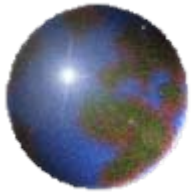


US energy and environmental policies and US / World oil and gas markets

IEEJ-BIPP International seminar

Hotel Grand Pacific le Daiba

June 18, 2010

Yoshikazu Kobayashi

Leader, Oil Group,

The Institute of Energy Economics, Japan (IEEJ)

Driving forces of US E&E policies

- US energy and environment policies are driven by the following four forces:
  - Job creation and economic stimulus
  - Technological innovation and next-generation industry
  - Energy security (reduction of oil imports)
  - Climate change actions (GHG emissions reduction and US leadership)

"…even if you disagree on the threat posed by climate change, investing in clean energy jobs and businesses is still the right thing to do for our economy. Reducing our dependence on foreign oil is still the right thing to do for our security. We can't afford to spin our wheels while the rest of the world speeds ahead."

--- President Obama, 3 February 2010)

Legislation and policy areas

- ARRA is the administration's biggest achievement in E&E area so far.
  - Many of the administration's E&E policies are also based on EISA provisions.
- Legislation process for comprehensive E&E bill seems stalled; but some policy items are being proactively pursued.

- Legislation:
  - American Recovery and Reinvestment Act 2009 (ARRA)
  - (Energy Independence and Security Act 2007(EISA))

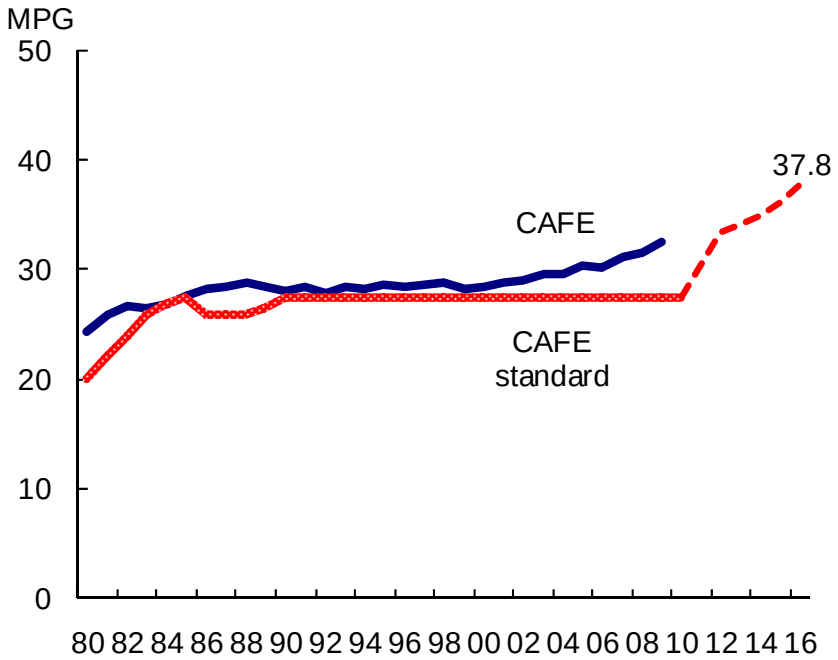
  - American Clean Energy and Security Act (Waxman-Markey)
    - Passed the House in June 2009
  - American Power Act (APA)
    - Submitted to the Senate in May 2010.

- Major oil & gas related policy areas:
  - Fuel efficiency (CAFE)
  - Bio fuels
  - Domestic offshore E&P
  - Energy efficiency improvement and conservation
  - Electrification
  - CCS
  - Natural gas utilization

Fuel efficiency

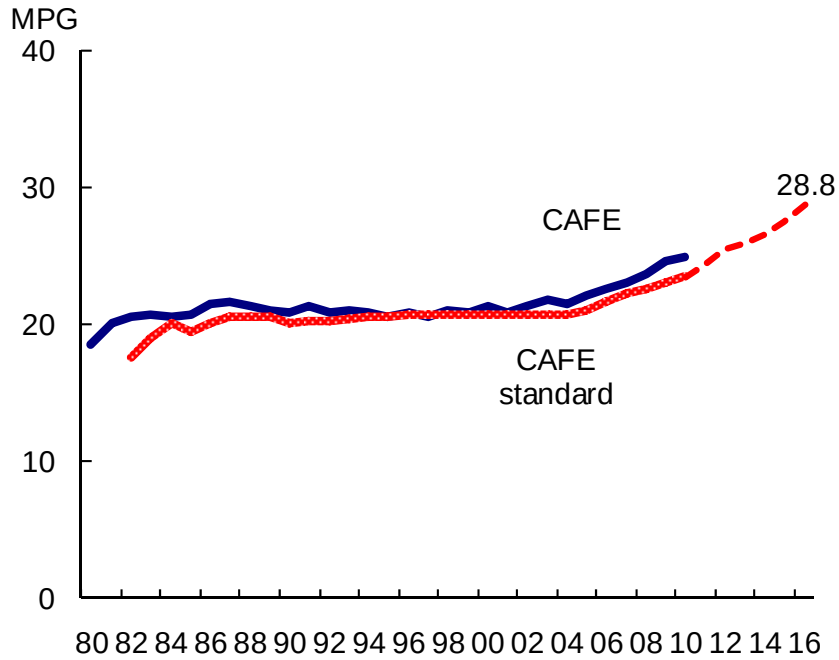
- One of the most important policies for Obama administration since fuel efficiency improvement can achieve many of its E&E policy objectives.
  - The administration accelerated the target year of the existing CAFE standard by four years from 2020 to 2016.
  - President Obama requested EPA and NHTSA to prepare for additional fuel efficiency standards for commercial medium- and heavy-duty vehicles.

CAFE and CAFE standard (cars)



Source: NHTSA

CAFE and CAFE standard (light trucks)



Source: NHTSA

Bio fuels policy

- Obama administration supports the existing bio fuels target set in 2007.
  - EPA published the revised RFS in February 2010 setting annual volume standards and GHG emission threshold based on life-cycle analysis.
- Bottlenecks such as transportation infrastructure, high cost of 2nd generation biofuels, and the 10% blending ceiling need to be addressed.

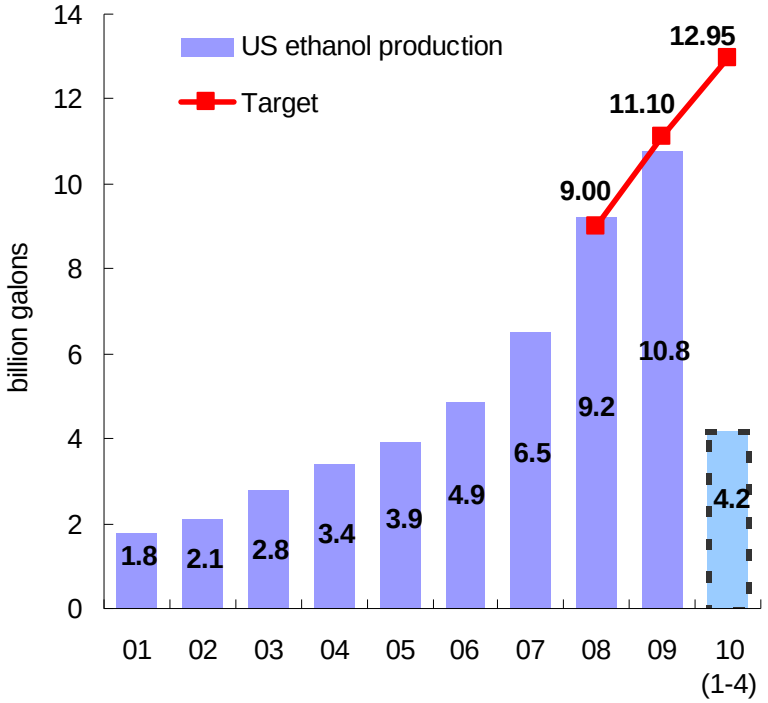
Renewable fuel requirements
(billion gallons)

Year	Cellulosic biofuel requirement	Biomass-based diesel requirement	Total Advanced biofuel requirement	Total renewable fuel requirement
2008	n/a	n/a	n/a	9.0
2009	n/a	0.5	0.6	11.1
2010	0.1	0.65	0.95	12.95
2011	0.25	0.80	1.35	13.95
2012	0.5	1.0	2.0	15.2
2013	1.0	a	2.75	16.55
2014	1.75	a	3.75	18.15
2015	3.0	a	5.5	20.5
2016	4.25	a	7.25	22.25
2017	5.5	a	9.0	24.0
2018	7.0	a	11.0	26.0
2019	8.5	a	13.0	28.0
2020	10.5	a	15.0	30.0
2021	13.5	a	18.0	33.0
2022	16.0	a	21.0	36.0
2023+	b	b	b	b

[a] To be determined by EPA through a future rulemaking, but no less than 1.0 billion gallons.
[b] To be determined by EPA through a future rulemaking.

Source: EPA

US ethanol production

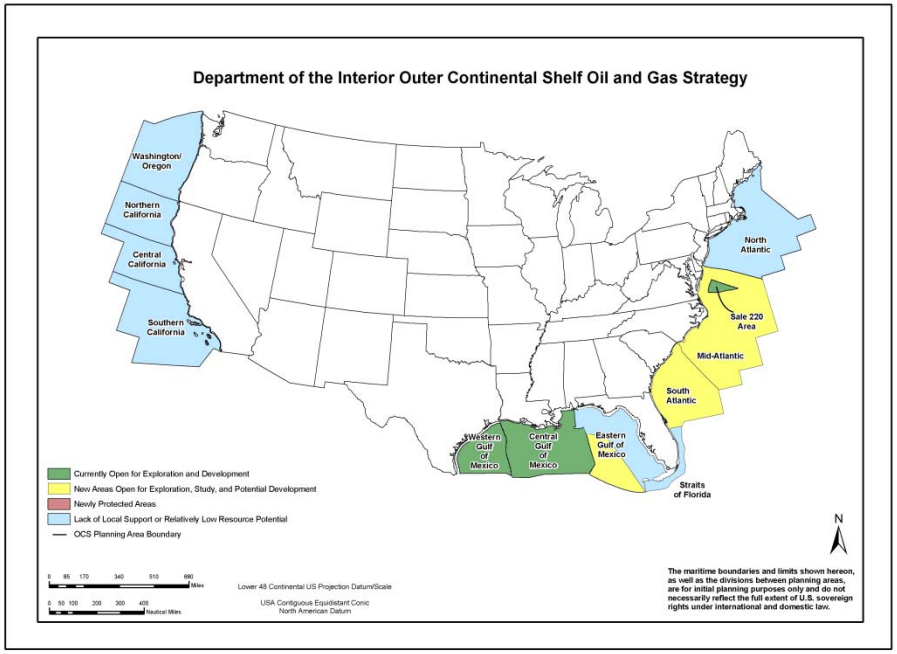


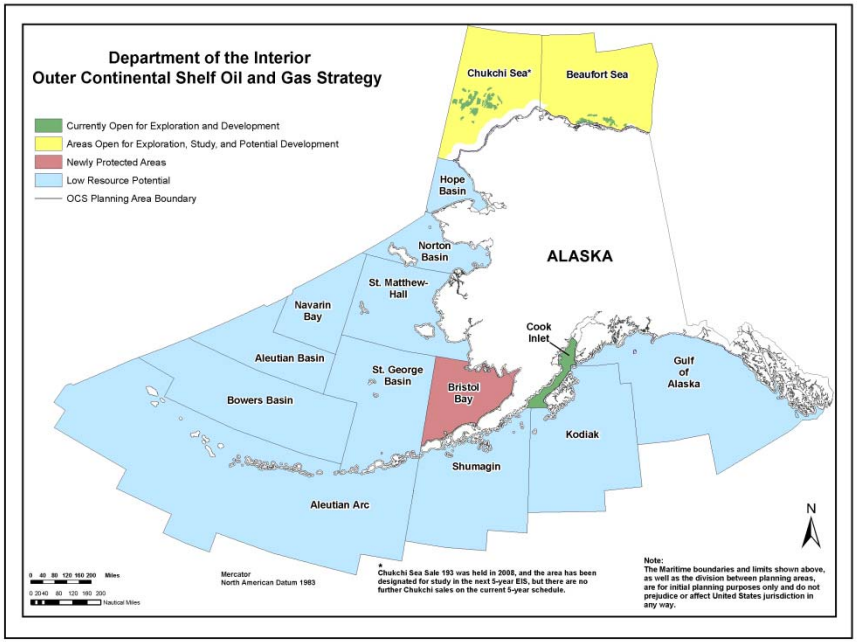
Source: Renewable fuels association

Domestic offshore E&P

- Obama administration announced a new strategy to develop new offshore areas in March 2010.
- The recent oil spill incident in GoM, however, unexpectedly changed the administration's position toward offshore E&P activities.
  - The administration extended moratorium for deepwater drilling for 6 months, including existing wells.

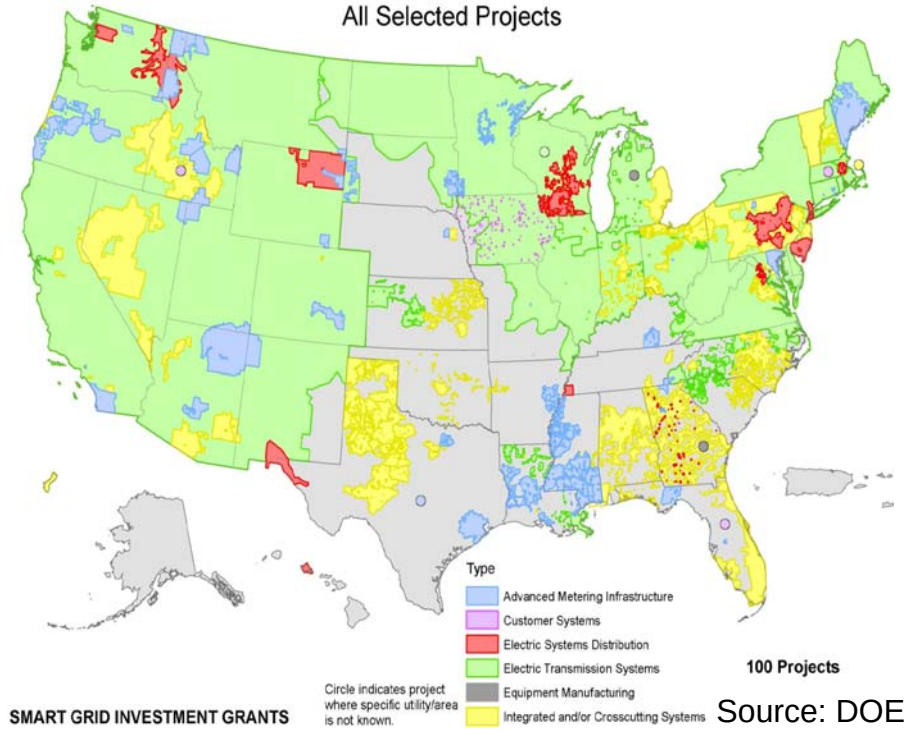
New areas for exploration (yellow colored)



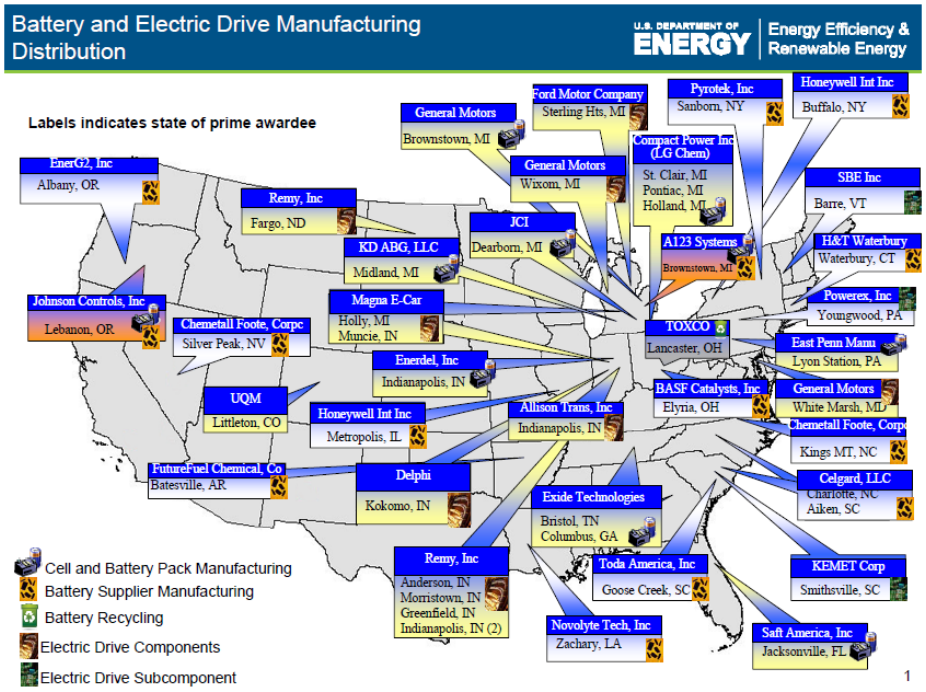


Electrification

- Electrification meets all objectives of the US E&E policies.
  - Development of smart grid and deployment of plug-in HV or EV will reduce the US oil demand.
    - US government provides $3.4B investment to spur transition to smart grid, and $2.4B grants for deployment of next generation batteries and EVs.
  - Electrification may also affect natural gas demand for power sector if it proceeds with an extensive use of renewable energy.



Source: DOE



Source: DOE

CCS

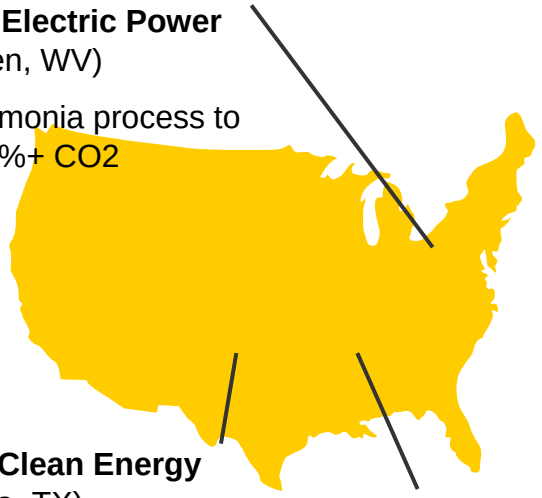
- Commercialization of CCS will make coal to be a more acceptable fuel, and affect the other energy demand for power sector.
  - ARRA allocates $3.4B for fossil energy CCS developments through DOE.

Funds allocated for fossil energy in ARRA

Fossil Energy ($ in Thousands)	Funding Amount
Fossil Energy Research and Development	$1,000,000
Clean Coal Power Initiative – Round 3	$800,000
Industrial Carbon Capture Solicitation	$1,520,000
Geologic Formation Site Characterization	$50,000
Geologic Sequestration Training & Research	$20,000
Program Direction	$10,000
Total, Fossil Energy	$3,400,000

Source: DOE

DOE funding for CCS projects



American Electric Power
(New Haven, WV)

Chilled ammonia process to capture 90%+ CO2

Summit Texas Clean Energy
(Midland-Odessa, TX)

New-build IGCC with CO2 CCS; used for EOR in West Texas

Southern Co. Services
(north of Mobile, AL)

CO2 capture, transportation with PL and store deep saline formation. Exploration of EOR potential

Energy efficiency improvement & conservation

- ARRA provides financial supports for energy efficiency improvement.
  - $5.0B for weatherization assistance and $3.1B for energy efficiency and renewable energy development.
    - Weathering assistance program helps low-income households to save energy bills by energy efficiency improvement investments up to $6,500 per home.
  - ARRA expects that the support will create 87,000 American jobs.

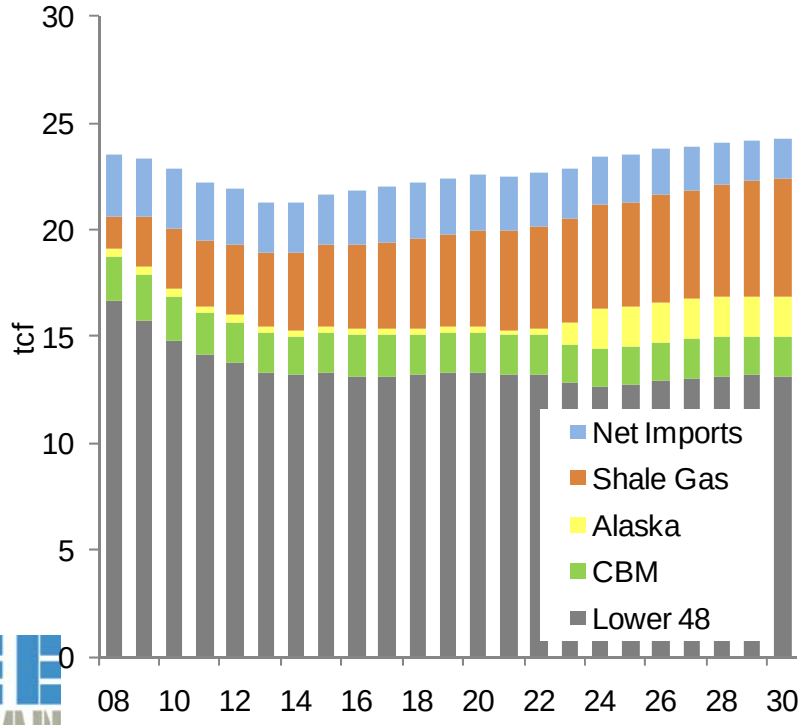
- President Obama tasked DOE with quickening the pace of energy conservation standards for appliances.
  - DOE announced a new regulation for lighting equipment in June 2009.
  - DOE tightened enforcement process of the existing efficiency standards by urging manufacturer to submit certificates of their compliance.

- State Energy Efficiency Action Network was founded in February 2010
  - DOE and EPA jointly support states to promote energy efficiency through residential efficiency program, energy usage information improvement, targeted technical assistance, etc.

Natural gas utilization

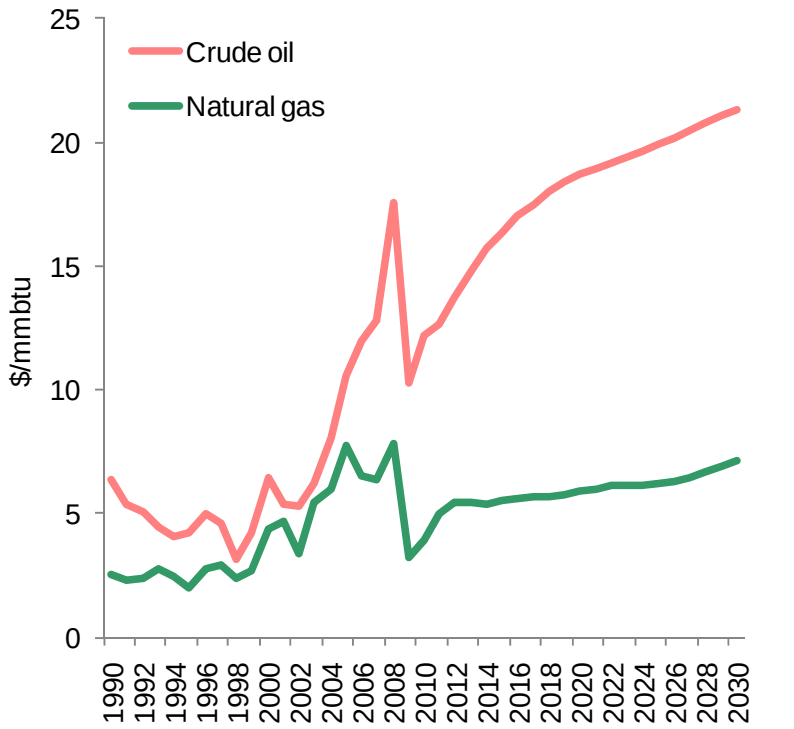
- Obama administration has not made a clear natural gas utilization policy, while “shale gas revolution” is transforming the world natural gas market.
- CNG vehicle may gain more economic attractiveness as the price gap between oil and natural gas widens

US natural gas production outlook



Source: EIA

US oil and gas price forecast by EIA



Source: IEA

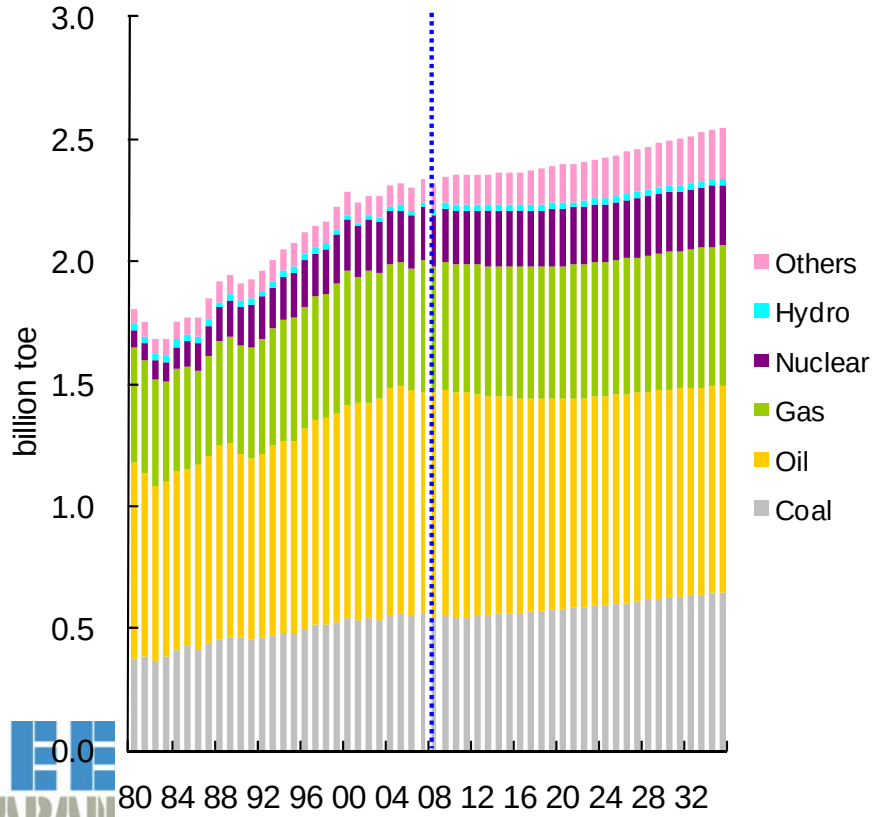
Two scenarios for US energy demand (as of 2035)

	Reference case	Advanced technology case
Nuclear	121 GW	137GW
Power generation efficiency	Coal: 42%; Gas: 48%	Coal: 49%; Gas: 58%
CCS	No commercialization	Adopted mainly in replaced coal-fired generation (500 mil tons captured and stored)
Renewables	Solar: 34GW; Wind: 72GW; Bio fuels: 71 mtoe	Solar: 85GW; Wind: 87GW; Bio fuels: 139 mtoe
Automobiles	Share of clean energy vehicles is 25% (HV: 59.9 million; Diesel HV: 4.97 million; EV: 330 thousand; FCV: 30 thousand; Plug-in HV: 12.6 million) Fuel efficiency 13.8km/L	Share of clean energy vehicles is 55% (HV: 59.9 million; Diesel HV: 4.97 million; EV: 330 thousand; FCV: 30 thousand; Plug-in HV: 12.6 million) Fuel efficiency 20.1km/L
Residential/ Commercial sector		Energy saving of 80 mtoe through air conditioning and electric appliances
Industrial sector		Same efficiency as Japan in steel, cement, paper, and petroleum refining sectors.

Primary energy demand in US

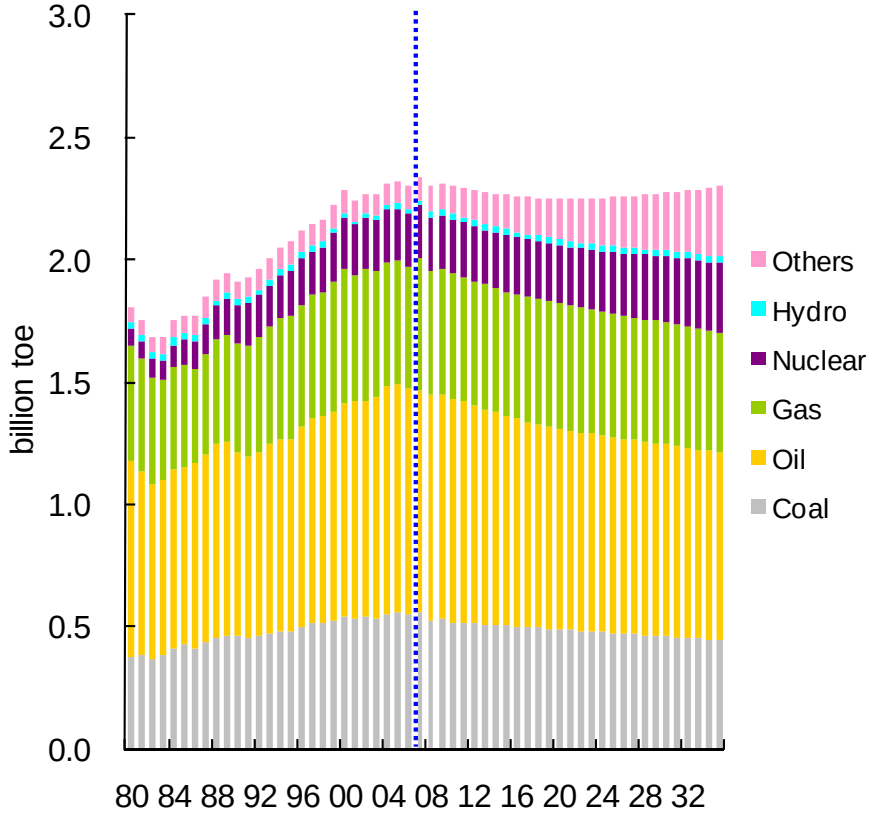
- Primary energy demand in US will flatten the Advanced tech case.
  - Coal consumption as of 2035 is reduced by more than 30% in the Advanced tech case compared to Reference case.

Reference case



Source: IEEJ

Advanced technology case



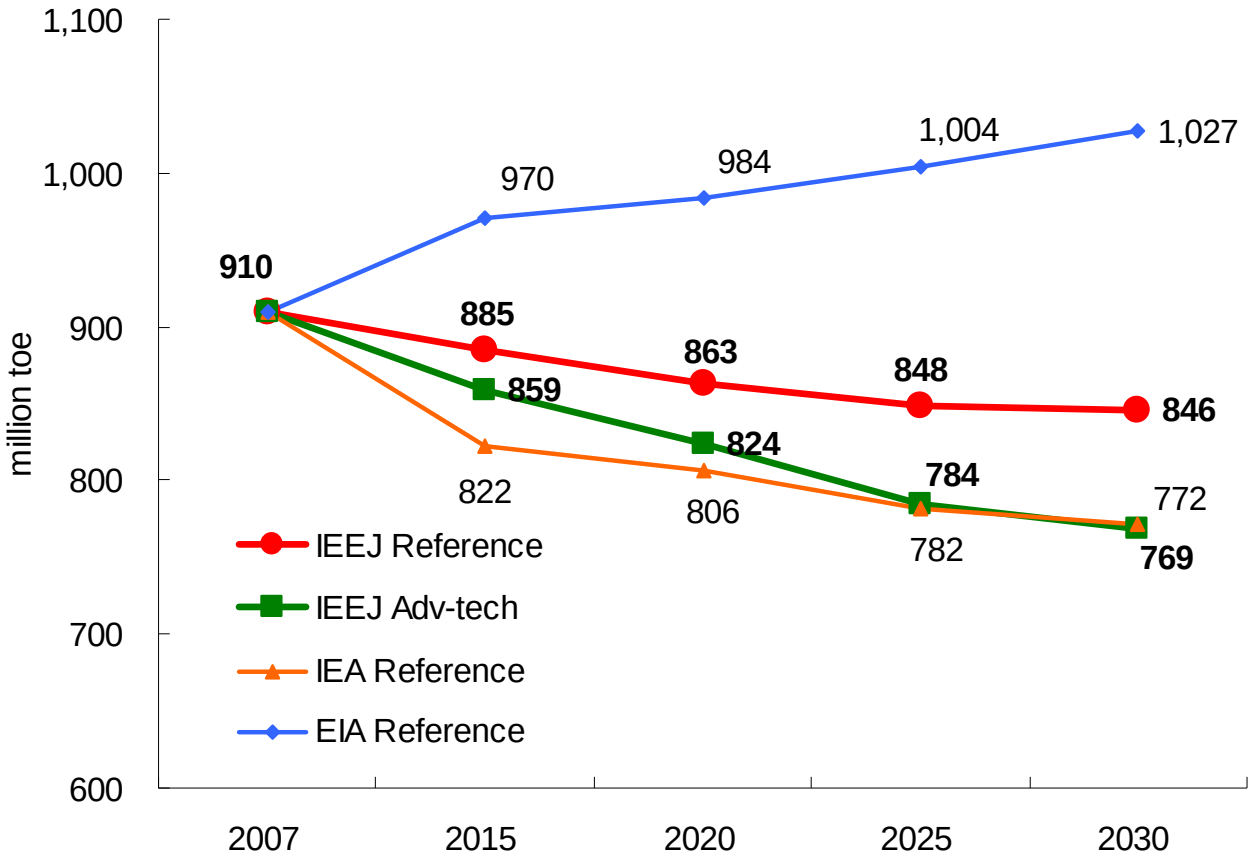
Source: IEEJ

US oil demand outlook

- US oil demand is expected to decrease in both IEEJ outlook cases because of fuel economy, bio fuel penetration, and efficiency improvement.

US oil demand outlook

Source: IEEJ

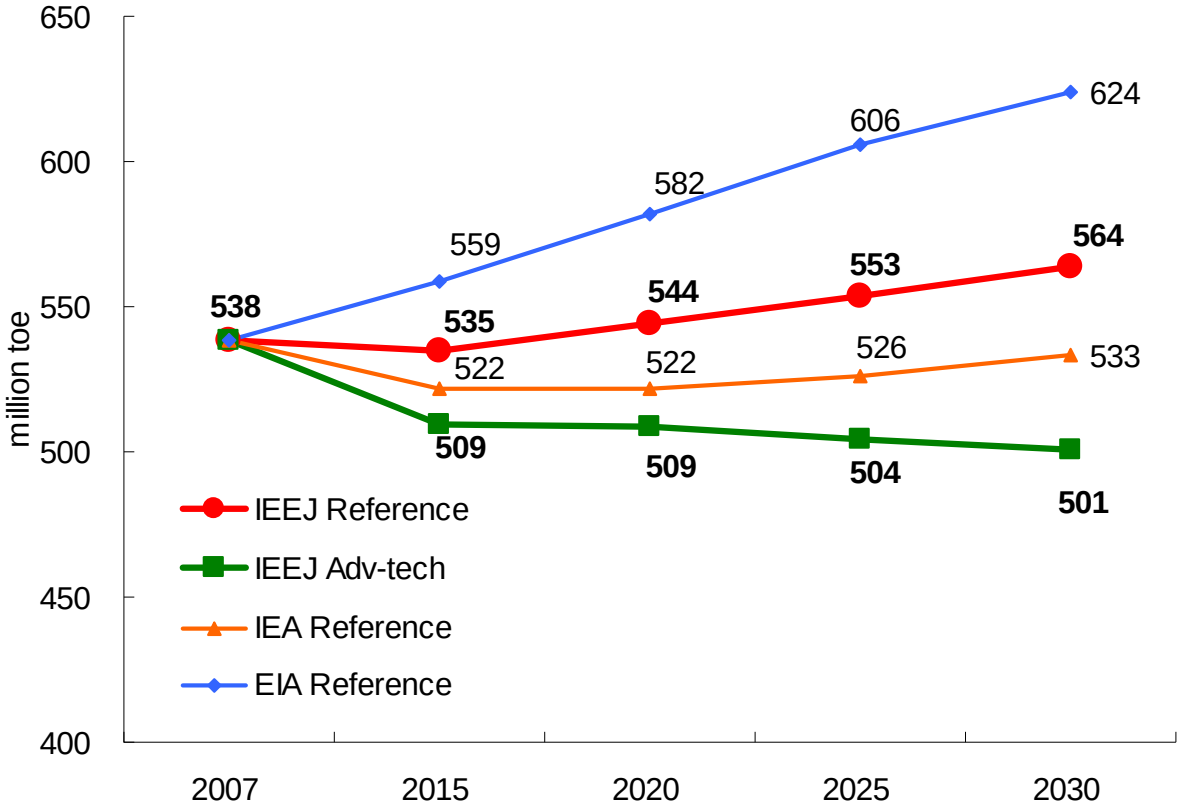


US natural gas demand outlook

- Natural gas demand may or may not increase subject to energy efficiency improvement.
  - Natural gas demand in Advanced technology case will not grow much as renewable, nuclear, and coal with CCS will increase.

US natural gas demand outlook

Source: IEEJ



Impacts on the world oil market

- Market fundamentals
  - US oil demand peak will partially offset the demand growth in the developing countries.
    - The difference between EIA and IEEJ Adv-tech case is 5.2 million b/d as of 2030.
  - Both physical and psychological effects will put downward pressures on the world oil market.

- Technological innovations
  - Potential impacts of electrification process (innovations in battery, smart grid, EV technologies), though it will happen in the long-term, should not be underestimated .
  - Technological breakthrough in first and second generation biofuels.

- International relations
  - Relative presence of Asian countries in the world oil market will inevitably rise.
  - Implications of the tightening relationship betweens China and Middle East and other oil producers.

Impacts on the world natural gas market

- Market fundamentals
  - US market is expected to move toward “self-sufficiency,” reducing its significance in the world LNG market.
    - Yet its import demand may unexpectedly grow in the long-term if renewables, nuclear, and coal with CCS fail to meet their expected supply.

- Technological innovations
  - Oil – gas price difference may trigger technological innovation in natural gas use in transportation and other sectors.

- International relations
  - Loosened market condition may make Russia reconsider its natural gas development and export policy.
    - Oil –linked natural gas pricing in Europe is now being revisited.
  - Potential cooperation among gas producers at GECF.

Summary

- ARRA is so far the most significant achievement by the Obama administration and its effects will be realized more deeply in the long term rather than in the short term.

- US oil demand is likely to have peaked, and its decline can be accelerated by the current administration's policies.

- US natural gas demand may or may not increase subject to its future demand for power sector, policy factors, and energy efficiency improvement.

- US E&E legislation and policies will continue to be influenced by various factors; but its driving forces will remain resilient.

Implications for Japan

- Continue to have a close eye on the current dynamics of US E&E policy and business developments to take advantage of them in developing our own energy security and green growth strategies.
  - First and second generation bio fuels
  - Downstream restructuring
  - Unconventional natural gas developments
  - Changing power balance between oil/gas producers and consumers
  - Cooperation with Asian countries
  - Comprehensive electrification business model

Supplemental slides

Energy Independence and Security Act (EISA)

- The Energy Independence and Security Act of 2007 was signed into law on December 19, 2007 under the previous Bush administration.

Major provisions that may have impacts on oil & gas markets:

- RFS requirements for the use of 36 billion gallons of ethanol per year by 2022.
- A new CAFE standard for LDVs (cars and light trucks) of 35 mpg by 2020.
- Appliance energy efficiency standards for boilers, dehumidifiers, dishwashers, clothes washers, external power supplies, and commercial walk-in coolers and freezers.
- Lighting energy efficiency standards for general service incandescent lighting in 2012 and sooner for general-service tubular fluorescent lighting and metal halide lamp fixtures.
- Standards for industrial electric motor efficiency, requiring industrial motors of various sizes to meet the NEMA premium motor efficiency standards.
- Standards for energy use in Federal buildings, requiring a 30-percent reduction by 2015.

Source: EIA web-site

American Recovery and Reinvestment Act (ARRA)

- The biggest achievement of Obama administration's E&E policies so far.
  - Financial support for next-generation battery and tax credit for plug-in hybrid purchase will cause direct impacts on oil demand.
  - Other items, such as support for smart grid, will impact natural gas demand through electrification process.

Major energy-related items in ARRA

Item	$ billion
Grid modernization, smart grid	11.0
State and local renewable energy and energy efficiency efforts	6.3
Loan guarantee for innovative technology (renewables, electric transmission)	6.0
Low-income home weatherization projects	5.0
Green federal buildings	4.5
Fossil energy research (CCT, CCS, etc)	3.4
Competitive grants to develop the next generation of batteries	2.0
Renewable energy manufacturers' tax credit	2.3
Plug-in vehicle tax credit	2.0

Source: Whitehouse; DOE; Recovery.gov

American Clean Energy and Security Act

- A.k.a. “Waxman-Markey”
- The bill was approved in the House of Representative in June 2009.
  - Major oil and gas related provisions are as shown below.
  - The bill aims to proactively reduce oil consumptions and relatively indifference to natural gas and nuclear power generation.

Major provisions that may have impacts on oil & gas markets:

- GHG emissions to reduced by 17% by 2020 and by 83% by 2050 compared to 2005.
- Cap & trade system to be introduced from 2012.
- Renewable electricity standard (20% of total electricity demand as of 2021).
- Subsidies for new and clean energy technologies ($60 billion for CCS; $90 billion for renewable energy; $20 billion for advanced vehicles; etc)
- Energy efficiency improvement (standards for building, lighting, and electric appliances; CAFÉ for heavy-duty vehicles, etc)
- Carbon tariff adjustment system
- Financial supports for modernization of electric grid

American Power Act (APA)

- The bill was submitted to the Senate in May 2010.
  - "Tri-partisan" bill prepared by Sen. John Kerry (D), Sen. Lindsay Graham (R), and Sen. Joseph Lieberman (I); but Sen Graham left before the submission.
  - More supports from industries than Waxman-Markey; but whether it will actually be debated in the Senate is uncertain.

Major provisions that may have impacts on oil & gas markets:

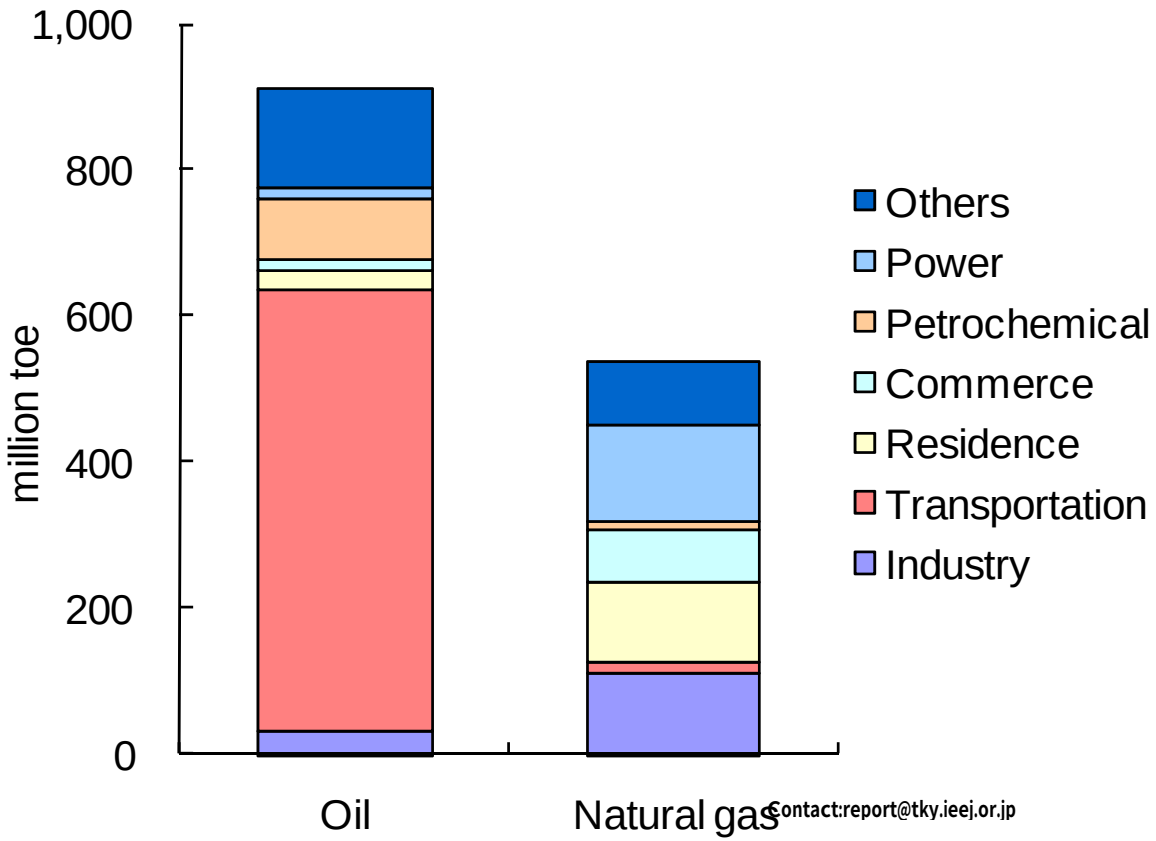
- Encouragement of nuclear power generation through tax credit, loan guarantees, etc.
- Revenues allocation to state government in offshore oil & gas activities
- Promotion of CCS R&D through funding from other fossil fuel power generations
- Renewable energy deployments through government's loan
- Clean transportation system by developing electric drive refueling infrastructures, standardization of electricity providers, vehicle manufacturers, etc.
- Reduction of global warming pollution by 17% by 2020, 42% by 2030, and 83% by 2050.
- Promotion of NGV through government funding and R&D supports

US oil and natural gas demand by sector

- Oil is dominantly used in transportation sector.
- Natural gas does not have a specific sector in which it has a dominant posision.

ES oil and natural gas demand by sector

Source: IEA



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