

Michigan's Renewable Energy Roadmap

Increasing Renewable Energy Production Within Michigan Will:

- Create jobs
- Create clean, non-polluting energy sources within Michigan
- Reduce amount of energy purchased out-of-state



Green Jobs

- America's Energy Problem can be Michigan's Economic Solution
- John Doerr – Green tech will be the single biggest economic opportunity of the 21st Century.
- Venture capital dollars pouring into renewable energy at rates far exceeding the internet boom.
- Early stages of a green industrial revolution.

Michigan Fuel Imports:

- \$20 billion per year
- 100% of coal used for power generation
- 96% of transportation fuels
- 75% of natural gas

Cost of fuels will continue to increase

- Increasing demand – China and India
- Carbon regulation
- Cost of extraction and transportation
- Diminishing supply

Michigan Renewable Energy Goals:

- 25% of Michigan's energy from renewable sources by 2025
- 25% of Michigan's transportation fuels from renewable energy by 2025
- 1% per year reduction in energy demand
- Create Tens of Thousands of New Jobs

Roadmap Overview

- Biofuels
- Wind power
- Solar, biomass, and other renewable electricity
- Advanced Battery
- Energy Efficiency
- Carbon Capture & Sequestration



Biofuels

- Renewable Fuels Commission
Recommendations Are Our Starting Point
- Centers of Excellence: Industry and universities
co-locate to commercialize technology
- Additional tax incentives to encourage biofuels
production: Anchor companies
- Infrastructure: Biofuels corridor

Wind Manufacturing Key Opportunity for Michigan

- Demand is exploding
 - More wind installed in 4th quarter of 2007 than all of 2006
 - 2007 - Nationwide
 - \$9 billion in investment;
 - 15,000 manufacturing jobs
 - 10,000 construction and operation jobs
 - 30,000 indirect jobs

Wind Manufacturing Key Opportunity for Michigan

- Michigan's Advantages
 - Manufacturing facilities and expertise
 - Expert supply chain already in possible
 - World class industrial R&D
 - Great wind resource
- Key: Pass an aggressive RPS
 - Progress: 17-1 Vote in House Energy Committee A Few Weeks Ago.
 - Well received testimony from RE manufacturers in Senate Energy Committee last week.

Wind Component Manufacturers



Solar Manufacturing in Michigan

- Hemlock Semi-Conductor
 - World's Largest Supplier of Polycrystalline Silicon
- United Solar Ovonic
 - World's Leading Producer of Thin Film Solar
- Dow Solar Solutions
 - Next Generation of Solar Installations

Energy Efficiency

- The “first fuel” for electricity
- Robust New EE programs
- CFL program
- “Pay As You Save” financing programs
- EE Workforce Development:
Collaborating with Community Colleges
- Leading By Example: Efficiency in State Government

Midwestern Regional Greenhouse Gas Reduction Accord

Signed by Midwestern leaders on November 15, 2007 at the Midwestern Governors Association (MGA) Energy Security and Climate Change Summit:

- Governor Jennifer Granholm of Michigan
- Governor Rod Blagojevich of Illinois
- Governor Chester J. Culver of Iowa
- Governor Jim Doyle of Wisconsin
- Governor Tim Pawlenty of Minnesota
- Governor Kathleen Sebelius of Kansas
- Premier Gary Doer of Manitoba

Midwestern Regional Greenhouse Gas Reduction Accord

- Regional Goal: Maximize the energy resources and economic advantages and opportunities of Midwestern states while reducing emissions of atmospheric CO₂ and other greenhouse gases.
- Establish greenhouse gas reduction targets and timeframes
- Develop a market-based and multi-sector cap-and-trade mechanism to help achieve those reduction targets

MGA Energy Security and Climate Stewardship Platform Themes

- Biobased Products and Transportation
- Renewable Electricity
- Advanced Coal and Carbon Capture and Storage
- Energy Efficiency

MGA Biobased Products and Transportation Goals

- By 2012: Advanced cellulosic and other low-carbon transportation fuels should be commercially produced in the region.
- By 2015: E85 will be offered at 15% of retail filling stations, or around 4,400 stations – five-fold increase. Currently, E85 is available at 3% of filling stations regionally.

MGA Biobased Products and Transportation Goals

- By 2020: E85 will be offered at 20% of retail filling stations, or around 5,900 stations – six-fold increase.
- By 2025: E85 will be offered at 33% of retail filling stations, or around 9,700 stations – 10-fold increase.
- By 2025: Average fossil fuel inputs in the production of conventional biofuels in the region will be reduced by 50%.

MGA Biobased Products and Transportation Goals

- By 2025: At least 50% of all transportation energy consumed in the region will be supplied by regionally produced biofuels and other low-carbon advanced transportation fuels, with the expectation that a significant and additional portion of the region's biofuel production will help the U.S. meet a national 25 x'25 goal.
- 14 policy options to achieve these goals

Michigan Climate Action Council

- **Executive Order No. 2007-42** issued on November 14, 2007, establishing the Michigan Climate Action Council
- Climate change is the focus of intense scientific scrutiny
- Modeling efforts all over the world
- Extraordinary scientific consensus
- CO₂ concentration is increasing
- For the last 650,000 years CO₂ -- 300ppm
- Now 381 ppm increasing at >3ppm per year

Michigan Climate Action Council

The Council consists of the following members:

- Director of the DEQ
- Director of the MDA
- Director of the DLEG
- Director of the DMB
- Director of the DNR
- Chairperson of Agriculture Commission
- President of the Michigan Strategic Fund
- Chairperson of the PSC
- State Climatologist
- 27 other residents of the state appointed by the Governor

Michigan Climate Action Council

Comprised of members representing academia, industry, utilities, state and local government, and environmental interest groups. Council will act in an advisory capacity to:

- Produce an inventory and forecast of greenhouse gas sources and emissions from 1990-2020;
- Consider potential state and multi-state actions to mitigate and adapt to climate change in various sectors including energy supply, energy efficiency and conservation, industrial process and waste management, transportation and land use, and agriculture and forestry;
- Develop a comprehensive climate action plan with specific recommendations for reducing greenhouse gases in MI by business, government and the general public;
- Advise state and local government on measures to address climate change.

Michigan Climate Action Council

The Council shall complete its work in two phases:

- By April 30, 2008, the Council will develop an interim report with a list of policy recommendations on reducing greenhouse gas emissions to meet short-, mid-and long term goals or targets.
- By December 31, 2008, the Council shall issue a comprehensive Climate Change plan for Michigan. The Plan will further develop the policy recommendations in the interim report and include an assessment of climate change impacts to Michigan including likelihood of occurrence, and recommendations for adaptive measures. The Council shall also recommend legislation to support its recommendations.

Michigan Climate Action Council

- The Council is being supported by the DEQ, which is the lead state agency for this effort and by the Center for Climate Strategies (CCS) a nonprofit service organization that has substantial experience working directly with public officials and their stakeholders to facilitate the development of climate action plans.
- Five technical work groups will have further input into the process by reviewing technical documents, developing and reviewing proposed policy actions and recommendations and providing feedback on priorities.

Federal Energy Bill

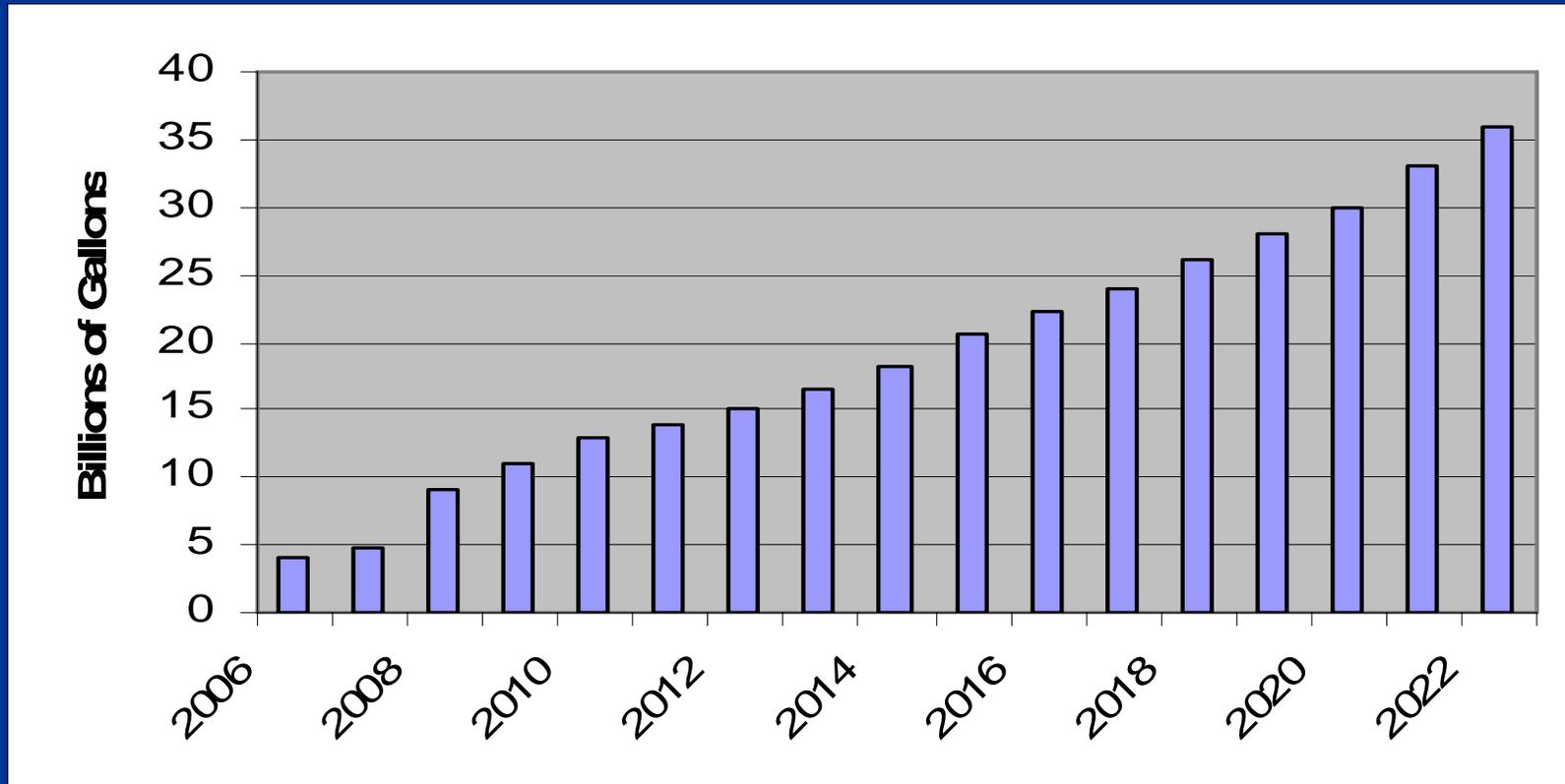
- The Energy Independence and Security Act of 2007, U.S. Public Law No. 110-140, was signed into law on December 19, 2007.
- CAFE Standards Increase
 - Previously: 27.5 - cars, 20.7 - light trucks.
 - Fleetwide Average of 35 mpg by 2020.
 - Flex fuel credit preserved: 1.2 mpg for flex fuel vehicles. Phased out (.2 mpg per year decrease) from MY 2015-2020.
 - Grant and loan programs authorized

Federal Energy Bill - RFS

- Previous Renewable Fuel Standard
 - 2006 – 4.0 billion gallons
 - 2007 – 4.7 billion gallons
 - 2008 – 5.4 billion gallons
 - 2012 – 7.5 billion gallons
 - 2012 onward – 250 million gallons of cellulosic
- Current Ethanol Production
 - 2006 - 4.86 billion gallons
 - 2007 – Likely 6.5 billion gallons (5.85 billion gallons of as Nov. 30, 2007).
 - Source: Renewable Fuels Association

New Renewable Fuel Standard

- 2008 – 9 billion gallons
 - EPA determined this is 7.76% in 2008
- 2022 – 36 billion gallons
- New plants must have greenhouse gas reductions of 20% from gasoline (EPA can further reduce to 10%)

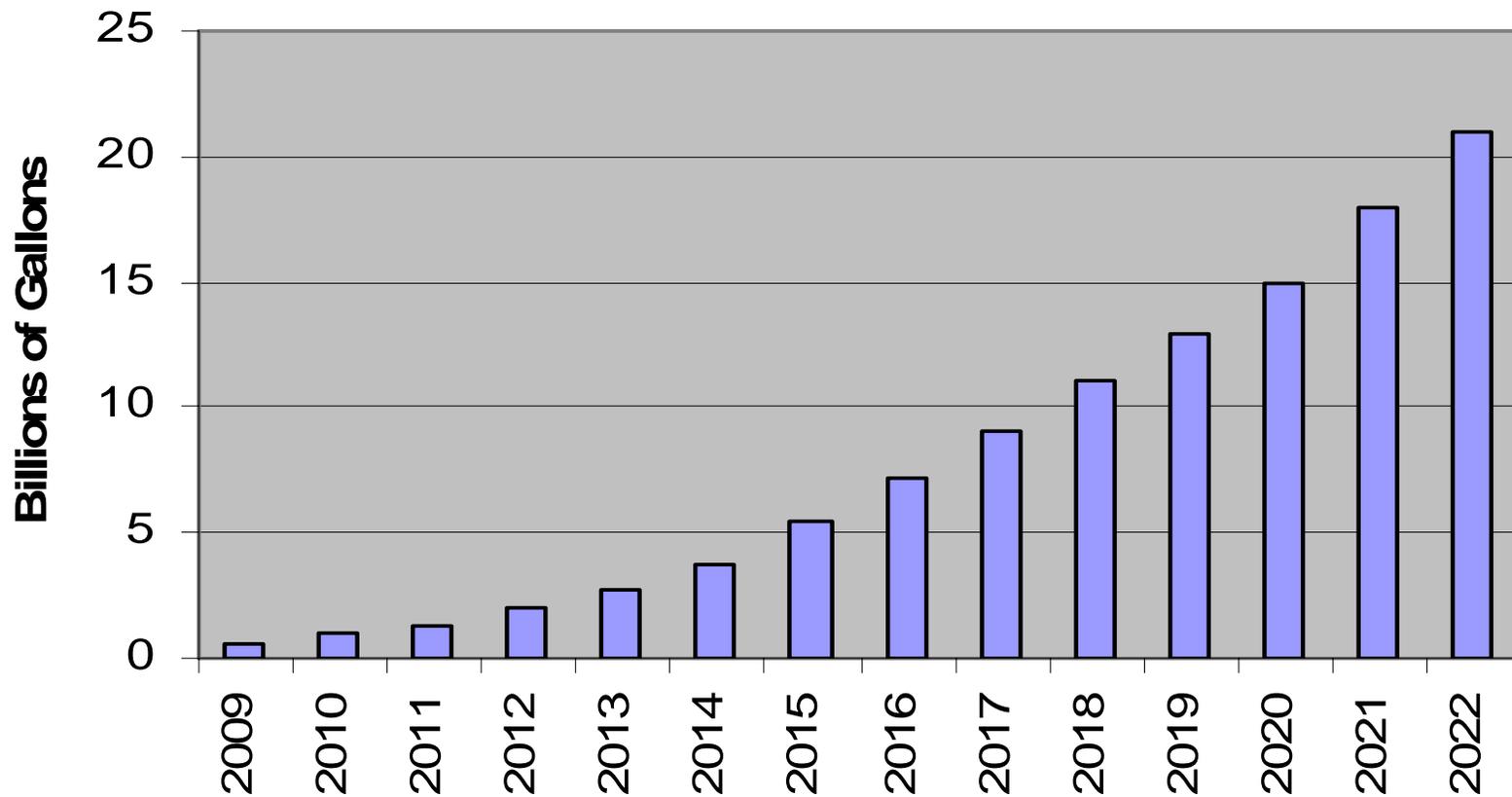


New Focus on Advanced Biofuels

- Renewable fuel, other than ethanol derived from corn starch, that has **lifecycle gas emissions...that are at least 50 percent less than gasoline or diesel.**
 - EPA still working on this methodology.
 - EPA can further reduce to 40%
- May Include:
 - Ethanol derived from cellulose, hemicellulose, or lignin
 - Ethanol derived from sugar or starch (other than corn starch)
 - Ethanol derived from waste material
 - Biomass-based diesel
 - Biogas (including landfill gas and sewage waste treatment gas) produced through the conversation of organic matter from renewable biomass
 - Butanol or other alcohols produced through the conversation of organic matter from renewable biomass
 - Other fuel derived from cellulosic biomass

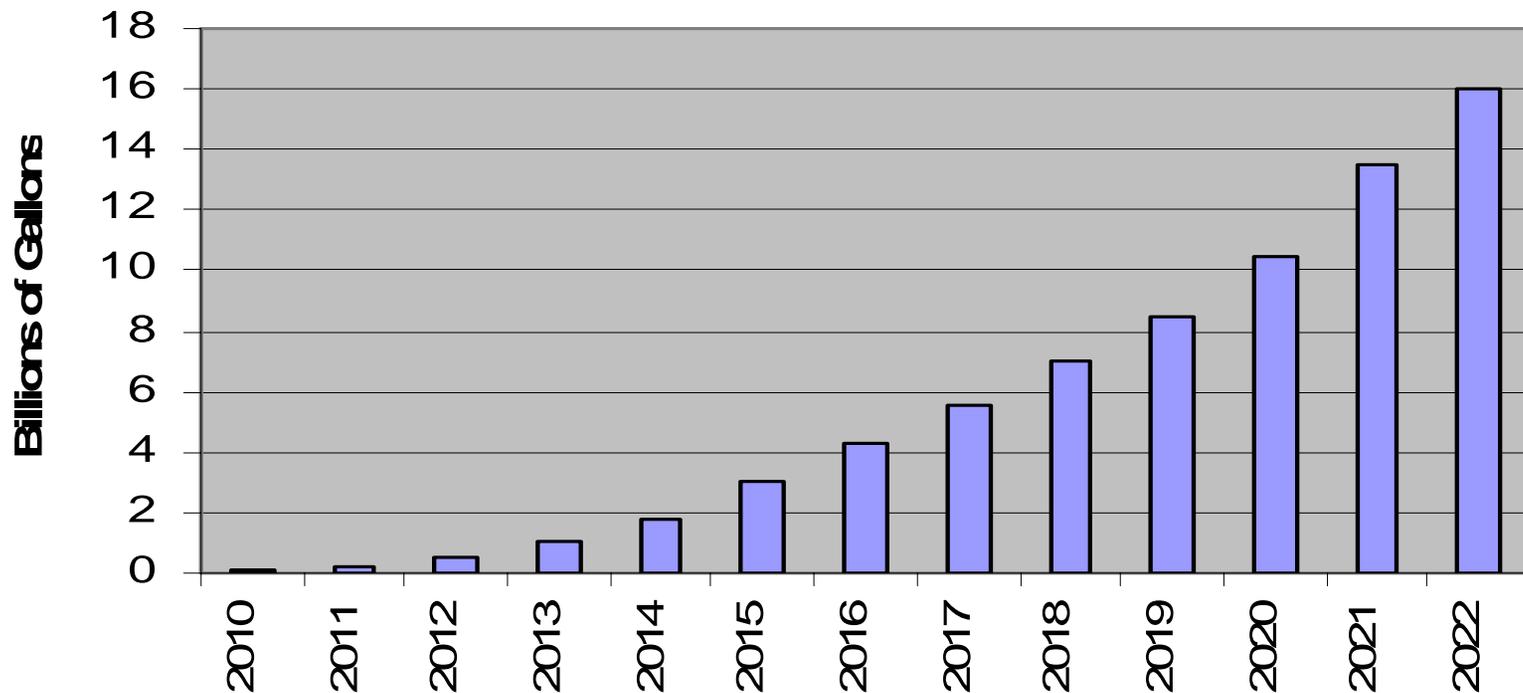
RFS for Advanced Biofuels

- 2009 – 600 million gallons
- 2022 – 21 billion gallons (so 15 billion in corn ethanol)



RFS for “Cellulosic Biofuel”

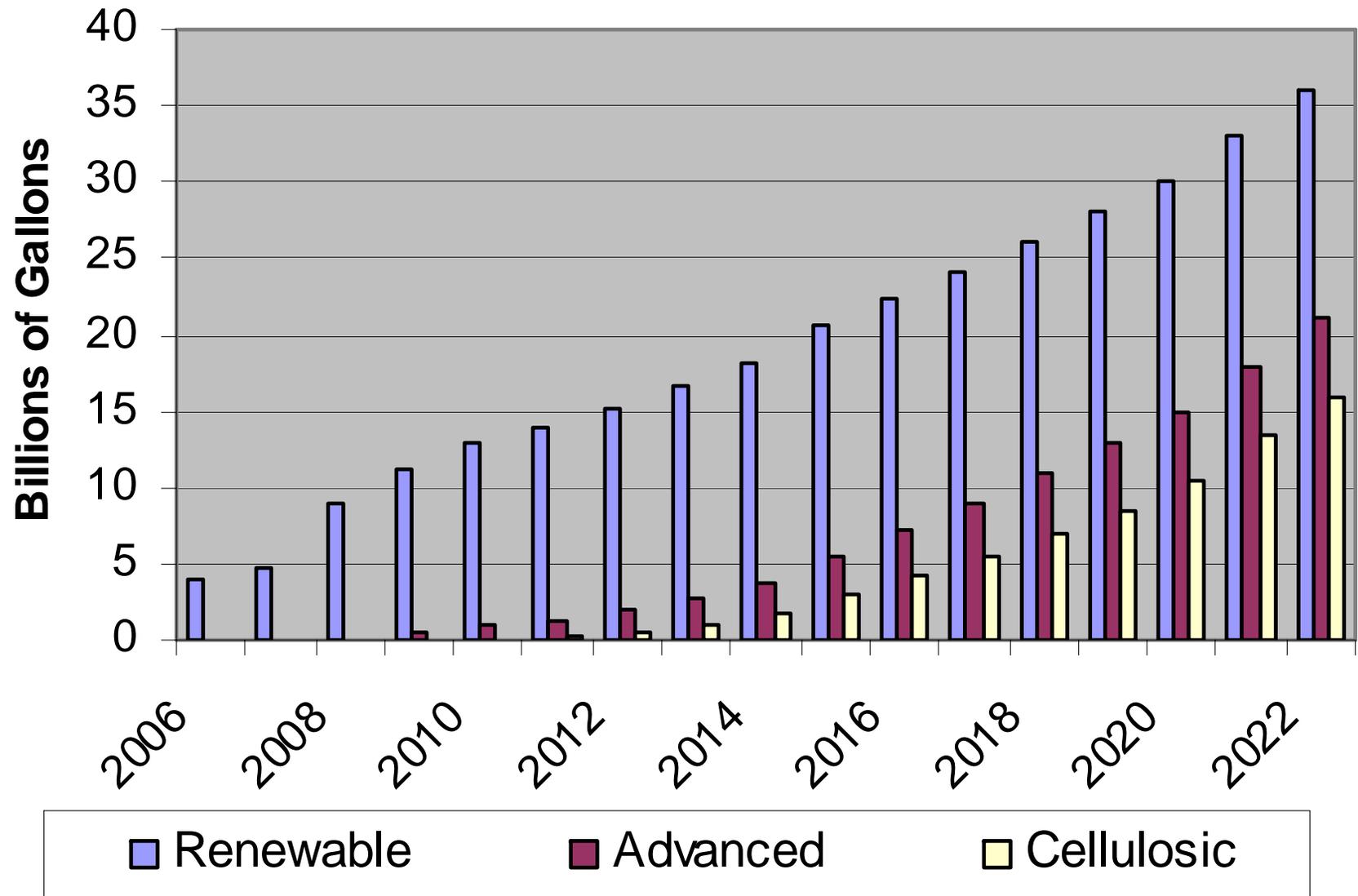
- “Renewable fuel derived from any cellulose, hemicellulose, or lignin that is derived from renewable biomass and that has **lifecycle greenhouse gas emissions that are 60% less than gasoline or diesel**”
- 2010 – 100 million gallons
- 2022 – 16 billion gallons



Safety Net for Cellulosic Biofuel RFS

- EPA can revise the RFS mandate to the projected domestic production of cellulosic biofuel in any given year
- Refiners can use credits (with a price cap) to prevent price escalation if the cellulosic ethanol is scarce

RFS Charts Combined



Biodiesel Provisions

- RFS for Biodiesel
 - 2009 – 500 million gallons
 - 2010 – 650 million gallons
 - 2011 – 800 million gallons
 - 2012 – 1 billion gallons
- Pumps shall be labeled to inform consumers of the biodiesel blend
- Unless the American Society for Testing and Materials has adopted B20 and B5 standards by the end of 2008, the EPA shall establish a uniform per gallon fuel standards by rule (which can take up to 18 months).
- EPA shall establish and annual inspection and enforcement program for compliance with standards.

Studies Required by Federal Agencies

- Impacts on feed grains, livestock, food, forest products, and energy
- Impacts on Environment and Resource Conservation
- Credits for Use of Renewable Electricity in Electric Vehicles as adjunct to RFS
- R&D challenges facing biodiesel and biogas
- Optimizing flex fuel vehicles to increase E85 efficiency
- Engine durability and performance with biodiesel
- Optimizing biogas in natural gas vehicles
- R&D of using algae as a feedstock
- Market penetration of flex fuel vehicles
- Feasibility of requiring retailers to install E85 pumps in regions where flex-fuel penetration reaches 15% of vehicles.
- Feasibility of ethanol pipelines
- Adequacy of transportation of domestic biofuels by rail or other methods

Grants Programs Authorized

- Advanced biofuels production - \$500 M
- Cellulosic Ethanol and Biofuels R&D - \$50 M
- Existing Bioenergy R&D program increase existing levels and add \$1 B in 2010
- Establish 7 bioenergy research centers
- University based competitive grant program - \$25 M
- Renewable fuel pump installation - \$1.4 B
- Biofuel production in states with low rates of ethanol production - \$75 M
- Biorefineries – R&D, demonstration, and commercialization program to increase energy efficiency and retrofit corn ethanol plants to produce cellulosic ethanol.
- Biofuels storage - R&D, demonstration, and commercialization program to improve storage and distribution

Future franchise agreements shall not restrict a franchisee from:

- Installing E85 or biodiesel pumps (except on “leased marketing premises” of franchisors)
- Converting pumps to E85 or biodiesel, so long as tanks or pumps are warranted by the manufacturer or certified by a recognized organization
- Advertising the sale of E85 or biodiesel
- Selling renewable fuel in any specified area on the marketing premises of the franchisee
- Purchasing renewable fuel from sources other than the franchisor
- Listing renewable fuel availability or prices
- Allowing for payment of renewable fuel with a credit card