



# Cellulosic Biofuels & RFS2

Paul Argyropoulos  
Office of Transportation and Air Quality  
U.S. EPA  
November, 2009

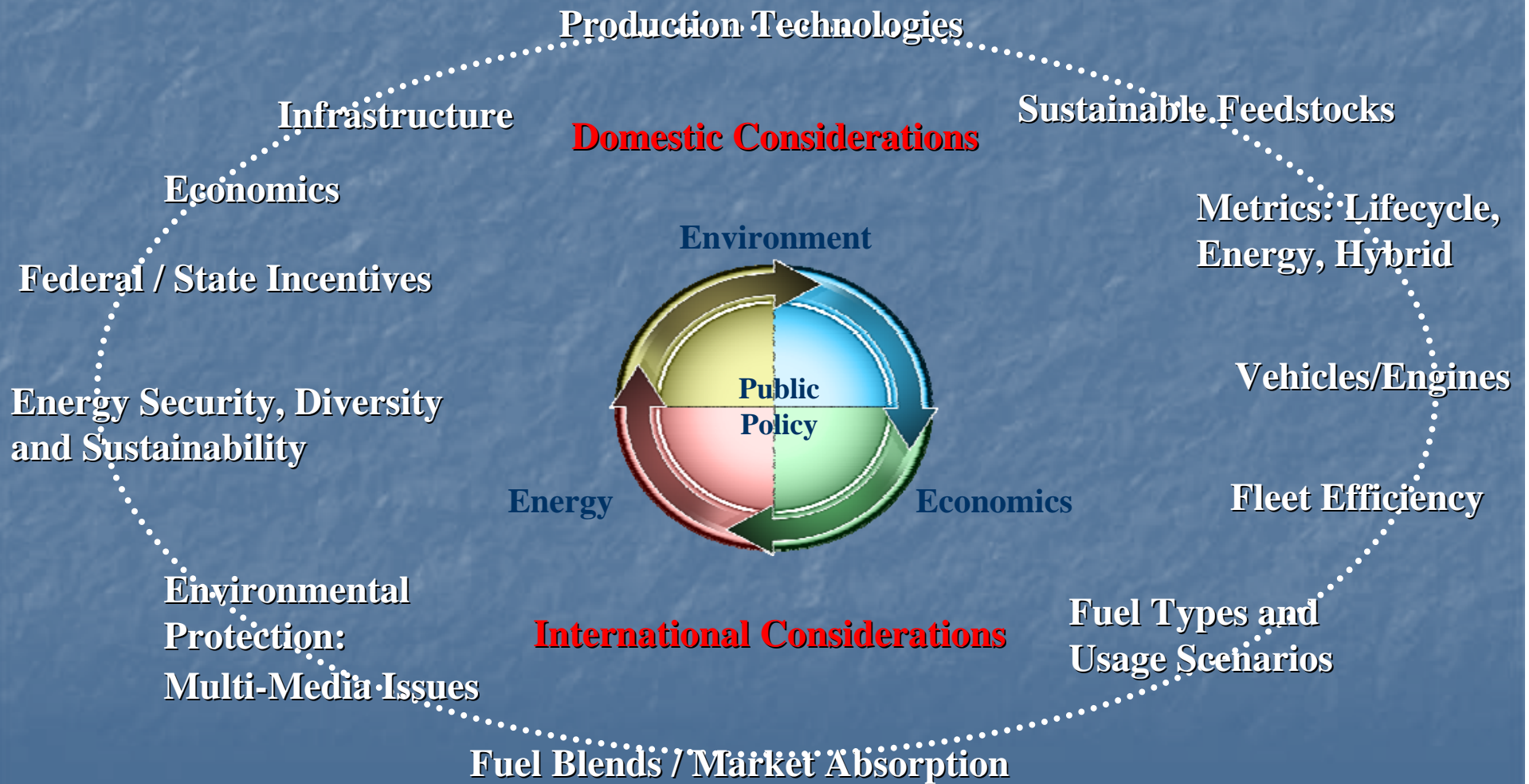




# Overview

- What's in Play?
- Update on the status of the RFS2 Rulemaking and next steps
- The role of cellulosic biofuels in the future of RFS2
- Cellulosic waiver provisions in RFS2
- Renewable biomass definition
- Other implications and questions

# What's in Play?



# Rulemaking Refresher



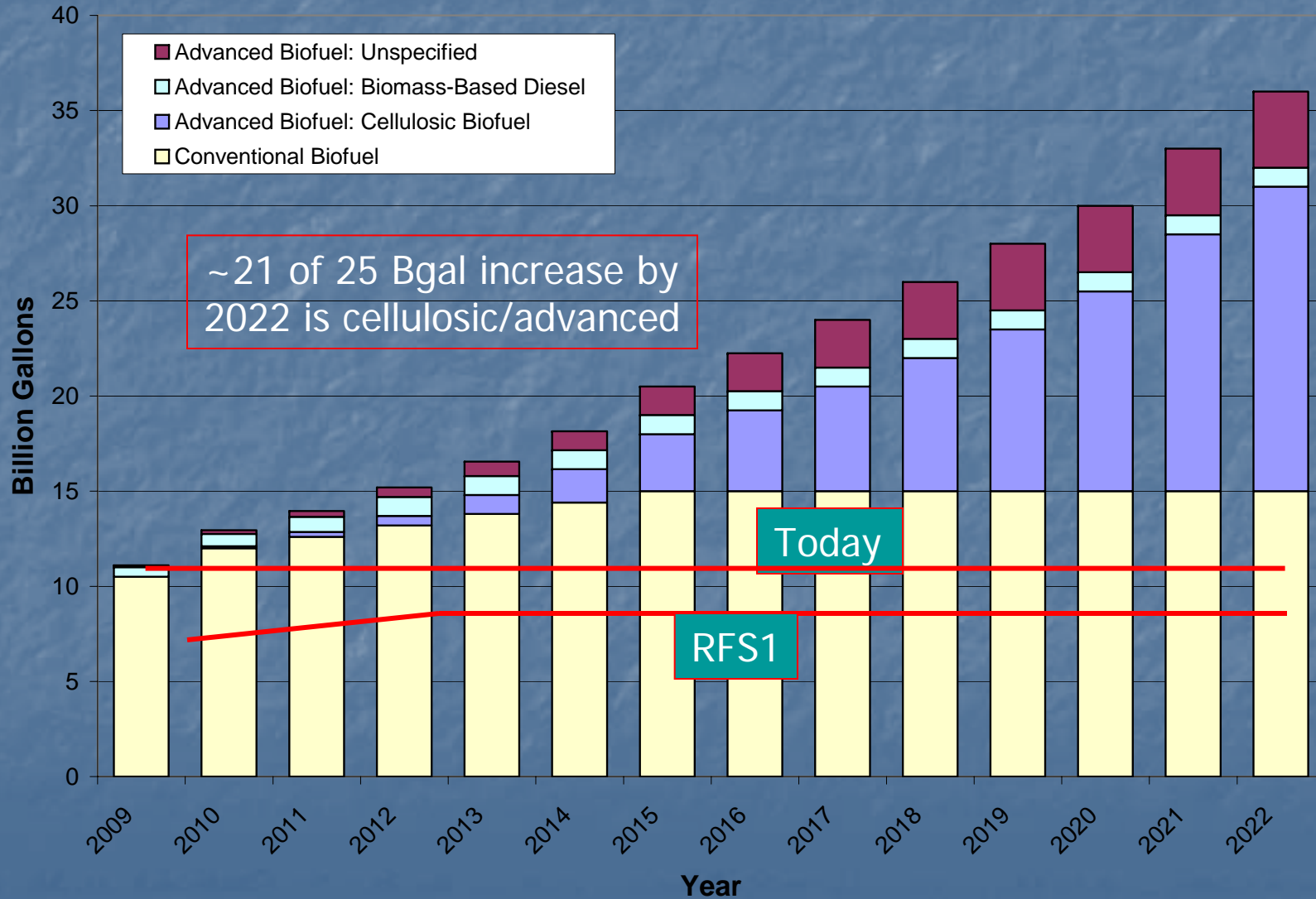
- On May 5, Administrator Jackson signed the Renewable Fuel Standard (RFS2) proposal required by EISA
  - Published in the Federal Register on May 26
  - Public hearing held June 9
  
- Formal Peer Review of lifecycle GHG analyses released for comment in early August
  
- Official comment period closed Sept 25
  - Thousands of public comments received – hundreds of substantive comments
  
- Working hard to complete rule as expeditiously as possible.
  
- Regardless of When: Successful implementation of RFS2 in 2010 will require a concerted effort by EPA and industry
  - Expanded registration process to implement the new provisions and standards
  - New renewable biomass definition
  - Many newly regulated parties

# Mandate for Cellulosic Biofuels is the Heart of RFS2 in EISA

- Large mandated growth in renewable fuels set in EISA - 36 Bgal by 2022
  - 21 Bgal of advanced biofuels
    - 16 Bgal cellulosic
  - 15 Bgal preserved for conventional biofuels
    - Double the volume from EPAAct 2005



# Cellulosic Biofuels in EISA



# RFS2 Benefits Driven by Cellulosic Biofuels



- Per gallon benefits
  - Energy savings
  - Greenhouse gas emission reductions
- Multiplied by majority of gallons means:
  - Story of RFS2, as mandated by Congress, cellulosic and other advanced biofuels key to RFS2
- In addition, these fuels generally tend to exhibit a lower level of concern with respect to other sustainability issues

# The List of Companies Pursuing Cellulosic Ethanol & Other Alcohols is Growing

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- Abengoa
  - Agresti Biofuels
  - BlueFire
  - Biobutanol LLC.<sup>BP</sup>
  - Catchlight Energy<sup>Ch</sup>
  - Clearfuels Technology
  - Coskata
  - DuPont Danisco
  - Enerkem
  - Florida Crystals
  - Fulcrum Bioenergy
  - Gevo<sup>Tot</sup>
  - Gulf Coast Energy
  - ICM
  - INEOS Bio
  - Iogen<sup>Sh</sup>
  - Mascoma<sup>Mar</sup>
  - ~~Novozymes~~
  - PanGen Global
  - Pencor/Masada
  - POET
  - PureVision
  - Qteros<sup>BP,Val</sup>
  - Range Fuels
  - Raven Biofuels
  - Verenium<sup>BP</sup>
  - Zechem<sup>Val</sup>

*This list is illustrative.*

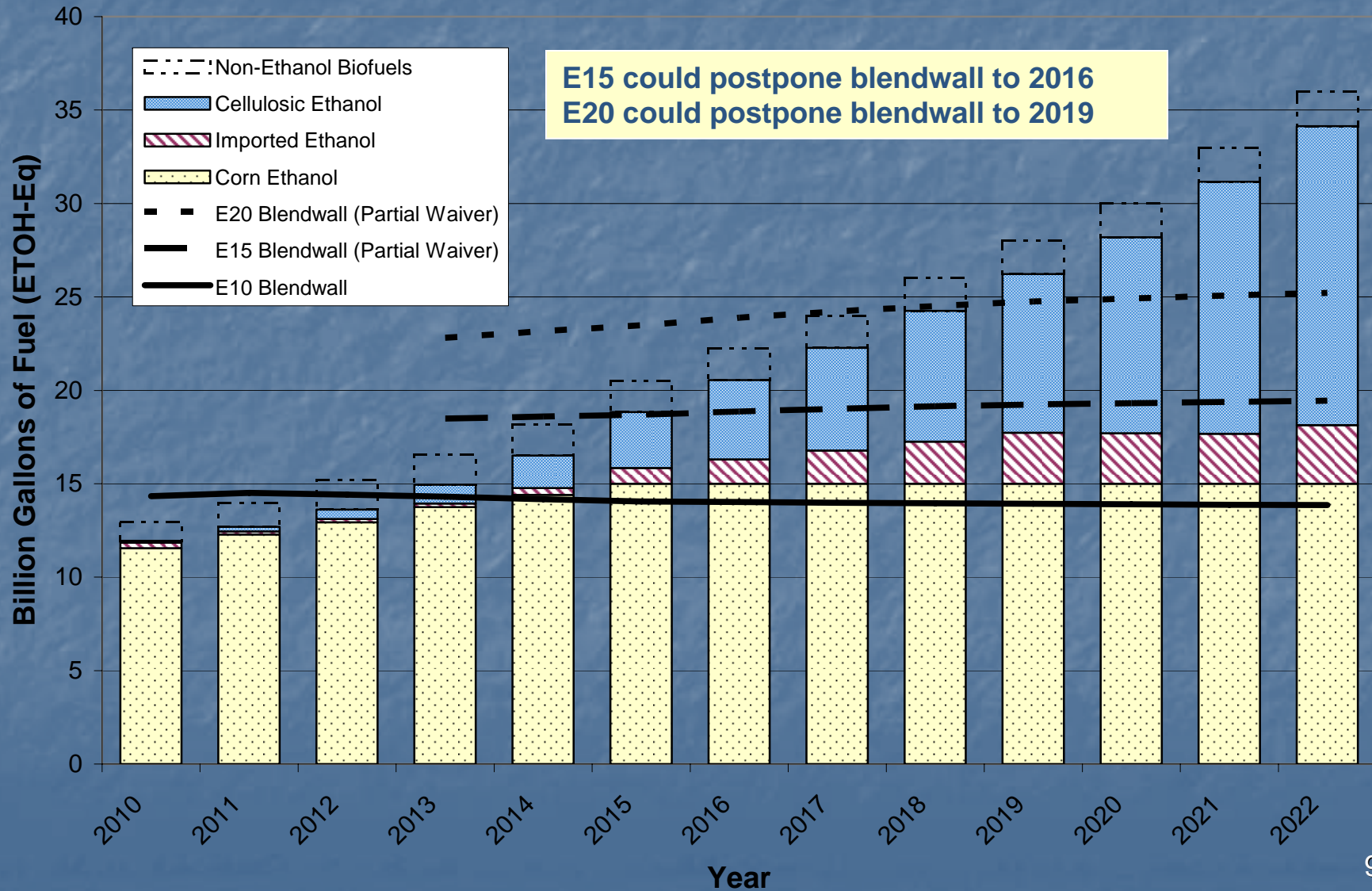
Oil Company Investments: BP=British Petroleum, Ch=Chevron,  
Mar=Marathon, Sh=Shell, Tot=Total, Val=Valero



# Ethanol in Gasoline Currently Faces Issues with "The Blendwall"



(Based on AEO 2009 ER & Other NPRM Assumptions)





## Fuels That Are Transparent to the Marketplace Have an Advantage

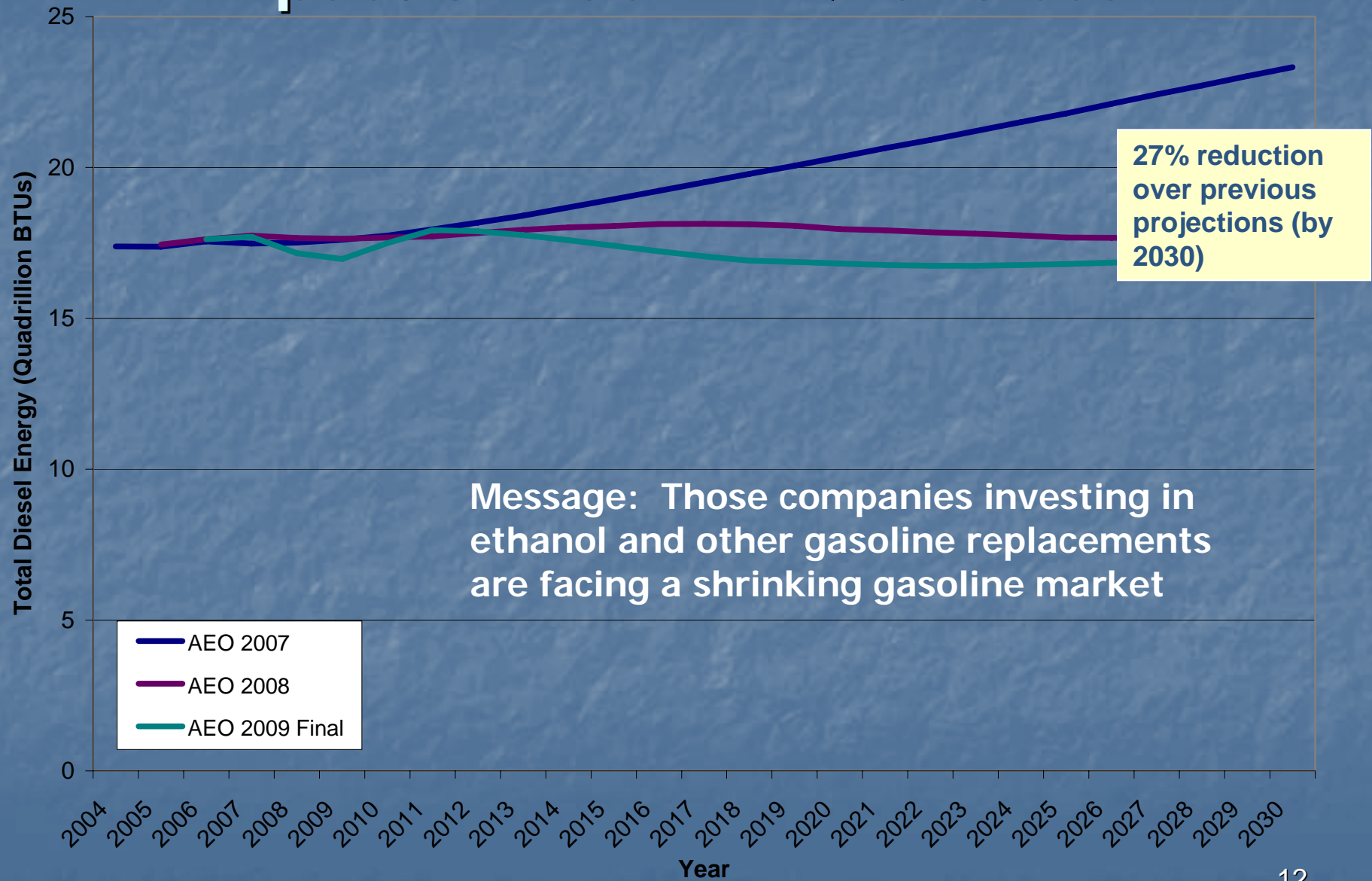
- Mid-level ethanol blends, by themselves cannot reach the RFS2 mandated volumes – or go beyond
- E85 economics makes it a tough sell
  - Needs to be priced appropriately comparative to gasoline
- Conversely, there may be fewer barriers of entry into the marketplace for other renewable products such as:
  - Renewable gasolines, diesels, jet fuels
  - Key - possible use in existing fleet and fuel infrastructure without modification
  - However, also need to be competitive economically

# Many Companies Pursuing Cellulosic Diesel & Advanced Hydrocarbons

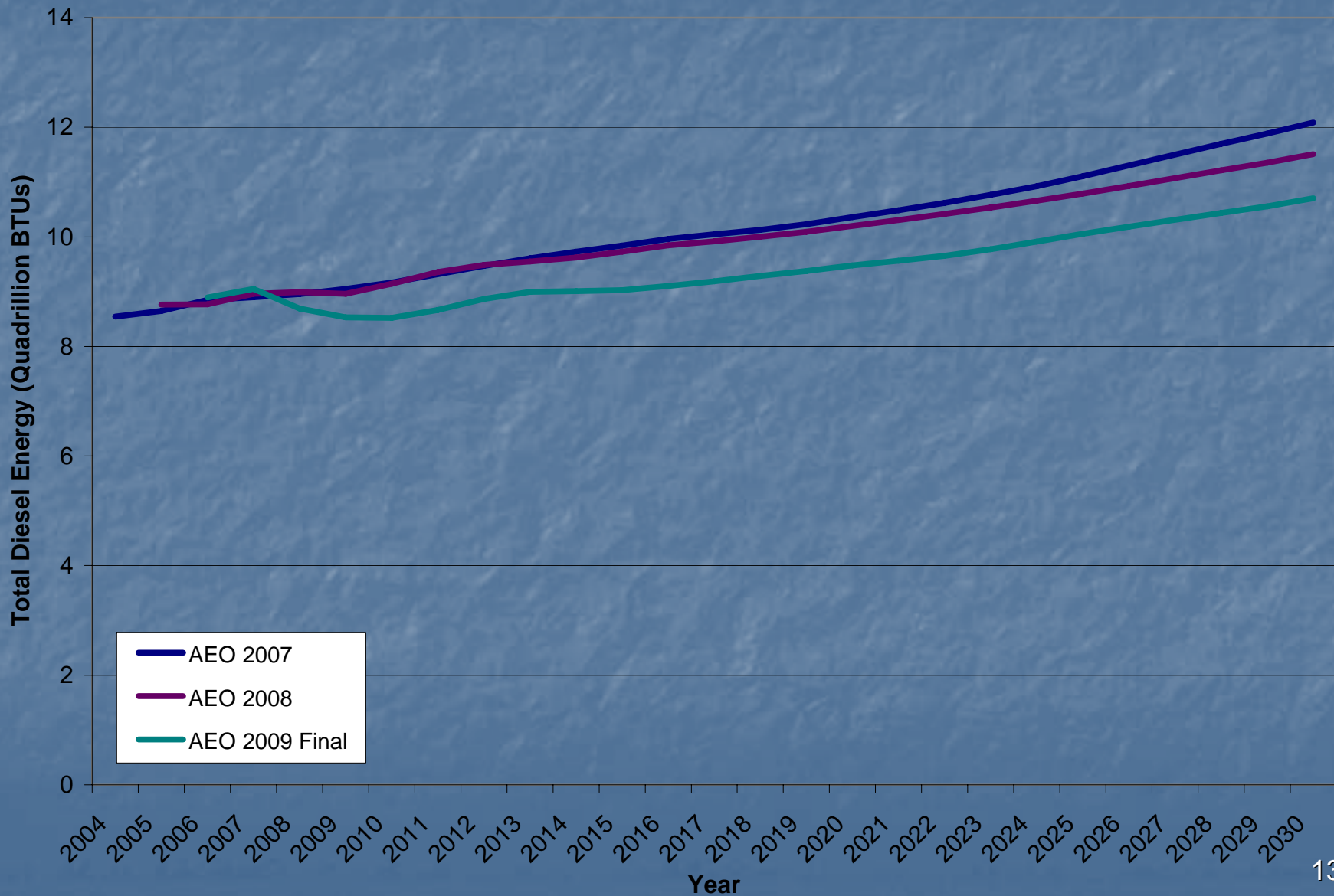
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- Amyris
  - Baard
  - Bell Bioenergy
  - Cello
  - Choren<sup>Sh</sup>
  - Clearfuels Technology
  - Envergent (UOP/Ensyn)
  - Dynamotive
  - Flambeau River Biofuels
  - Gulf Coast Energy
  - KiOR
  - LS9
  - NewPage / Chemrec
  - Petrobras
  - Swift Fuels
  - Rentech
  - Terrabon
  - TRI
  - Virent<sup>Sh</sup>
- Additional companies (Neste, Syntroleum, etc.) pursuing renewable diesel

*This list is illustrative.*

# Gasoline Market is Shrinking – What is Impact on Fuel Mix / Choices?



# Diesel Market Continues to Expand – How Does This Influence Fuel Mix / Choices?



# Optimal Fuel/s?

- Low GHG
- High comparative energy value
- Low cost / cost competitive
- Replaces fuels whose demand is increasing (e.g., diesel, jet)
- More transparent with existing vehicle and fuel delivery / storage / use infrastructure
- No meaningful sustainability issues
  - Competition for prime lands
  - Food vs Feed vs. Fuel
  - Sensitive habitats
  - Etc.
- **SCALE:** Able to replace very large percentages of crude oil derived products



# Some of the Companies Pursuing Algae-Based Biofuels



- Algenol
- Aurora Biofuels
- Cellana<sup>Sh</sup>
- Live Fuels
- Petroalgae
- Petrosun
- Sapphire Energy
- Solazyme<sup>BP</sup>
- Solix Biofuels<sup>Val</sup>
- SunEco Energy
- Synthetic Genomics<sup>BP,EM</sup>

*This list is illustrative.*

Oil Company Investments: BP=British Petroleum, EM=Exxon Mobil,  
Sh=Shell, Val=Valero

# Cellulosic Biofuel Credit Provisions



- **Cellulosic Biofuel Standard: Irrespective of the volumes required in the Act**
  - Administrator must set the cellulosic standard each November for the following year "Based on" October 31<sup>st</sup> EIA projections
- **If cellulosic standard is set less than volume required in Act - EPA must make EPA-credits available for sale to obligated parties in meeting the lowered standard at the greater of:**
  - 25 cent/gallon – or value greater than 25 c/gal based on EISA Formula:
  - \$3.00 per gallon less the wholesale price of gasoline (adjusted for inflation)
    - (Example 1:  $\$3.00 - 2.82 = .18$  c/gal) - Since this is less than 25c/g, it would default to 25 c/gal
    - Example 2: (Example 1:  $\$3.00 - 1.80 = 1.20$  c/gal) - Since this is more than 25c/g, the credit would sell for \$1.20/gal
- **If the cellulosic standard is lowered, EPA can lower the volume standards for advanced biofuel and total renewable fuel accordingly**
- **Standard/s for 2010 may be set as part of the RFS2 FRM**



# Another Key Consideration in EISA

## - Not All Feedstocks Count Under RFS2 -



- **EISA restricts the types of renewable fuel feedstocks and land that feedstocks can come from**
  - 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
  - Only separated yard and food waste portions of MSW
  - Provisions apply domestically as well as internationally
  
- **We proposed to that renewable producers could only generate RINs for fuel produced from feedstocks for which they have documentation that it qualifies**
  - Requires new tracking of feedstocks from point of production to renewable fuel producers
  - Recognizing the burden and complicated nature of the provision, we sought comment on a wide range of alternatives
  
- **As expected, we received near unanimous support to find some way to simplify the implementation of the provision**

# Other Implications and Questions



Disclaimer: Information in this presentation is not intended to convey any final decisions pertaining to the current deliberative process the Agency is undergoing to complete the final rule for the RFS2 program.

**Thank you**

Paul Argyropoulos  
Senior Policy Advisor  
Office of Transportation and Air Quality  
[argyropoulos.paul@epa.gov](mailto:argyropoulos.paul@epa.gov)