AIRA Dallas Energy Seminar – Alternative Energy Issues

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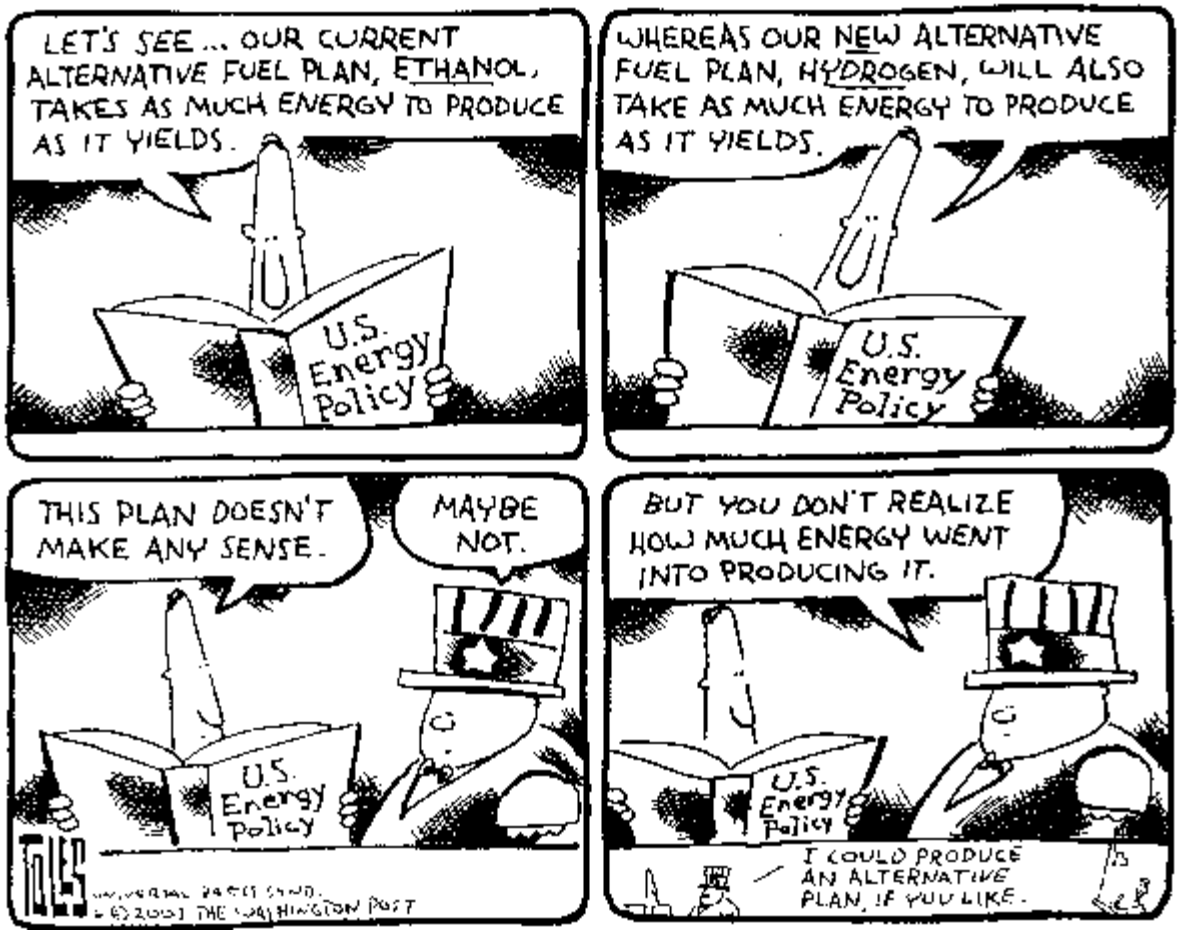
Introduction to Alternative Energy Issues

The Logic Behind Alternative Energy



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Alternative Energy Challenges

- Natural gas working inventories ended July 2012 at an estimated 3.2 trillion cubic feet (Tcf), or approximately 17% higher than the same time last year. The U.S. Energy Information Administration (EIA) expects average Henry Hub natural gas spot prices to decline from $4.00/MMBtu in 2011 to approximately $2.67/MMBtu in 2012 and $3.34 per MMBtu in 2013.
- As long as natural gas prices remain depressed, alternative energy sources will continue to see less demand because of higher power generation costs being passed through to consumers.
- This has significantly impacted the coal industry and other energy sources.
- As a result of severe drought conditions throughout the Midwest in 2012 affecting corn harvests and pricing, ethanol production decreased from 920.0 thousand bbl/d (13.8 billion gallons) for the week ending June 8, 2012 to 809.0 thousand bbl/d (13.3 billion gallons) for the week ending July 27, 2012. The EIA expects ethanol production to recover in the second half of 2013, averaging approximately 880.0 thousand bbl/d.
- While first generation biofuel companies have had some success, there is a new wave of second generation companies that are looking to produce different products other than the traditional ethanol or use non-food based feedstocks. These companies are still in early R&D stages.
- Other alternative energy sources, specifically solar power generation, face significant challenges from both foreign manufacturers increasing capacity without supporting demand, as well as continued reduction in government subsidies and tariffs.

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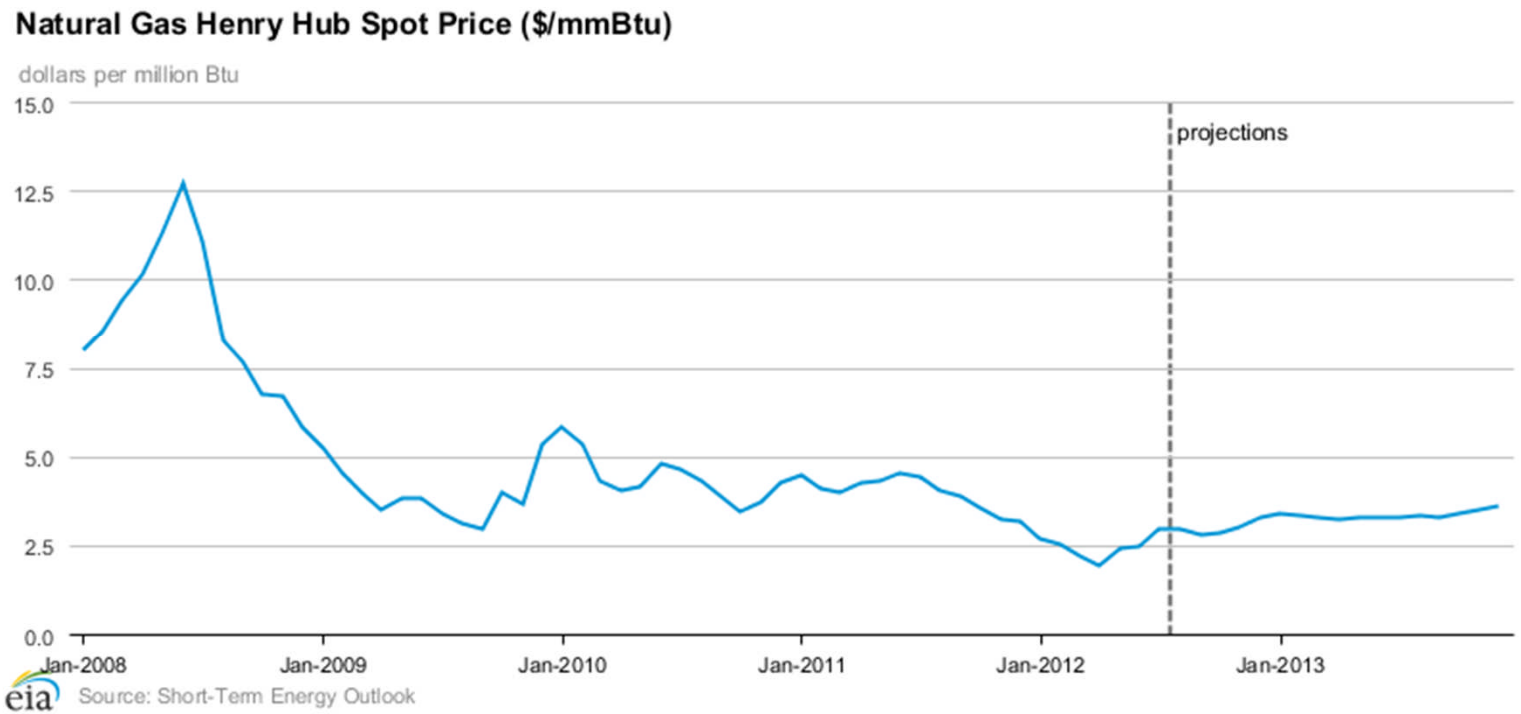
Historical and Projected Natural Gas Henry Hub Spot Prices

- The graphic below details the historical natural gas Henry Hub spot prices through July 2012, as well as the projected spot prices through the end of 2013.
- Since its peak price of $12.69 in June 2008, natural gas prices have declined by approximately 77.6% to $2.84 as of August 2012.
- Prices are projected to increase to only $3.62 by December 2013.



Source: EIA

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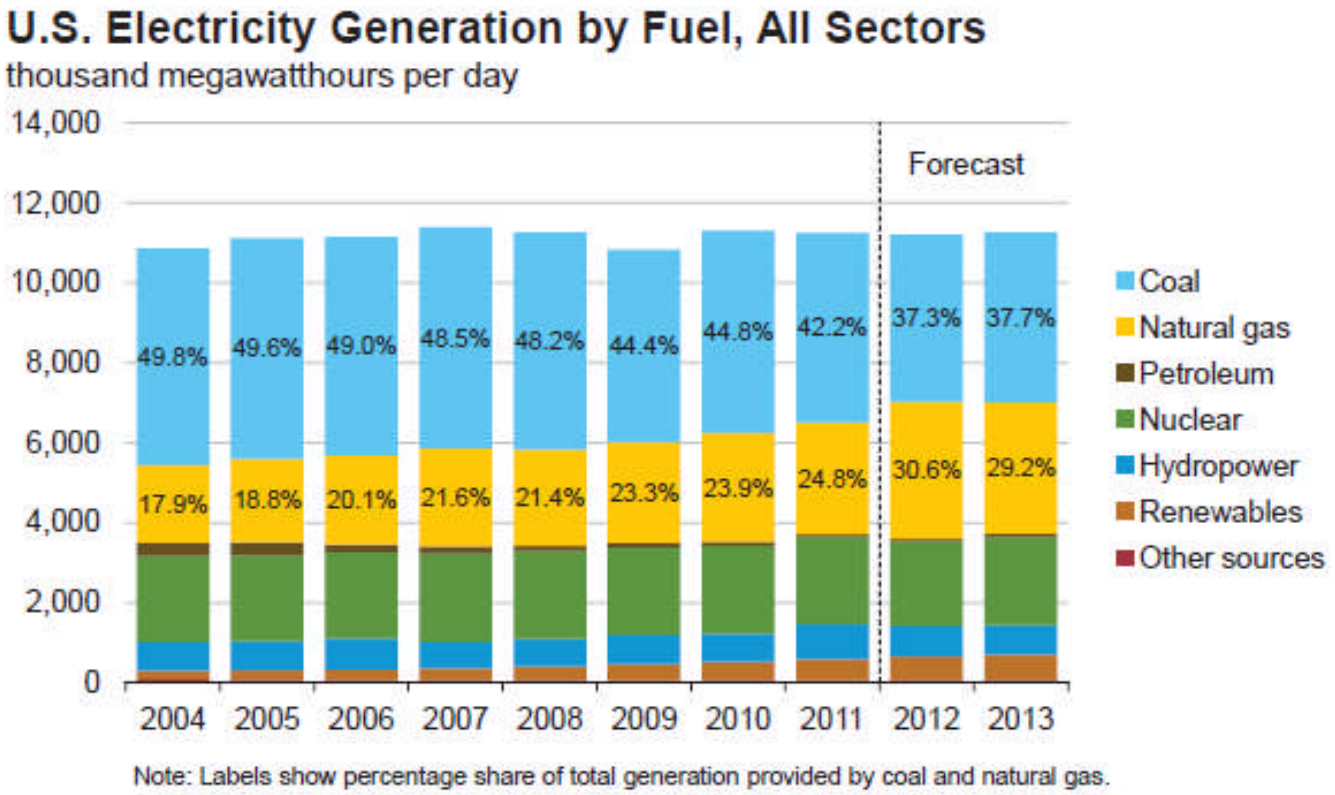
Comparison of Electricity Generation by Fuel Type

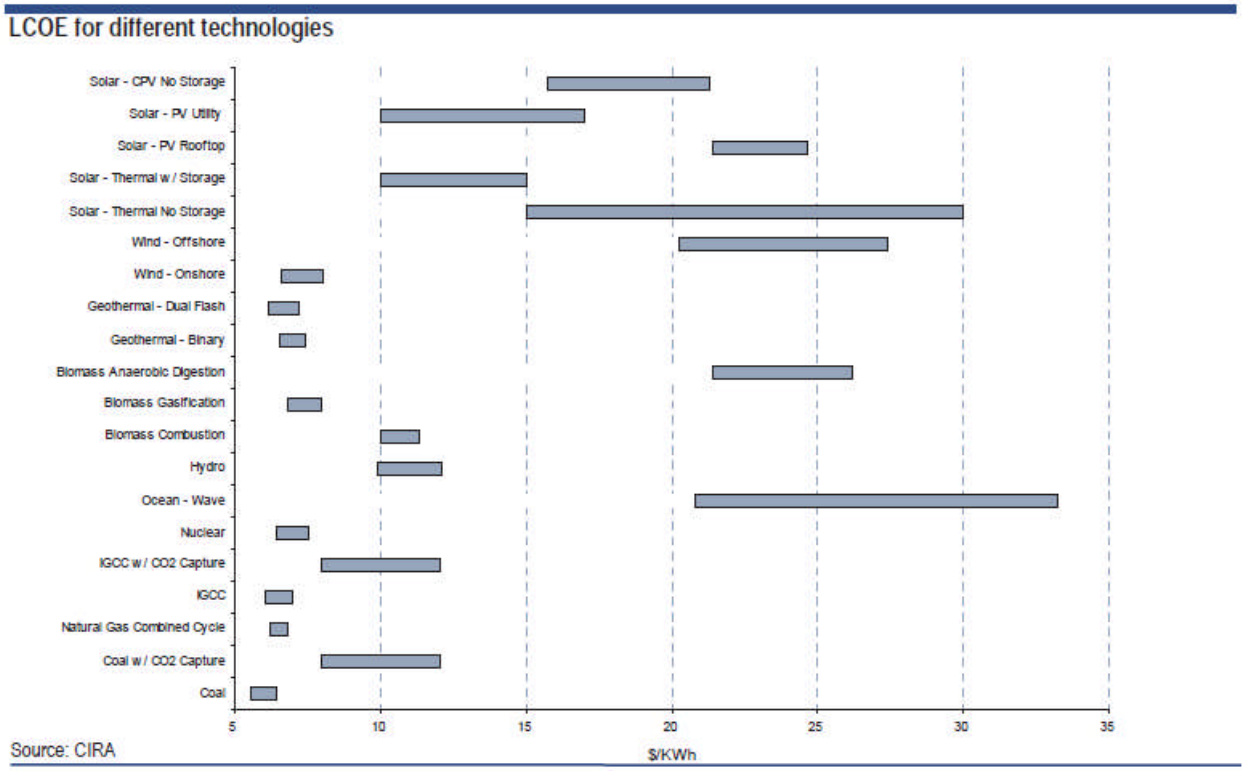
- The graphic below details the percentage of electricity generated by various fuel types.
- Coal and natural gas continue to be largest contributors, while nuclear makes up the third largest component of electricity generated.



Source: Short-Term Energy Outlook, August 2012

Cost of Generation – Levelized Cost of Energy ($/kWh)

- Levelized costs of energy (LCOEs) include capacity factor, O&M, financing / development costs.
  - LCOE is the constant unit (per kWh or MWh) of a payment stream that has the same present value of the total cost of building and operating a generating plant over its life.
  - Typical LCOE is calculated over 20-40 year life and are given in units of currently per kWh or MWh.
  - Very useful in comparing technologies with different operating characteristics.
  - Still includes system integration/transmission cost and energy value (is it there when you need it).



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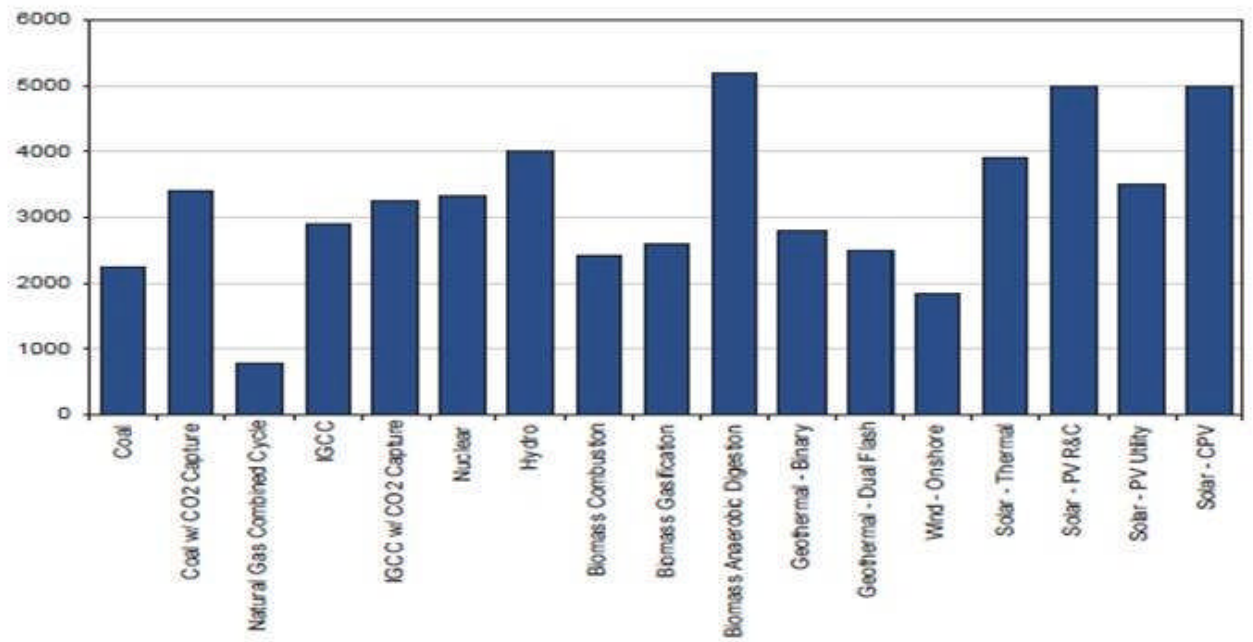
Capital Costs of Generation

- $/KW is a common benchmark for comparing differing generation types
- Relatively little coal and nuclear capacity has come online in the past couple years, so difficult to say what actual price are
- Capacity factor is the portion of nameplate capacity that is actually delivered, on average

Capital Costs ($/Kw) for Various Types of Generation



Source: Citi, CIRA

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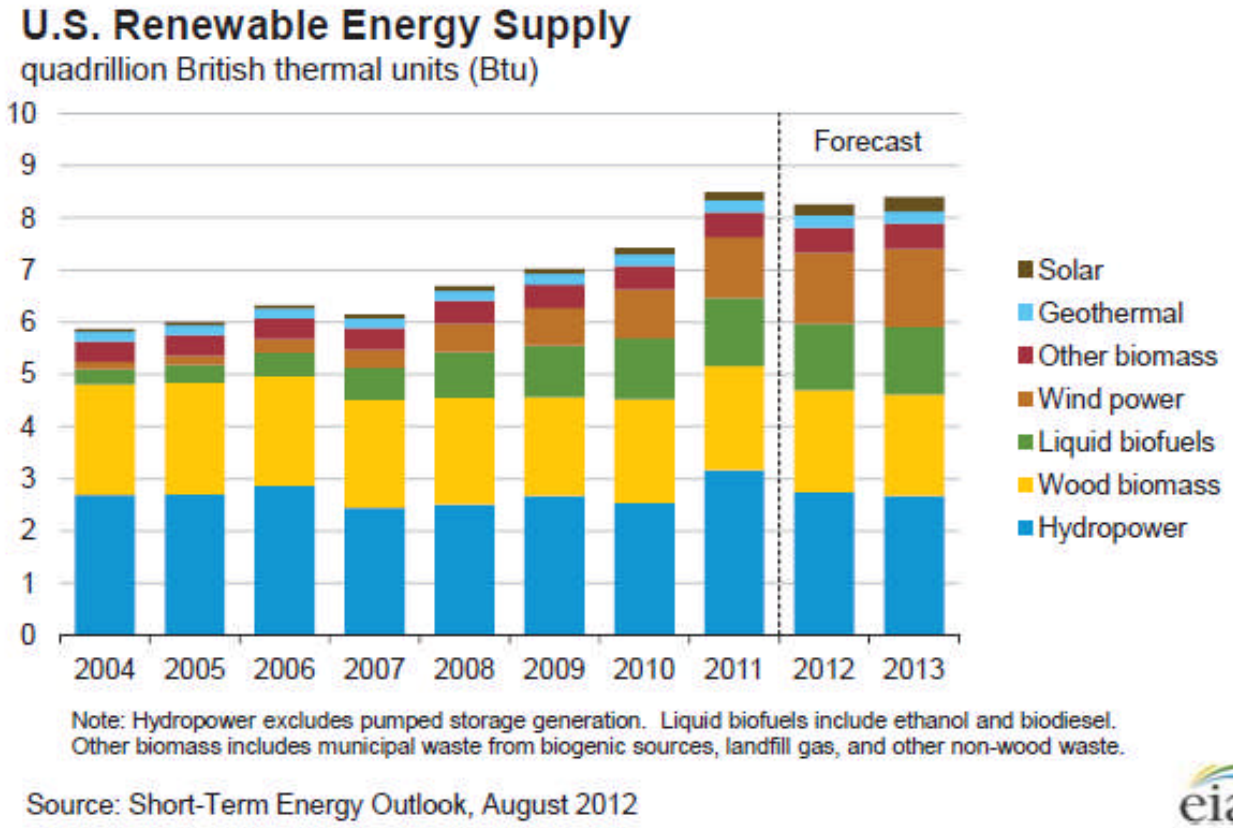
Short-term Plateauing of Renewable Energy Supply

- The graphic below details the recent growth in the supply of various renewable energy sources.
- Since 2004, the supply of renewable energy has increased year over year until the decline from 2011 to 2012. Supply is projected to slightly increase in 2013, but remain below 2011 levels.



Source: EIA

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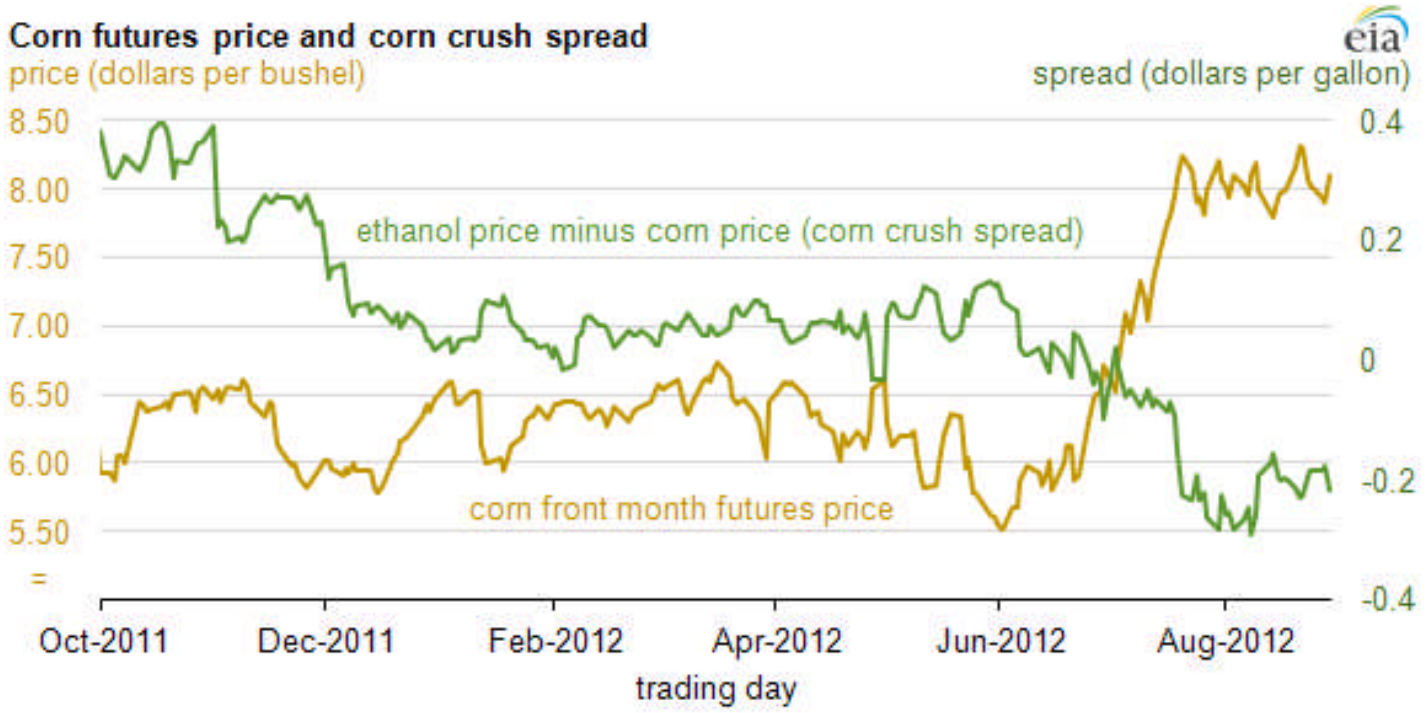
Ethanol & Biofuels

Effect of Drought on Ethanol Margins

- The graphic below details the impact the drought has had on corn prices since June 2012 and ultimately the decrease in ethanol margins over the same period.
- The price of corn has increased by approximately 35.0% since June 18th to August 29th this year, while the spread between ethanol and corn prices (known as the crush spread) declined by $0.22 per gallon.



Source: EIA

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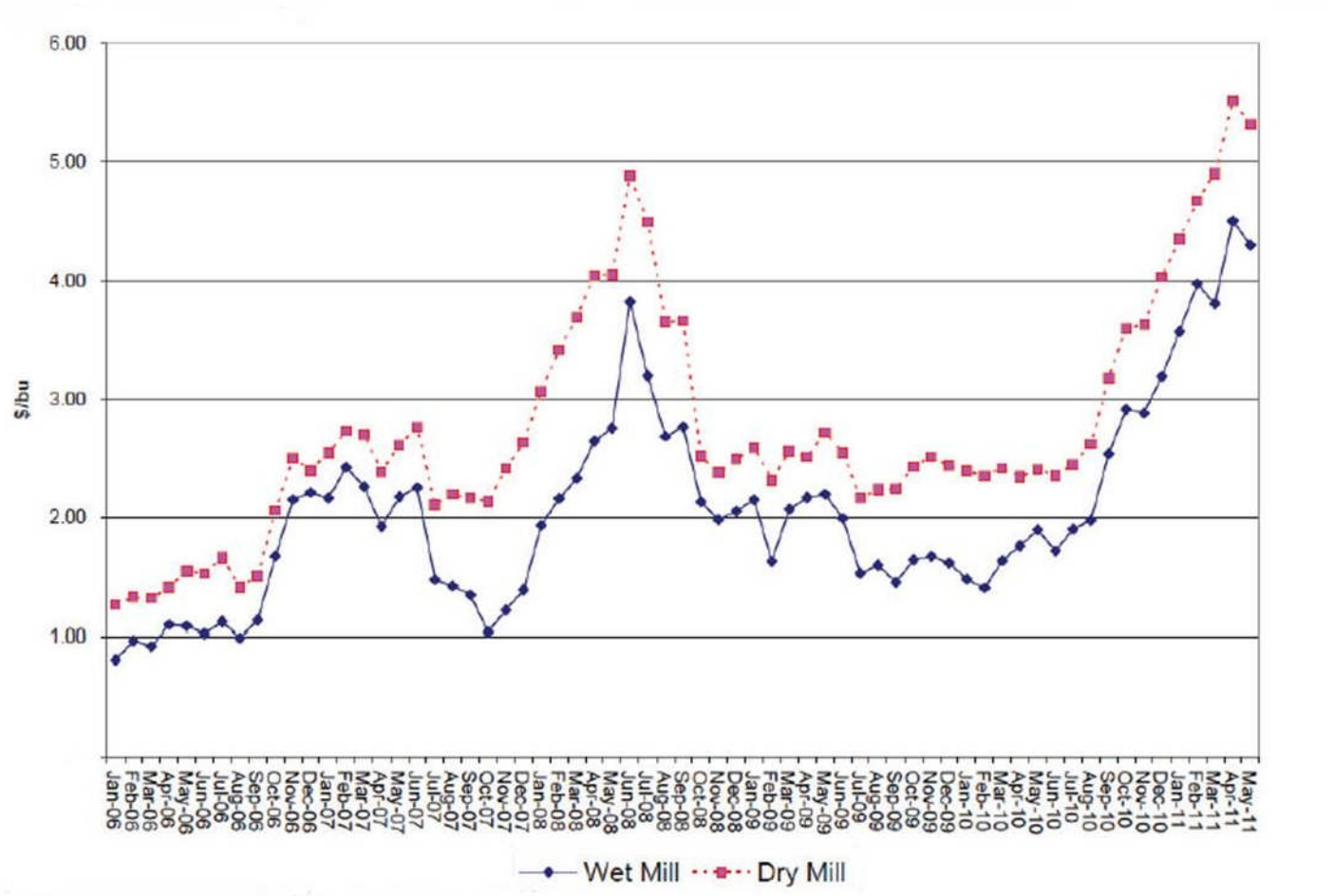
Cost of Ethanol Production

Net Corn Costs – Wet Mill vs. Dry Mill



Source: Citi, CIRA, USDA

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Signs of Distress in the Ethanol and Biofuel Industries

- Since mid June, three large ethanol producers have idled plants:
  - Valero, the third largest U.S. ethanol producer in terms of capacity, idled two of its ten plants in late June. Valero plans to resume production at the plants in the fall if market conditions improve.
  - Abengoa Bioenergy has idled three of its six total plants so far this year, the most recent in early June.
  - Nedak, a small ethanol company, idled its only plant in June.
- Several other producers are slowing ethanol production at less efficient plants:
  - Green Plains Renewable Energy, the fourth largest U.S. ethanol producer, slowed production at two of its plants in early 2012.
  - Pacific Ethanol cut its overall capacity by 10% in 2012.
- On September 10th, bioenergy company Terrabon filed for Chapter 7 after it was unable to raise additional funding. Terrabon had planned to construct a 5MMgy facility that would convert biomass products into renewable transportation fuels such as gasoline and jet fuel.

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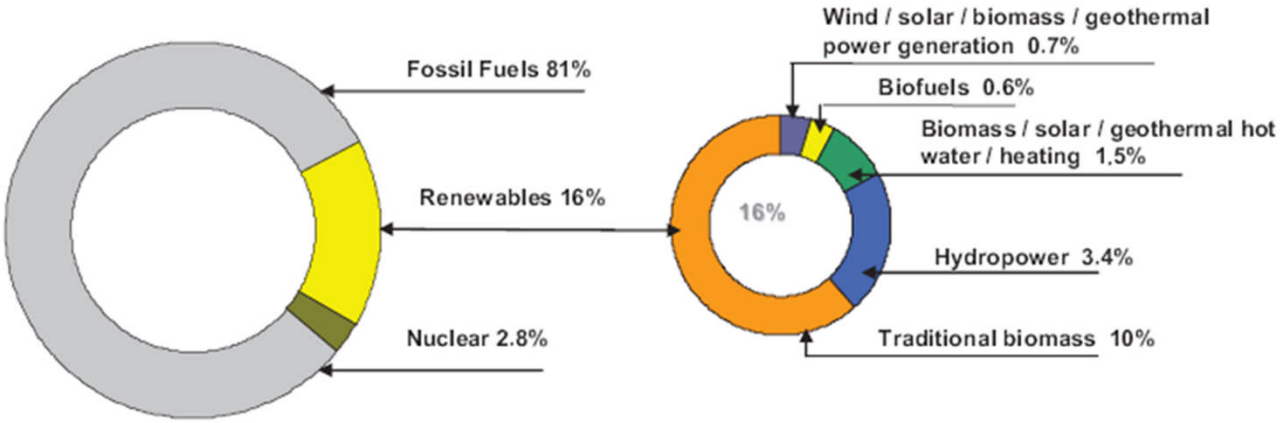
Solar

Solar & Renewables Contribution to Power Generation

Renewables Installed Capacity (2010) – Global



- Although solar generation increased >500% from 2000-2010 it still represents <1% of global generation
- Demand has been driven by incentives within the key markets such as Germany, Italy, Spain and Japan
- The US, China and India are the next demand frontiers
- China & Taiwan are the largest manufacturer bases representing >60% of global PV cell production capacity
- Spain remains the leading concentrating solar power (CSP) market with 150MW in 2010

Source: Citi, CIRA, REN21

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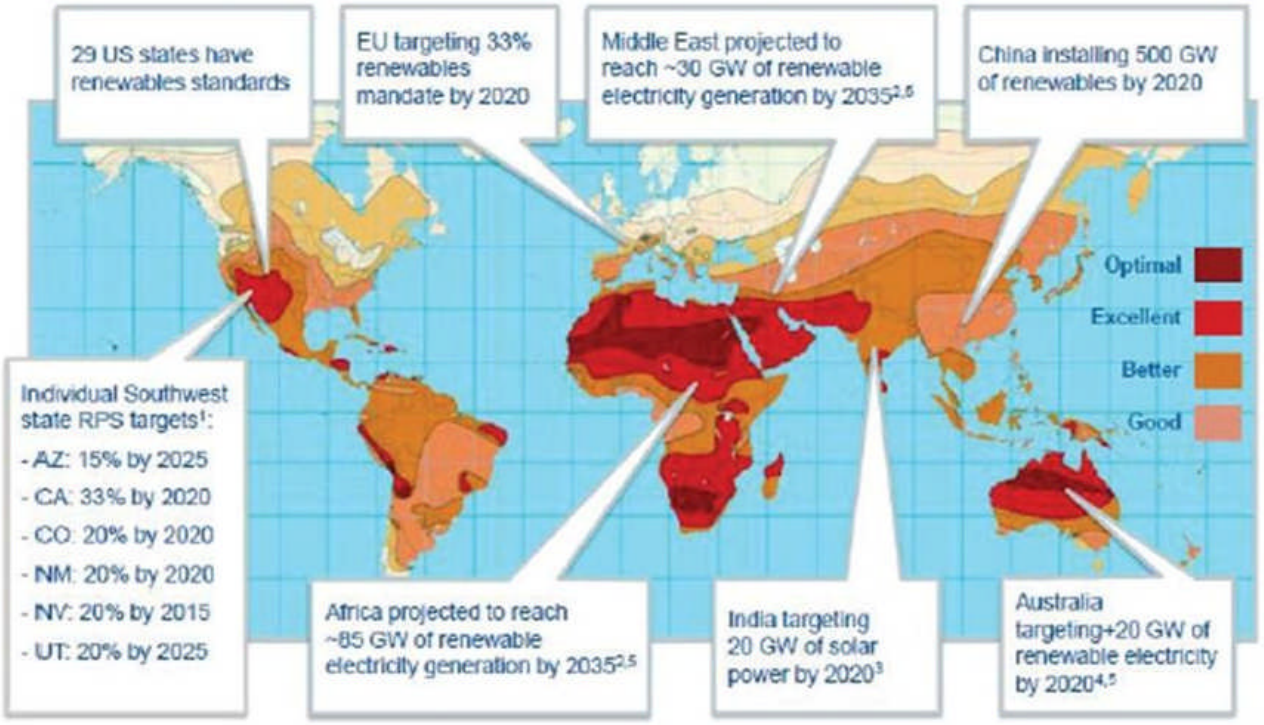
Global Solar Incentives

Incentives in Key End Markets



- Solar demand has been driven by government incentives
  - Both total dollar amounts and dollar per unit is trending down with cost and government austerity
- Demand will remain primarily subsidy driven until renewables are cost comparable with traditional forms of power generation

Source: Citi, EPA, EIA, Ministry of New & Renewable Energy, India Gov, REN21

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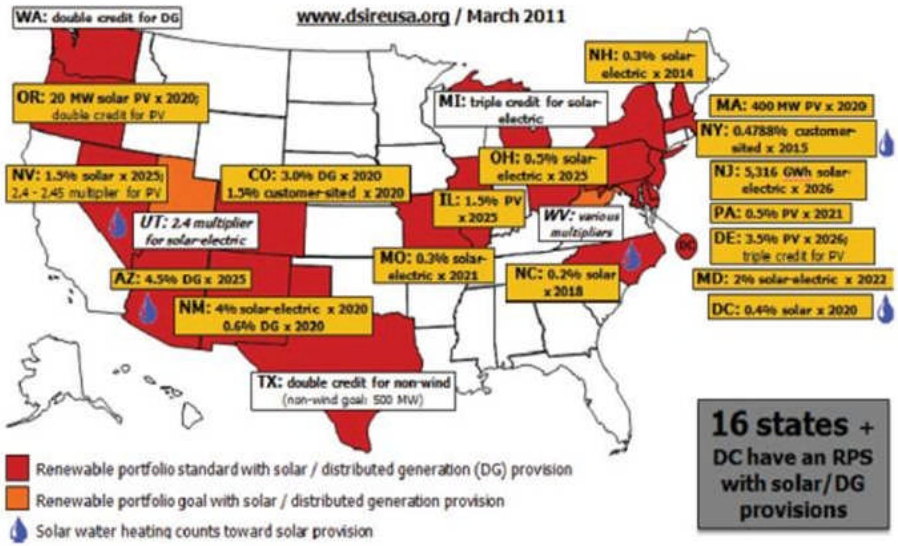
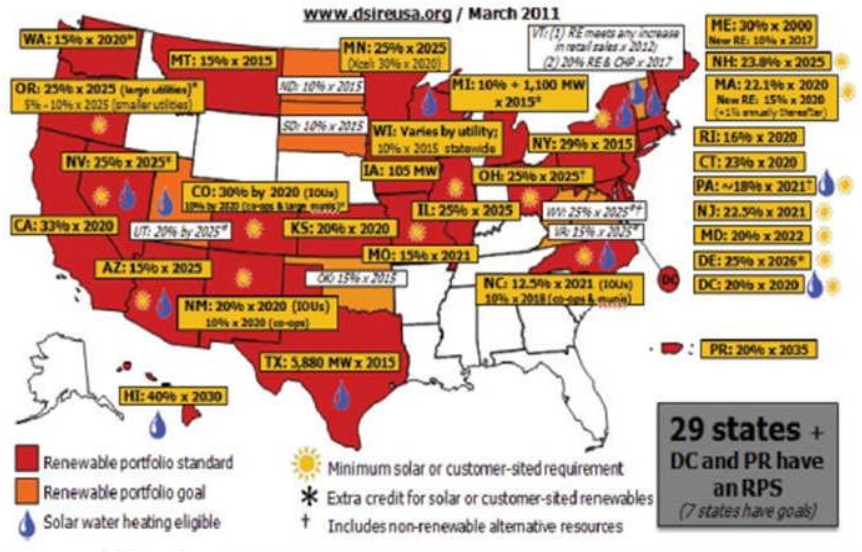
U.S. Government Solar Subsidies

- Renewable energy targets / standards
- Regional feed-in tariffs (FIT)
- Government tax credits

U.S. RPS Policies



Incentives in Key End Markets



Source: Citi, DOE, NASC, EERE

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Solar Subsidy Programs

- Investment Tax credit (ITC)
  - Reduces federal income tax for qualified tax-paying owners based on capital investment in renewable energy projects
  - Tax credit in the amount of 30% of total project investment
  - Currently expires year end 2016 when the hope is that it will no longer be necessary
- Cash grant program
  - Option for ITC-eligible projects to receive the value of the ITC as a direct grant instead of as a tax credit
  - Recovery Act allowed developers to apply for cash grant in the amount of the ITC when the project goes into service
  - Requires project commencement prior to the Dec. 31, 2011
- Loan guarantee program
  - Funds allocated to service a program that would guarantee loans made on renewable investment however, full details remain a bit murky, and fee guarantees have been announced
  - Requires project commencement prior to Sept. 30, 2011
- Modified Accelerated Cost-Recovery System (MACRS)
  - Permits businesses to accelerate depreciation of solar installations in five years
  - H.R. 4853 has allowed for a one time bonus depreciation of 50% until the end of 2012

Source: Citi

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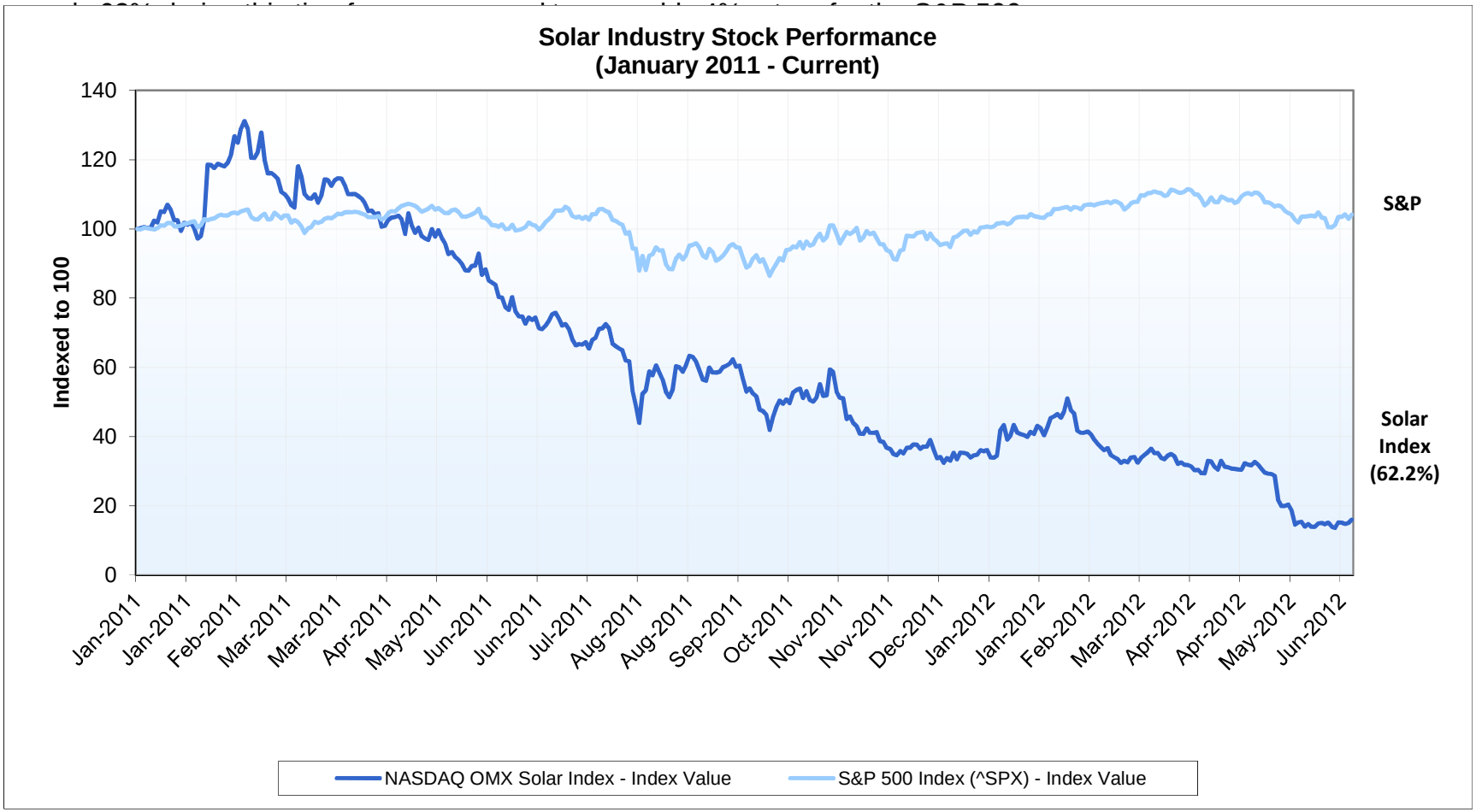
Solar Industry Stock Performance

- The graphic below details the NASDAQ OMX Solar Index versus the S&P 500.
- Since the beginning of 2011, the Solar Index has dramatically underperformed the S&P 500. The Solar Index is down



Source: Capital IQ

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Recent Bankruptcies in the Solar Industry

- July 2012: Centrotherm Photovoltaics AG
- Apr. 2012: Solar Trust of America LLC and Q-Cells
- Mar. 2012: Scheuten Solar, Solarhybrid and Odersun
- Feb. 2012: Uni-Solar Energy and Energy Conversion Devices
- Dec. 2011: Solar Millennium AG and Solon
- Sep. 2011: Solyndra LLC
- Aug. 2011: Evergreen Solar Inc. and SpectraWatt Inc.

- Based on the affidavits filed in support of the First Day Motions in a number of the cases mentioned above, the most common factors leading to distress disclosed were:
  - Over-supply of solar panels dramatically reduced solar panel pricing worldwide.
  - Growing capacity of foreign manufacturers that utilized low cost capital provided by governments.
  - A significant reduction or elimination of governmental subsidies and incentives for the purchase of solar energy.

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Other Signs of Distress in the Solar Industry

- In September 2012, the U.S. House of Representatives passed a bill that would phase out a program for energy loans after a lengthy investigation into why a now bankrupt California solar panel maker received a $535 million government loan.
- In April 2012, Phoenix Solar advised it amended its restructuring plan due to cuts in feed-in-tariffs ("FiTs"), which are the foreign equivalent of government subsidies, for solar power in several of its key markets.
- In April 2012, BrightSource Energy, a leading solar thermal company, announced that it was withdrawing its IPO due to adverse market conditions.
- In April 2012, China-based solar maker LDK initiated a restructuring by laying off a significant number of its 25,000 employees in mid-April.
- In April 2012, First Solar said it would reduce its workforce by 30%, eliminating 2,000 jobs.
- In March 2012, Renewable Energy Corp ("REC"), a Norway-based solar firm, announced it would close its last production plant in Norway to focus on operations in Singapore and the United States. The REC CEO stated that the boom of production of solar wafers in China had pushed prices down to a point in which the Norway plant could no longer compete.
- In December 2011, BP Solar stopped its business of selling solar modules to the distribution channel.

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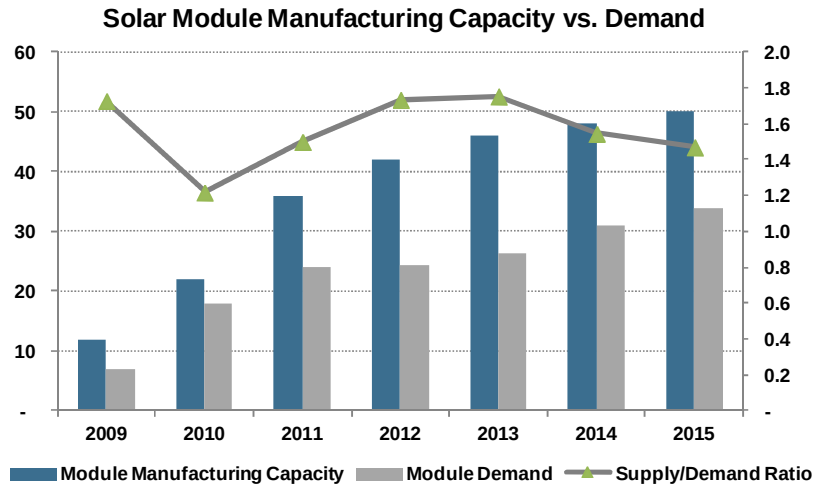
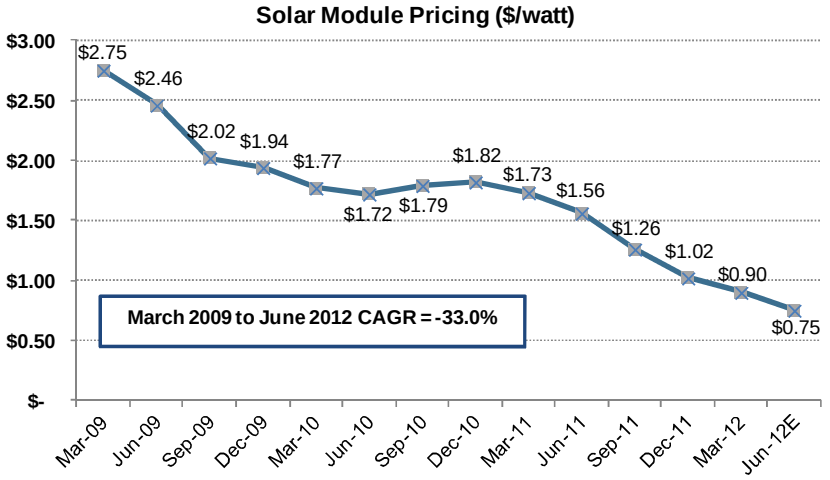
Solar Module Supply, Demand, and Pricing





Similar to upstream manufacturers, module providers are facing an over-capacity issue:

- Despite reasonable growth achieved in 2011 (global solar PV installations were approximately 24 GW in 2011, up from 19 GW in 2010 for an increase of 24%), there has not been a surge in demand for PV components.
  - This is a result of the high inventory levels with customers installing previously purchased modules and inverters.
  - Module inventory stood at a huge 10 GW, while inverter inventory was at an unusually high level of 6 GW.
- Global PV installations are projected to have flat to moderate growth through 2013, increasing slightly thereafter; however, the demand will not display material improvement vs. available manufacturing capacity.
- The prevailing solar module price was $0.70 to $0.80 as of May 2012 vs. $0.90 in February, with the decline primarily due to lower polysilicon pricing.
- On a geographical basis, low labor costs and scale have allowed Chinese companies to capture 56% market share, likely the primary rationale for the U.S. Dept of Commerce imposed 31% tariff.

Source: Citi, Bank of America, Collins Stewart

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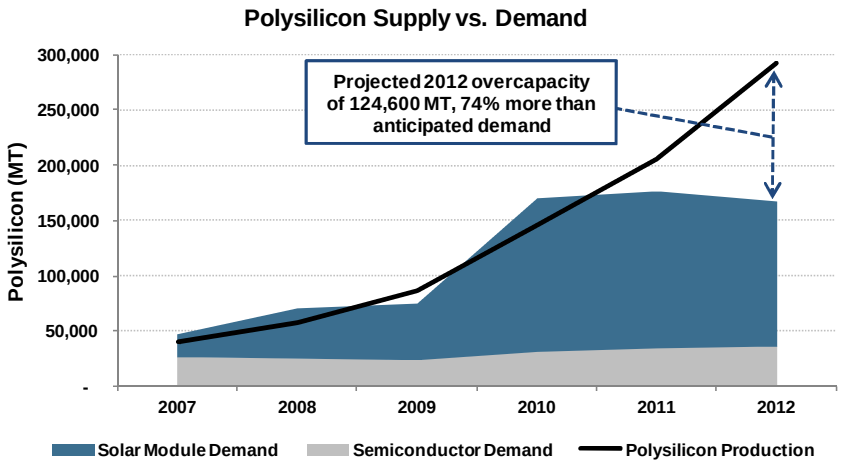
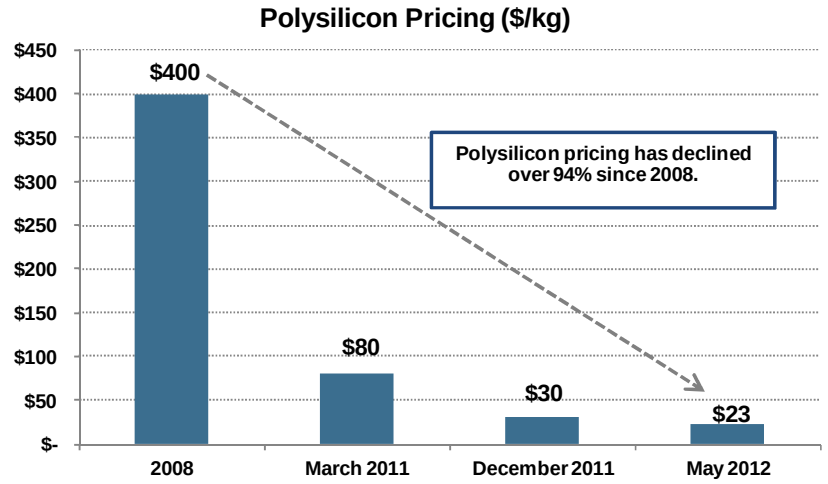
Polysilicon Oversupply and Pricing Declines





Historically high polysilicon pricing and attractive margins resulted in significant investment in incremental capacity within the industry from 2009 to 2011.

- Excess capacity is the most significant issue facing the solar industry in 2012. Many solar firms are facing falling capacity utilization and risk of bankruptcy/insolvency.
- Massive overcapacity has resulted in oversupply, resulting in sharply reduced prices producing minimal to negative margins.
- Since 2008, polysilicon pricing has dropped from $400/kg to $23/kg.
- There are now over 170 polysilicon manufacturers/startups, with only 10-20 expected to survive long-term.
- At current prices, upstream solar product makers are suffering more than downstream solar vendors; therefore, upstream firms are demanding downstream firms to honor take-or-pay supply contracts.
- As pricing pressures continue, more upstream vendors, including polysilicon and solar wafer makers will shut down or cut production if ASP goes below cash cost.

Sources: Collins Stewart, GTM Research, Bloomberg

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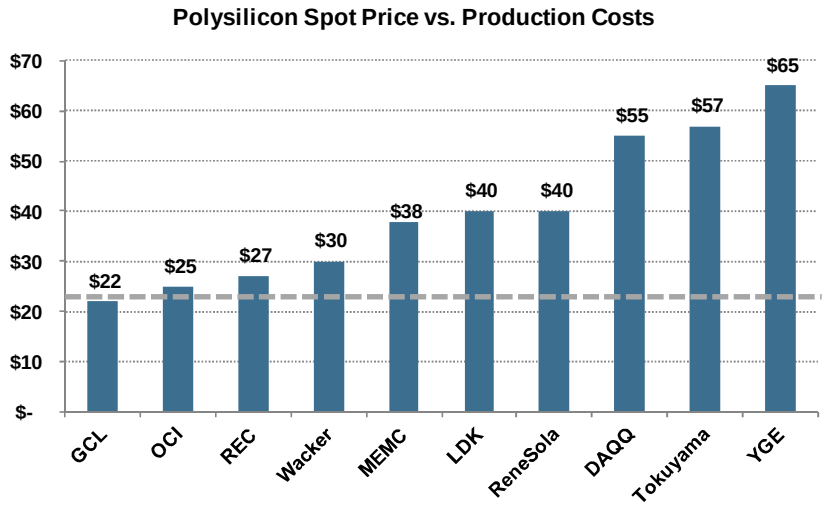
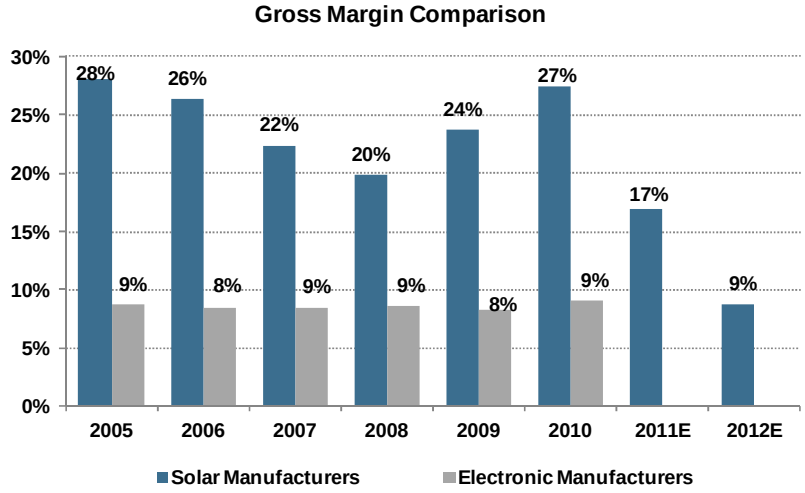
Polysilicon/Upstream Weakening Profit Margins





Fixed plant costs are a large component of polysilicon production; vendors will continue to operate until market price is several dollars below cash costs.

- Several public solar companies all produce polysilicon above ASP and may face the decision to either shut down plants or incur a significant financial burden until operations can become more efficient or prices return to higher levels (price increases unlikely at current capacity levels).
- Many photovoltaic ("PV") manufacturers that transitioned from adjacent manufacturing segments to PV during 2009 to 2011 will likely return to their core business activities.
- Solar manufacturing margins are rapidly trending toward electronic manufacturing services ("EMS") margins and are likely to stay in that range. If so, the PV module vendors models are currently unsustainable. Upstream providers will be required to either pursue a model which accepts sub-10% gross margins and sub-5% operating margins or expand downstream. The realistic long-term outcome for the solar industry is massive consolidation.

Sources: Daiwa, Citi. Solar Manufacturers in chart include Suntech Power, Trina Solar, and Yingli Green Energy.

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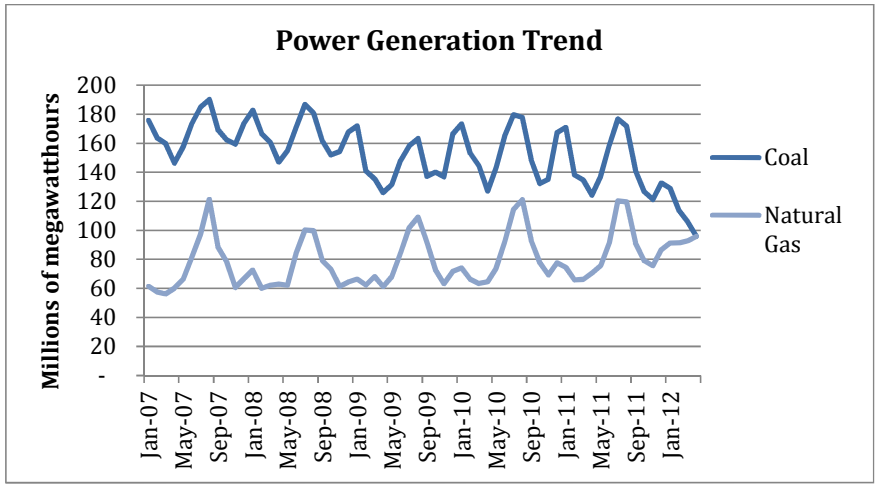
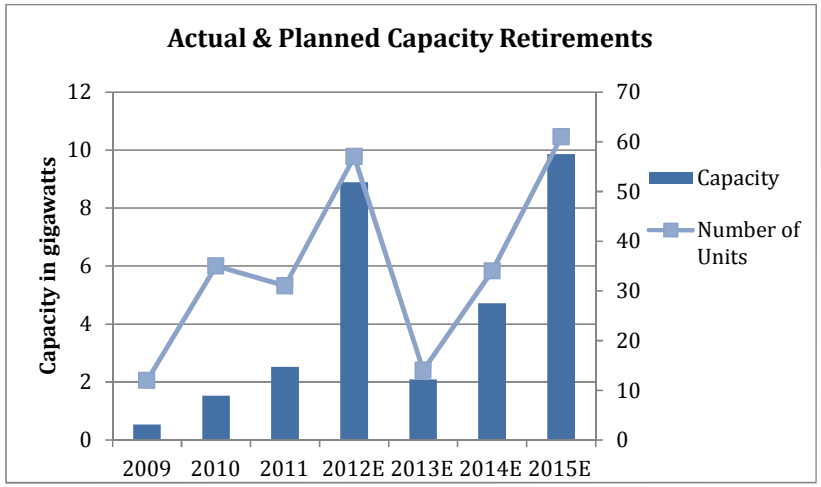
Coal

Trend in Coal Power Generation

- Coal burning power plants are the largest driver, by far, of demand for thermal coal. Historically, electricity production has accounted for over 90% of total U.S. coal demand. The U.S. has more than 1,400 coal-fired power plants which consume a total of over 900B tons of coal annually, however these numbers are predicted to decline due primarily to clean-air initiatives.
- Although coal has been the largest source of electricity generation for over 60 years, recently the proportion of power generated by coal has decreased for several reasons:
  - The increased production of shale gas has caused a mismatch between natural gas supply and demand. Recently, the price of natural gas declined to a 10-year low, making it a more attractive option for base-load power generation.
  - Increased regulation from the Environmental Protection Agency, particularly regarding new rules being finalized to limit greenhouse gases and other air emissions.
- In April 2012, for the first time since the data has been collected, domestic electricity generation from natural gas and coal-fired power plants was equal. Each fuel provided 32% of total power generation (see chart on left, below).
- Power plant operators plan to retire almost 26GW of coal-fired capacity between 2012 and 2015, representing 8.1% of total coal-fired capacity in 2011 (see chart on right, below).





Source: U.S. Energy Information Administration

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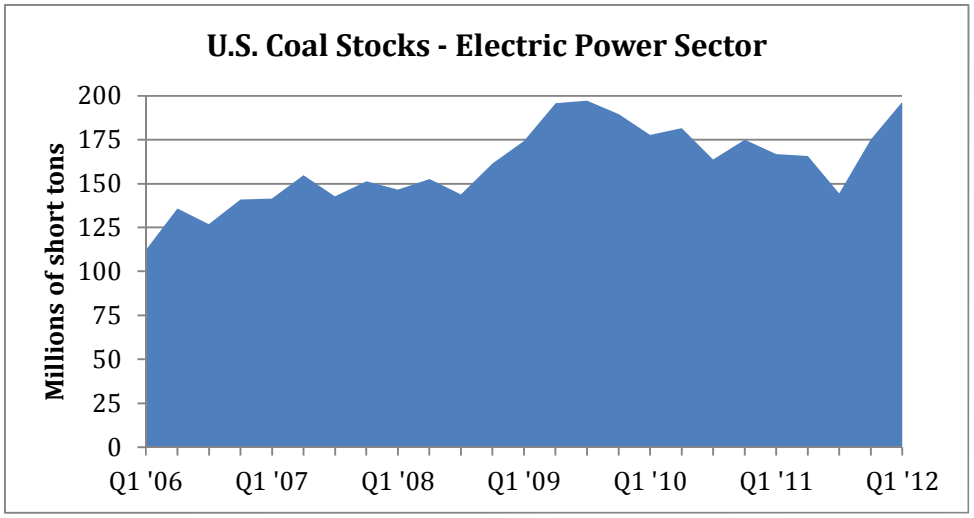
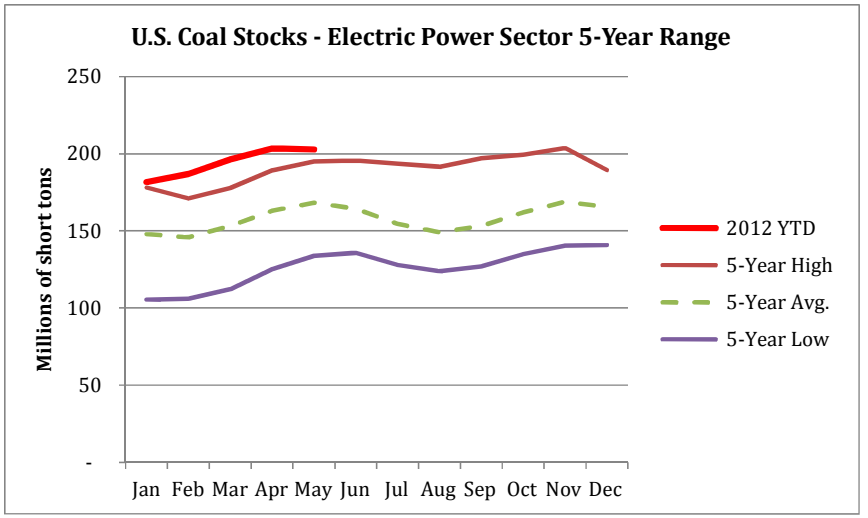
U.S. Coal Supply

- The decline in coal-fired electricity generation has caused coal stockpile levels at power plants to soar. Coal-fired generators are using several methods to manage their growing stockpiles:
  - Not accepting additional shipments of coal by using the contractual procedure force majeure.
  - Renegotiating or buying out contracts with coal producers.
  - Deferring purchases of coal to later years in long-term contracts.
  - Identifying new coal storage facilities.
- Through May, the latest data available, U.S. coal stocks in the electric power sector have been above their previous 5-year highs every month in 2012 and significantly above 5-year averages (see chart on right, below).
- The increased stockpile levels will cause a delayed reaction between when power plants increase their coal use and when coal producers see an increase in demand.





Source: U.S. Energy Information Administration, Company Provided Information

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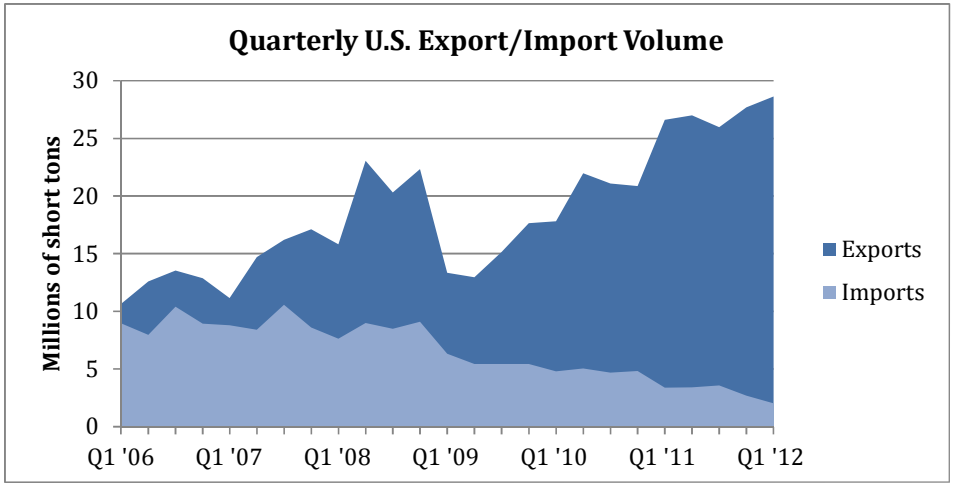
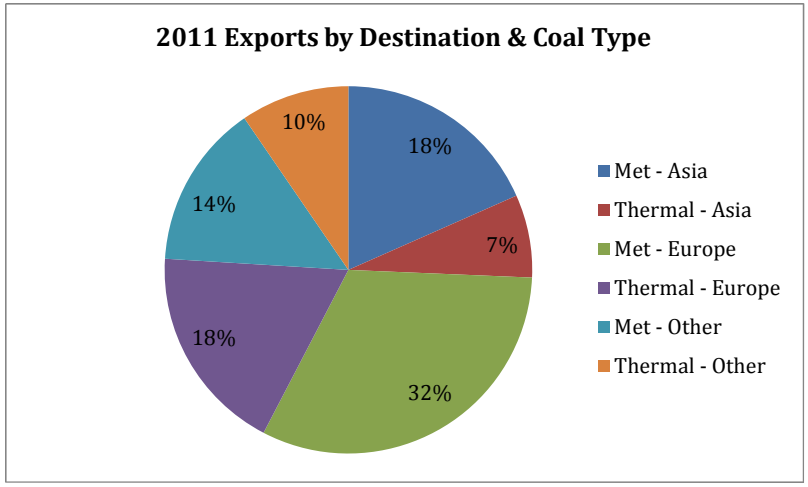
U.S. Coal Exports & Imports

- Overall domestic coal consumption dropped by 4.6% in 2011, while U.S coal production rose by 0.9%. This misalignment of supply and demand has caused U.S. coal producers to increasingly turn to the export market in order to maintain sales volume.
- In 2011 annual U.S. coal exports totaled 107M tons, an increase of 31% over 2010.
- Metallurgical exports dominated thermal exports, accounting for 70M of the 107M tons exported. Met coal exports increased in 2011 for two primary reasons:
  - Increased demand abroad, particularly from Asia.
  - Supply disruptions in other met coal producing countries, most notably Australia.
- The majority of thermal coal exports went to Europe, where the breakeven cost of producing electricity using natural gas instead of coal is much higher than in the U.S. Natural gas prices in Europe rose roughly 35% in 2011 making it more economical to import coal (however most analysts agree that thermal export pricing is still not attractive for high cost Central Appalachia producers).





Source: U.S. Energy Information Administration, Credit Suisse, Nomura

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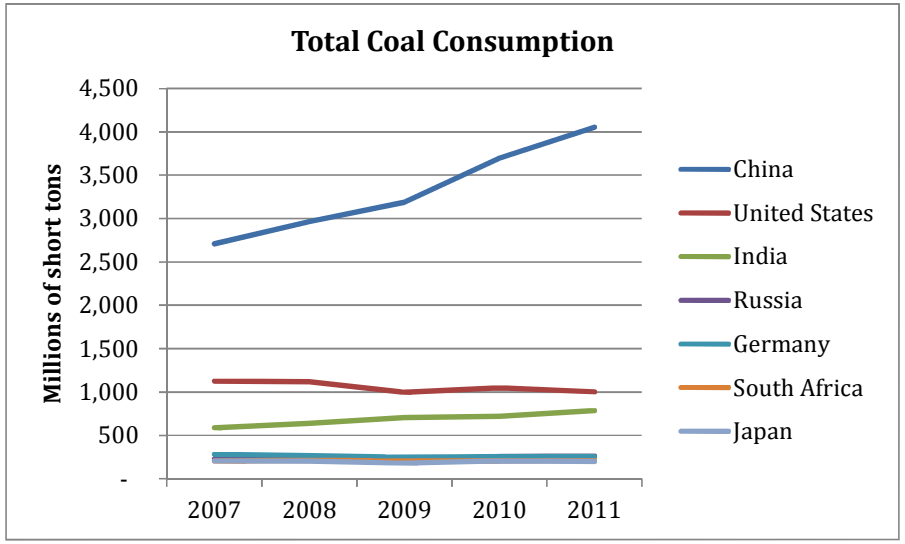
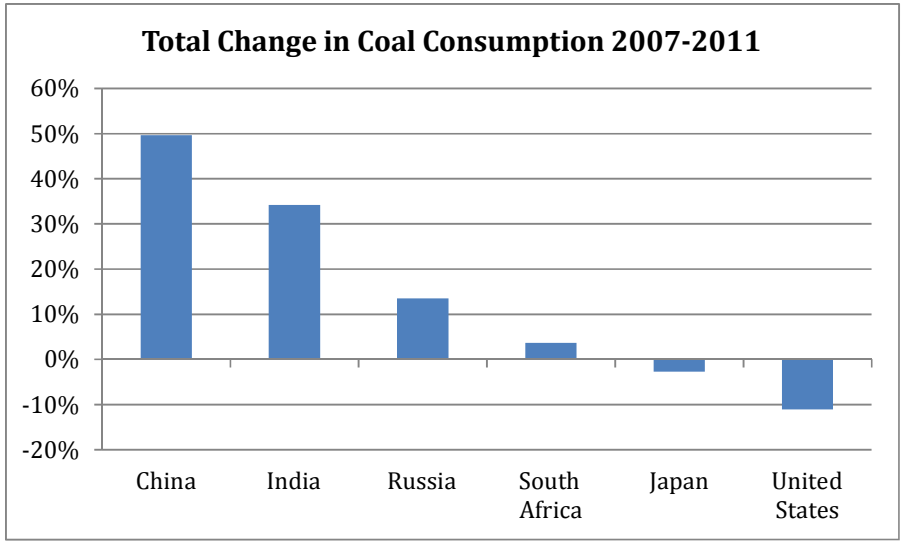
Global Coal Consumption

- Seven countries make up the preponderance of global coal consumption, in order of consumption they are; China, the U.S., India, Russia, Germany, South Africa and Japan.
- China is by far the worlds largest coal consumer, and consumed over 4 times more coal in 2011 than the next country, the U.S. (see chart below, left).
- China also makes up the majority of worldwide coal consumption growth, with coal consumption growing 50% from 2007-2011. India also experienced considerable growth, but from a much smaller base than China (see charts below).
- Although the U.S. is still the second largest coal consumer in the world, U.S. coal consumption has markedly declined over the last several years.





Source: U.S. Energy Information Administration

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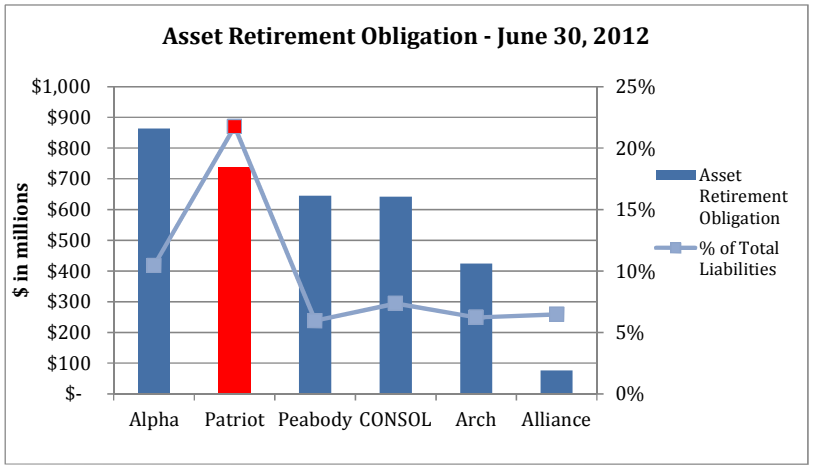
Coal Industry Laws & Regulations

- Surface Mining Control and Reclamation Act (SMCRA) – created the Office of Surface Mining Reclamation and Enforcement (OSM) and requires that land used in coal mining be restored to levels equal to or greater than pre-mining conditions. Mine operators must obtain SMCRA permits and permit renewals from the OSM.
  - SMCRA permits can take up to a year to prepare, and often take two years or more to be issued. SMCRA permits require compliance with many other environmental programs, such as the Clean Air Act and the Clean Water Act.
- The Clean Air Act – regulates the emissions of materials into the air, including carbon dioxide, mercury and other greenhouse gases. The Clean Air Act affects coal companies directly through permit applications, and also indirectly by regulating the coal industry's biggest client, coal-fired power plants.
- The Clean Water Act – regulates the discharge of pollutants, including fill materials, into U.S. waters. Mine operators must obtain permits to place materials in streams for the purpose of creating refuse areas, water impoundments or slurry ponds, activities which are frequently required in the industry. Permits are also required for wastewater discharge of pollutants, including selenium.
- These laws and regulations represent a significant liability for the coal industry, and as such coal companies carry "Asset Retirement Obligations" on their balance sheets to represent the future anticipated costs of land and water restoration.



Source: Office of Surface Mining Reclamation and Enforcement, Environmental Protection Agency, Companies' Q2 2012 SEC 10-Q Filings

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