Energy Conservation Program for Consumer Products and Certain Commercial and Industrial Equipment

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Full-Fuel-Cycle Proposed Policy

October 7, 2010

Building Technologies Program, Office of the General Counsel & Argonne National Laboratory

AGENDA

- Welcome, Introductions & Agenda Review
- Overview of Proposals/Questions
- Brief opening statements
- Proposed shift to full-fuel-cycle (FFC) analyses, using GREET model
- Addition of Methane and Nitrous Oxide Emissions to GHG estimates
- Improving information available to consumers
- Final Remarks and Questions
- Next steps and closing

Background

- Section 1802 of EPACT 2005 (Pub. L. 109-58) directed DOE to contract with the NAS to examine whether the goals of energy efficiency standards are best served by measurement of energy at the actual site of energy consumption or through the FFC

- The NAS transmitted its report to DOE on May 15, 2009

- A key recommendation was to use FFC measures of energy consumption to assess national and environmental impacts of standards and to provide more comprehensive information to the public through labels and other means

- This DOE notice of proposed policy addresses this and other NAS recommendations

Overview of DOE Proposal

- Use FFC measures of energy and greenhouse gases (GHG), rather than primary energy
  - Primary energy includes point-of-use energy and energy losses that occur in the generation, transmission and distribution of electricity
  - FFC additionally takes into consideration the energy consumed in extracting, processing, and transporting primary fuels
- Add methane and nitrous oxide to GHG emission impact estimates
- Work with Federal Trade Commission (FTC) to make FFC and GHG emissions data available to the public

Public Comments Solicited

Key Questions:

- Shift to FFC? Methodology for calculating FFC?
- Additional GHGs? Methodology for calculating?
- Added consumer information most needed?
- Best mechanisms for conveying information?

DOE will consider all public comments to develop a final statement of policy on these issues (by end of 2010)

DOE will use the statement of policy as the basis for future regulatory proposals (also subject to public review and comment) and other supporting actions

General statements by participants

Brief summary statements by interested parties

- Prepared statements submitted in advance
- Additional statements

The Shift from Primary to FFC Energy

- **Use FFC measures of energy, and CO2 and other emissions** in the national impact analyses and environmental assessments included in future energy conservation standards rulemakings

  - FFC measure would provide more complete information about the total energy use and emissions than primary energy measure currently use

  - Would NOT require significant change to methods used to estimate energy and emission impacts of standards

  - Would NOT alter measures used to determine efficiency of covered products, as existing law still requires such measures to be based on energy consumed at point of use (42 U.S.C. 6291(4), 6311(4))

  - Using FFC measure in lieu of primary energy would have modest effects on the environmental assessments and national impact analyses that support future standards levels

The Shift from Primary to FFC Energy

Likely Impacts of Shift to FFC

- A shift to considering FFC impacts would increase the energy savings and emission reductions (both physical and monetary values) estimated to result from specific efficiency standard levels by roughly 7 to 15% (see table 1)

- But would not alter the estimated impacts on consumer life cycle costs, net present value of consumer savings, or manufacturer impacts

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Comments?

- Argonne National Laboratory's GREET Model:
  - Is already capable of estimating the FFC energy use and emissions of all forms of energy covered by the program
  - Is in the public domain and has been used previously to support other Federal and state regulatory actions
  - Can generate factors that would be used to convert the primary energy and emission values currently generated by DOE's analyses to FFC values

The GREET Model

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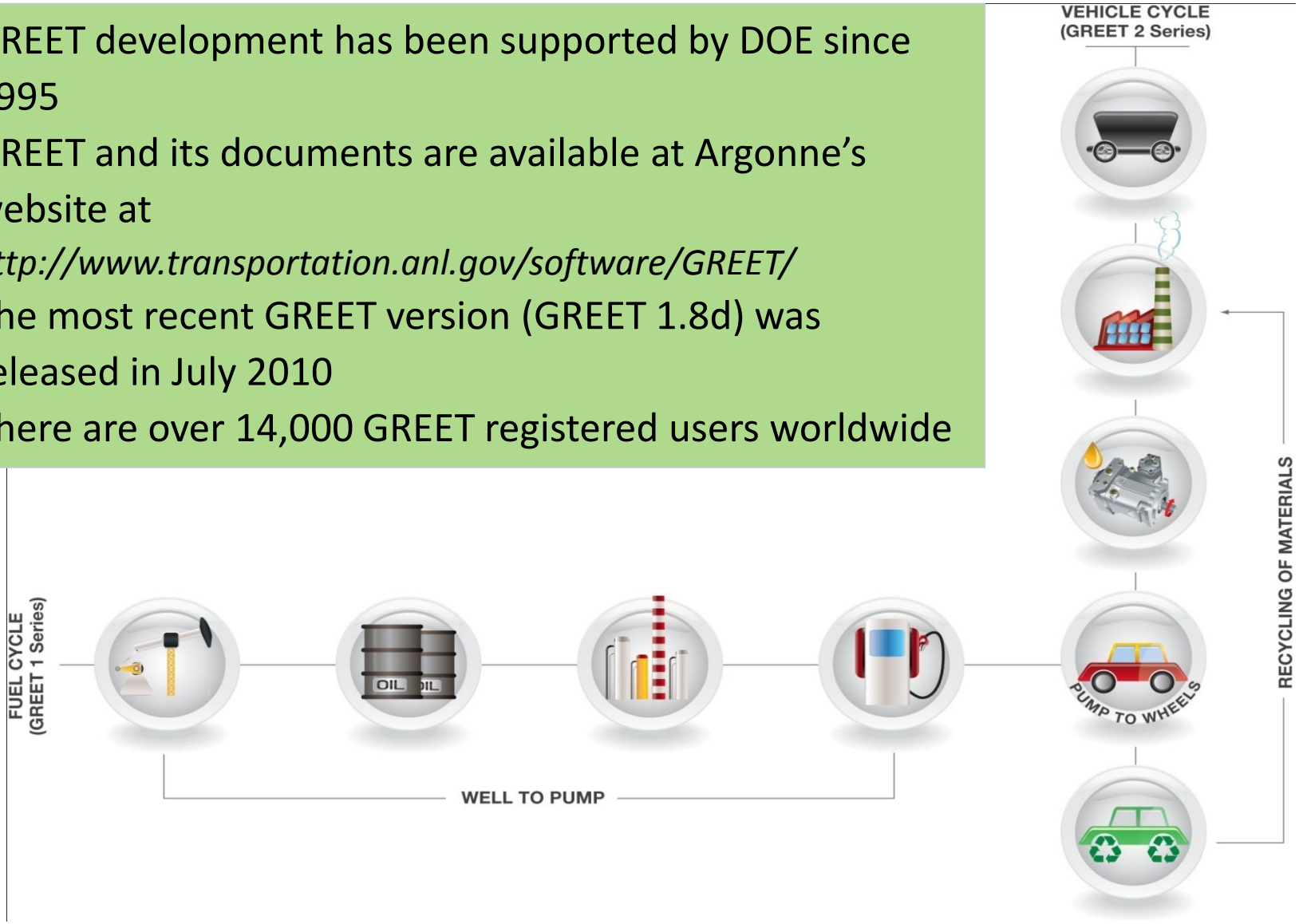
- GREET development has been supported by DOE since 1995
- GREET and its documents are available at Argonne's website at *http://www.transportation.anl.gov/software/GREET/*
- The most recent GREET version (GREET 1.8d) was released in July 2010
- There are over 14,000 GREET registered users worldwide



Outputs of the GREET Model

- **Energy use**
  - Fossil energy: petroleum, natural gas and coal (each is estimated separately)
  - Renewable energy: biomass, hydro-power, wind power, and solar energy
  - Nuclear energy (currently combined with renewable energy)
- **Greenhouse gases (GHGs)**
  - CO_2
  - CH_4
  - N_2O
  - CO_2e of the three (using IPCC global warming potentials of 1, 23, and 296, respectively)
- **Criteria pollutants**
  - VOC
  - CO
  - NO_x
  - PM_{10}
  - $PM_{2.5}$
  - SO_x

GREET Includes More Than 100 Fuel Production Pathways

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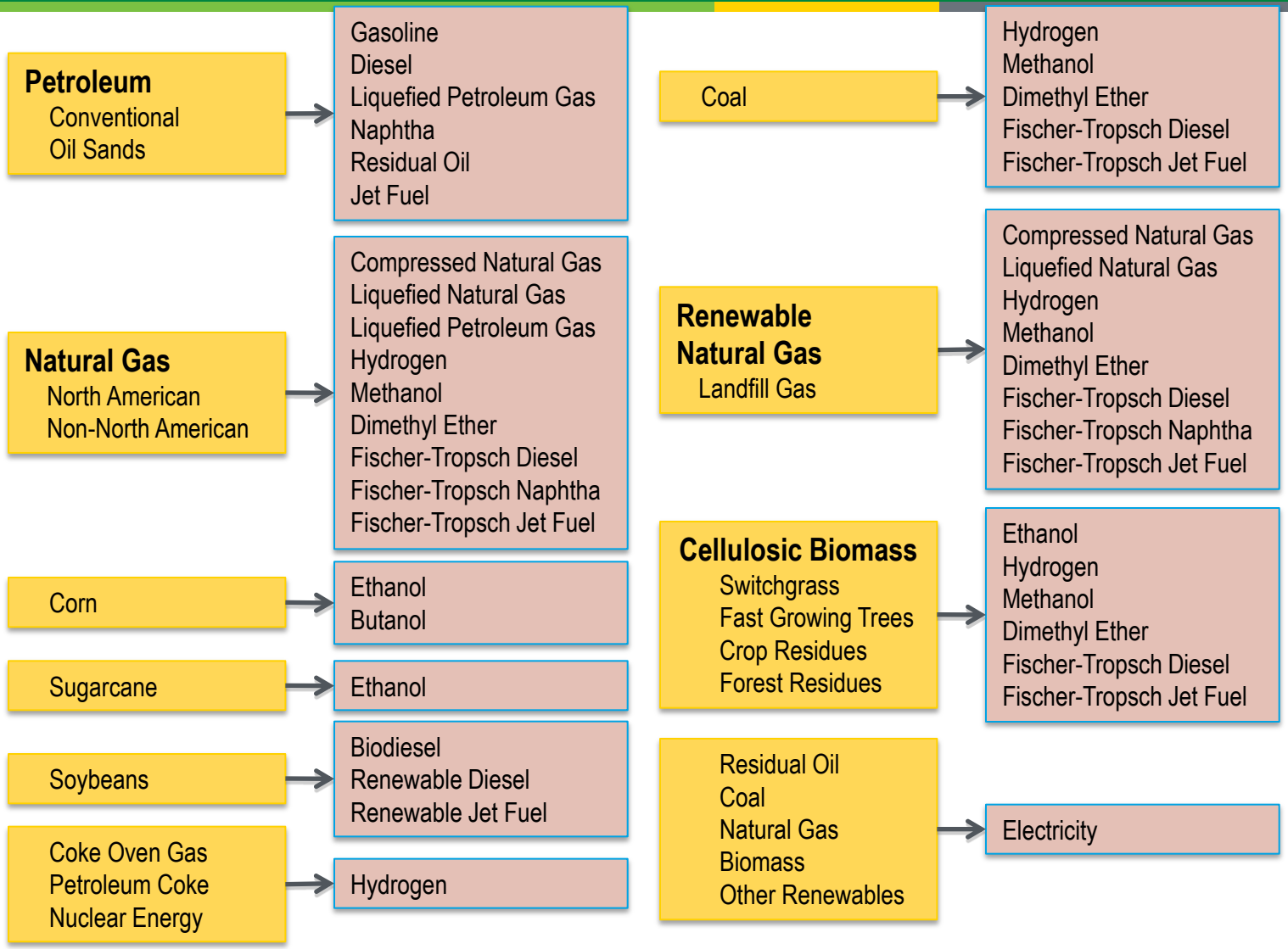

The yellow boxes contain the names of the feedstocks and the red boxes contain the names of the fuels that can be produced from each of those feedstocks.

Electricity Generation Systems in GREET

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1. Coal: Steam Boiler and IGCC
Coal mining & cleaning
Coal transportation
Power generation

2. Natural Gas: Steam boiler, Gas Turbine, and NGCC
NG recovery & processing
NG transportation
Power generation

3. Nuclear: light water reactor
Uranium mining
Yellowcake conversion
Enrichment
Fuel rod fabrication
Power generation

4. Petroleum: Steam Boiler
Oil recovery &transportation
Refining
Residual fuel oil transportation
Power generation

5. Biomass: Steam Boiler
Biomass farming & harvesting
Biomass transportation
Power generation

6. Hydro-Power

7. Wind Turbine

8. Solar Photovoltaics

9. Geothermal

GREET Enables Extension from Primary to FFC Energy

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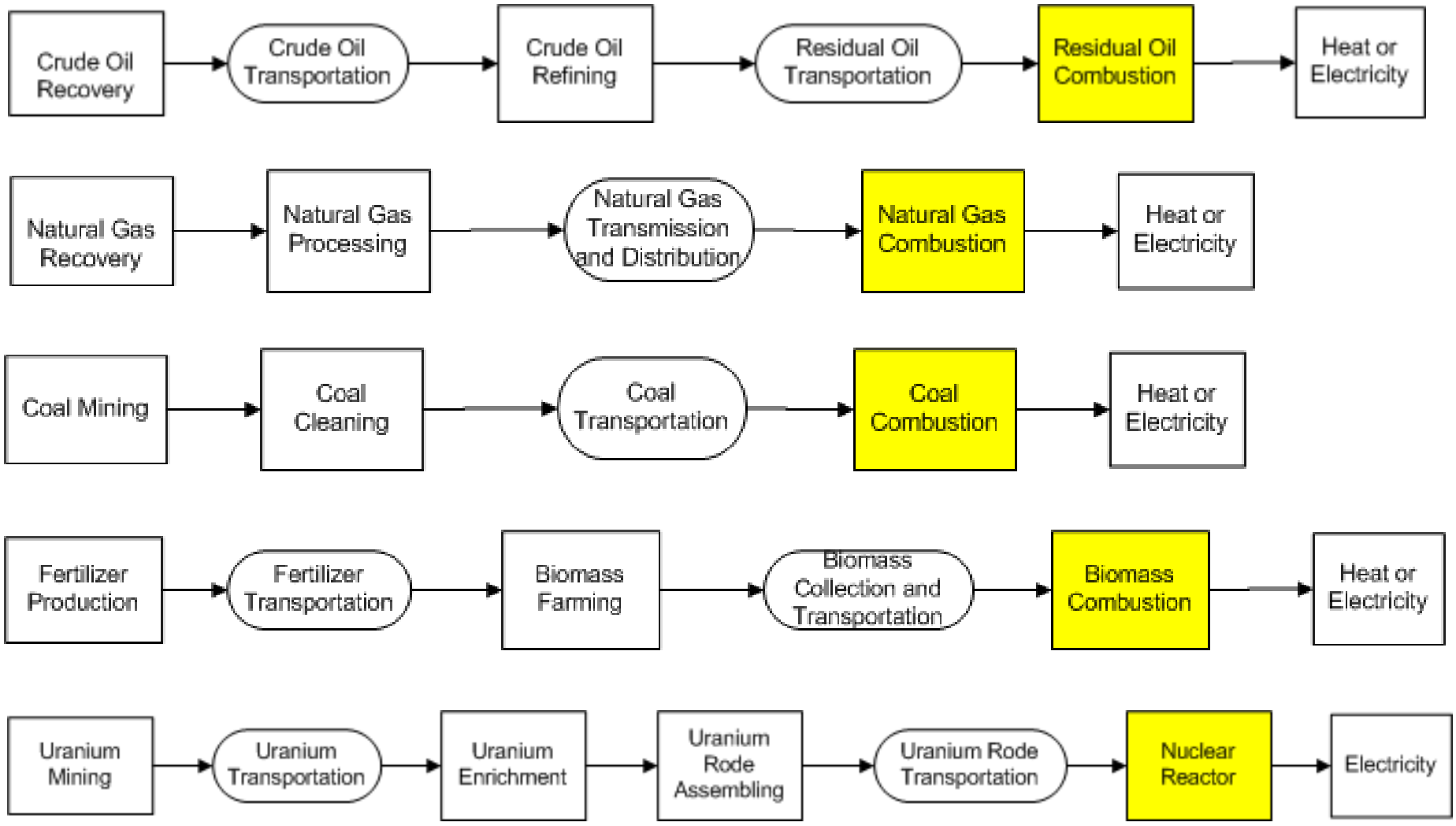

AEO 2010 Generation Mix Used as Basis for Some Initial Estimates

	Coal	Natural Gas	Nuclear	Residual Oil	Biomass	Others
2010	45.4%	21.8%	20.2%	1.1%	1.0%	10.5%
2030	43.9%	20.6%	17.6%	1.0%	5.3%	11.6%

Adjustment Factors Were Developed for Application to NEMS Results

- From combustion only to the FFC
  - Ratios of FFC results to combustion results (both were from GREET) were developed
  - The ratios were developed for both energy use and emissions
  - The ratios were applied to NEMS results

Proposed Use of ANL's GREET Model to Estimate FFC Impacts

Table 1 lists the preliminary factors to be used to convert primary energy to FFC energy for natural gas and fuel oil used in home appliances

TABLE 1—PRELIMINARY ENERGY CONVERSION FACTORS FOR FUELS USED IN HOME APPLIANCES

Conversion factor from primary energy to FFC energy	Natural gas	Fuel oil
GREET 2010 Preliminary Estimates		
Total Energy	1.073	1.134
Fossil Fuels	1.072	1.126
Petroleum	0.004	1.050
Natural Gas	1.065	0.056
Coal	0.002	0.020
GREET 2030 Preliminary Estimates		
Total Energy	1.073	1.147
Fossil Fuels	1.072	1.138
Petroleum	0.004	1.050
Natural gas	1.065	0.068
Coal	0.002	0.019

Proposed Use of ANL's GREET Model to Estimate FFC Impacts

Table 2 lists the preliminary factors to use to convert primary energy to FFC energy for natural gas, fuel oil, coal, biomass, and nuclear energy used for electricity generation

TABLE 2—PRELIMINARY ENERGY CONVERSION FACTORS FOR POWER PLANT FUEL CONSUMPTION

Conversion factor from primary energy to FFC energy	Natural gas	Fuel oil	Coal	Biomass	Uranium
GREET 2010 Preliminary Estimates					
Total Energy	1.071	1.134	1.021	1.032	1.065
Fossil Fuels	1.070	1.126	1.019	0.030	0.047
Petroleum	0.004	1.050	0.013	0.024	0.004
Natural Gas	1.063	0.056	0.002	0.004	0.017
Coal	0.002	0.020	1.004	0.002	0.026
GREET 2030 Preliminary Estimates					
Total Energy	1.071	1.147	1.021	1.032	1.038
Fossil Fuels	1.069	1.138	1.019	0.031	0.027
Petroleum	0.004	1.050	0.013	0.024	0.003
Natural Gas	1.063	0.068	0.002	0.004	0.011
Coal	0.002	0.019	1.003	0.002	0.013

Public Comment Solicited

- **DOE solicits comment on its proposals to use:**
  - FFC measures of energy use and emissions in these analyses,
  - the GREET model to estimate FFC energy use and emissions, and
  - any other related issue.

- **DOE seeks comment on the proposed methodology for:**
  - converting primary energy use to FFC energy use
  - determining FFC GHG and other emissions, and
  - any other related issue.

- **Comments?**

Adding Two New Greenhouse Gases

- DOE proposes to add two additional energy-related greenhouse gases for the environmental assessments:
  - Methane (CH_4)
  - Nitrous Oxide (N_2O)
- Both gases are associated with the production and transportation of energy
- The addition of these gases will likely increase total estimated GHG emission impacts by roughly 4-8% (see Table 4 in Notice), compared to CO2 only estimates using the FFC methodology

GREET model estimates energy-related CH_4, and N_2O emissions

- From CO_2 only emissions to CO_2e emissions of CO_2, CH_4, and N_2O combined
  - Emissions of CO_2, CH_4, and N_2O were estimated separately with GREET
  - Ratios of CH_4 and N_2O to CO_2 (based on GREET results) were developed
  - The ratios of CO_2e (CO_2, CH_4, and N_2O combined with their GWPs) to CO_2 were developed
  - The CO_2e ratios were applied to CO_2 only emissions

Public Comment Solicited

- **DOE seeks public comment on:**
  - Its proposal to add estimates of likely impacts on CH4 and N2O emissions
  - The use of the GREET model methodology for making these estimates.
- **Comments?**

Improving Information Available to Consumers

- Use of FFC factors to provide product-specific data on energy use and GHG emissions associated with appliance operation
- Possible support of consumer research on options for encouraging consumer understanding and use of such information
- Improve upon the FTC's existing on-line databases by enabling the public to make *cross-class comparisons* of product-specific data
- Possible addition to the Energy Guide label of an indicator of appliance greenhouse gas emissions

Public Comments Solicited

- DOE is soliciting comment on whether:
  - The suggested online service would likely benefit consumers and, if so, the most effective way to present this information, and
  - Information on whether FFC energy use and/or GHG emissions should be provided on Energy Guide labels
- DOE also seeks comment on the issues associated with disseminating this type of information to consumers via labels or other means.

- **Comments?**

Final Remarks & Questions

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ANY FURTHER COMMENTS OR QUESTIONS ON ISSUES RELATED TO THIS PROPOSED POLICY??

Closing

- Transcript of public meeting (and all written comments) will be available via regulations.gov
- All written [electronic] comments due by October 19
  - Docket Number: EERE-2010-BT-NOA-0028
  - RIN: 1904-AC24
  - Submit:

    Through Federal eRulemaking Portal: www.regulations.gov

    By email: FFC-2010-NOA-0028@ee.doe.gov

    Or by Hand Delivery or Mail [see below]

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