DOE Quadrennial Technology Review

Vehicle Efficiency and Electrification Workshop

Knoxville, TN

4 May 2011

Welcome and Logistics

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FACA Guidelines

- Participants attending this Workshop are not members of a Federal Advisory Committee, nor do we intend to use this group as a Federal Advisory Committee.
- We are not seeking a group decision or consensus view with respect to the issues before you, or as to any action the Federal government should take.
- We welcome your individual recommendations and advice, and are looking forward to a productive workshop.

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Transparency and Outreach

PCAST Recommendation: *"The [process] needs strong external input from many sources, including other levels of government, large and small businesses, academia, national laboratories, Congress, nongovernmental organizations, consumers, and other Federal agencies. …"*

We are committed to engaging our stakeholders consistent with the President's commitment to transparency, public participation, and collaboration. To meet these goals, the DOE will pursue a variety of mechanisms, including:

- A publicly accessible web site
- Release of ex parte communications
- Request For Information (RFI) and Framing Document (published mid-March)
- Public comment
- Focus groups & workshops through mid June

Notes and attendee list from this workshop will be published on the project webpage. Individuals' names will be redacted from comments.

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Outreach: Workshops

TRANSPORT

- Alternative Fuels
  - April 26
  - Chicago, IL
- Vehicles Efficiency and Electrification
  - May 4
  - Knoxville, TN

STATIONARY

- Stationary Efficiency
  - May 17
  - Pittsburgh, PA
- Grid
  - May 24
  - Tempe, AZ
- Clean Electricity
  - June 7
  - Denver, CO

Capstone

June 21 in Washington, DC

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Agenda and Logistics

8:30-9:00 AM	**Welcome and framing remarks, Salon B & C**
	Dr. Steven E. Koonin, Under Secretary for Science
9:00-9:30 AM	**Panel discussion of cross-cutting questions**
	Wayne Eckerle, Cummins
	Alan Taub, General Motors
	John German, International Council on Clean Transportation
	Thomas Turrentine, UC Davis
9:30-10:00 AM	**Full-workshop open discussion with the panel on cross-cutting questions**
10:00-10:15 AM	**Break**
10:15-11:30 AM	**Breakout sessions on the cross-cutting questions, Summit 1**
11:30-1:00 PM	**Lunch (non-working)**
1:00-2:00 PM	**Technology roadmaps presentations from QTR Technology Team, Salon B & C**
	Ed Owens, Pat Davis, and Gurpreet Singh
2:00-3:00 PM	**Technology-specific breakout sessions, Summit 1**
3:00-3:15 PM	**Break**
3:15-3:45 PM	**Report-back session I from technology breakout followed by brief discussion**
3:45- 4:00 PM	**Report-back session II from the morning's cross-cutting breakout sessions**
4:00-4:45 PM	**Full group discussion on cross-cutting questions**
4:45-5:00 PM	**Closing Remarks**
	Dr. Steven E. Koonin, Under Secretary for Science

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DOE Quadrennial Technology Review

Steven E. Koonin

Under Secretary for Science

U.S. Department of Energy

4 May 2011

Scope

- The DOE-QTR will provide a context and robust framework for the Department's energy programs, as well as principles by which to establish multiyear programs plans and budgets. It will also offer high-level views of the technical status and potential of various energy technologies.

- The primary focus of the DOE-QTR process and document will be on the following:
  - Framing the energy challenges
  - A discussion of the roles of government, industry, national laboratories, and universities in energy system transformation
  - Summary roadmaps for advancing key energy technologies, systems, and sectors
  - Principles by which the Department can judge the priority of various technology efforts
  - A discussion of support for demonstration projects
  - The connections of energy technology innovation to energy policy

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Timeline

Nov 2010

PCAST made recommendations for DOE to do QER

3/14 – 4/15

Public comment period for DOE-QTR Framing Document

4/20

First batch of public comments released on project website

Through mid-June

Hold workshops and discussions of each of the Six Strategies

End July/Aug

Submit DOE-QTR to White House for approval

Before Dec 2011

Release DOE-QTR

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DOE-QTR Logic Flow

Energy context
- Supply/demand
- Energy essentials

Energy challenges
- Oil security
- US Competitiveness
- Environmental Impact

Six strategies

Players and Roles
- Private/Gov't
- Within gov't
- Econ/Policy/Tech
- Acad/Lab/Private

Technology Assessments
- History
- Status
- Potential

Technology Roadmaps
- Milestones
- Cost
- Schedule
- Performers

DOE portfolio principles

DOE priorities and portfolio
Balanced within and across strategies

Program plans and budgets

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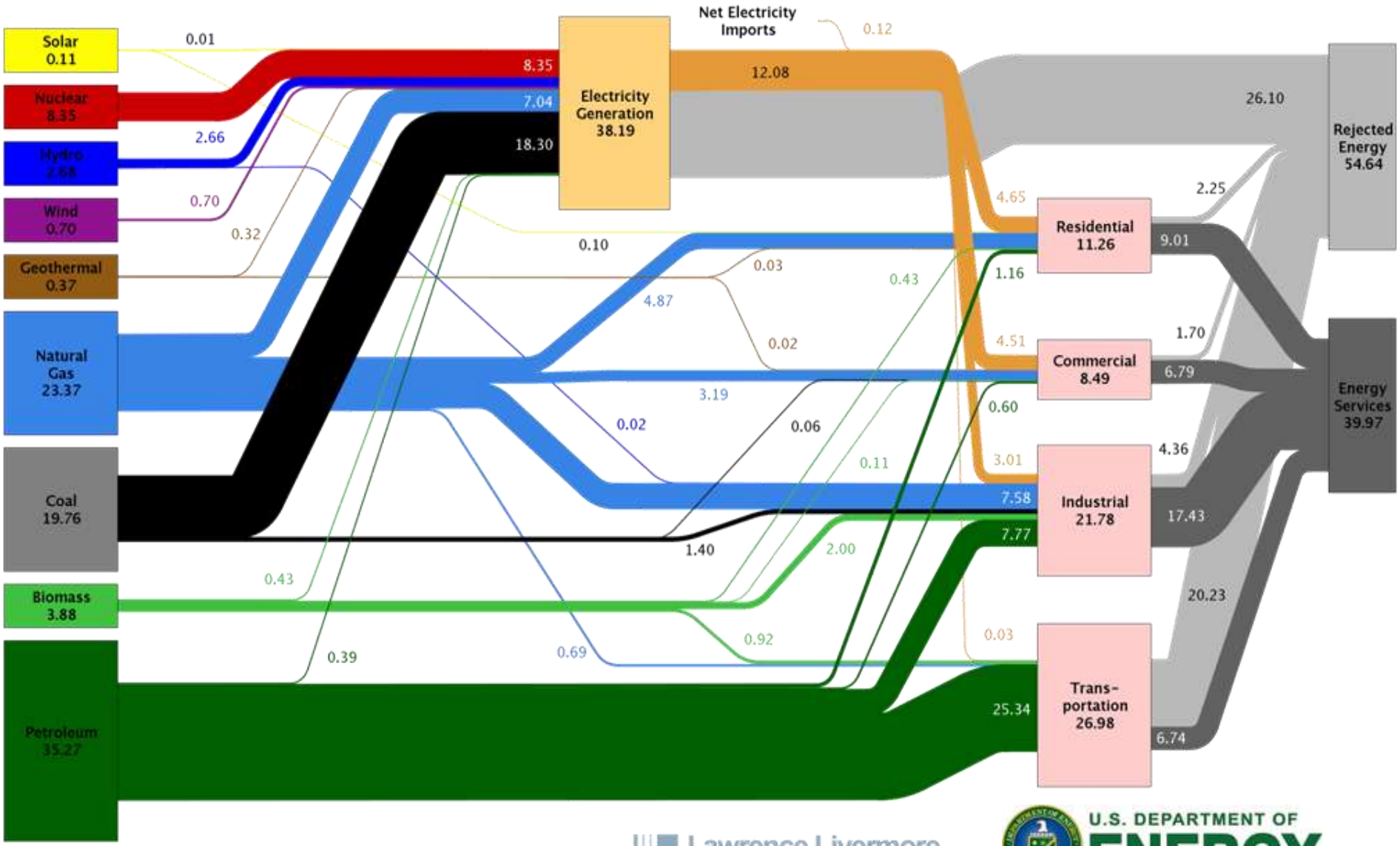
Estimated U.S. Energy Use in 2009: ~94.6 Quads



https://flowcharts.llnl.gov/

Lawrence Livermore National Laboratory

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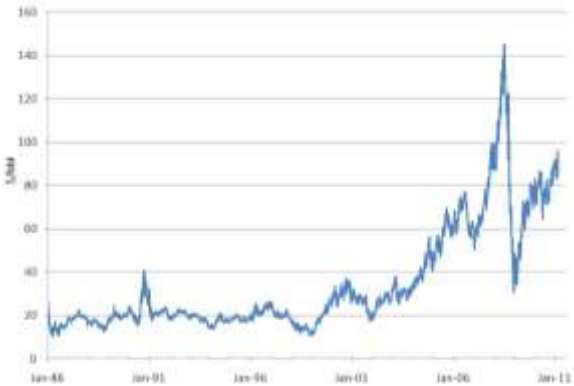
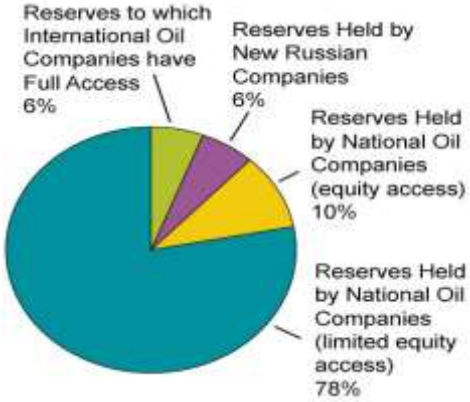
U.S. Energy Challenges

Energy Security

Daily Spot Price OK WTI

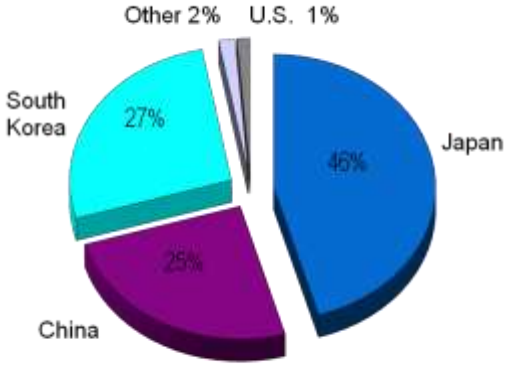


Share of Reserves Held by NOC/IOC

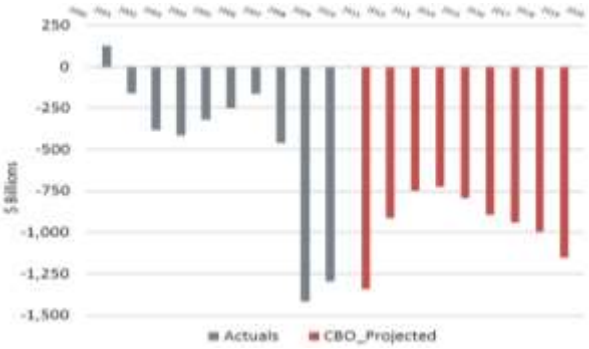


Competitiveness

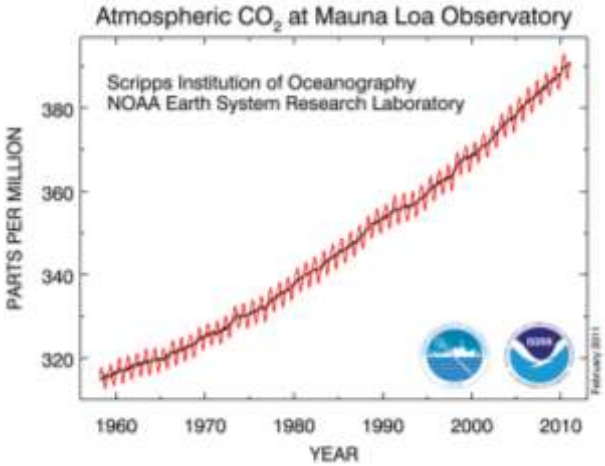
Global Lithium-ion Battery Manufacturing (2009)

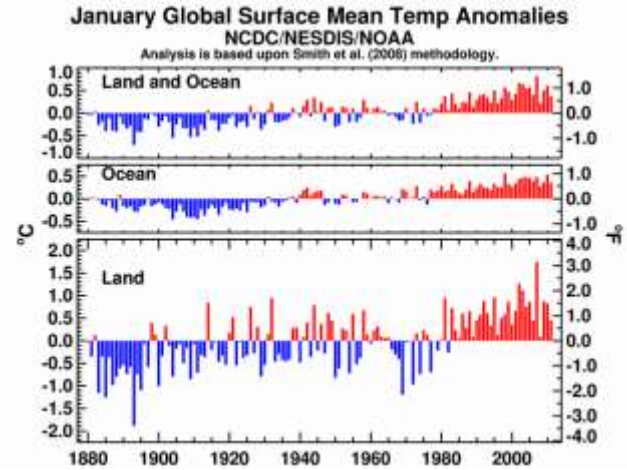


Federal Deficit



Environment





Administration Goals

Transport

- Reduce oil imports by 1/3 by 2025
- Put 1 million electric vehicles on the road by 2015

Stationary

- By 2035, generate 80% of electricity from a diverse set of clean energy sources
- Make non-residential buildings 20% more energy efficient by 2020

Environmental

- Cut greenhouse gas emissions in the range of 17% below 2005 levels by 2020, and 83% by 2050

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Six Strategies

	Supply		Demand
Stationary	Deploy Clean Electricity	Modernize the Grid	Increase Building and Industrial Efficiency
Transport	Deploy Alternative Fuels	Progressively Electrify the Fleet	Increase Vehicle Efficiency

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DOE-QTR Logic Flow

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Six strategies

DOE portfolio principles

DOE priorities and portfolio
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Program plans and budgets

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A QTR Technology Discussion Includes

- Why this technology is included
- Headroom
  Resource
- Current industry
  Actors and their roles
- Roadmap
- DOE history and accomplishments
- Policy context
  Barriers
- Tech-specific items needed for prioritization
- More?

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We will require input on:

- Roles of government, industry, national laboratories, and universities in energy system transformation
- Principles by which the Department can evaluate and prioritize various technology efforts
- Connections of energy technology innovation to energy policy

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A Few Comment Excerpts Specific to Vehicles

Organization	Comments Specific to Vehicle Efficiency and Electrification in QTR Framing Document (direct quotes)
Fuel Cell and Hydrogen Energy Association	We believe any rational analysis of the facts, the data, the market experience, and their actual and potential benefits leads to the conclusion that fuel cells and hydrogen energy have a crucial role to play in America's energy security.
Ken Reifsnider (Univ of South Carolina/ EFRC for Heterogeneous Functional Materials)	…just progressively electrifying the fleet does not necessary result in vehicle efficiency. We should look at the entire fuel supply chain, and determine the most efficient and economic approach to deliver fuel (not necessary electricity only) that will provide the highest vehicle efficiency. When there is a need for high energy density, (e.g. HLV, long distance vehicles), batteries inherently do not scale well. Chemical storage using reversible electrochemical cells (fuel cells) naturally scale well with energy density since all volume/weight increase is due to the fuel, versus fuel plus energy conversion component in batteries.
Electric Drive Transportation Association	DOE's transportation strategies for achieving these goals include progressive electrification of the vehicle fleet, which is an essential technology and deployment path for achieving our national energy policy goals. We encourage DOE to continue its portfolio of electric drive research, development, demonstration, and deployment programs.
Holy Chappell (Umicore USA Inc.)	The demands for energy and materials are closely interlinked as it takes energy to produce the materials that can enable the clean energy future. Recycling of metals requires much less energy than their primary production, hence recycling is a core technology in achieving a clean energy society. To support the implementation of the above we suggest assigning a dedicated person who can take the lead on recycling and materials efficiency, and is responsible for embedding this underpinning and cross-cutting theme throughout the six strategies.
Amy McKnight Fazen (XL Hybrids, startup)	By also targeting technology/applications for vehicles already on the road, DOE can increase fuel economy even more in the near and mid-term than sole reliance on new technology sales.
Near Zero	"Electrification of the vehicle fleet means both light-weighting vehicles and better batteries and energy systems."; would "not spend a cent on…electrification of the vehicle fleet, since it will happen by itself as soon as electric grids are smarter, distributed and with good storage capabilities, and vehicles more efficient."

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Comments can be found at: http://energy.gov/qtr/10091.htm

Cross Cutting Questions

- There are lots pathways to reduce oil use – should DOE make fewer bigger bets or support all bets with fewer dollars? What should be the rules for entry, allocation and exit in DOE's vehicles portfolio? As a technology becomes more mature, how should DOE's posture change?
- What value does DOE provide to you? Where have you seen the benefit of DOE involvement in your work?
- What do you think will happen in this field if oil prices drop, or skyrocket? How would you alter your priorities? How should DOE's portfolio differ if oil prices change? How should DOE account for price in seeking to balance its portfolio?
- How should DOE balance effort across the boxes in the Six Strategies, particularly between alternative fuels, vehicle electrification, and efficiency of conventional vehicles?
- How should DOE balance the challenges of oil security, environmental impacts, and US competitiveness?
- Should the US focus on international competition or cooperation in vehicle R&D?

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Panel Discussion

- Wayne Eckerle, Cummins
- Alan Taub, General Motors
- John German, International Council on Clean Transportation
- Thomas Turrentine, UC Davis

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Breakout: Cross-cutting questions (Summit 1)

- 1: A-B
- 2: C-D
- 3: E-Joel
- 4: John-Mark
- 5: Martin-R
- 6: S-Z

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Breakout: Technology-specific (Summit 1)

- 1: Lightweighting & Aerodynamics
- 2: ICE Efficiency
- 3: Batteries/Electricity Storage
- 4: EV/Hybrid Powertrain
- 5: EV Infrastructure
- 6: Fuel Cells and Infrastructure

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THANK YOU!

Project Website

http://www.energy.gov/qtr

Questions/Feedback

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Official (Public) Comments

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