

Analysis at Oak Ridge National Laboratory: Highlights of PBFA and Related Projects

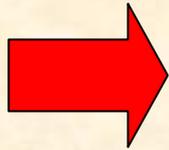
Russell Lee

leerm@ornl.gov

**Briefing at PBFA-LabTeam meeting,
September 26, 2003**

ORNL's Analysis Activities are Diverse

- **Market analysis**
 - Barbara Ashdown, Melissa Lapsa, David Bjornstad, Barry Shumpert, Frank Southworth – Cross-cutting
 - David Greene, Paul Leiby, - Transportation
 - Jerry Hadder (with Dave Andress, Steve Zukor) - Biomass
- **Policy and planning analysis** – David Greene, Jerry Hadder
- **Benefits analysis** – Russell Lee
- **Evaluation** – Marty Schweitzer, Linda Berry, Bruce Tonn, Michaela Martin, Marilyn Brown
- **Data development** – Stacy Davis, Jerry Hadder et al.



Market Analysis

Policy and Planning Analysis

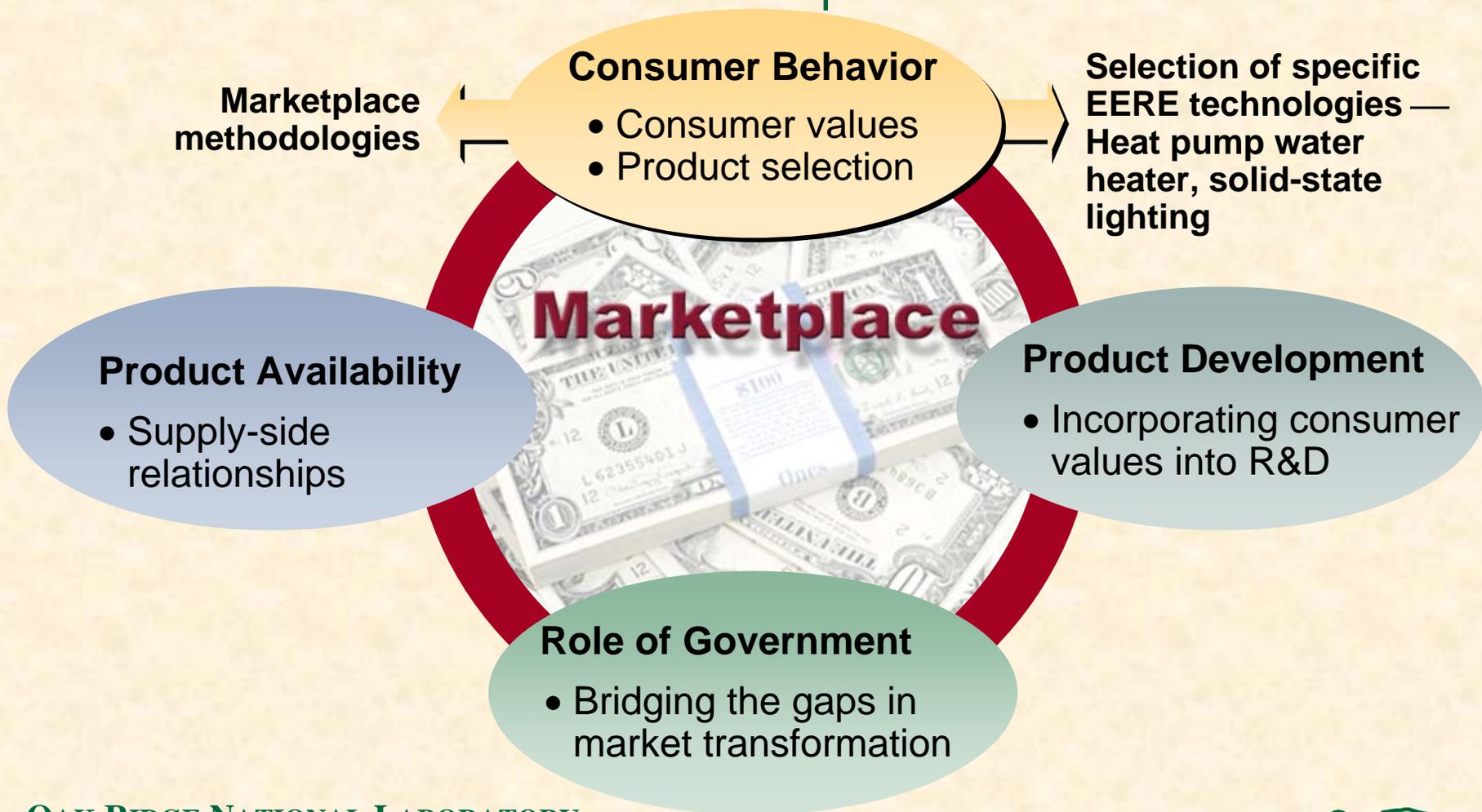
Benefits Analysis

Evaluation

Data Development

Other Areas of Analysis

To increase the effectiveness of market transformation activities, need to understand the marketplace



Results in FY03:

EERE Market Transformation Research Team

Team Members

Reports

Calendar

Discussion Forum

Links

EERE Home

EERE Home: [EERE Reports](#)

- Bjornstad, D.J., "Economic Incentives in the Purchase and Use of Energy-Using Products: Past Practices and New Developments." [JIEE 2003-01](#), January 2003.
- Ashdown, B.G., Bjornstad, D.J., Lapsa, M.V., and McKeown, R., "Assessing Marketplace Methodologies for Understanding Consumer Values Influencing Product Selection in Building and Other EERE Technologies." [ORNL/TM-2002/292](#), November 2002.
- Consumer Values Analytical Research - Brown Bag Presentations & Coordination Meeting, January 15, 10:00 a.m., DOE HQ, Room GH-027
[Presentation by David Bjornstad](#)
[Presentation by Barbara Ashdown](#)
- Farhar, B.C., "Willingness to Pay for Electricity from Renewable Resources: A Review of Utility Market Research," [NREL/TP.550.26148](#), July 1999.

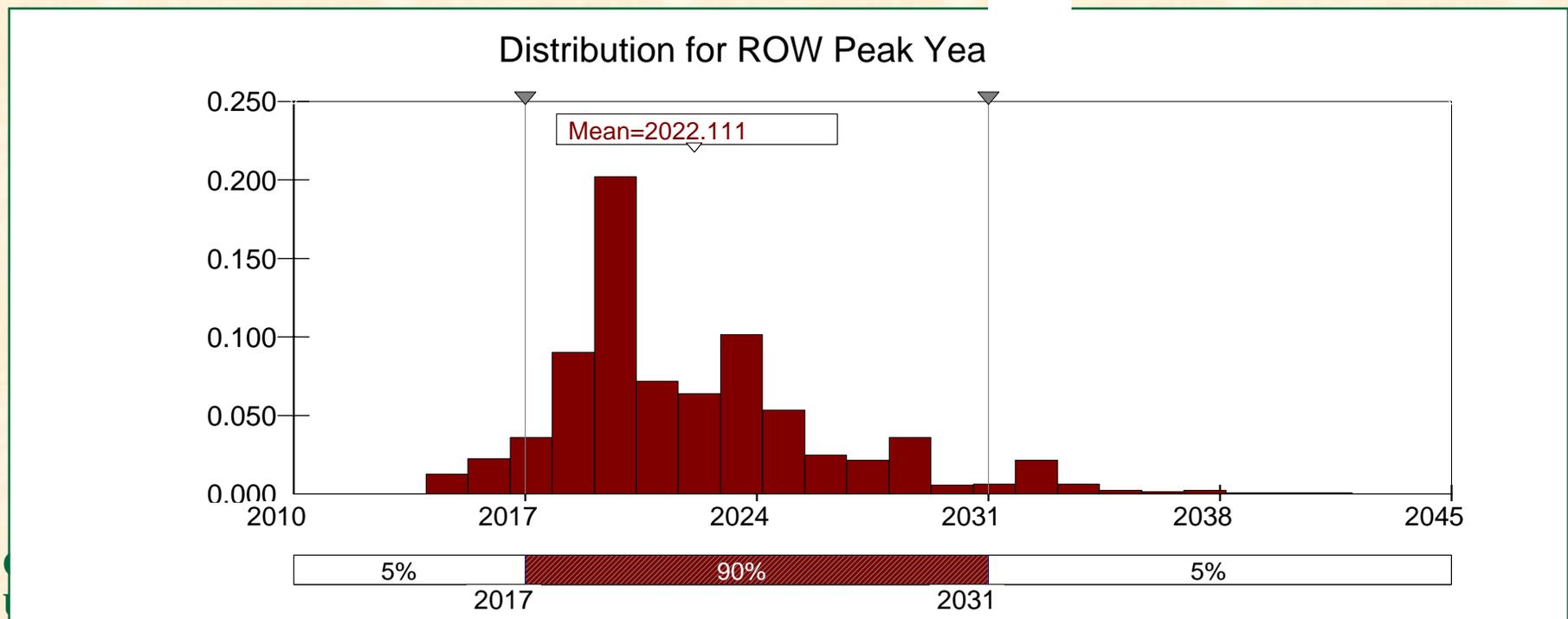
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Last Modified: Tuesday, 18-Feb-2003 15:57:42 EST

- **Publications addressing:**
 - Methodologies to assess consumer values that influence product selection: pros and cons of approaches
 - Economic theory applied to purchase of energy efficient technologies: asymmetric information, investment uncertainty, behavioral economics
- **In progress:**
 - Market adoption studies for heat pump water heater and solid state lighting technologies
 - Supply chain analyses for specific EERE technologies
 - Assessment of the role of government in market adoption of energy efficient technologies

http://www.ornl.gov/mkt_trans

Estimate the Peaking of Conventional Oil Production and Transition to Unconventional Oil

- **Based on USGS 2000 world oil resource assessment, unconventional-oil resource estimates for 11 regions, and the IIASA/WEC scenarios of world energy supply and demand to 2050.**
- **Peaking of non-OPEC oil production prior to 2025 appears likely.**
- **Even with a transition to oil sands, heavy oil and shale oil starting in 2010-2020, OPEC could maintain market dominance through 2050.**



Analysis of Biomass Markets Draws on Decades-Long Research Program on Availability of Biomass Feedstock and Refinery Modeling



<http://bioenergy.ornl.gov/bfdpmain.html>

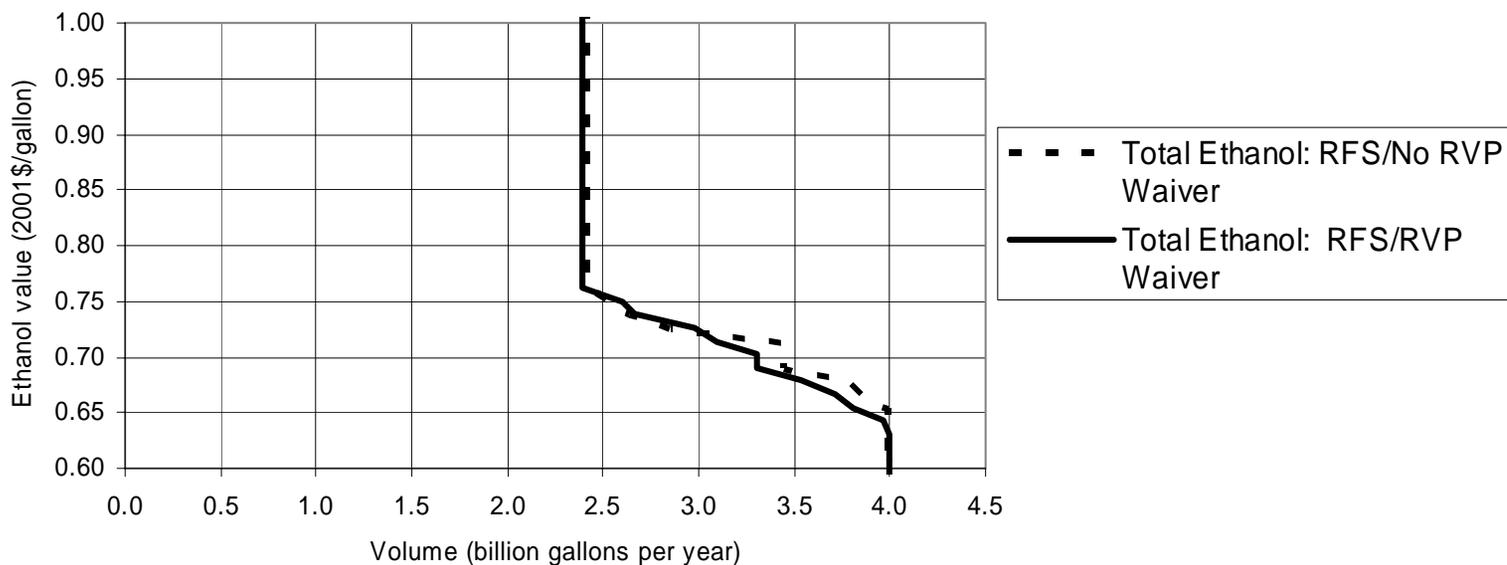
- **Update supply and demand curves for biomass-based fuels and products (e.g., for input to Ethanol System Analysis Spreadsheet)**
- **Update and exercise existing biomass market models – input to benchmark NEMS and MARKAL biomass representations**



ORNL Refinery Yield Model Application:

While loss of vapor pressure waiver for E-10 would increase production costs, it might not significantly decrease ethanol demand at low ethanol prices

Fig. 6. Ethanol demand in PADD II gasoline production
Year 2012 summer - Impact of RVP Waiver

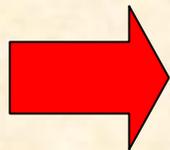


With funding from PBFA and HFC&IT, ORNL and ANL are utilizing their previously developed models and data to develop models to analyze key questions about the ...

Transition to a Hydrogen Economy

- In what scenarios (under what conditions) will the hydrogen economy succeed?
- How might individual technologies affect the transition to and functioning of the system?
- How could alternative energy sources affect the transition to and functioning of the system?
- What are the implications for water consumption in the production and use of hydrogen?
- How will the temporal and geographic evolution of the system affect costs and benefits?
- What is the role for policy in the transition and maintenance of the hydrogen economy?
- What are the costs and benefits (including the global macroeconomic effects) of a hydrogen economy?





Market Analysis

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Benefits Analysis

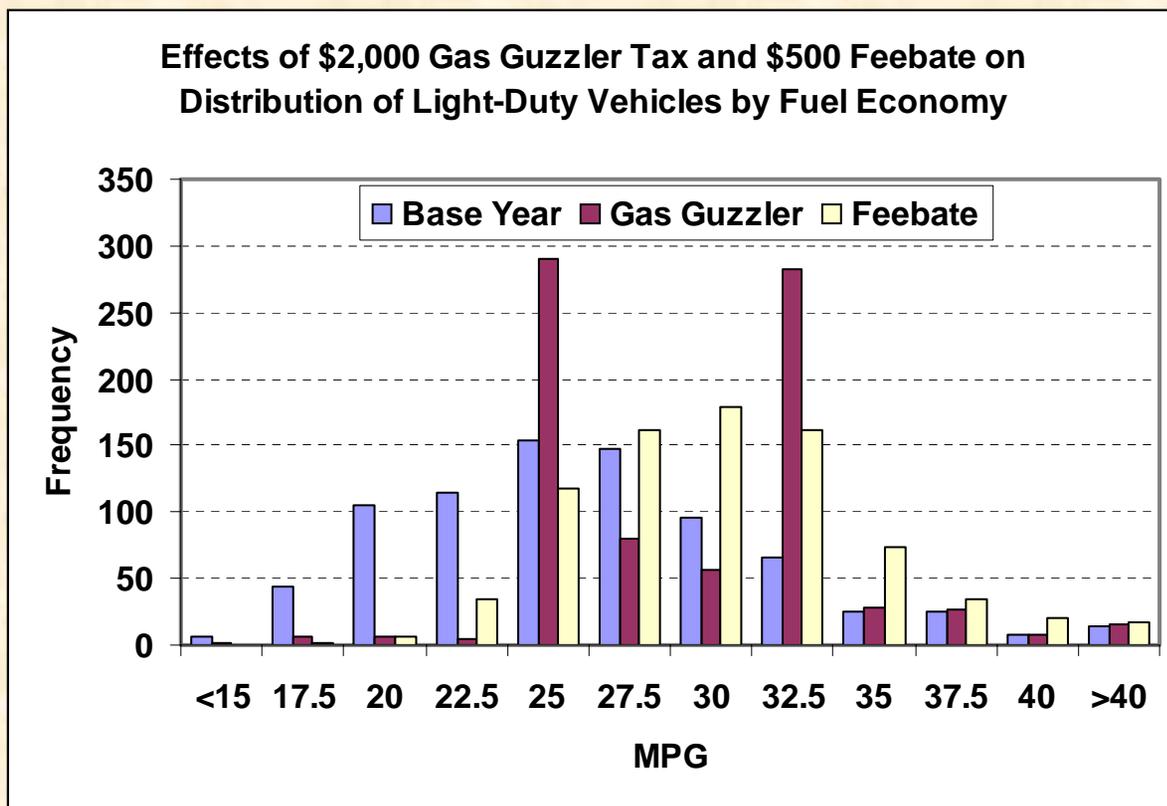
Evaluation

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Other Areas of Analysis

Impacts of Feebates, Rebates, and Gas-Guzzler Taxes on Light-Duty Vehicle Fuel Economy

- Used fuel economy cost curves from the National Academies “CAFE” study and a flexible model of vehicle choice.
- Estimated impacts on new-vehicle average fuel economy, fuel savings and carbon emissions, consumers’ surplus, and manufacturers’ revenues.



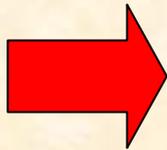
Note: \$500 rebate or fee for each deviation of 0.01 gal per mi from pivot point

Provided Inputs to NEMS and MARKAL for Policy and Planning Analyses

- **Analyses in support of legislative initiatives and policy scenarios**
- **Cellulosic ethanol market penetration scenarios – without and with the Renewable Fuels Standard**
- **Cellulosic ethanol benefits relative to no-EERE case (corn ethanol) in terms of life cycle differences in energy use and greenhouse gas emissions**

Market Analysis

Policy and Planning Analysis



Benefits Analysis

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Other Areas of Analysis

ORNL is Supporting EERE's Efforts to Improve Estimates of the Benefits of Its R&D Programs



Benefits Matrix Used to Categorize and Identify Benefits of R&D: Filling in the Matrix a Priority

**OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY**

	Past	Future	
	Realized	Projected	Option Cases
Economic			
Environmental			
Security			
Knowledge			

www.esd.ornl.gov/benefits_conference

ORNL-RAND Collaboration to Develop Framework for Estimating the Energy Security and Reliability Benefits of EERE Technologies

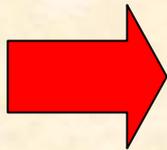
- **Fuel security**
- **Energy infrastructure security**
- **Electricity reliability**



Market Analysis

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Benefits Analysis



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Other Areas of Analysis

STATE ENERGY PROGRAM METRICS DEVELOPMENT AND OUTCOMES ANALYSIS

Oak Ridge National Laboratory Reports:

State Energy Program and State, Territory Energy Offices Deliver Annual Energy and Cost Savings

- APPROACH:**
- **Collect Data From States on Number of Completed SEP Activities of Various Types**
 - **Estimated Energy Savings, Cost Savings, and Emissions Reductions of Typical Projects and Multiplied by Number of SEP Activities**
- RESULTS:**
- **Estimated Annual Energy Savings of 41 Trillion Source BTUs**
 - **Estimated Annual Cost Savings of \$256 Million**
 - **Estimated Carbon Reduction of 720,000 Metric Tons**
- APPLICATION:** Document State Energy Program Accomplishments

http://www.naseo.org/about/SEP_study2.pdf

DEVELOP EVALUATION FRAMEWORK AND INTRANET TOOLBOX FOR EERE PROGRAM MANAGERS

PURPOSE: To Provide Support and Build Capacity for Good Evaluation Management in EERE

APPROACH: In collaboration with Sandia National Laboratory:

- Ascertain Key Evaluation Needs of EERE Program Managers
- Develop Evaluation Framework Showing Key Evaluation Questions, Data Needed, and Most Appropriate Methods
- Develop Intranet Toolbox Providing Most Relevant Evaluation Information for EERE Program Managers

RESULTS TO DATE: Completed Needs Assessment Interviews with OWIP Program Managers and Documented Key Findings

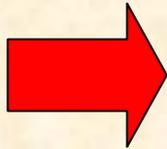
APPLICATION: Evaluation Framework and Intranet Toolbox Will Provide Valuable Evaluation Support to EERE Program Managers

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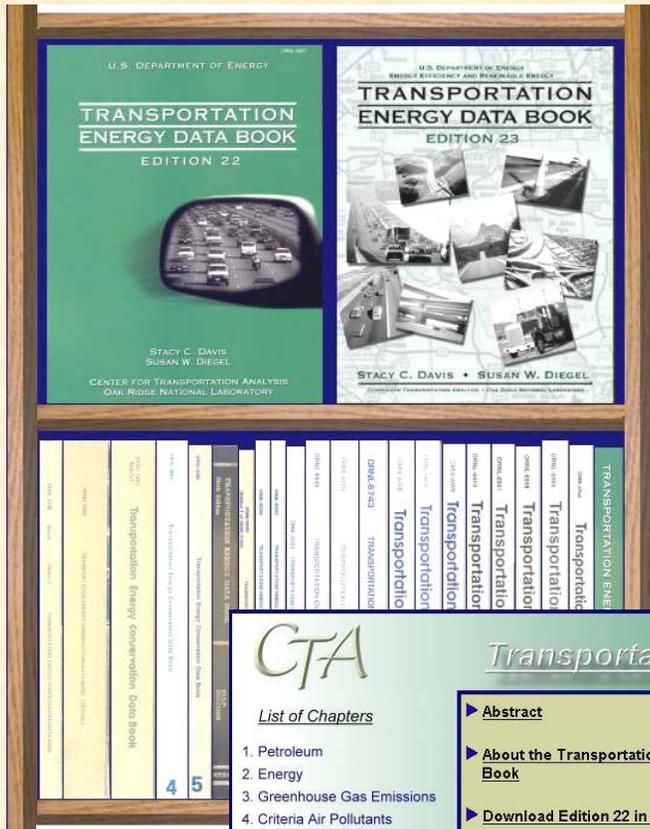
Evaluation



Data Development

Other Areas of Analysis

Transportation Energy Data Book and Web Site



- Hard copy since 1975 – 1,000 copies annually to 25 countries
- Web site provides data in pdf and Excel formats
- Excel spreadsheets contain historical data not found in hardcopy
- 9,707 Excel downloads; 3,462 pdf downloads; 631 unique visitors in August 2003
- <http://www-cta.ornl.gov/cta/data/Index.html>

CTA U.S. Department of Energy's *Transportation Energy Data Book*

List of Chapters

1. Petroleum
2. Energy
3. Greenhouse Gas Emissions
4. Criteria Air Pollutants
5. Transportation and the Economy
6. Highway Vehicles and Characteristics
7. Light Vehicles and Characteristics
8. Heavy Vehicles and Characteristics
9. Alternative Fuel and Advanced Technology Vehicles and Characteristics
10. Fleet Vehicles and Characteristics
11. Household Vehicles and Characteristics
12. Nonhighway Modes

Appendix A
Appendix B

New for Edition 22
Contacts

Abstract

About the Transportation Energy Data Book

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New Expanded Spreadsheets

Search the Transportation Energy Data Book

Edition 22

search

Tips for using this search engine

EERE Data Books Disclaimer ORNL DOE OTT

- Password protected site to be used by all programs within EERE
- Data extraction to ensure consistency
- Energy efficiency ratios across EERE technologies to facilitate comparisons
- Organization of common data into functional units
- Search functions for finding data that could reside in one or more of 11 program areas

EERE Data Home Page

U.S. Department of Energy
Energy Efficiency and Renewable Energy *Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable*

EERE Home

EERE Data Home Page

Most Commonly Used Data by Program

- PowerPoint Data Slides
- Maps
- Selected Data
- Conversions
- Technology Characterizations
- Energy Intensity Indicators
- AFDC
- DSIRE
- Green Power Network
- Renewable Resource Data Center
- REPIS
- Transportation Fact of the Week

EERE PROGRAMS

- ▶ Biomass
- ▶ Building Technologies
- ▶ Distributed Energy Resources
- ▶ Federal Energy Management
- ▶ FreedomCAR & Vehicle Technologies
- ▶ Geothermal Technologies
- ▶ Hydrogen, Fuel Cells & Infrastructure Technologies
- ▶ Industrial
- ▶ Solar Energy Technology
- ▶ Weatherization & Intergovernmental Program
- ▶ Wind & Hydropower Technologies

ENERGY USE BY SECTOR

- ▶ Buildings
 - Commercial
 - Residential
- ▶ Industry
- ▶ Power
- ▶ Transportation

ENERGY RESOURCES

- ▶ Biomass
- ▶ Geothermal
- ▶ Wind
- ▶ Hydropower
- ▶ Solar
- ▶ Hydrogen
- ▶ Electricity
- ▶ Natural Gas
- ▶ Petroleum
- ▶ Nuclear Energy
- ▶ Coal

Corporate

Site Map

FAQ

Ask an Expert

Suggestion Box

Search the EERE Data Website

● Tips for using this search engine

Budgets **Information** **Models** **Tools** **Links**

Ad-Hoc Data Requests: ORNL frequently delivers data covering a wide range of subject areas to PBFA and to the public

- **Recommendations for Clean Air Act Advisory Subcommittee on linking energy, land use, transportation, and air quality**
- **Information for Senator Lugar's office to respond to *Wall Street Journal* article critical of the benefits of ethanol energy**
- **Transportation, biofuels, other information requested by other countries**
- **Transportation Fact of the Week**

<http://www.ott.doe.gov/facts/fact.shtml>



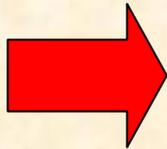
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Other Areas of Analysis

Also, Many Other Analyses

- **TAFV (Transition to Alternative Fuel Vehicles) Model for analysis of alternative fuel choice and market share – Leiby et al.**
- **ORCED (Oak Ridge Competitive Electricity Dispatch) analysis of distributed generation benefits (e.g., for PJM region) – Hadley, Stovall, et al.**
- **Benefits assessment of advanced vehicle technologies – Das, Tonn, et al.**
- **Analysis of effectiveness of web-based information for product/service delivery – role of government in acceptance of new technologies – D’Urso**
- **Computable general equilibrium modeling – measure economy-wide effects of policies and technologies -- Oladosu**
- **Regional analysis of economic impacts – Vogt, Rizy, et al.**
- **Environmental externalities – Lee, Greene, et al.**
- **Climate change modeling & policy analysis – Wilbanks, Perlack, Leiby**
- **Technology life cycle costing, e.g., automotive lightweight materials) – Das, Curlee, et al.**
- **Geographic Information Systems – land use, population, emissions, environmental impacts – Xiong, Bhaduri, et al.**