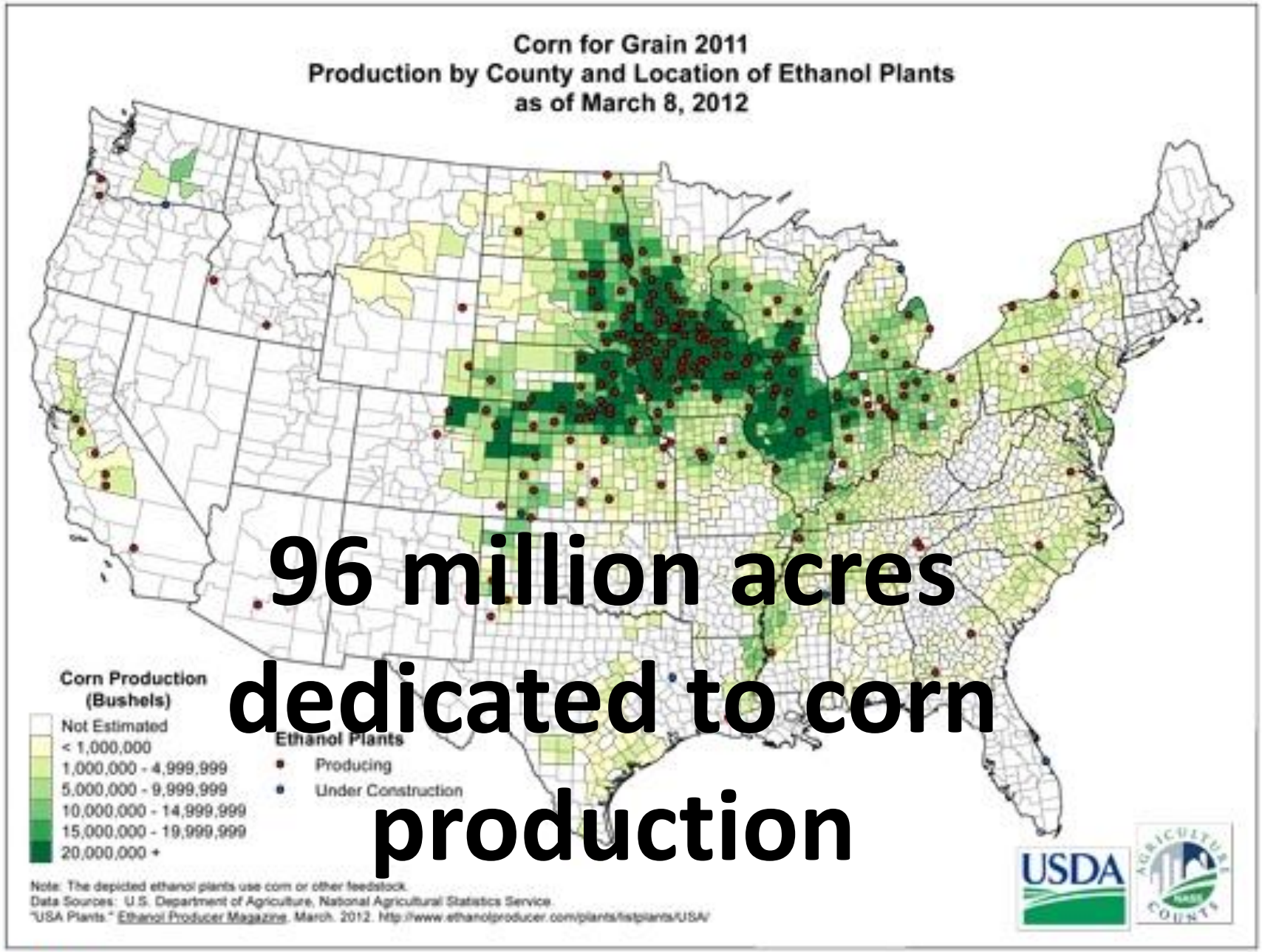
State of Play:

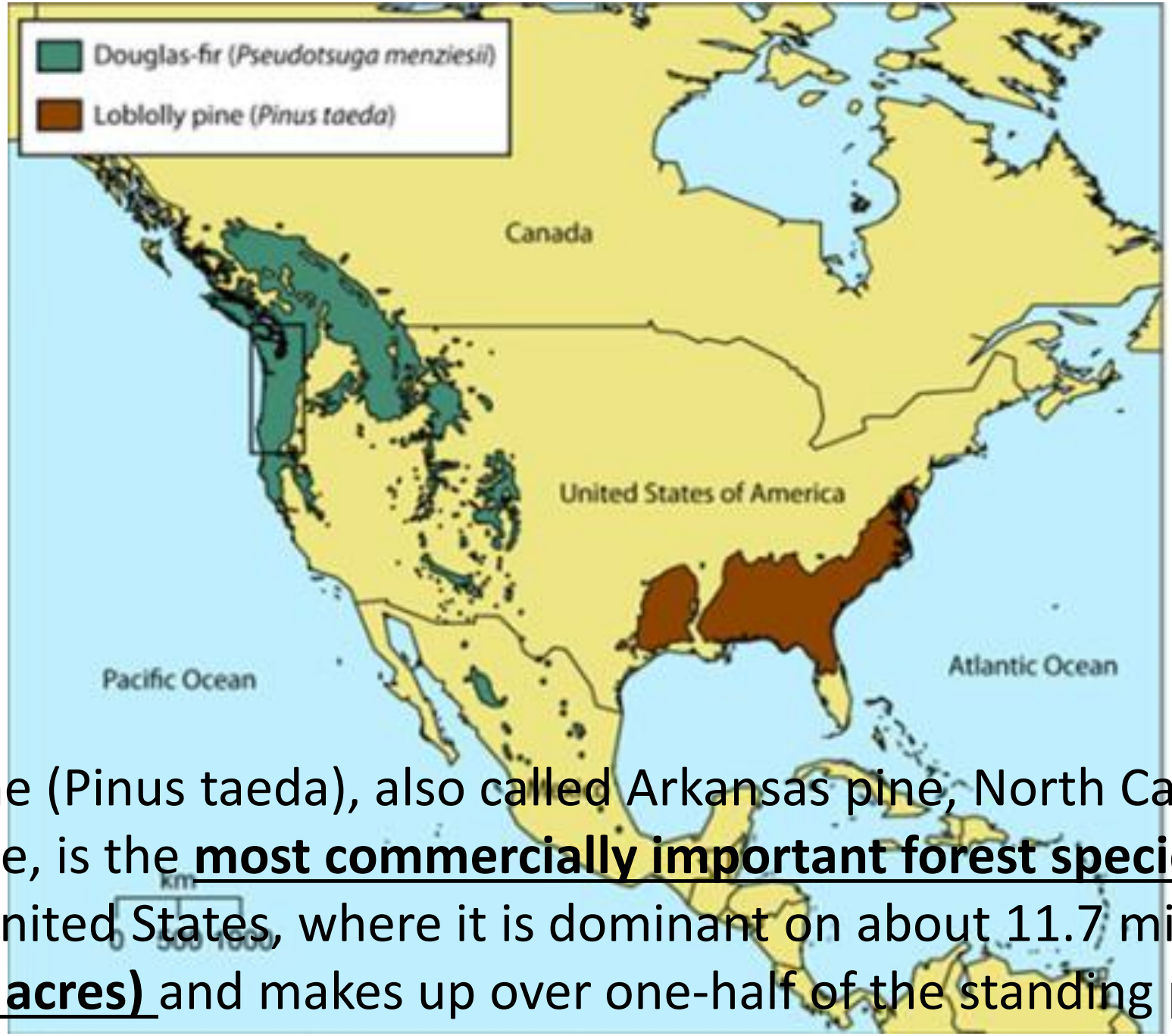
How National and International Renewable Energy Policies are Impacting North American Biomass Inventories

Renewable Fuel Standard


Renewable Energy Directive



96 million acres dedicated to corn production

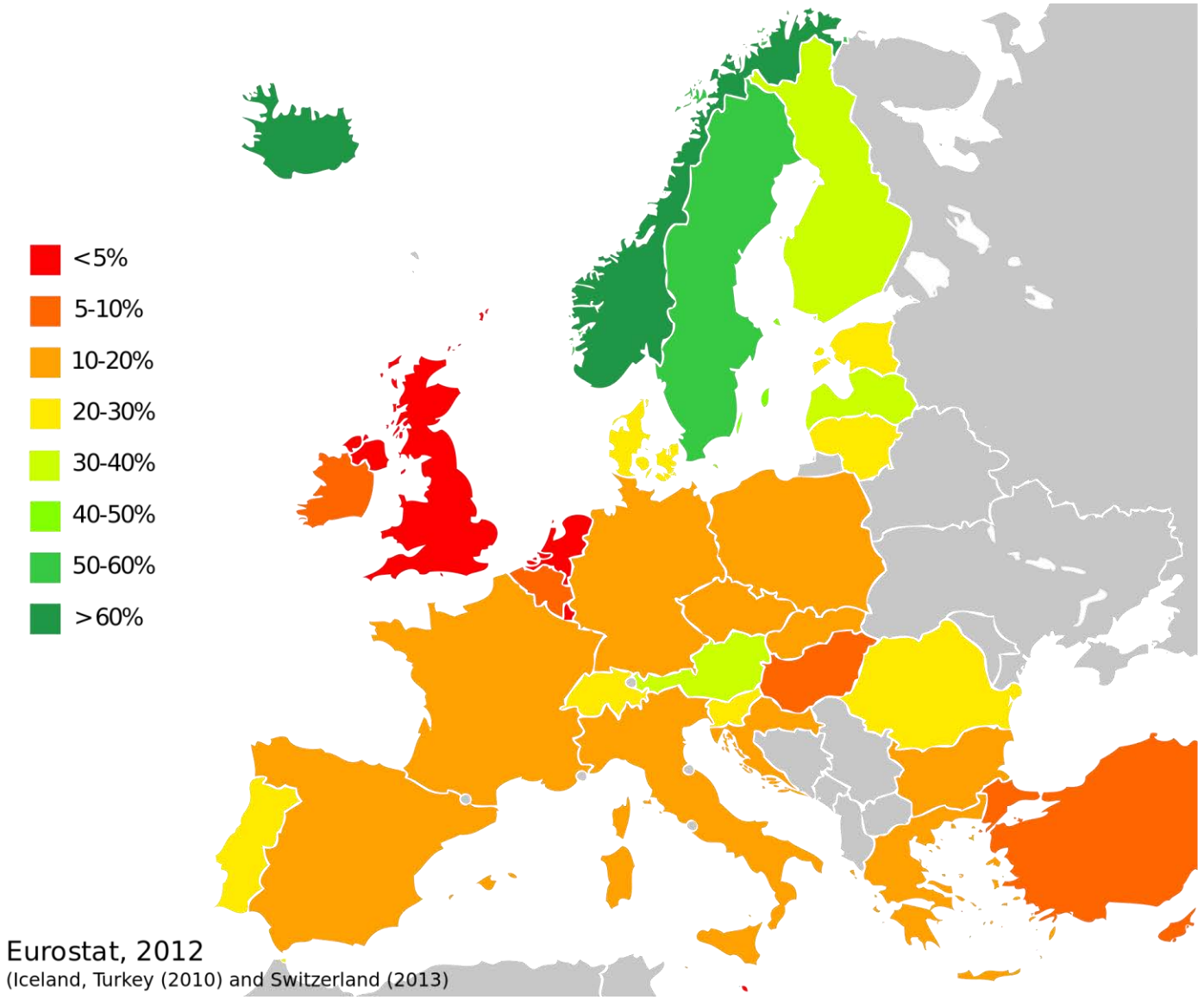


Loblolly pine (Pinus taeda), also called Arkansas pine, North Carolina pine, and oldfield pine, is the **most commercially important forest species** in the southern United States, where it is dominant on about 11.7 million ha **(29 million acres)** and makes up over one-half of the standing pine volume.

	CORN STOVER	SOUTHERN YELLOW PINE
ACRES UNDER CULTIVATION	96,000,000	29,000,000
CONVERSION APPROACH	BIOLOGICAL - FERMENTATION	MECHANICAL – EXTRUSION
NECESSARY TO REMOVE?	NO	YES
INSTALLED DEMAND	1.1 MILLION TONS	10 MILLION TONS*
POTENTIAL DEMAND	82 MILLION TONS	18.2 MILLION TONS*
OTHER SOURCES OF DEMAND	MOST OFTEN LEFT IN PLACE	PULP & PAPER, CHIP BOARD, MDF

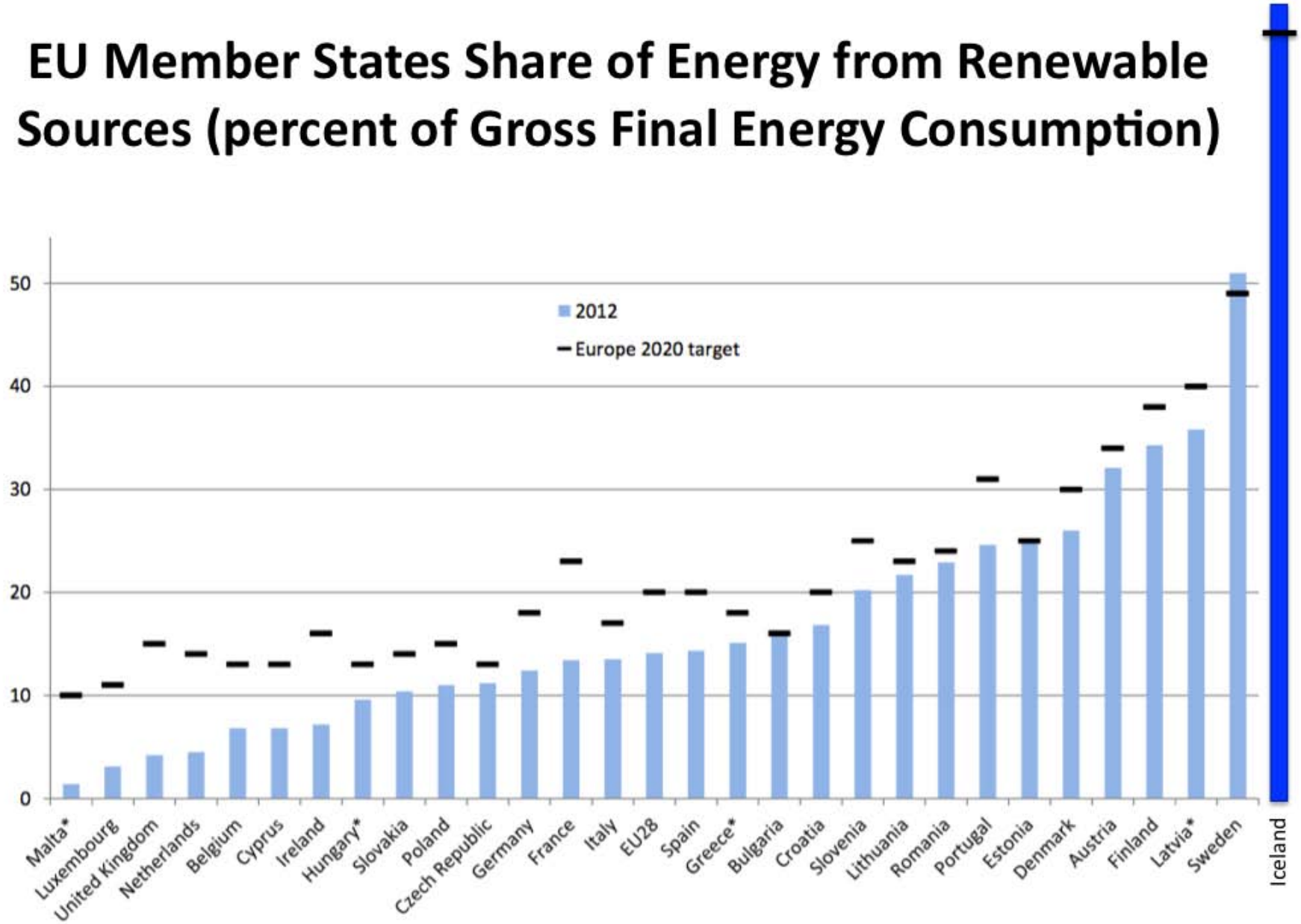
20% by 2020

The Renewable Energy Directive establishes an overall policy for the production and promotion of energy from renewable sources in the EU. It requires the EU to fulfil at least 20% of its total energy needs with renewables by 2020 – to be achieved through the attainment of individual national targets.



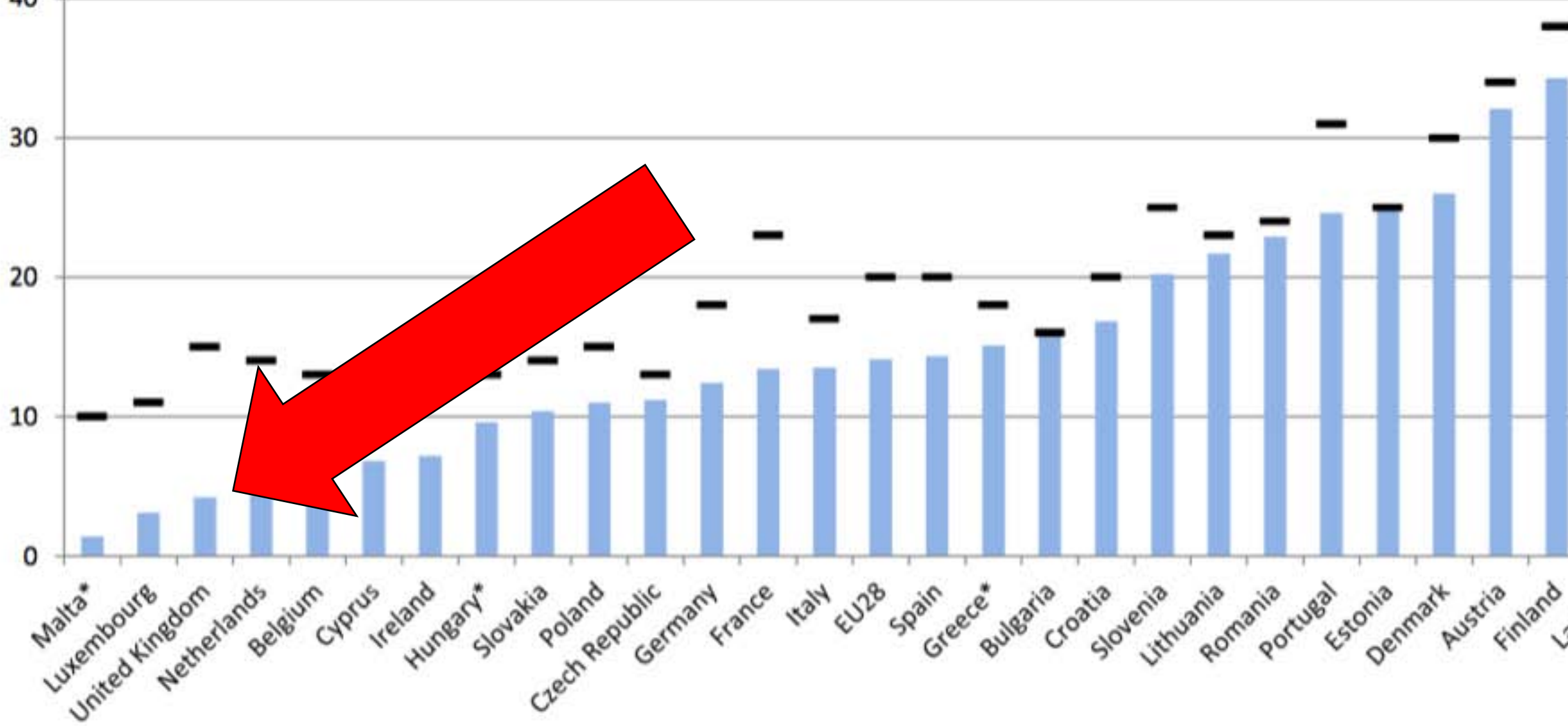
Share of Renewables in Final Energy Consumption by Country

EU Member States Share of Energy from Renewable Sources (percent of Gross Final Energy Consumption)



* Estimated

Source: Eurostat, March 2014



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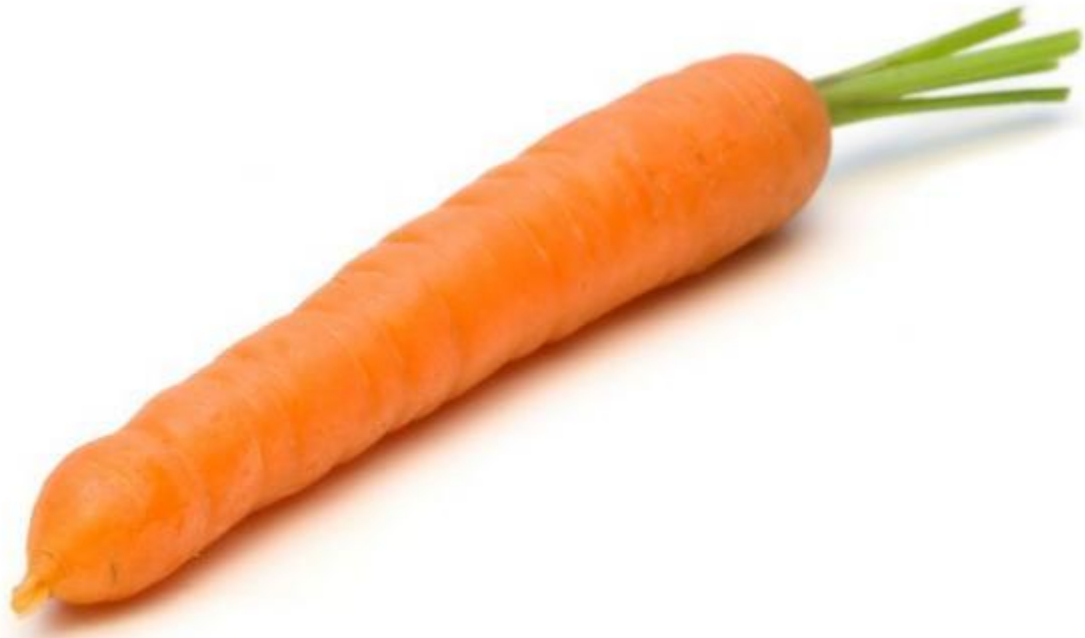


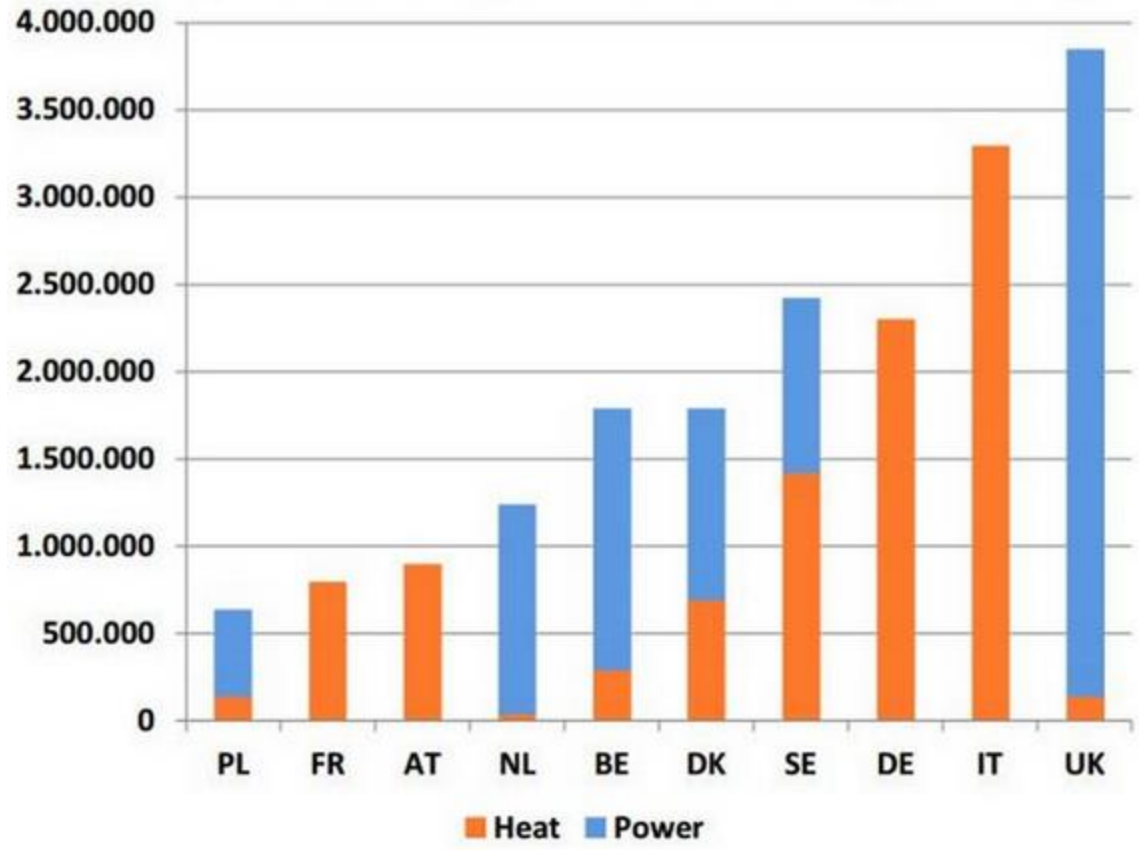
- MEP
- SDE
- SDE +
- CfD
- Renewable Obligation

- Carbon Tax
- Emissions Penalties

Pellet market

European consumption overview

EU wood pellet consumption share in 2013 [in tonnes]

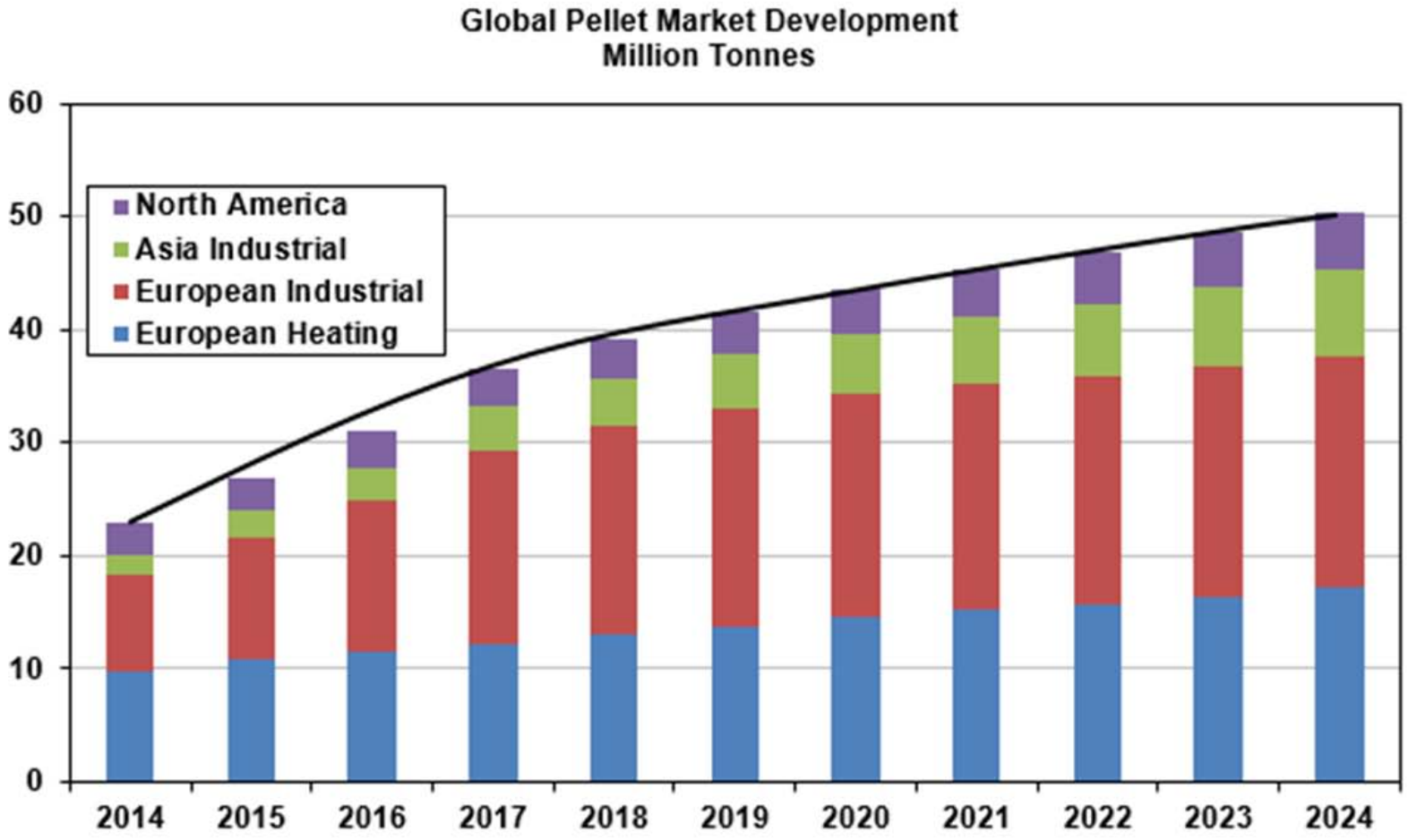


3 different markets:

- **Heat oriented market**
- **Power oriented market**
- **Mix market**

Source: European Pellet Council

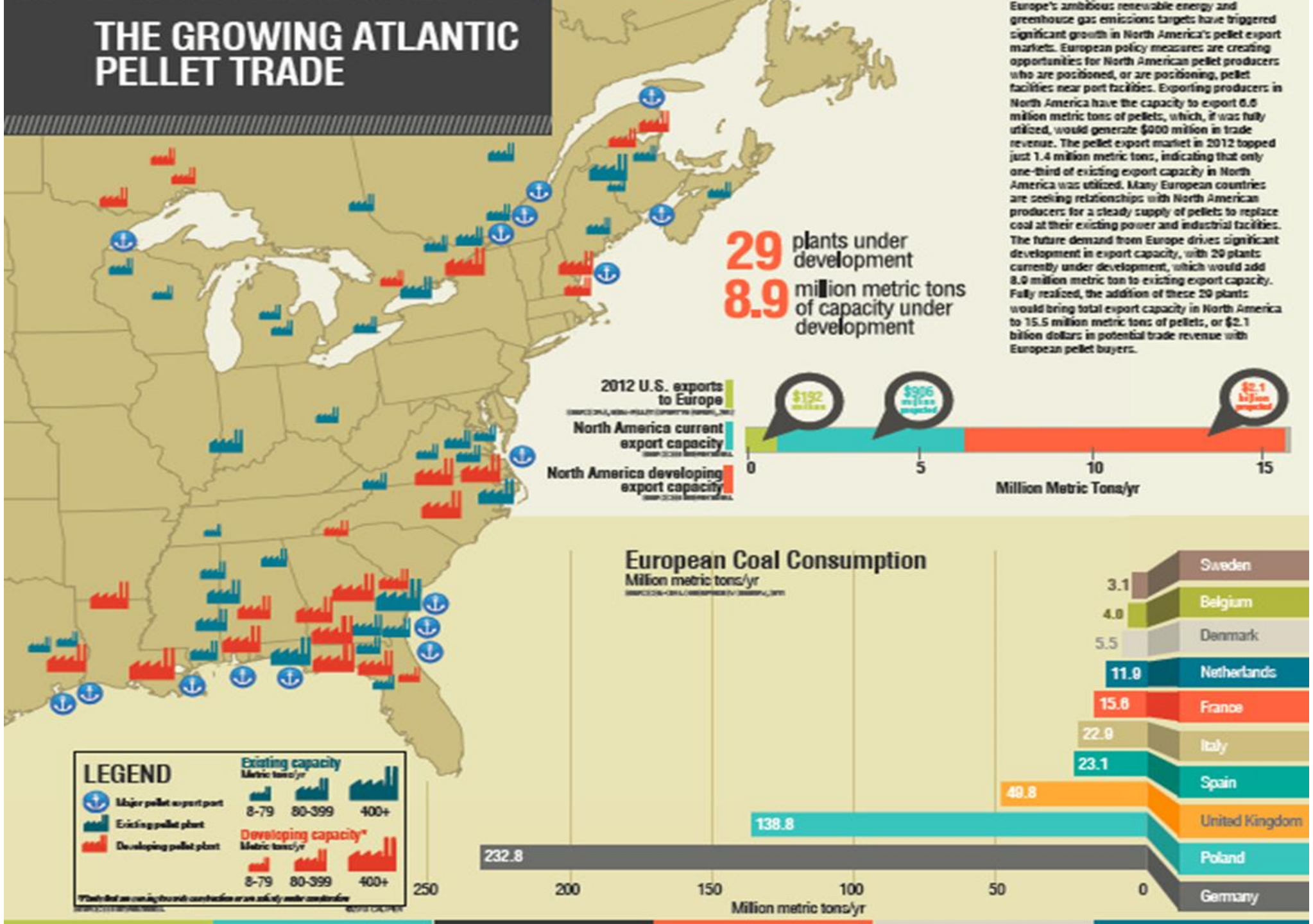
So how did we get to 50 million tonnes?



RISI

Credit:
Seth Walker
RISI

THE GROWING ATLANTIC PELLET TRADE



Europe's ambitious renewable energy and greenhouse gas emissions targets have triggered significant growth in North America's pellet export markets. European policy measures are creating opportunities for North American pellet producers who are positioned, or are positioning, pellet facilities near port facilities. Exporting producers in North America have the capacity to export 6.6 million metric tons of pellets, which, if was fully utilized, would generate $000 million in trade revenue. The pellet export market in 2012 topped just 1.4 million metric tons, indicating that only one-third of existing export capacity in North America was utilized. Many European countries are seeking relationships with North American producers for a steady supply of pellets to replace coal at their existing power and industrial facilities. The future demand from Europe drives significant development in export capacity, with 29 plants currently under development, which would add 8.9 million metric ton to existing export capacity. Fully realized, the addition of these 29 plants would bring total export capacity in North America to 15.5 million metric tons of pellets, or $2.1 billion dollars in potential trade revenue with European pellet buyers.

Total Existing Capacity - US	11,158,927
Total Under Construction Capacity - US	2,600,000
Total Proposed Capacity - US	5,415,000
Total	19,173,927

Total Existing Capacity - Canada	3,242,060
Total Under Construction Capacity - Canada	805,000
Total Proposed Capacity - Canada	1,452,216
Total	5,499,276

From a web story on Jennifer Hedrick comments at the annual Pellet Fuels Institute Conference:

"Capacity utilization plummeted from nearly 90 percent in 2007 to around 55 percent in 2009 due to price-depressing over expansion, she explained. Capacity utilization has since slowly rebuilt, with projections indicating it should reach 80 percent by 2018. North American wood pellet production is forecast to grow 14 percent annually over the next five years from 7.9 million tons in 2013 to 15.5 million tons in 2018, she continued. "

14,400,987	North American INSTALLED Capacity
- 976,000	Capacity Added in 2014/2015
13,424,987	**Installed Capacity in 2013**
x 58%	Capacity Utilization Rate

7,900,000 → **Typically Reported North American Production for 2013**


ANDRITZ
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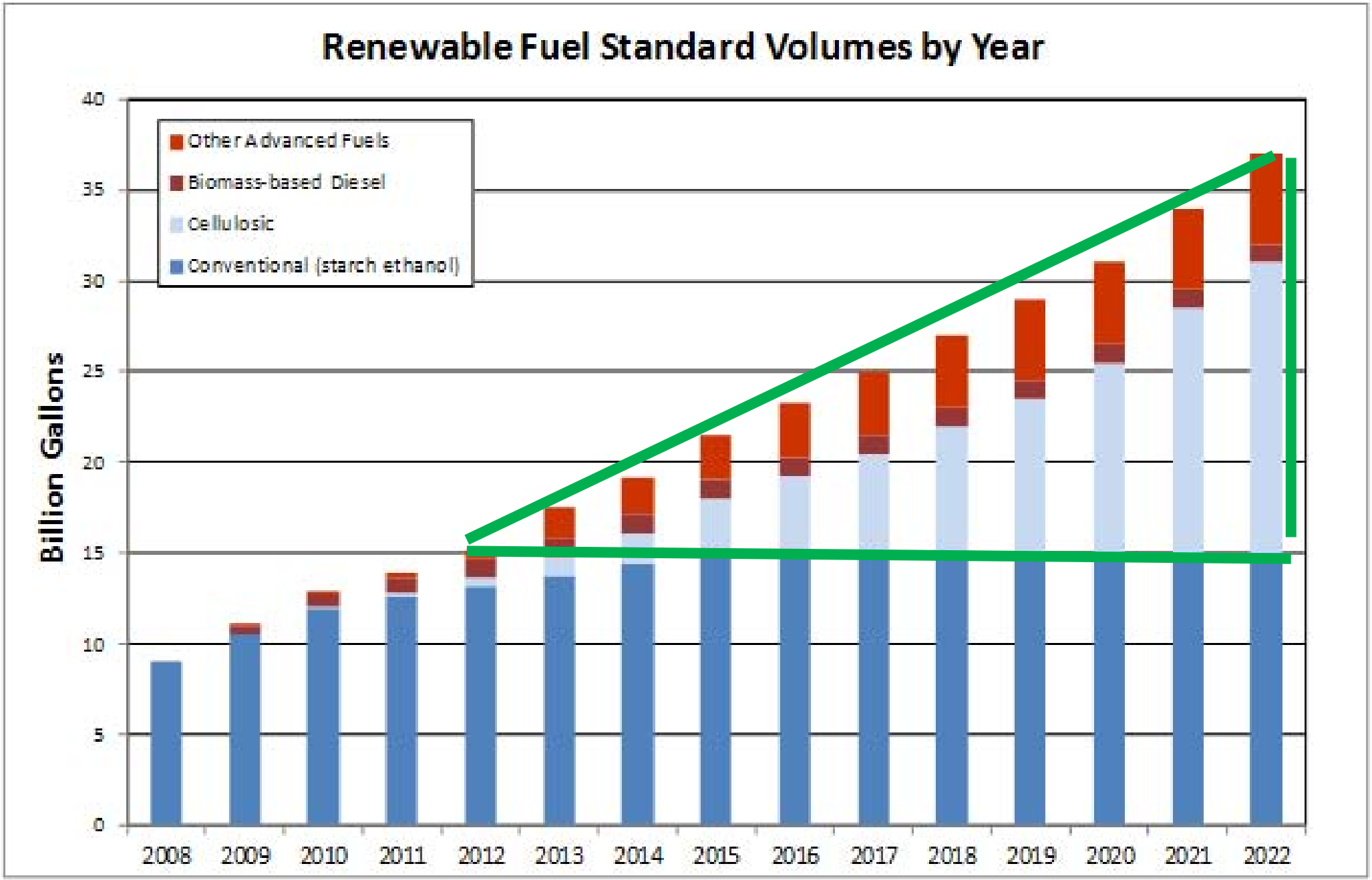
RAINBIRD


WAGENBORG

Renewable Fuel Standard

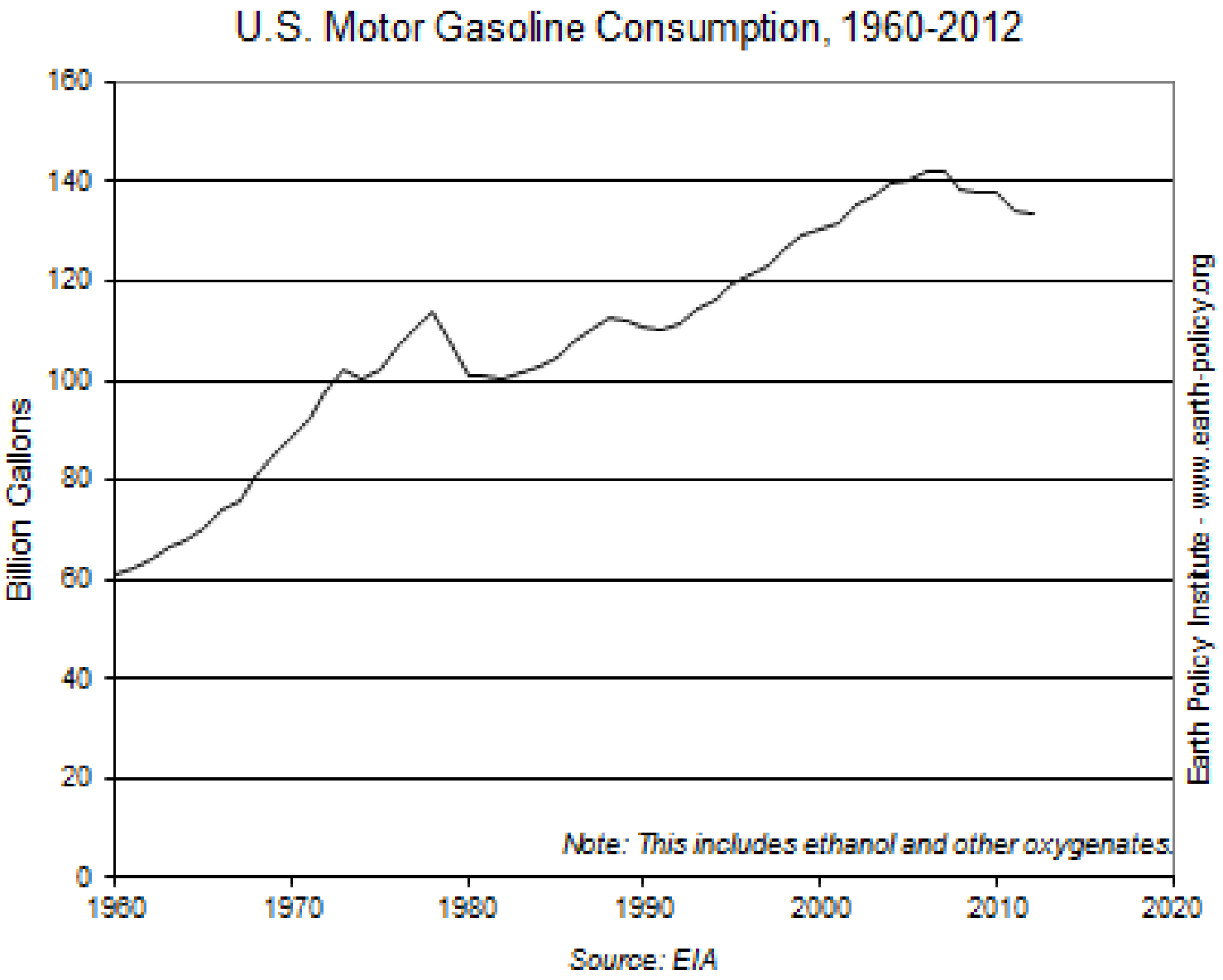
"(I) RENEWABLE FUEL.—For the purpose of subparagraph (A), the applicable volume of renewable fuel for the calendar years 2006 through 2022 shall be determined in accordance with the following table:

"Calendar year:	Applicable volume of renewable fuel (in billions of gallons):
2006	4.0
2007	4.7
2008	9.0
2009	11.1
2010	12.95
2011	13.95
2012	15.2
2013	16.55
2014	18.15
2015	20.5
2016	22.25
2017	24.0
2018	26.0
2019	28.0
2020	30.0
2021	33.0
2022	36.0

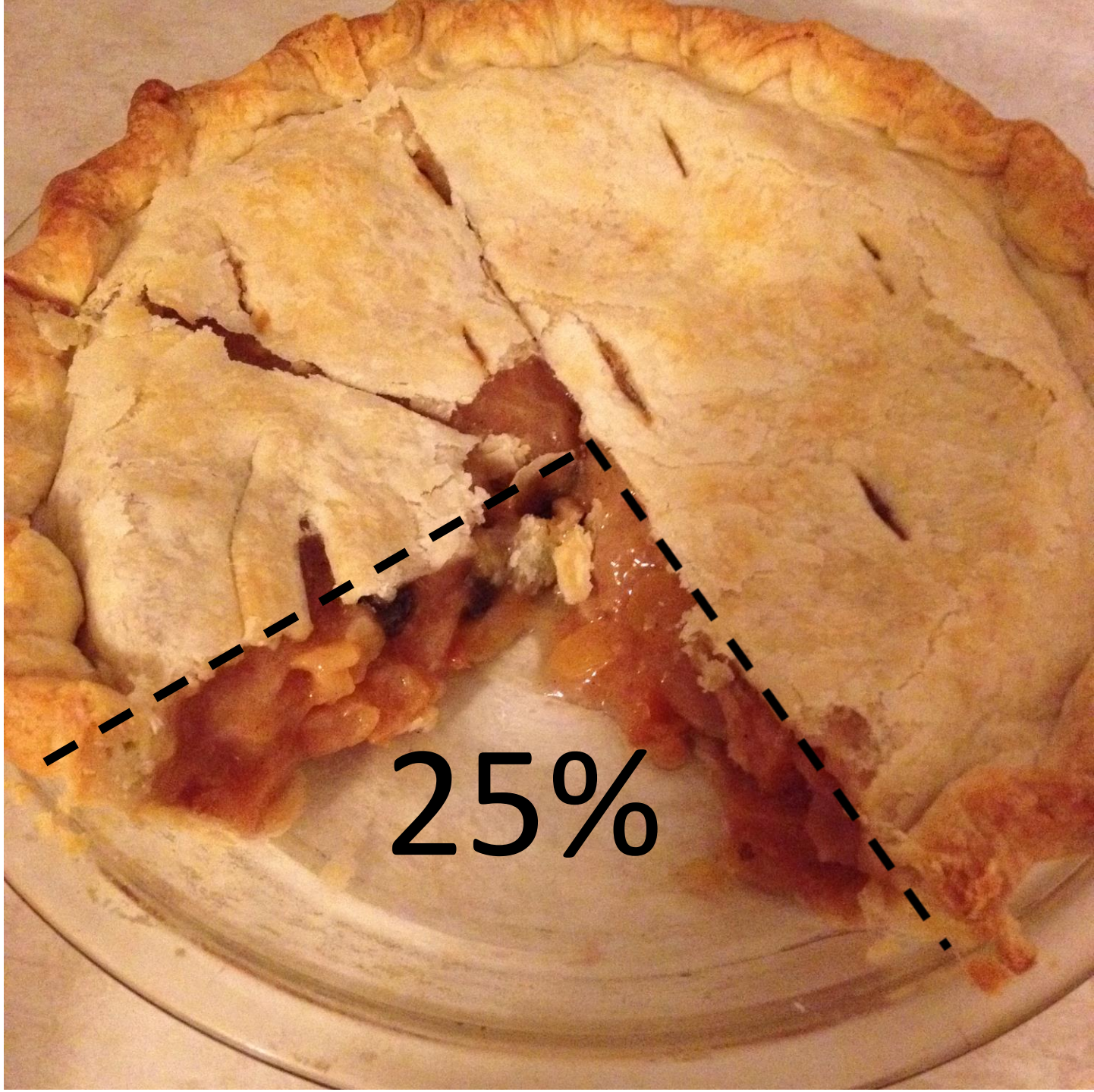

Renewable Fuel Standard Volumes by Year
Billion Gallons
40
35
30
25
20
15
10
5
0
Other Advanced Fuels
Biomass-based Diesel
Cellulosic
Conventional (starch ethanol)
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

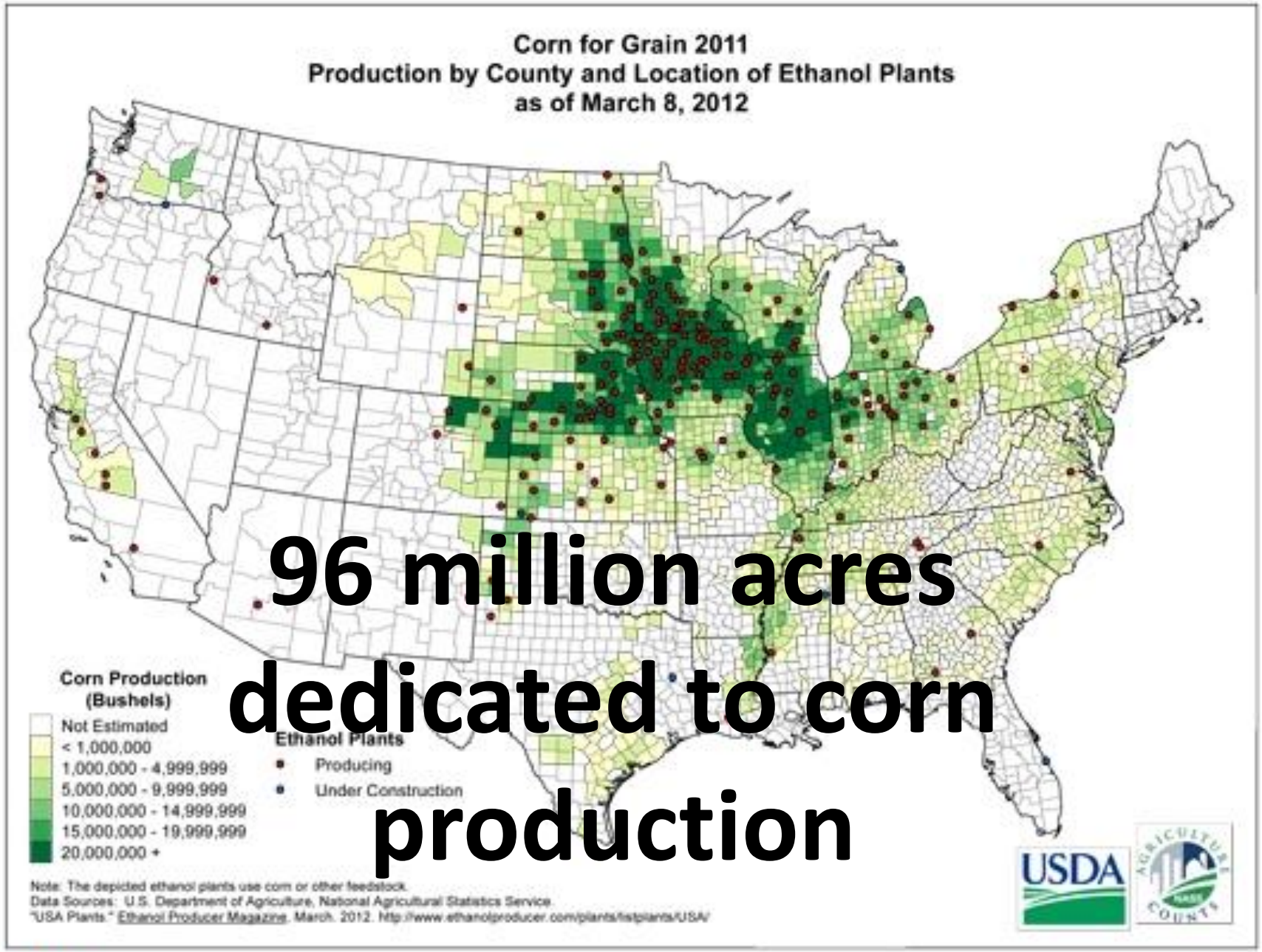
Proposed Renewable Fuels Volumes

	2014	2015	2016	2017
Cellulosic biofuel	33 mill gal	106 mill gal	206 mill gal	n/a
Biomass-based diesel	1.63 bill gal	1.70 bill gal	1.80 bill gal	1.90 bill gal
Advanced biofuel	2.68 bill gal	2.90 bill gal	3.40 bill gal	n/a
Total renewable fuel	15.93 bill gal	16.30 bill gal	17.40 bill gal	n/a


U.S. Motor Gasoline Consumption, 1960-2012
Billion Gallons
160
140
120
100
80
60
40
20
0
1960
1970
1980
1990
2000
2010
2020
Note: This includes ethanol and other oxygenates.
Source: EIA
Earth Policy Institute - www.earth-policy.org

It’s all about market share.



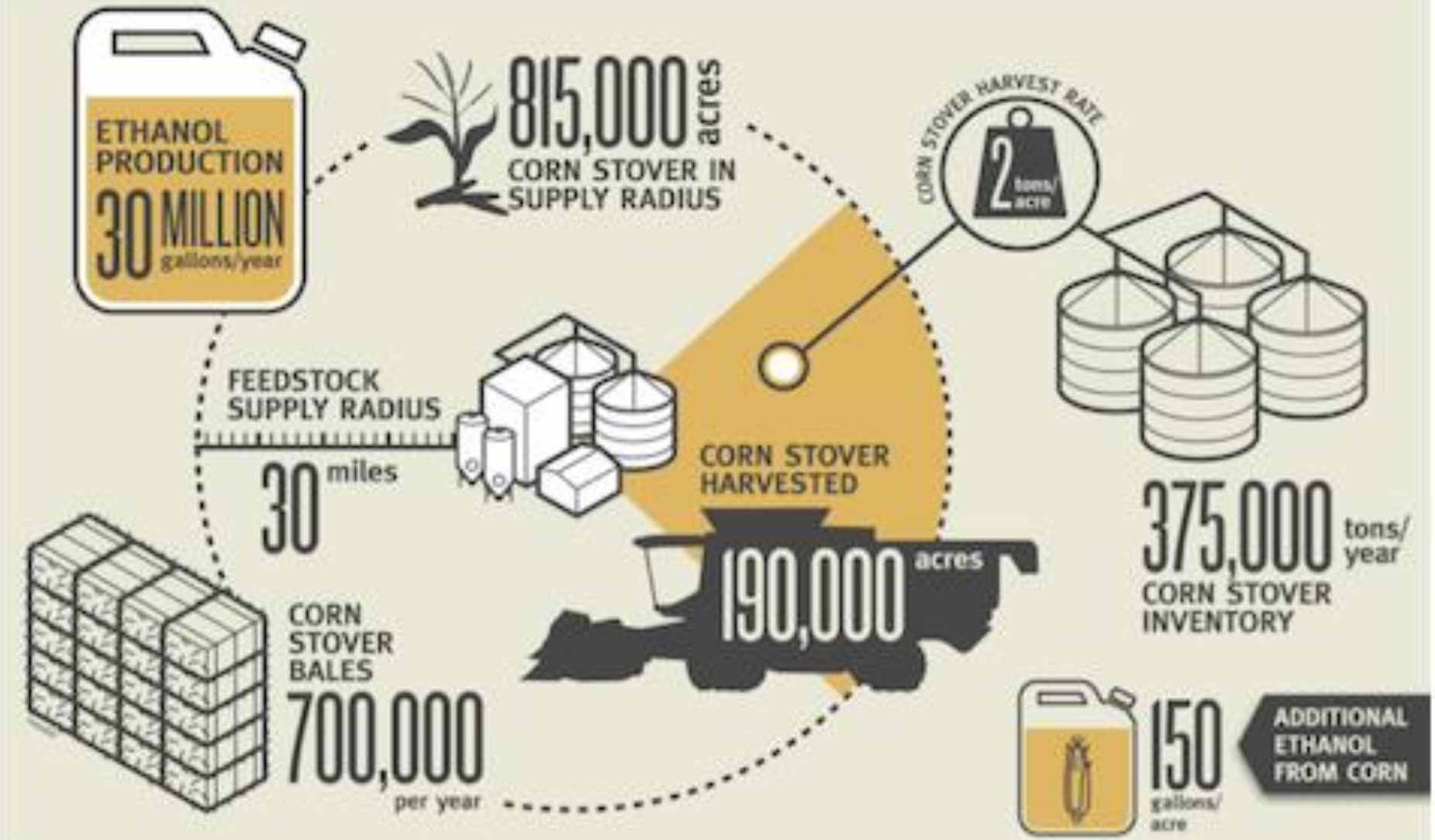


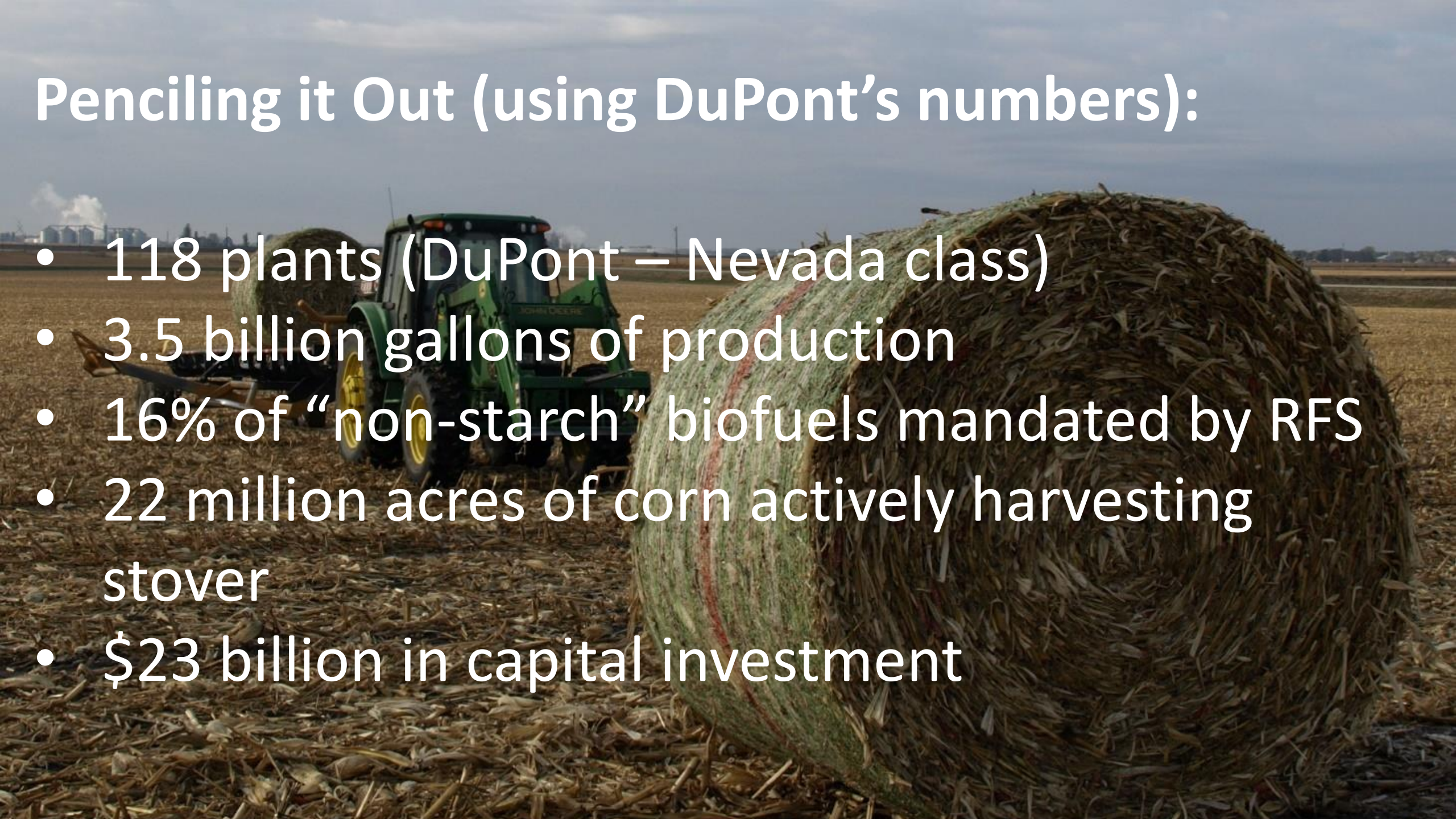
96 million acres dedicated to corn production

The Energy Independence and Security Act further specifies that 21 billion US gallons of the 2022 total must be derived from non-cornstarch products (e.g. sugar, biodiesel, or cellulose).

Making Cellulosic Ethanol a Reality: By the Numbers

The DuPont Nevada Site Cellulosic Ethanol Facility is expected to be completed in the second half of 2014. Situated in a prime agricultural location, this over $200 million facility will be among the first commercial-scale cellulosic biorefineries in the world.





Penciling it Out (using DuPont's numbers):

- 118 plants (DuPont – Nevada class)
- 3.5 billion gallons of production
- 16% of "non-starch" biofuels mandated by RFS
- 22 million acres of corn actively harvesting stover
- $23 billion in capital investment