse gas emissions

Source: The U.S. Department of Energy (DOE) Biomass Program
Total Value Analysis – Coal vs WTE

- Coal generates 54% of our electricity, and is the most significant source of air pollution in the US
- A typical (500 megawatt) coal plant burns 1.4 million tons of coal each year
- US Coal plants emit 3.7 mmt* of CO2 per year

*million metric tons

Source: Union of Concerned Scientists, Page Last Revised: 08/18/05
Total Value Analysis – Coal vs WTE

- WTE produces more CO² than NG, but far less than coal
- Emissions technology = large reductions in pollution
  - EPA estimates WTE annually avoids 33 mmt* of CO²
- Emissions are offset by
  - Landfill space and gases saved
  - Reduced mining
  - Increased metal captured
  - Pollutants captured in furnace
  - Electricity produced

* Million metric tons

Source: Union of Concerned Scientists, Page Last Revised: 08/18/05
Total Value Analysis – Coal vs WTE

• Average coal emissions = 3822.74 (pounds CO²/short ton)
• Average WTE emissions = 1999 (pounds of CO²/short ton)

Source: EIA, Voluntary Reporting of Greenhouse Gases Program, Fuel and Energy Source Codes and Emission Coefficients, Union of Concerned Scientists, Page Last Revised: 08/18/05
Return on Investment
Life-cycle Perspective

Measuring “cradle to grave” impact and benefits
Return on Investment

Total Valuable Approach

Objective environmental measures
• Pros
• Cons

Service Attributes
• Dependability
• Output
• Efficiency

Social Benefits
• Jobs
• Long-term Risks
• Ancillary benefits
Time for a Closer Look

Collaborative Effort – Wal-Mart Example
Emerging Energy Plans
States Taking The Lead

- California
- New York
- Minnesota
- Florida
California

Energy Action Plan of 2003

• Electricity
  • Aggressive energy efficiency goals
  • New building & appliance standards
  • Increased electricity generation & transmission

• Renewables
  • Acceleration of the RPS
  • Access renewable resources
  • Achieve 3,000 Mw new solar

• Natural Gas
  • Increase pipeline & storage
  • Establish NG R&D

• Establish CO$_2$ reduction targets

Source: State of California Energy Action Plan II, June 8
California

California’s Renewable History Beginning In 1976

- 1978 tax credits were increased 44%
- Target of 500 Mw of wind capacity by the mid-1980s
- In 1996, 1.5 cents/ Kwh credit for purchase of renewable electricity
- In 2002, introduced RPS requiring utilities to purchase 20 from renewable generators by 2017
- 2003, 27% of California electricity was produced by renewable resources

Source: California Energy Commission, California’s Gross System Power for 2003, August 2004
Renewable Energy Program of 2005

- Incentives & Rebates for Renewable Resources
  - Supports market competition
  - Encourages prospective renewable electricity generation
  - Stimulates technology market by providing rebates to purchasers
- Customer Credit – Discontinued
- Consumer Education

**Highlights Of Renewable Energy Program**

- Incentive payments totaling more than $4.36 million
- Since 1998 a total of $54 million in production incentives to 45 renewable generating facilities for 5,400 (GWh) of generation.
- 47 projects producing electricity (488 Mw of renewable capacity)
- 378 facilities are registered as renewable suppliers

New York

New York State Energy Plan of 2002

- Secure and reliable energy and transportation system infrastructures
- Competitive market development and government support
- Increasing energy diversity through energy efficiency and renewable-based energy
- Cleaner and healthier environment
- Ensuring fairness in an competitive market economy

New York

New York State Energy Plan of 2002

- 300 Mw wind power facility in Lewis County
- $17 million in funding for five wind farms
- Funding for development of a biomass fuels
- Development of three or more E - 85 ethanol fueling facilities
- $900,000 R & D for biodiesel fuel for city transit vehicles

New York State Renewable Incentives

- Corporate & personal tax credit
- Property & sales tax exemption
- State grant & loan programs
- Utility rebate program
- Alternative fuel and vehicle incentives
- Green power purchasing
- Net metering rules

Source: Database for State Incentives For Renewable Energy (www.dsire.com)
Minnesota

CAP X 2020

• Capital Expenditures by the year 2020
  • major upgrades and expansion to support growing demand for electricity

Source: CAPX 2022 website
Minnesota Renewable Mandates

- **Wind**
  - Xcel* is required to acquire 1,125 Mw of capacity

- **Biomass**
  - Xcel is required to acquire 110 Mw of capacity

- **Renewable Energy Objective**
  - Utilities must make a "good faith effort" to generate or purchase electricity from renewable resources
    - 2005 = 1% of total sales
    - 2015 = 10% of total sales

Source: Minnesota Department of Commerce, Minnesota's Leadership in Renewable Energy, December 2004
Minnesota Financial Support

- State wind production incentive
- LCMR Community wind rebates
- Net metering
- Low-interest loan programs
- State sales tax exemption (Wind & Photovoltaic)
- State property tax exemption
- State production tax exemption
- Xcel Renewable Development Fund

Source: Minnesota Department of Commerce, Minnesota’s Leadership in Renewable Energy, December 2004
Research And Development

• Establishment of the Initiative for Renewable Energy and the Environment (IREE)
  • Develop bio-based and other renewable resources and processes
  • $20 million for initiative
• Xcel Energy must contribute $16 million annually to the Renewable Development Fund

Source: Minnesota Department of Commerce, Minnesota’s Leadership in Renewable Energy, December 2004
Environmental Benefits

- 11% renewable electricity generation avoids over 5 million tons of CO$_2$
- In 2015, when at least 20% of the state’s electricity is from renewable fuels, 12.7 million tons of carbon dioxide avoided

Source: Minnesota Department of Commerce, Minnesota’s Leadership in Renewable Energy, December 2004
Florida Energy Plan Of 2005

- Review current and projected energy needs, infrastructures, security, storage and cost for electric generation and fuels
  - Oil, natural gas, coal, renewable fuels, ethanol, biodiesel, and hydrogen
- Review diversification of electric power supply
- Methods for protecting energy supplies during an emergency

Source: Department of Environmental Protection, Florida’s Energy Plan, January 2006
Florida Energy Plan Update January 2005

- Electric Power Generation & Transportation Fuel
  - Diversity
  - Conservation
  - Energy Efficiency
  - Economic Incentives
  - Grant funding R & D
- Improve fuel infrastructure
- Before the 2006 hurricane season, register 10% of retail fueling stations in a generator program

Florida

Current Renewable Energy Projects

• Hydroelectric generation accounts for less than 0.1 percent of Florida’s generation mix

• Landfill gas = nearly 40Mw statewide

• 7 utilities purchase 506Mw from MSW and biomass

• The City of Lakeland Electric and Water Department has a solar thermal program where the utility installs and owns the solar water heater and sells the produced hot water to the customer

Source: Department of Environmental Protection, Florida’s Energy Plan, January 2006
Florida

Florida And Alternate Fuels

- **Ethanol**
  - No ethanol production plants Florida’s seven ethanol fueling stations

- **Biodiesel**
  - 18 million gallons
  - 9 companies

- **Hydrogen**
  - One station in operation,
  - Two stations in the construction
  - Two stations in the planning phase

Source: Department of Environmental Protection, Florida’s Energy Plan, January 2006
Emerging Energy Plans

Progress So Far

- Progress
- Need for improvement
- Consistency issues
- Definition of renewables
- Stand alone plans

- A prototype plan would be helpful
A Call To Action
What Can New Graduates Do?
It Is Wrong To Waste Energy

• Blaming OPEC is not an energy plan
• All energy sources should be evaluated
• American households are reaching their own dramatic conclusions
• Political strategies are needed to achieve peace with nature*
• Our standard of living is in jeopardy
• A fuel versus production issue
• Pragmatic national energy policy required
• 130 million tons of RSF wasted
• Recycling left-overs are valuable energy resources
• The US trails Europe and Asia
• This winter has reminded us all that It Is Wrong to Waste Energy

Source: * Hermann Scheer, author of A Solar Manifesto
Renewable Fuels, a Critical Part of a Sustainable Energy Policy

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