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Economic Security: Neglected Dimension of National Security?

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Energy Security is National Security

Alternative Energy and Fuels

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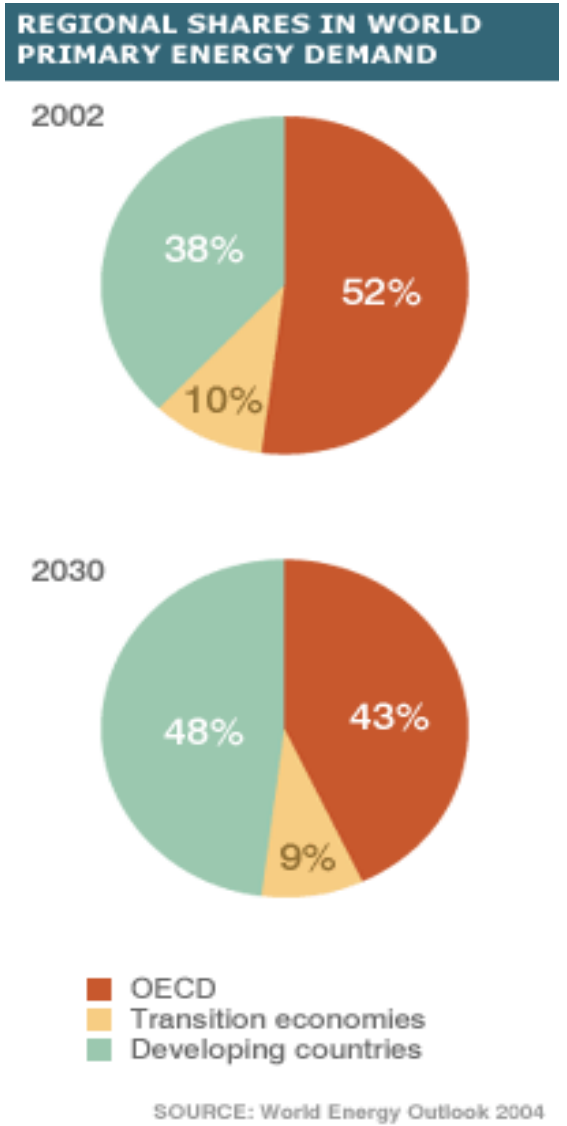
Energy Security Fears are Driving Alternative Fuel Policies

- Fossil fuels will continue to dominate global energy use over the next 20-30 years
- BUT…
  - Over two thirds of rise will come from developing countries mostly from transportation & power stations
  - Vulnerability to supply disruptions increases as international trade expands
  - Large consuming countries (inc. China and India) are increasingly dependent on imports from a smaller group of producer countries – some are politically unstable
  - Predicted 60% rise in CO2 emissions 2005–30
- ***Alternative Fuels and Secure Energy Sources are Economic and National Security issues***



The Future Energy Vision in a Perfect World…

- **The Perfect World of Energy would be…**
  - **Generate 100% renewable stationary power needs:**
    - **Hydro**
    - **Tidal**
    - **Solar**
    - **Wind**
    - **H2.**
    - **GeoThermal**
  - **Transportation systems (Road, Rail & Air) powered by:**
    - **Electrical Energy**
    - **H2 IC Engines & Fuel Cells**
  - **What is the transition path to 100% renewable and non-polluting sources??**

The Current Energy Scenario is Quite Imperfect…

- **Chaos Describes our Current Energy Scenario**
  - **~6 major sources of power generation,**
  - **Over 10 fuel types in Power Gen and Transportation sectors**
  - **Alternative sources of power being implemented near term**
  - **Alternative Fuels being developed and applied near term**
- **Complexity is expanding, not converging**
  - **Cost control is waning;**
  - **No macro view being taken**

Does Brazil Provide Positive Insights?

- **Brazil embarked on an alternative fuel plan over 30 years ago that could provide transport energy assurity by 2020.**
  - **Simple plan – Covers transportation sector only**
    - **Sugar cane based ethanol and**
    - **Development of offshore oil reserves**
  - **But… does not address the issues of stationary elements**
    - **Electrical shortages still must be addressed**
    - **Natural Gas reserves are grossly inadequate**

- **Brazil has half of it right… But on a temporary basis;**
  - **Reduced oil dependence until they run out offshore**
  - **Have much to do to achieve true energy security**
  - **The Good News – They chose a path and stuck to it!**

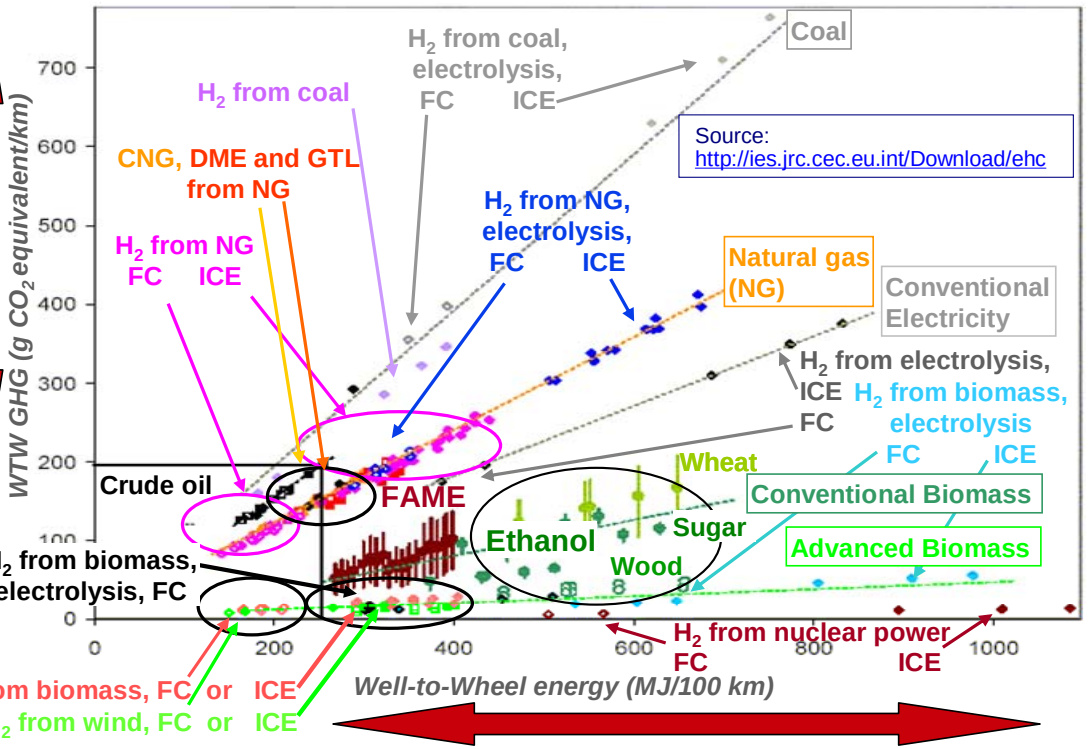
- **The Insight! Beware of partial and/or temporary solutions!!**

A Complex Set of Options for Alternative Fuels in The Transportation Sector

Well-to-Wheels study Concawe/EUCAR/JRC General conclusions

- Production, conversion of '**Conventional' biomass** involves significant amount of fossil energy
- **'Advanced' biomass**: Use biomass gasification or wind electricity for conversion process
  - Results in lower WTW GHG output
- WTW GHG and energy of H_2 in Fuel Cell are lower than H_2 in ICE due to better efficiency

Shift to low (zero) carbon fuels does not always result in WTW GHG reduction



Shift to renewable carbon routes offer GHG reduction but generally requires more energy
High cost does not always result in large GHG reductions

The US Corn Based Ethanol Story – A Transitional Solution??

- **The Good News**
  - **Billions of gallons of petroleum displaced from blended gasoline now.**
  - **Current land capacity estimates allow displacement up to 30% of imported petroleum**
  - **Future developments could put ethanol on par with diesel for medium duty truck use**
  - **Good transitional solution**

- **The Challenges**
  - **Vehicles can not yet take full advantage**
  - **E85 fuel cost / mile is uncompetitive**
  - **Not energy neutral to gasoline production**
  - **No national plan for full adoption**
  - **No regulated flex fuel requirement in vehicles i.e. Brazil**
  - **Food supply disruptions and Future Land Use Issues i.e. Food vs. Fuel when US population exceeds 400M?**

A Future Energy Scenario should be the Basis for Implementation of a National Energy Policy

- **A Quantitative Future Energy Scenario**
  - **Starts with a full map of our systems including elements of;**
    - **Functional Alternatives**
    - **Economics**
    - **Climate Effects**
    - **Environmental Policy**
    - **Political Policy**
    - **Technology Readiness Level**
- **Employ tools that plot a path to the ideal future state**
  - **Includes alternative scenarios and the steps forward to energy assurity. (How to get to the End Game)**
    - **Investments in effective systems with an understanding of the interrelated effects and life expectancies.**
    - **Creates new paths when disruptive technologies are added**

Enact Robust Policy, Guided and Tracked Through the Use of Sophisticated Multi-variant Toolsets

- **Treat National Energy Policy Development as a System of Systems**
  - **Develop an "End Game" vision**
  - **Quantify the current state accurately**
  - **Map new technological elements across multi-variant parameters**
  - **Provide the tools to policy makers to use to understand & choose alternatives**
  - **Understand the "Game Plan" to the "End Game"**
    - **Nationally, Regionally, Locally, & Internationally**

- **Complex Systems Analysis and Integration Tools Provide a Top-Down, Rational, and Technology agnostic guide to policy development and management**

How to Start on the Path to a Long Term Solution

- **Attainment of US National Energy Security is threatened by our chaotic approach. Development of new fuels and energy systems includes competing parameters**
- **A bottom –up approach without top-down policies & planning exists**
- **Invest in a process that provides a scenario planning capability in a toolset that policy makers can easily use to quantify roadmaps, costs and effects of alternatives.**
  - **Competing Issues dominate segments of the agenda**
    - **Political**
    - **Economic**
    - **Climatic**
    - **Environmental**
    - **Functional Feasibility**
    - **Near term vs. Long term & full vs. partial solutions**

The Role of The Federal Government

- **Create order in this incredible array of alternatives.**
- **Interagency development of a set of energy system alternatives that are:**
  - **Financially acceptable**
  - **Functionally workable**
  - **Environmentally friendly**
  - **Politically astute**
  - **Economically stimulating**
  - **Socially acceptable**
- **Form the energy equivalent of NASA. (Isn't this is at least as complex as going to the Moon)**
- **Agencies that must contribute:**
  - **DoE DoD DoT DoA EPA DHS, etc.**

A National Energy Security Initiative?

- **The National Energy Security Initiative could be an interagency team of participants from all contributing departments that models the current system, and alternative scenarios to define the path to energy security.**
  - **Deliver to the Executive and Legislative Branches models that provide full background for development of a National Energy Policy**
  - **Recommends investments in achievable and sensible alternatives that can achieve real advancements as a part of the path to a "New Reality" in the US Energy System**
  - **After policies are enacted, the models are used to measure actual effects, test new technological readiness and quantify progress toward achievement of national energy security and assurity**

DoD Can Lead Enactment of An Energy Policy / Plan

- **Today - A bottom – up approach to Energy Use Reduction**
  - **At least 20 offices have "energy" as a basis of existance**
  - **Each is developing approaches to meet a collection of conflicting directives, none of which are based on an "End Game"**
  - **Many are centered on CONUS base energy reduction**
  - **Some interagency action – a DoE / DoD MOU has been agreed recently**

- **A Path Ahead – Treat energy as a strategic acquisition**
  - **Use the same type of "model" systems where ever applicable**
  - **Model energy balance in all systems as a normal part of acquisition process**
  - **Establish a suitable set of energy requirements and interoperable components for systems deployments and sustainment**
  - **Provide energy planning tools to the war fighting labs**
  - **Treat CONUS bases as a part of the National Energy Security Initiative**