U.S. Ethanol Outlook

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NIST 4th International Conference on Biofuels Standards: Current Issues, Future Trends

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A Quick Note on the NRC Study:

Renewable Fuel Standard—Potential Economic and Environmental Effects of U.S. Biofuel Policy

- Committee Co-chairs:
  - "…our **clearest conclusion** is that there is **very high uncertainty** in the impacts we were trying to estimate."
  - "The bottom line is that it simply was **not possible to come up with clear quantitative answers** to many of the questions."
- Committee member Virginia Dale (ORNL):
  - "…the report is **not based on the most current information**."
  - "Strictly speaking, this report is **not a conclusion** and should not be read as such but rather a report on work in progress."*[1]*
- Context is Key: How do the potential impacts of biofuels compare to the potential impacts of other energy options? (e.g., tar sands, tight oil, deep-water drilling, etc.)

1. http://www.forestbusinessnetwork.com/9009/nrc-report-on-rfs-misses-some-real-world-biofuel-industry-developments/

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U.S. Biofuel Policy Objectives

- Reduce fossil fuel use (particularly imports)
- Diversify transportation energy portfolio
- Stimulate economic development (particularly in rural areas)
- Enhance farm income
- Reduce emissions of tailpipe air pollutants
- Decrease greenhouse gas emissions

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Major U.S. Ethanol Policies

- Energy Tax Act (1978)
  - Established ethanol blender's tax credit
- Clean Air Act amendments (1990)
  - Created reformulated gasoline (RFG) program
- Energy Policy Act (2005)
  - Created first Renewable Fuel Standard (RFS)
  - Excluded liability protection for MTBE
- Energy Independence & Security Act (2007)
  - Expanded requirements and scope of RFS

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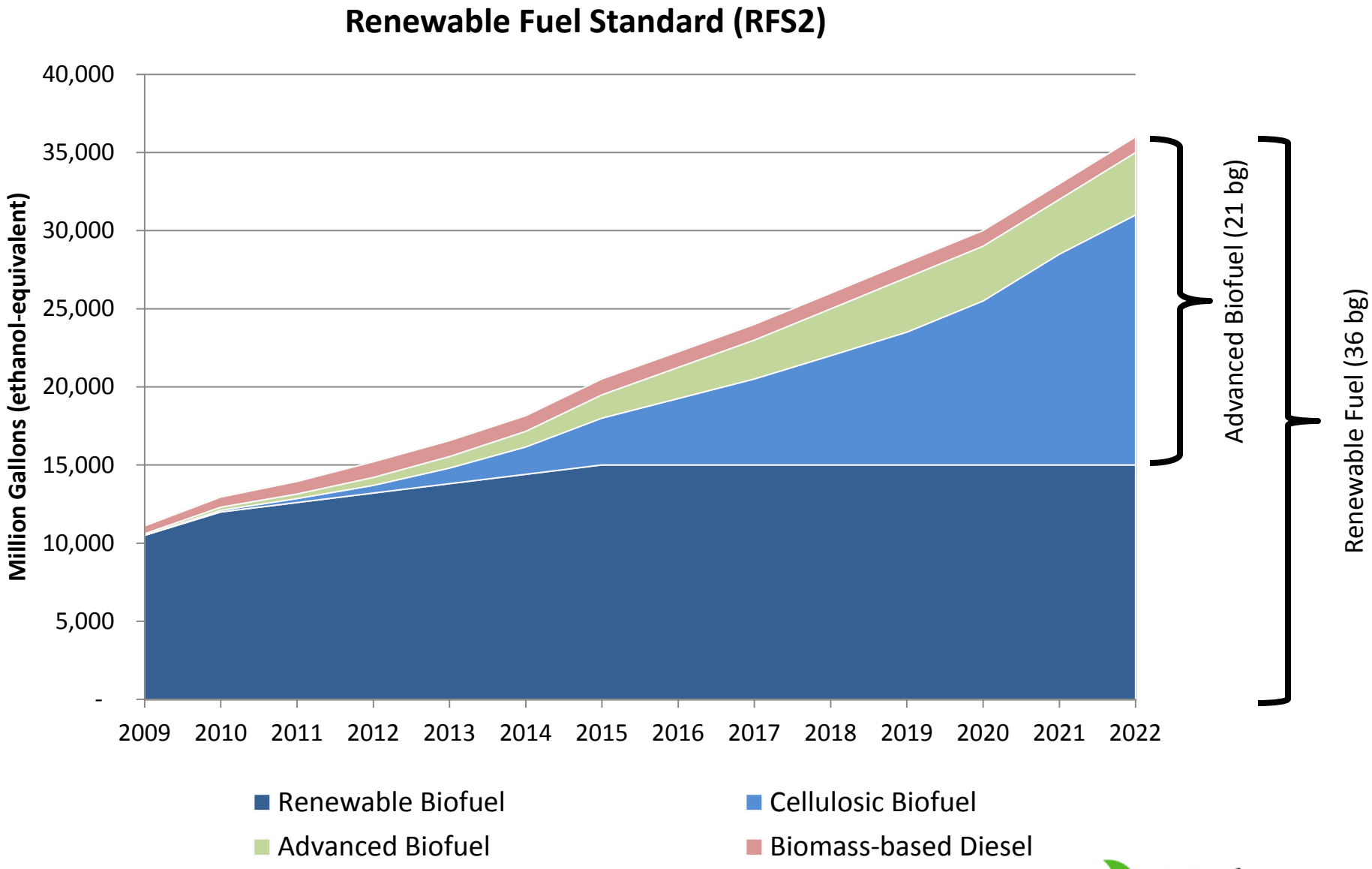

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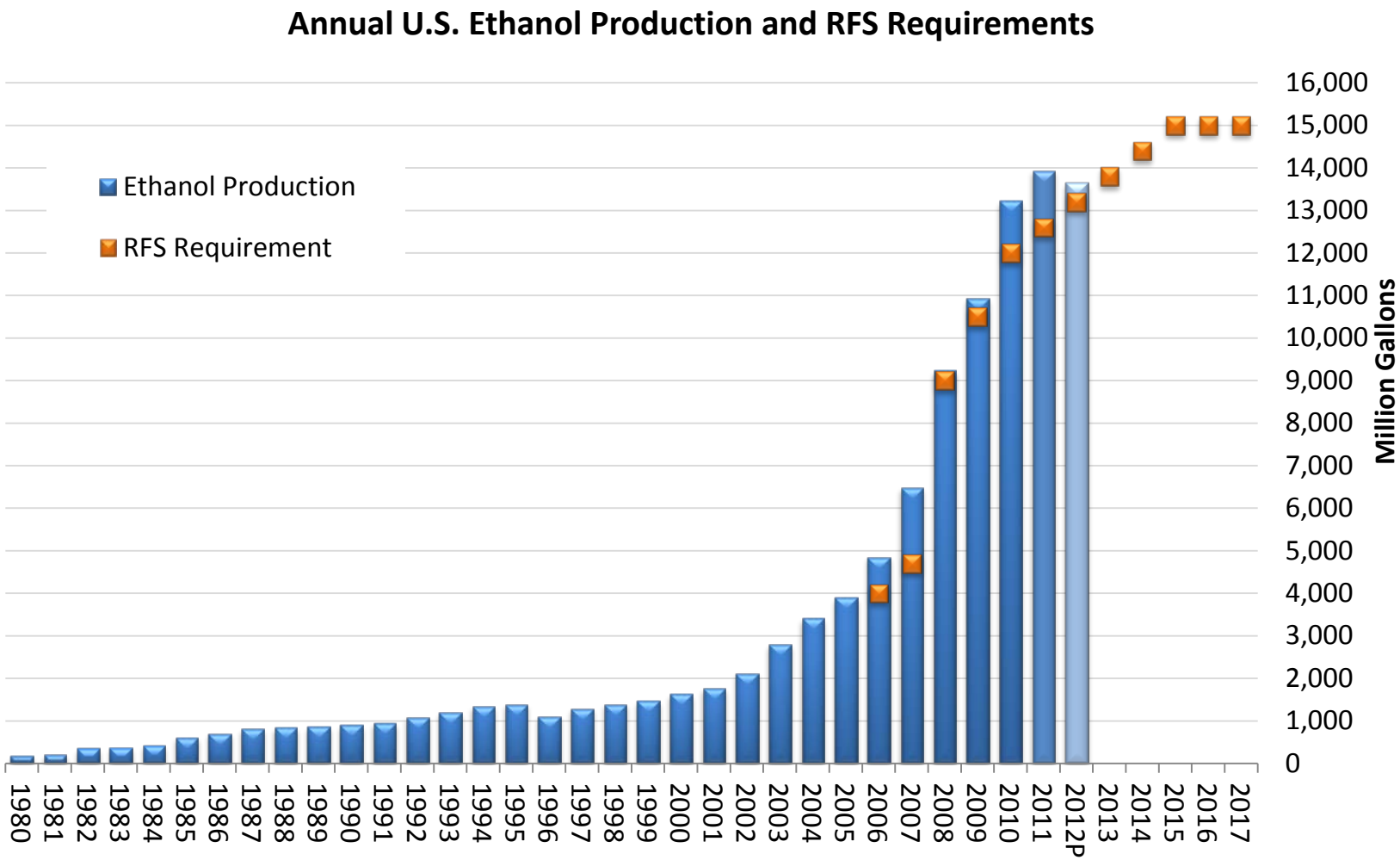
Ethanol Production Response to Policy Signals



Source: RFA and EIA

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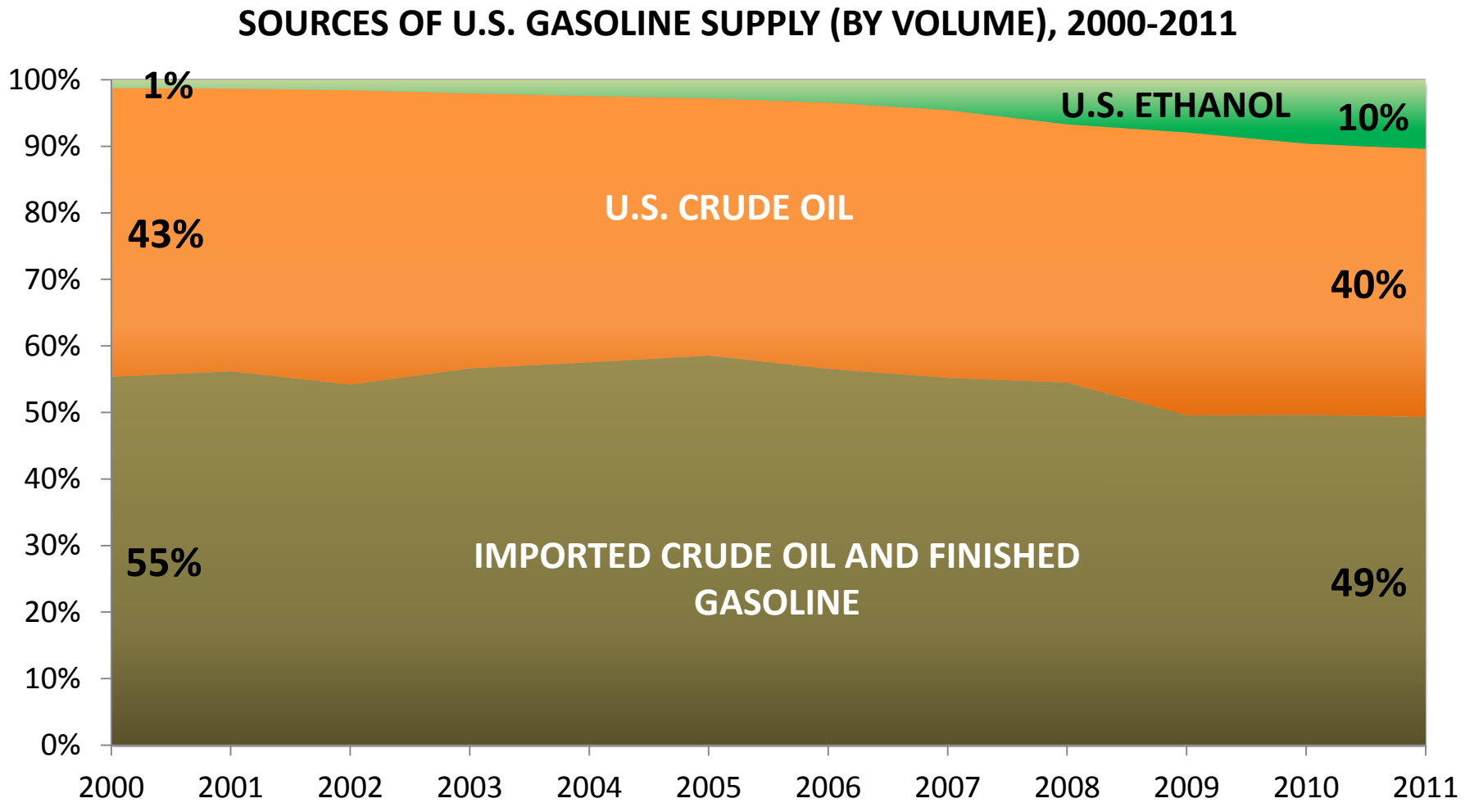
Impact on Transportation Fuels Portfolio



Source: EIA

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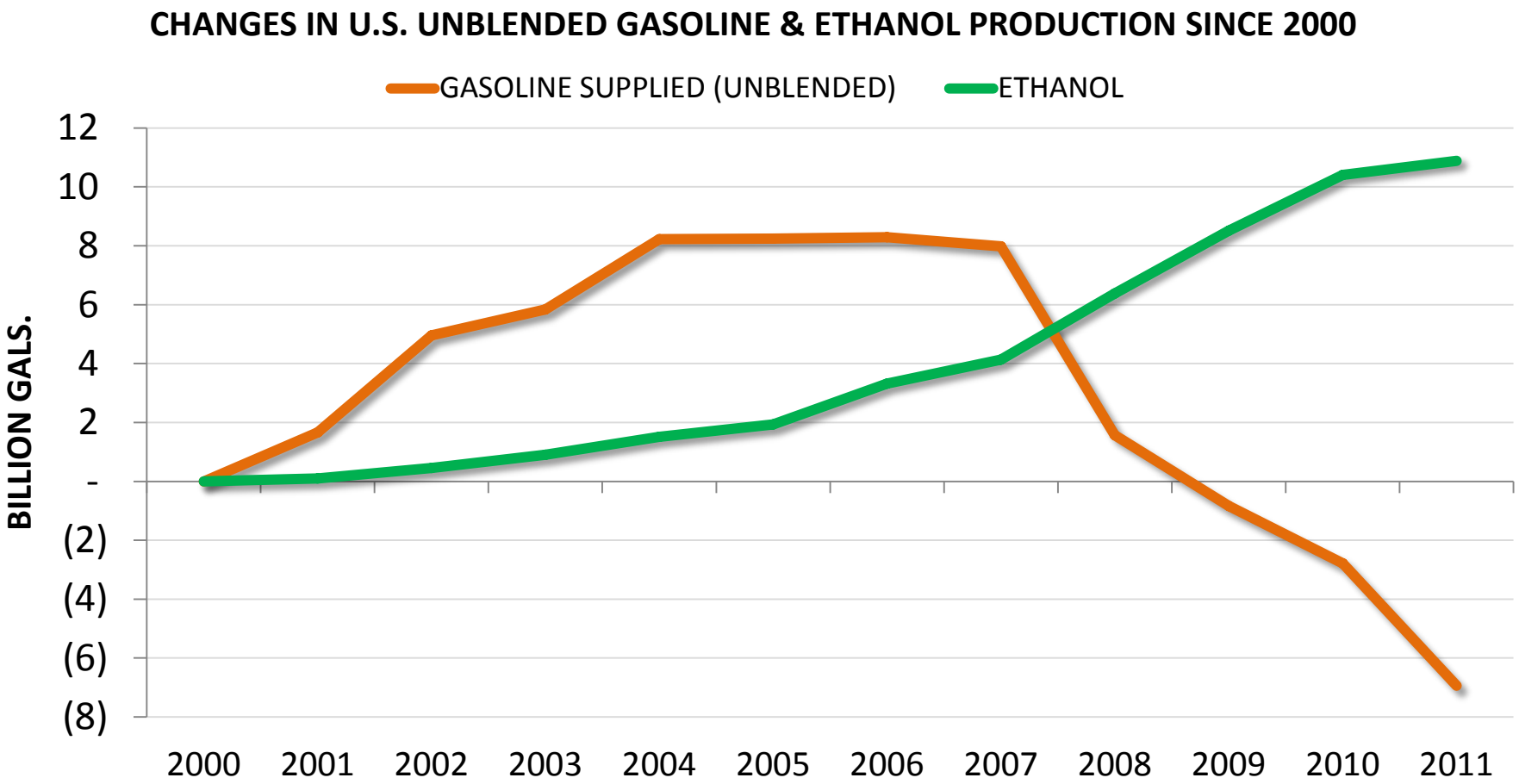
Recent Changes in U.S. Ethanol and Gasoline Production



Source: EIA

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Impact on Fuel Prices

- Over last three years:
  - Ethanol typically priced $0.40-$1.10/gal. under gasoline
  - Ethanol priced $1.50-$2.25/gal. under other octane sources
- From 2000 to 2011, ethanol reduced wholesale gasoline prices by **$0.29 per gallon.**—*Iowa St. Univ./Univ. of Wisconsin*
- Ethanol lowered gasoline prices by as much as **$0.78 per gallon** in 2011.—*Louisiana State University*
- Ethanol use at current levels lowers gasoline prices by **$0.26 per gallon** in the East Coast region.—*Duke University*
- Similar results from Merrill Lynch, Morgan Stanley, National Renewable Energy Lab

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Economic Impacts

- Net U.S. farm income set a new record of $118 billion in 2011
- Gross crop sales topped $200 billion in 2011 for the first time in U.S. history. Livestock receipts also hit a record level of $166 billion
- Government payments to farmers were $8.9 billion in 2011
  - 11% decrease from 2010
  - Lowest in 14 years
  - Less than *half* of 2005 ($20.2 billion)
- Ethanol industry supported 400,000 jobs in 2011, generated nearly $50 billion in GDP

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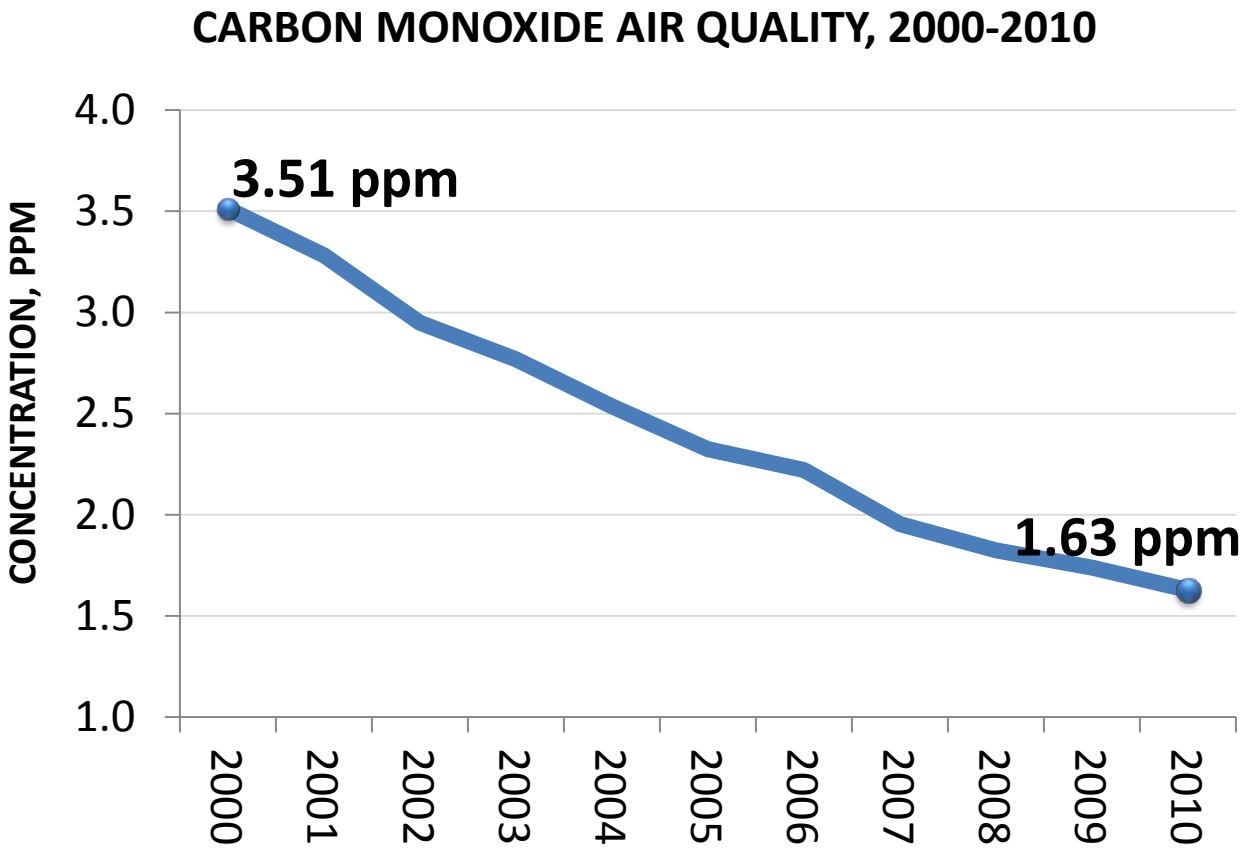
Air Quality Impacts



Since 2000, major reductions in:

- Carbon monoxide
- Particulate matter
- Ground-level ozone
- Air toxics

Source: EPA

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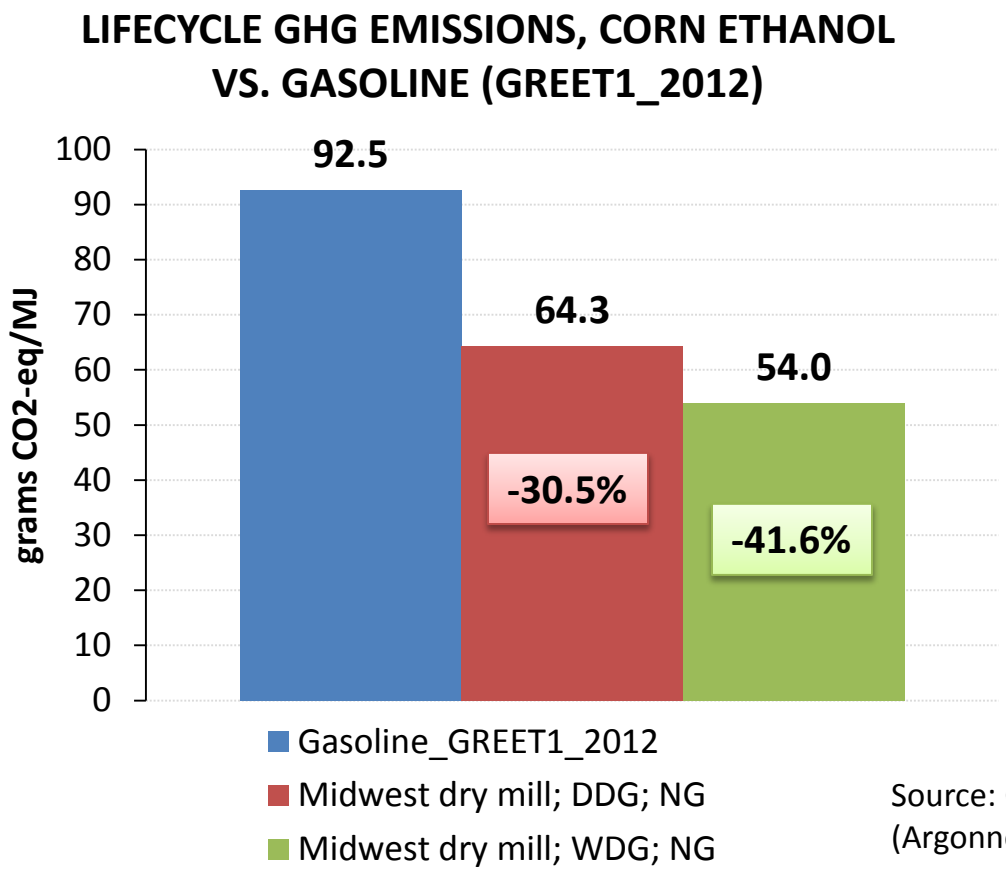
GHG Impacts

- Corn ethanol reduces GHG emissions by 30-40% *<u>even with</u> inclusion of highly uncertain ILUC emissions*



GHG reductions are even greater when compared to unconventional sources of petroleum at the margin (e.g., tar sands)

Source: GREET1_2012 (Argonne Natl. Lab)

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What's Next? Near Term

- Top priority is breaking through the "E10 Blend Wall"
  - E15 approved for use in MY2001 and newer LDVs
  - Challenges to broad commercialization:
    - Lack of 1 psi RVP waiver for E15
    - Certain state regulatory barriers
    - Some retailers concerned about misfueling liability
  - First commercial gallons of E15 being sold in KS, IA, and NE
- First commercial-scale cellulosic ethanol facilities under construction today

What's Next? Long Term

- Ethanol is a low-cost source of octane (99.5 AKI)
- Meeting aggressive new fuel economy and emissions standards will require new engine technologies and complementary fuels
- Combination of higher ethanol blends (e.g., E25-E35) and new engines (downsizing, DI, turbo-charging, higher compression, etc.) is a strategy to enable compliance with standards

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Some of Our Needs Moving Forward

- Consensus approaches to lifecycle analysis
  - Uniform framework for fair and consistent comparisons of transportation energy options
  - Standard terminology/definitions
  - Standard data sets
  - Regular updates to reflect technological change
  - Science-based methods for treatment of “indirect effects” for all fuels
- Research to determine optimum octane level and other fuel characteristics needed for new engine technologies (and ultimately new fuel specifications)

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Summary and Conclusions

- U.S. energy policy has enabled dramatic growth in ethanol production
- Ethanol growth has helped diversify U.S. energy portfolio, reduce oil imports, stimulate economic development, and reduce emissions
- E15 roll-out and cellulosic ethanol commercialization are current priorities
- In the long term, ethanol's unique properties make it an attractive component of the "future fuel" needed for fuel economy/GHG compliance

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