
RFS Implementation

Governors' Biofuels Coalition

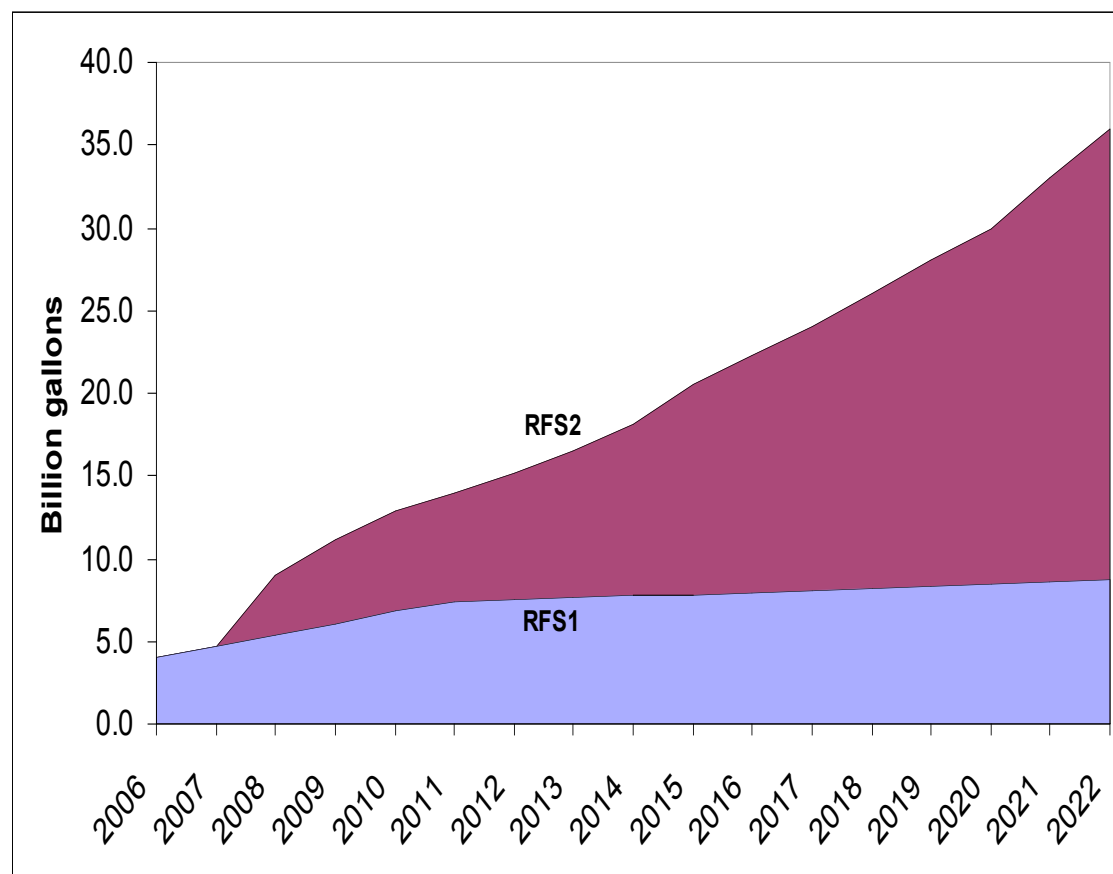
February 24, 2009

Energy Policy Act of 2005

- Final rule signed April 9, 2007
- Extensive educational outreach effort
- Program officially started on September 1, 2007
- Registration, recordkeeping, reporting underway
 - 2,000 parties regulated → over 500,000 reports from Sept - Dec 2007 alone
- “Growing pains” of implementing a new program are beginning to decrease
 - Seeing a number of preventable reporting problems
- RINs (Renewable Identification Numbers) are becoming valuable
- 2008 compliance period closes this week
- **Passage of the Energy Independence and Security Act significantly expanded volumes, extended the timeframes, and added GHG thresholds...**

Energy Independence & Security Act of 2007

- EISA passed by Congress and signed by President in December 2007
- Modifies current RFS program (“RFS2”)
 - Volumes increase to 36 billion gallons/yr by 2022
 - 5-fold increase from current RFS levels
 - Establishes new renewable fuel categories (e.g. conventional biofuel, advanced biofuel) and eligibility requirements
 - Provides new waivers and paper credit provisions
 - Includes new obligated parties
- Also includes new studies and reports



Four Separate Volume Mandates

Year	<i>Advanced Biofuels</i>			Other Renewable Fuel	TOTAL Renewable Fuel
	Cellulosic Biofuel	Biomass-Based Diesel	Other Advanced Biofuels		
2006				4.00	4.00
2007				4.70	4.70
2008				9.00	9.00
2009		0.50	0.10	10.50	11.10
2010	0.10	0.65	0.20	12.00	12.95
2011	0.25	0.80	0.30	12.60	13.95
2012	0.50	1.00	0.50	13.20	15.20
2013	1.00	1.00	0.75	13.80	16.55
2014	1.75	1.00	1.00	14.40	18.15
2015	3.00	1.00	1.50	15.00	20.50
2016	4.25	1.00	2.00	15.00	22.25
2017	5.50	1.00	2.50	15.00	24.00
2018	7.00	1.00	3.00	15.00	26.00
2019	8.50	1.00	3.50	15.00	28.00
2020	10.50	1.00	3.50	15.00	30.00
2021	13.50	1.00	3.50	15.00	33.00 ⁴
2022	16.00	1.00	4.00	15.00	36.00

Rulemaking Process & Key Issues

- **The RFS2 proposal has been developed through extensive communication and collaboration at both the staff and management levels**
 - EPA Workgroup
 - Federal Colleagues (particularly DOE and USDA)
 - Close Coordination with CARB and other State Partners
 - Trade Associations (RFA/ACE, NBB, API/NPRA, Alliance, NCGA, ABC, GEC, Farm Bureau, etc)
 - Environmental Associations (NRDC, ED, UCS)
 - Many Many Individual Companies and Experts
- **Broad support for most aspects of the package**
- **Different perspectives exist particularly on LCA and approach to Renewable Biomass provision**
 - We are highlighting them in the NPRM and seeking comment on a range of options
 - Seeking comment on aspects and assumptions in our analyses
 - Anticipate an extensive set of public comments will inform the final decisions for the FRM

Renewable Biomass Provision

- **EISA restricts the types of renewable fuel feedstocks and land that feedstocks can come from. For example:**
 - Agricultural land must have been cleared or cultivated prior to Dec 19, 2007 and actively managed or fallow, and non-forested
 - Woody biomass from federal land is not allowed, except from wildfire areas

- **EISA language does not prohibit a “shell game” in which food crops are moved to new ag land while existing ag land is used for fuel feedstocks**

- **Requires new tracking of feedstocks from point of production to renewable fuel producers**
 - Applies to both domestic and foreign producers

EISA Requires Lifecycle Assessment

- Each fuel category required to meet mandated GHG performance thresholds (reduction compared to baseline petroleum fuel replaced)
 - **Conventional Biofuel** (ethanol derived from corn starch)
 - Must meet 20% lifecycle GHG threshold
 - Only applies to fuel produced in new facilities
 - **Advanced Biofuel**
 - Essentially anything but corn starch ethanol
 - Includes cellulosic ethanol and biomass-based diesel
 - Must meet a 50% lifecycle GHG threshold
 - **Biomass-Based Diesel**
 - E.g., Biodiesel, “renewable diesel” if fats and oils not co-processed with petroleum
 - Must meet a 50% lifecycle GHG threshold
 - 20-50% still counts as renewable fuel
 - **Cellulosic Biofuel**
 - Renewable fuel produced from cellulose, hemicellulose, or lignin
 - E.g., cellulosic ethanol, BTL diesel
 - Must meet a 60% lifecycle GHG threshold
- EISA language permits EPA to adjust the lifecycle GHG thresholds by as much as 10%
- Baseline fuel for comparison is gasoline and diesel fuel in 2005

Definition of Lifecycle GHG Emissions

“(H) LIFECYCLE GREENHOUSE GAS EMISSIONS.—The term ‘lifecycle greenhouse gas emissions’ means the aggregate quantity of greenhouse gas emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential.

Life Cycle Boundaries- Components Included

- **Direct Impacts:**

- Agricultural inputs (e.g., fuel used in tractor, energy used to produce and transporting fertilizer to the field) used to grow crops directly used in biofuel production
- Fertilizer N₂O emissions associated with crops directly used in biofuel production
- Land use change associated with converting land to grow crops directly used in biofuel production
- Energy use and GHG emissions at production facility
- Energy used to transporting feedstock to plant
- Energy used to transporting fuel to end use
- Vehicle tailpipe GHG emissions

- **Indirect Impacts:**

- Agricultural inputs (e.g., fuel used in tractor, energy used to produce and transporting fertilizer to the field) and fertilizer N₂O emissions from growing crops indirectly impacted by use of feedstock for biofuel production (domestically and internationally)
- Amount of new land converted to crops, location of land converted to crops, type of land converted to crops, GHG emissions associated with type of land converted indirectly impacted by using feedstocks for biofuel production (e.g., to make up for lost exports)
- Emissions from changes in livestock numbers that are indirectly impacted by feed prices & availability due to the use of feedstocks to produce biofuels
- Rice methane emissions indirectly impacted by shifts in acres to produce feedstocks for biofuel production

Life Cycle Boundaries – Components Excluded

- Elements excluded were determined based on internationally accepted life cycle assessment standards, developed by the International Organization for Standardization (ISO), using environmental significance as the cut-off criteria
 - In general EPA is following ISO guidance on lifecycle analysis which requires:
 - Using recent data
 - Determining sensitivity of results to changes in major assumptions
 - Allocating environmental impacts among all system products
- Infrastructure-related activities are not included (e.g., emissions associated with the production of tractor or farm equipment)
- Construction-related emissions are also not included (e.g., steel or concrete needed to construct a refinery)

Overview of What We Need

- Need to develop life cycle GHG values for each potential fuel and production pathway, for example:
 - Corn ethanol (dry mill, wet mill, coal, natural gas, etc.)
 - Biodiesel / Renewable Diesel
 - Soybean oil
 - Waste grease
 - Cellulosic Ethanol (enzymatic, thermochemical)
 - Agricultural residue (e.g., corn stover)
 - Forest wastes
 - Switchgrass / other energy crops
 - Imports
 - Sugarcane ethanol

- The components of the analysis are generally the same for all biofuels, but each has own set of assumptions and issues

Methodology

- EISA definition requires the use of a number of models and tools
 - Including direct and indirect impacts such as land use change requires analysis of markets
 - Typical life cycle analysis tools are based on process modeling
 - To capture market impacts need to use economic models
 - Conducting our own process and emissions modeling as part of rulemaking
- Scenario Comparison: Run models with different volume scenarios to isolate the impact of specific fuel
 - Consider change between baseline projected fuel volume in 2022 (i.e., without RFS2) and projected RFS2 mandated volume.
 - Held volumes of other fuels constant at RFS2 mandated levels
- For areas of uncertainty, we have tested our primary approach and key assumptions with sensitivity analyses and different methods

Key Models and Data Sources

- Emission factors
 - The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model, Argonne National Lab
 - Winrock International
 - Woods Hole Research Institute
- Agricultural sector models
 - Forestry and Agricultural Sector Optimization Model (FASOM), Texas A&M University
 - Food and Agriculture Policy Research Institute (FAPRI), Iowa State University and University of Missouri - Columbia
 - Global Trade and Analysis Policy (GTAP), Purdue University
 - Bio Energy Systems Simulator (BESS), University of Nebraska - Lincoln
- Land use changes (FASOM, FAPRI, Winrock, GTAP)
- Fertilizer N₂O modeling (Colorado State University DAYCENT/CENTURY)
- Fuel production process models (GREET, USDA & NREL ASPEN models, BESS)
- Tailpipe emissions (Motor Vehicle Emissions Simulator (MOVES), US EPA)
- Energy sector modeling (National Energy Modeling System (NEMS), US DOE)

Key Factors in Land Use Assessment

- **This analysis has revealed which factors have the most significant impact on the final results**
 - **What Type of Land is Converted?**
 - Use of historic satellite data to project type of land converted
 - Alternative approach to use economic models to predict type of land converted
 - **Treatment of Time Related Land Use Changes and Benefits**
 - Land use change results in stream of emissions that are changing over time
 - We need to define a life cycle GHG value that is applicable to all gallons across time
 - We are looking at a range of approaches for treating this issue
 - The two main decisions to be made are what time period to consider and what discount rate (if any) to apply to emissions over time
- **We are conducting additional sensitivity analyses around these factors**

Next Steps on Lifecycle

- The notice of proposed rule-making (NPRM) provides an important opportunity for EPA to present our work and to seek comment on proposed approaches and alternative approaches
 - Planning to hold workshops on lifecycle analysis following release of the NPRM
- Engage experts between proposal and final to ensure expert-level feedback
- Anticipate 3-5 year cycles for updating the analysis

Rulemaking Status

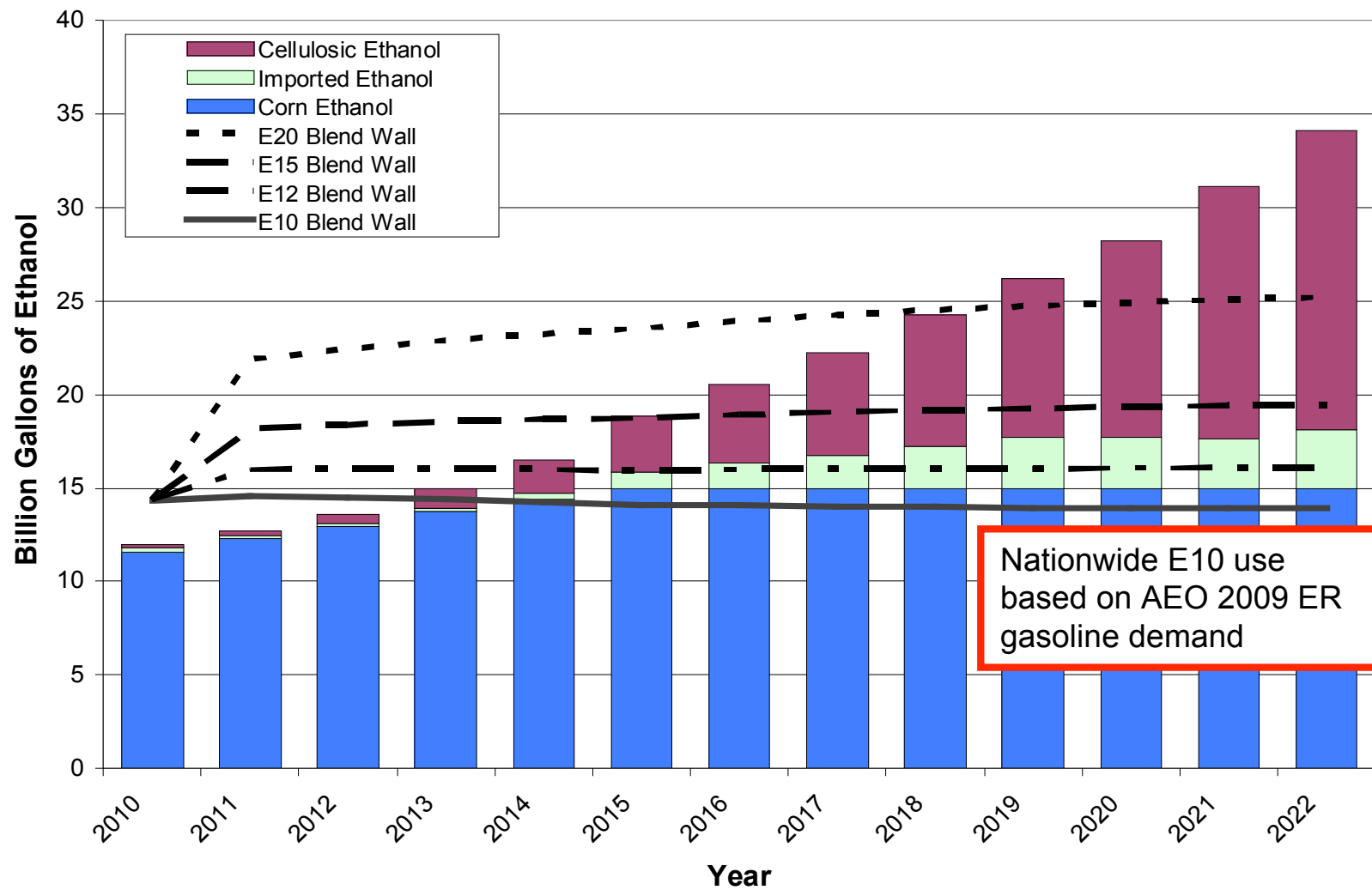
- Proposal is complete and undergoing OMB review
- Also continuing to meet with various stakeholders (e.g. industry, academic experts, CA/EU, environmental organizations, federal and state agencies), particularly with regards to lifecycle analyses
- Timing matters

Options for Reaching RFS2 Volumes

- Three main approaches that EPA is actively working on with stakeholders:
 - E85 and FFVs
 - About 7M FFVs on the road
 - E85 stations still not sufficient, though recent funding options will help
 - Non-ethanol renewable fuels
 - A number of companies have new processes in various stages of development, many of which appear to be very promising
 - Challenge is time for development and bringing such fuels to market
 - Mid-level blends
- Significant effort for some or all of these actions needed to reach 36 B gallon levels

Theoretical Ethanol Use with Mid-Level Blends

(Assuming Partial Waiver, Existing Retail Equipment Can be Used)



Midlevel Ethanol Blends

- **To bring higher blends to market, Clean Air Act includes two provisions**
 - **211(f)(4) Waiver Criteria**
 - **Exhaust emissions, Evaporative emissions, Durability issues** (Materials compatibility, driveability or operability)
 - **Testing needs to include emissions over the full useful life of vehicle or equipment**
 - **Long-term emissions durability impacts**
 - **Technical basis for approval: A fuel manufacturer applicant must demonstrate that the test sample size (for both on and non-road) is sufficient to infer that a significant portion of the fleet will not fail to achieve compliance within the requirements set in the 211(f)(4) waiver**
 - **211 (f)(1) registration process**
 - **Includes determination of health effects of new fuel or fuel additive**

- **EPA has been the catalyst in developing approaches that meet legal obligations in a manner that will save millions of dollars and years of work**
 - Streamlined approach to data gathering for E15/E20 waiver
 - Targeting applicability of existing health effects testing for E10 to determine impacts of higher blends
 - Discussion with stakeholders about other ideas to add 1-2% more ethanol to gasoline

Existing Mid-level Blends Data

- **MN/RFA test program on E20**
- **Rochester Institute of Technology testing**
 - Expect limited data on E20 for ten vehicles later this year
- **DOE Test Program**
 - Interim report released in October included instantaneous emissions for 13 newer model year vehicles
 - Operational issues including failures with various non-road equipment
- **EPA conducting emissions testing on a range of fuels**
- **These studies do not answer questions about long-term effects of E15/E20 on emissions, but are helping to complete the picture**

Waiver Testing Program

- **The bulk of mid-level blends testing is being conducted by DOE and the Coordinating Research Council (CRC)**
 - DOE is providing almost all of funding for the test program
 - EPA has provided technical guidance since the beginning of test plan development to ensure that the test program adheres to sound scientific and statistical principals
 - EPA views the DOE/CRC catalyst durability test program as the key element to the mid-level test program

- **The DOE test program is comprehensive and should be sufficient to address criteria for us to consider a 211(f)(4) waiver**
 - EPA very pleased with level of federal cooperation
 - New funding could be used to address unfunded test programs to expedite completion of the mid-level test program
 - Test data will be publicly available as testing is completed and may be used for waiver applications

Partial/Conditional Waivers

- **Very unlikely all vehicles and engines will operate on higher blends**
 - Especially for small non-road engines and older vehicles
- **Therefore, EPA has worked with DOE and other stakeholders to focus their test program on 2004+ model year vehicles**
 - With proper justification, allows E10+ blends into the marketplace sooner
 - Addresses vehicle and engine manufacturer/fuels industry concerns about impacts of new fuels on existing fleets
- **Implication is that any waiver approval would be:**
 - Applicable to only a subset of the in-use fleet (likely newer model vehicles)
 - Rely upon the continued availability of E0/E10
- **Many stakeholders are not comfortable that EPA is exploring this option**
- **Partial/conditional waiver creates new hurdles with regards to infrastructure and misfueling of vehicles/engines not approved for mid-level use**
 - EPA outlines the partial/conditional waiver issue in the RFS2 NPRM, and we are seeking comment on the appropriateness of this method
 - EPA has engaged stakeholders on how best to deal with the misfueling and infrastructure concerns
 - EPA will be hosting a workshop with stakeholders to discuss strategies to implement a partial/conditional waiver pending the release of the RFS NPRM
- **Pursuing this approach highlights general importance of educating consumers of new fuels on benefits and impacts**