

Beyond E-10

U.S.Biofuels Policy: Progress & Challenges

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About EPRINC

- Energy Policy Research Foundation Inc. (EPRINC), ***formerly the Petroleum Industry Research Foundation Inc. (PIRINC)***
- Founded in NY in 1944
 - Moved to Washington from NYC in Feb 2007
 - EPRINC brings policy analysis and industry economics to bear on current energy issues
- In April 2008, EPRINC and EIA/DOE held a workshop on meeting this year's 9 billion gallon mandate. While developments were seen as being on track for the near-term, longer run concerns were identified.

Issues Identified in the EPRINC/EIA Workshop---Still Applicable to Future Ethanol Blending

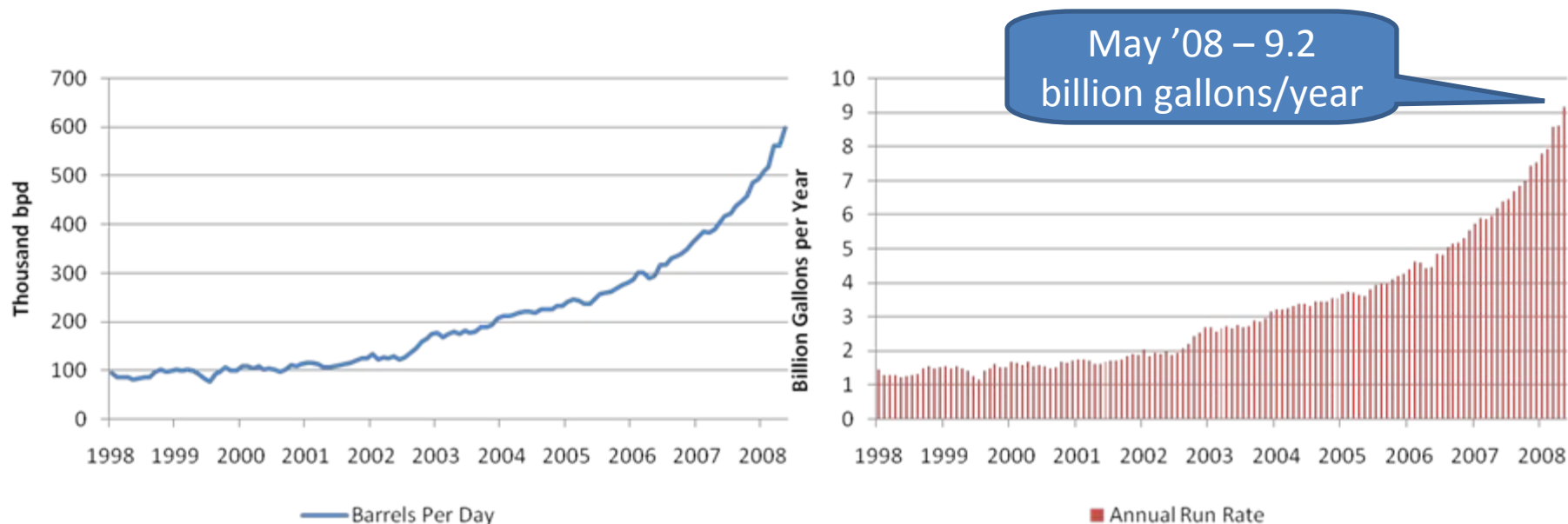
- Compatibility issues have kept ethanol and blends out of petroleum pipelines.
- The industry is studying compatibility. While optimism is prevalent, if and to what extent ethanol and its blends will be deemed suitable for pipeline input is unclear.
- Ethanol movement by rail grows, with unit trains offering the best economics. Few ethanol plants and fuel terminals have sidings for rail cars/unit trains. Trucks commonly cover the “first” and “last” mile.
- New oil terminal facilities are configuring rail access where they can. Rail offers routes that suit ethanol transport geographically; pipelines more often are laid-out for Gulf Coast-North/NE transport.
 - Ethanol needs to be supplied universally. Transport systems still need to be established for ESIA 2007 supply amounts.

Issues Identified in the EPRINC/EIA Workshop---Still Applicable to Future Ethanol Blending (Contd)

- Corn will likely be the feedstock of choice until 2015. Will there be enough supply? And at what cost to the food supply? 5.5 billion bushels will be needed, as well as significant new production capacity.
- E-10 is successfully operating in current model autos, most current model marine and small power applications. It was seen as the predominant fuel. Other higher blends were not seen as an option; a standardized E-85 product will absorb mandated ethanol amounts.
- Concern was expressed regarding the slow roll-out of E-85

Ethanol Background— Where We Stand Today

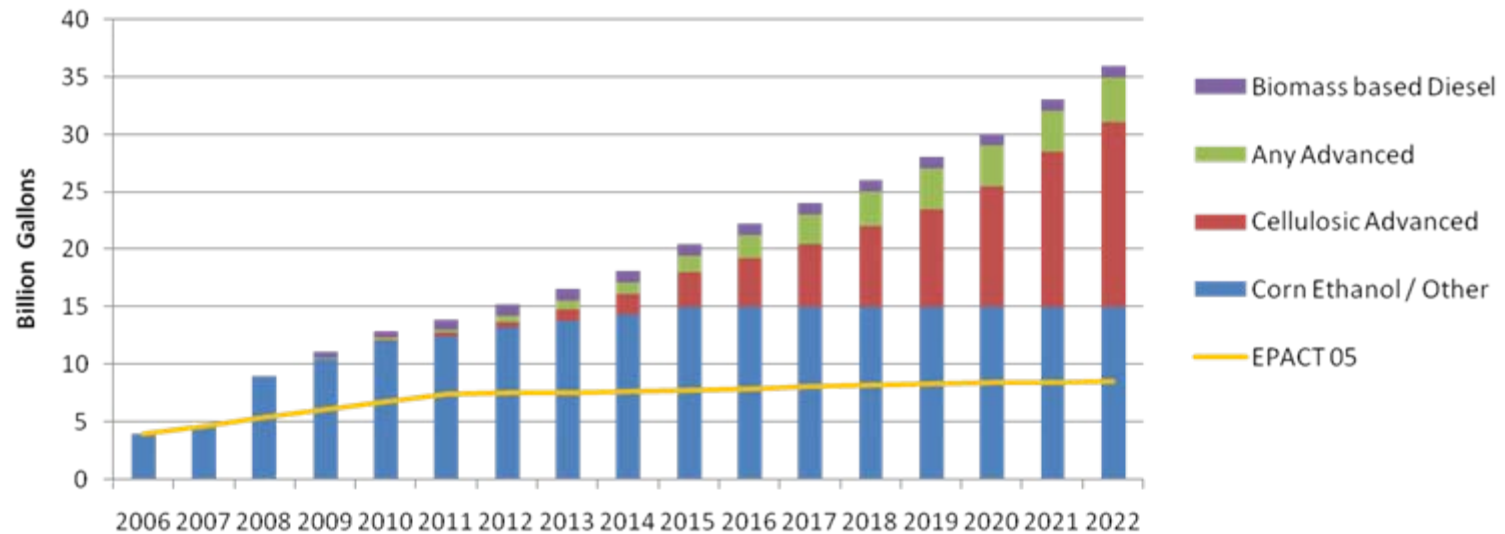
U.S. Corn Ethanol Production



- Ethanol In Gasoline---Long history/Early start as gasohol
 - 100,000 bd (150 million gal/yr) in 1998
 - Up-tick in mid-2006 due to MTBE phase-out
 - Present US production of 598,000 bpd--up nearly 50% in 12 months
 - Imports add to this
 - “Run-rate” equivalent to 9.2 bil gal/yr—6.6% of national gaso supply

Energy Independence and Security Act of 2007— Mandated Ethanol Future

EISA '07 Renewable Fuels Standard



Biomass based Diesel	-	-	-	0.5	0.65	0.8	1	1	1	1	1	1	1	1	1	1	1
Any Advanced	0	0	0	0.1	0.2	0.3	0.5	0.75	1	1.5	2	2.5	3	3.5	3.5	3.5	4
Cellulosic Advanced	-	-	-	-	0.1	0.25	0.5	1	1.75	3	4.25	5.5	7	8.5	10.5	13.5	16
Corn Ethanol / Other	4	4.7	9	10.5	12	12.5	13.2	13.8	14.4	15	15	15	15	15	15	15	15
EPACT 05	4	4.7	5.4	6.1	6.8	7.4	7.5	7.6	7.7	7.8	7.9	8.1	8.2	8.3	8.4	8.5	8.6

Source: DOE

EISA And Gasoline—Benchmarks

Billions of Gallons

<u>Materials</u>	<u>2008</u>	<u>2015</u>	<u>2022</u>
Corn Ethanol	9	15	15
Cellulosic	--	3	16
Advanced for Mogas*	--	0.7	2
Total	9	18.7	33

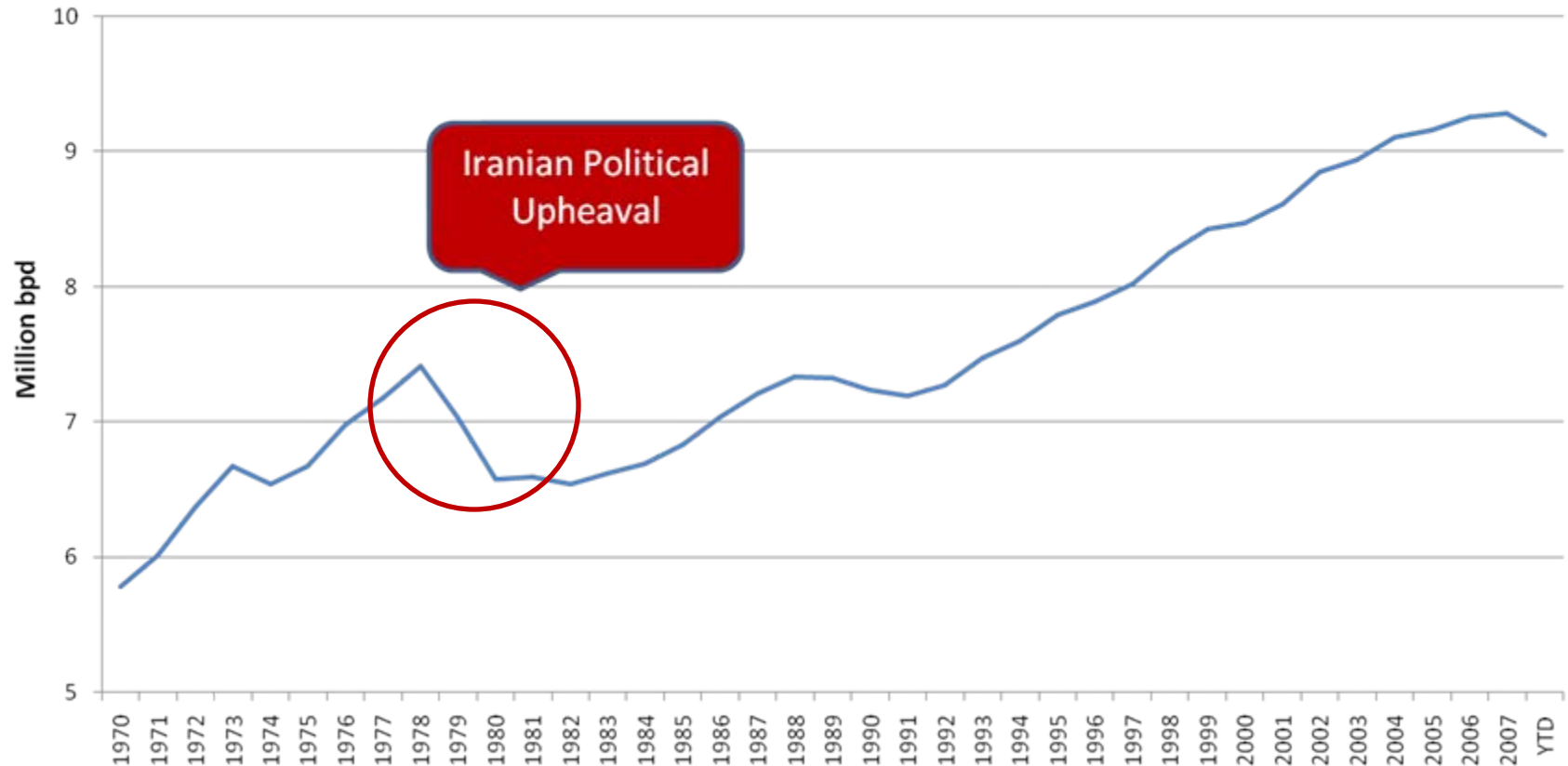
*Assumes Advanced is divided between diesel and motor gasoline.

Cellulosic Ethanol?

- Not a commercial product now
- Focal point of a great deal of R & D
 - Many promising projects
 - A number of corporate entities involved
 - Still in the lab
- If Cellulosic moves beyond the lab, significant capital investment needed
 - 16 bgy = 1 million bbls per day. That is the amount of crude produced in Texas!
- Policy-makers have placed a bet on something that does not exist
 - If Cellulosic is not available as EISA mandates, EPA will likely issue a waiver

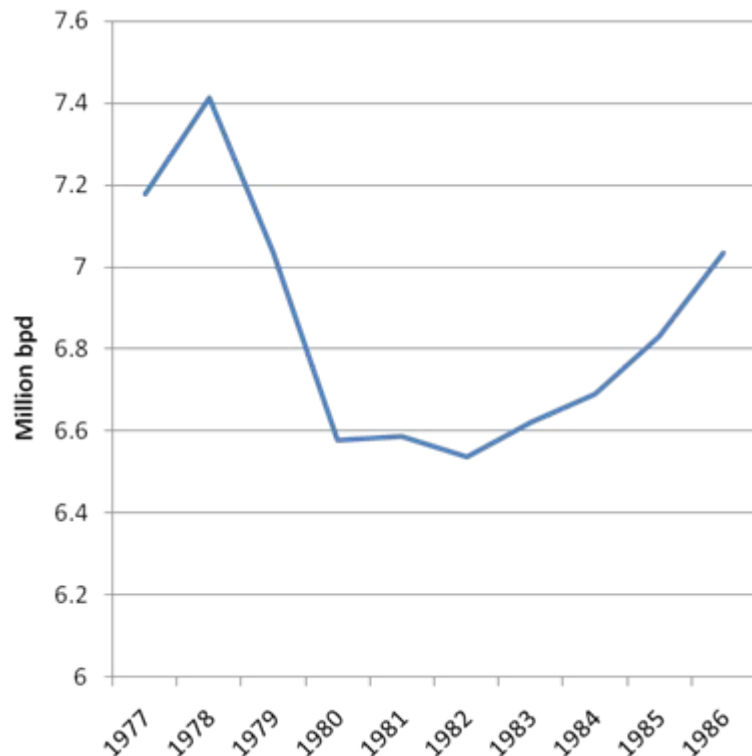
Declining Gasoline Demand—Making a Simple Forecast

Gasoline Consumption 1970 - Present



Source: EIA - http://tonto.eia.doe.gov/dnav/pet/xls/pet_cons_psup_dc_nus_mbbldpd_a.xls#

Gasoline Consumption: After the Shah

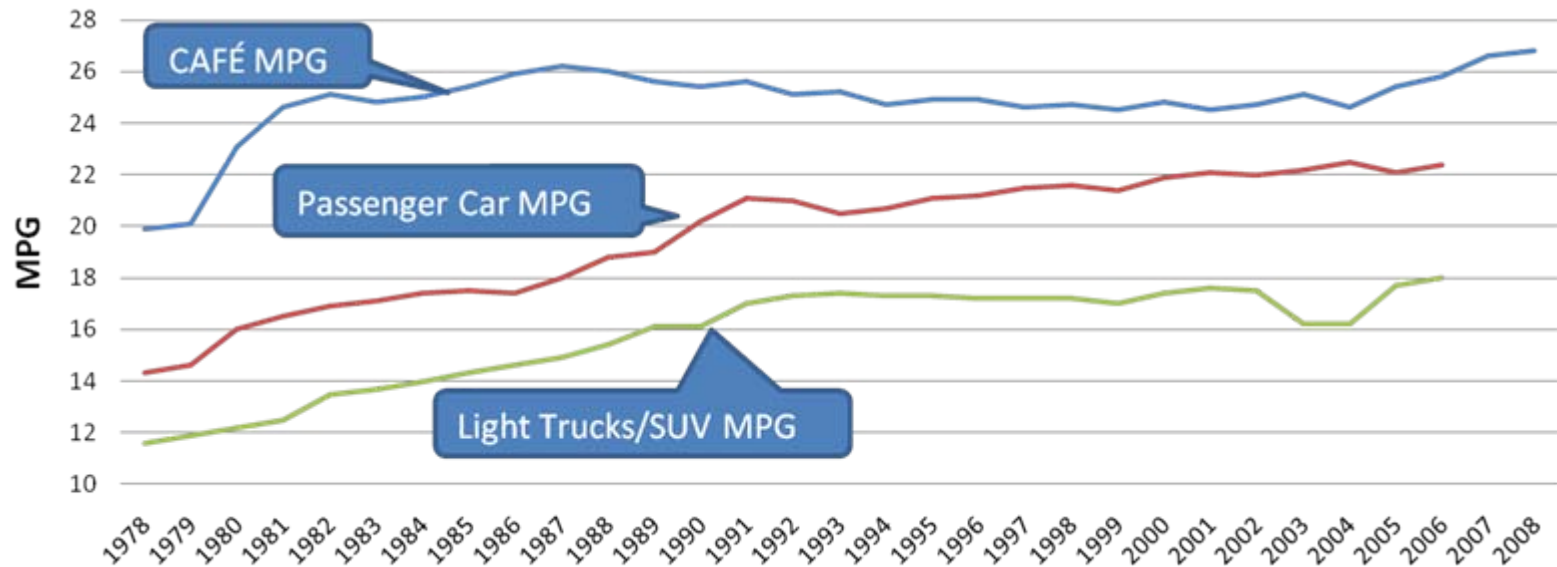


Factors acting to cut demand during 1979 to 1986 time frame:

- Pump prices doubled
- Fleet MPG up 2.9 mpg, from 14.6 to 17.4
- That's 20%!
- Gasoline Consumption: fell 13%--from 7.4 mbd to 6.5
- Motorists drove more miles/vehicle
- Gasoline prices fell

Source: EIA - http://tonto.eia.doe.gov/dnav/pet/xls/pet_cons_psup_dc_nus_mbbldpd_a.xls#

Model Year CAFÉ and Vehicle MPG



Take Away: Reality lags expectations. Mismatch between actual MPG and policy goals.

Source: NHTSA, EIA

Gasoline Consumption -- EISA Context

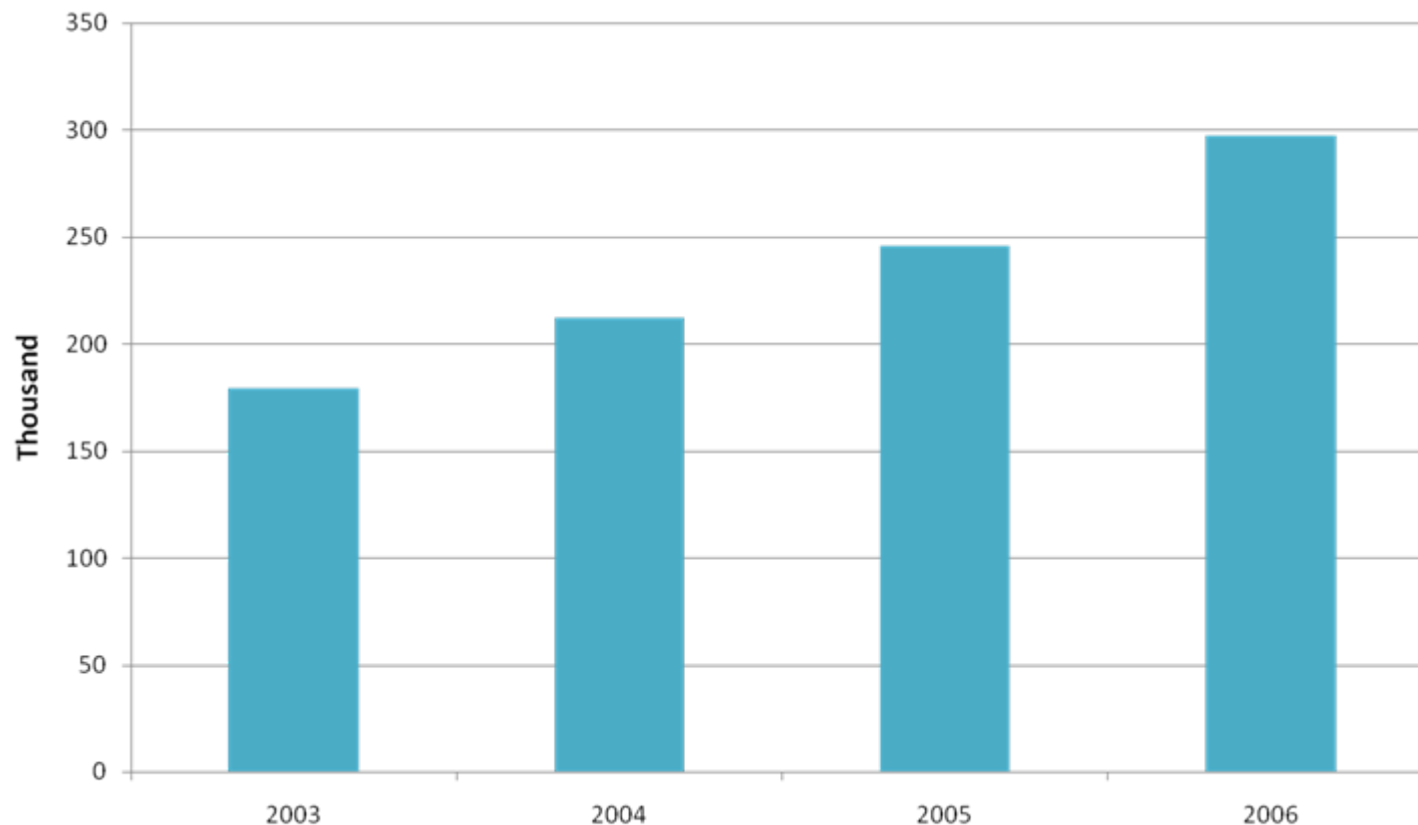
- Based on the Post-Iranian price experience, demand in 2008-out-years will drop 13%,--from 140 billion gallons to 120 in 2112.
 - a near doubling of prices
 - more robust CAFÉ standards
 - more attractive fuel-efficient vehicles now available
 - renewed environmental consciousness among consumers
- The RFS will not change, meaning the mandated amounts of ethanol will be blended.
- The E-10 “Wall” becomes a factor in 2011 or 2012; mandated ethanol beyond E-10 absorptive capacity is consumed as E-85.
- E-85 takes up the slack:
 - Need to have a finite number of fuels on the market
 - Fuels can’t change to accommodate the vagaries of demand
 - Stable fuels specs needed for manufacturers warranties, environmental compliance
 - A supply of blendable gasoline
 - Distribution and retailing infrastructure

E-85 Challenges

E85 Rollout Moves Slowly

- Currently sold at 1,400 service stations.
- Used in a disappointing few FFVs.
- Mispriced – Current MPG/BTU adjusted price is \$4.01 v. \$3.74 for regular gasoline.
 - Market mechanism needs to price E85 correctly.
 - E85 should be priced to attract motorist use.
- E85 convenience factor – takes 3 fill-ups to go as many miles as 2 regular fill-ups.
 - Convenience factor needs to be priced.
- Bottom Line – Consumer needs a good reason to walk into a dealership and ask to buy a FFV.

FFVs Actually Fueling with E85



- DOE estimates 6 million FFVs on the road, as of 2006.

- 1.3 million sold in 2007

- Less than 300,000 actually fueling with E-85

- Locational Mismatch—E-85 not sold in states where FFVs are common.

Source: EIA - http://www.eia.doe.gov/cneaf/alternate/page/atftables/afvtrans_v1.xls

Toward Meeting the RFS – An E-10 + E-85 World

Ethanol Blends to Meet RFS: Back of the Envelope Calculations

Billion Gallons Per Year

Year	Estimated Consumption	E-10	E-85
2015	120	110 (92%)	10 (8%)
2022	130*	100 (77%)	30 (23%)*

Some Variables:

- Higher consumption = less E-85
- Lower consumption = proportionately more E-85
- Forecasting is a challenge, it is easy to be wrong.

* Reflects the need for more gallons for MPG/BTU adjustment of E-85

For an E-10 + E-85 World

- Long-term commitments and major investment in transport/distribution infrastructure call for:
 - Stakeholders are making a commitment on their own to E-10/E-85 world.
- A 2 Fuel Standard
 - E-85 is a powerful tool for meeting RFS mandates beyond E-10 absorptive capacity.
- Transportation/Distribution infrastructure needs to be constructed
 - Systems need to be planned.
- E-10 will be called for marine and small power appliance use.
 - E-10 is now compatible with much infrastructure (but not all).
 - E-10 will be the predominant fuel since it will have the broadest footprint.