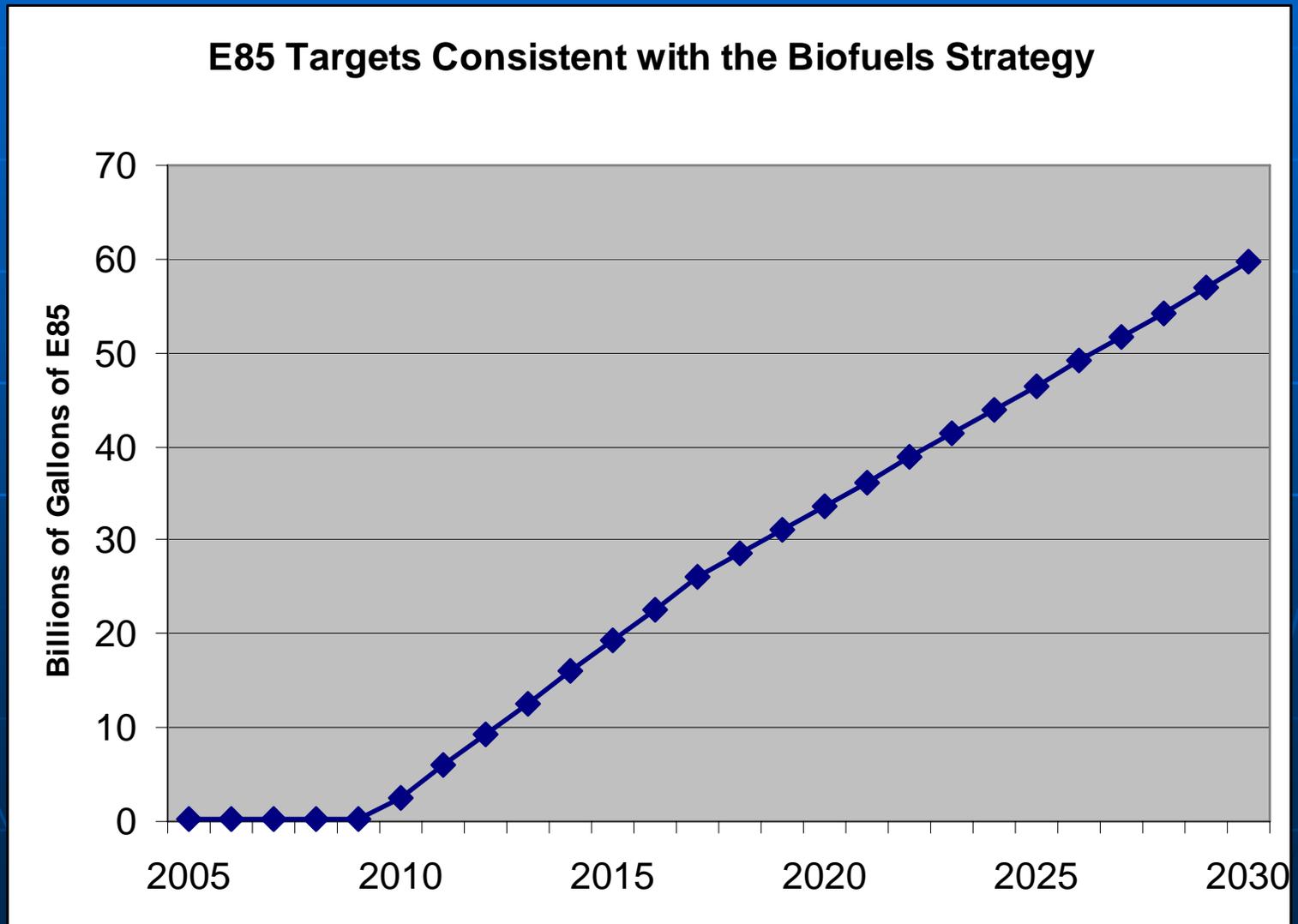


U.S. Biofuel Goals: Can we do it with E85?

David L. Greene
Oak Ridge National Laboratory

87th Annual Meeting of the Transportation Research Board
January 15, 2008
Washington, DC

Ambitious goals: 35 Bgals. in 2017, 60 Bgals. in 2030.
E10 blend market will saturate at about 14 Bgals./year.
If the rest is E85 we will need to sell a lot. Can it be done
without subsidies or mandates?

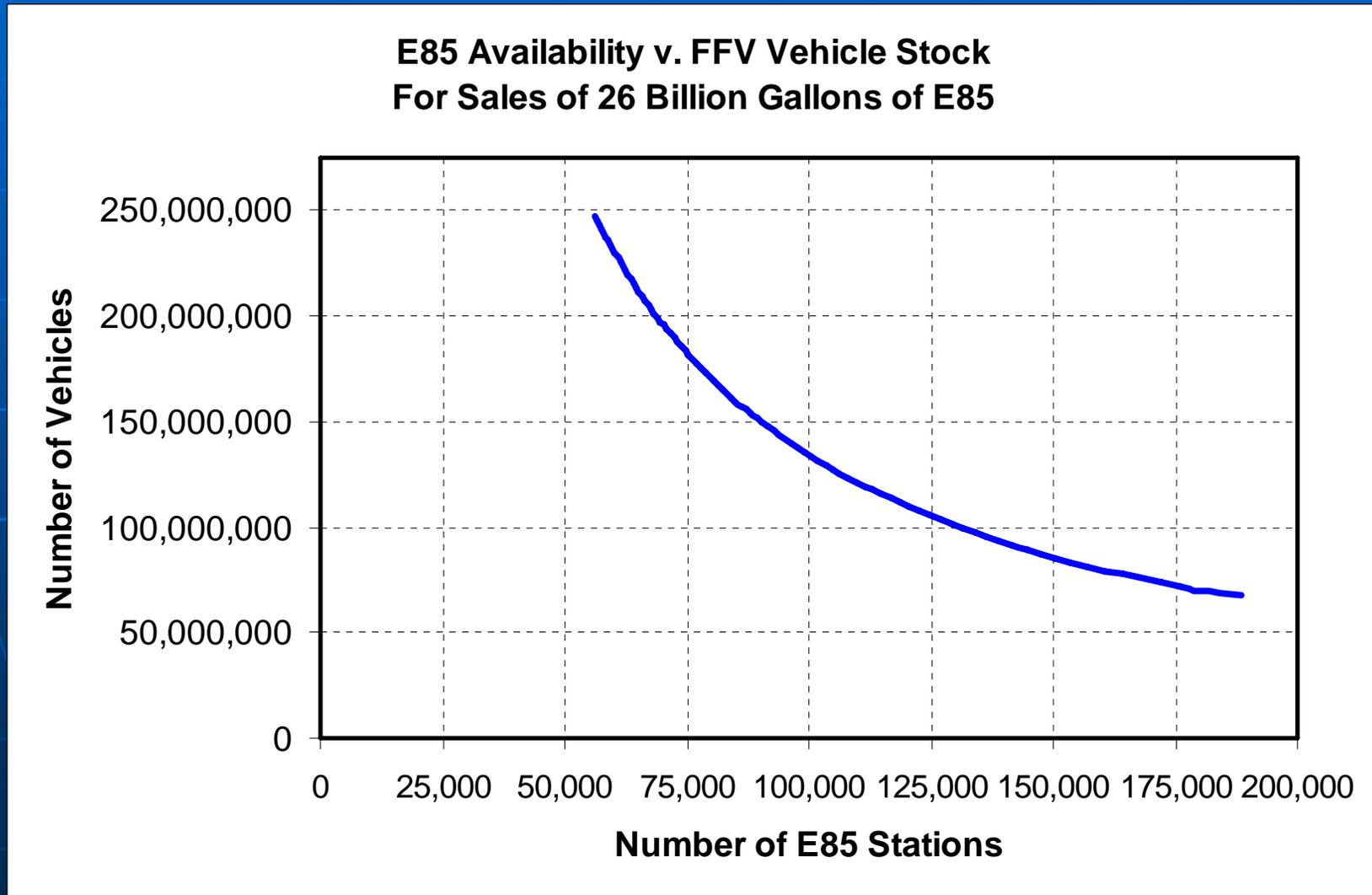


How many FFVs and how many stations are required?

- Consider a naïve model:
 - Motorists indifferent between E85 and gasoline.
 - Drive into station to refuel.
 - IF E85 available, flip a fair coin.
- A few data points:
 - Ethanol approx. 2/3 energy content of gasoline per gallon.
 - E85 is really about 80% ethanol.
 - E85 may boost efficiency by 5-10%.

We may have a problem.

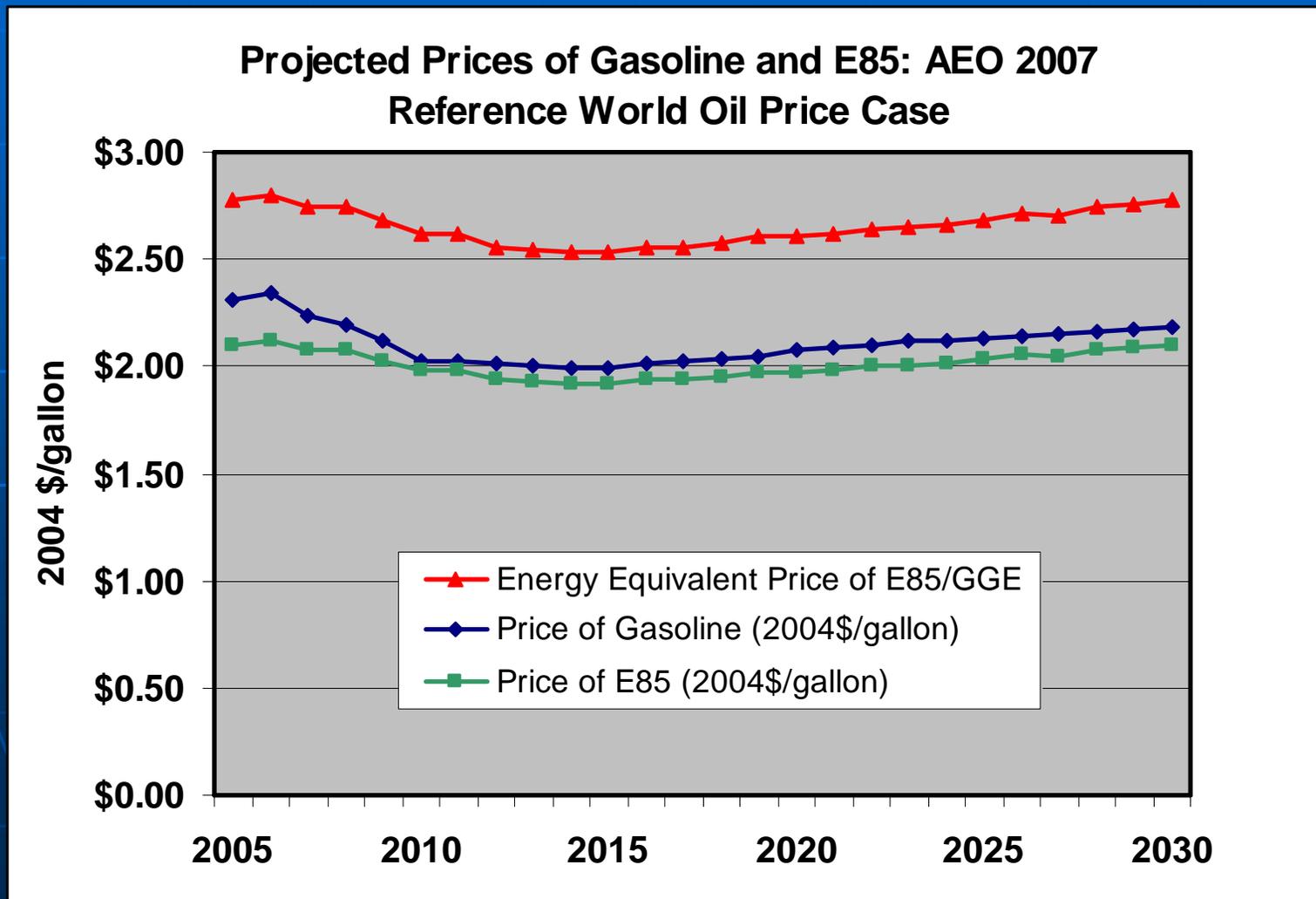
(There are approximately 170,000 stations and 240 million vehicles.)



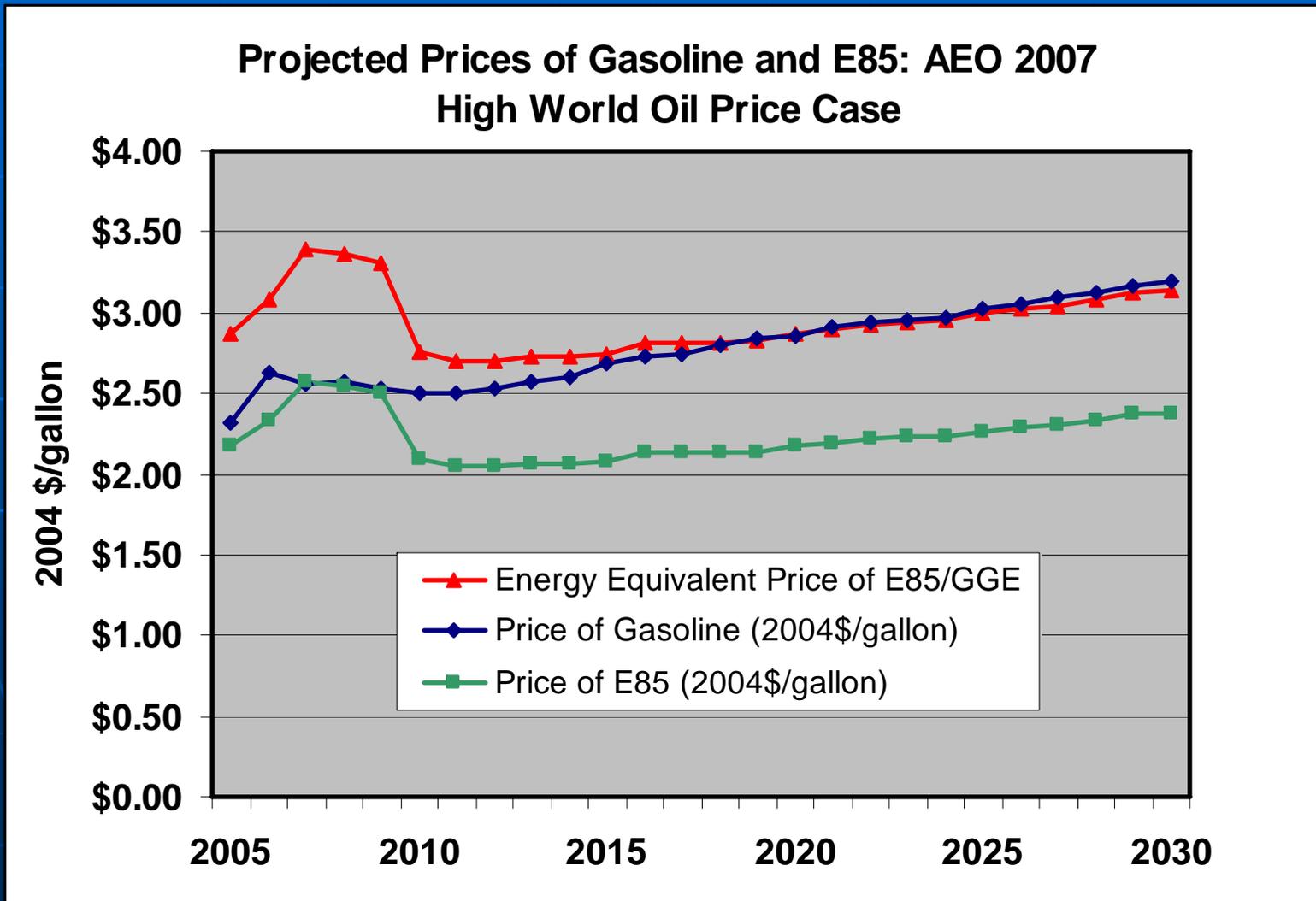
Unfortunately, E85 contains only about 72% of the energy of gasoline.

- Consider a less naïve model.
 - Choice depends on price, energy services, fuel availability and refueling frequency (range).
 - Assume a logit choice model.
 - Assume a price elasticity of -8 at 50% market share (-5 at 5%).
- DOE/EIA Annual Energy Outlook 2007 Reference and High World Oil Price Cases.

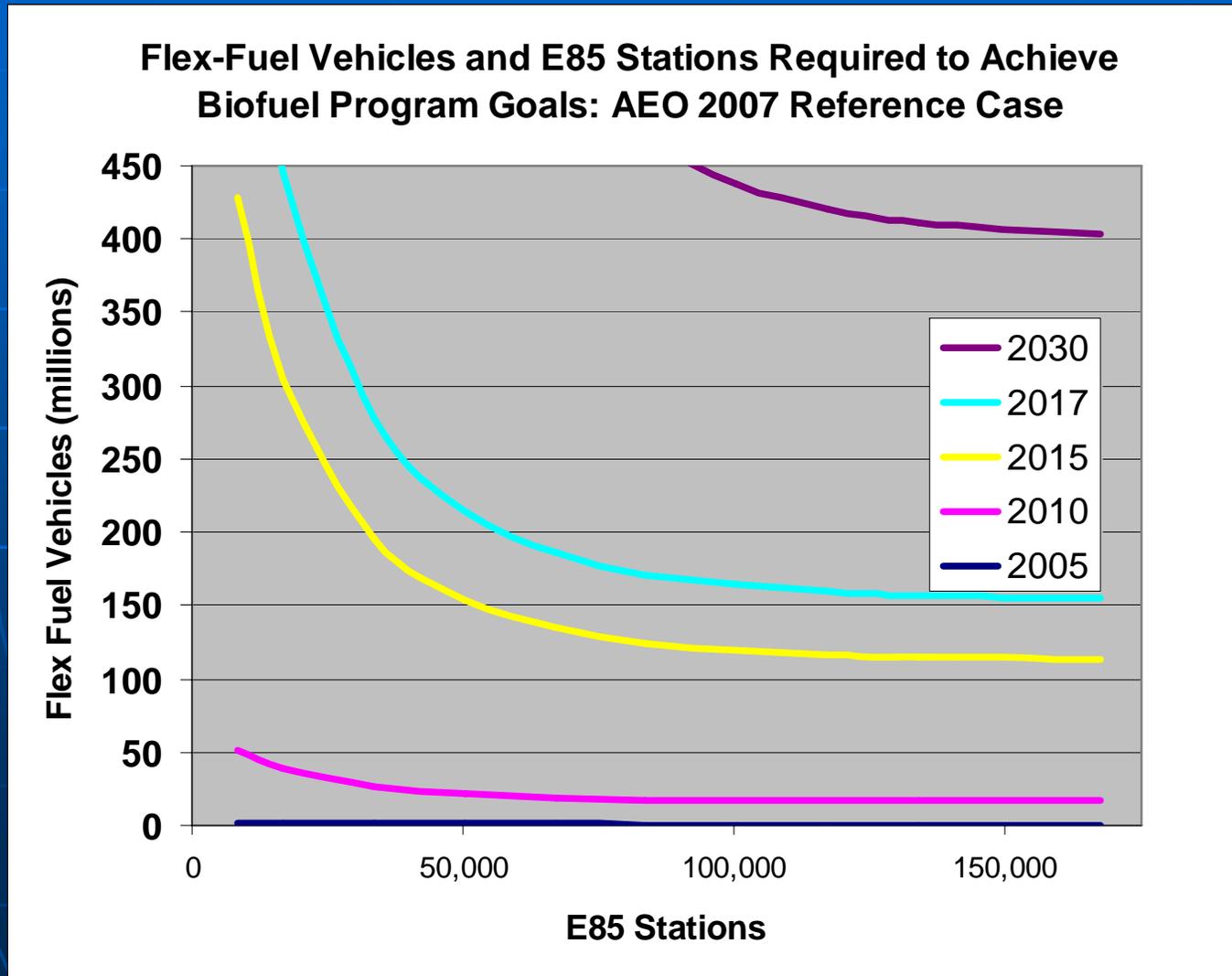
In the Reference Case, E85 costs about the same per gallon but is more expensive on an equivalent energy basis.



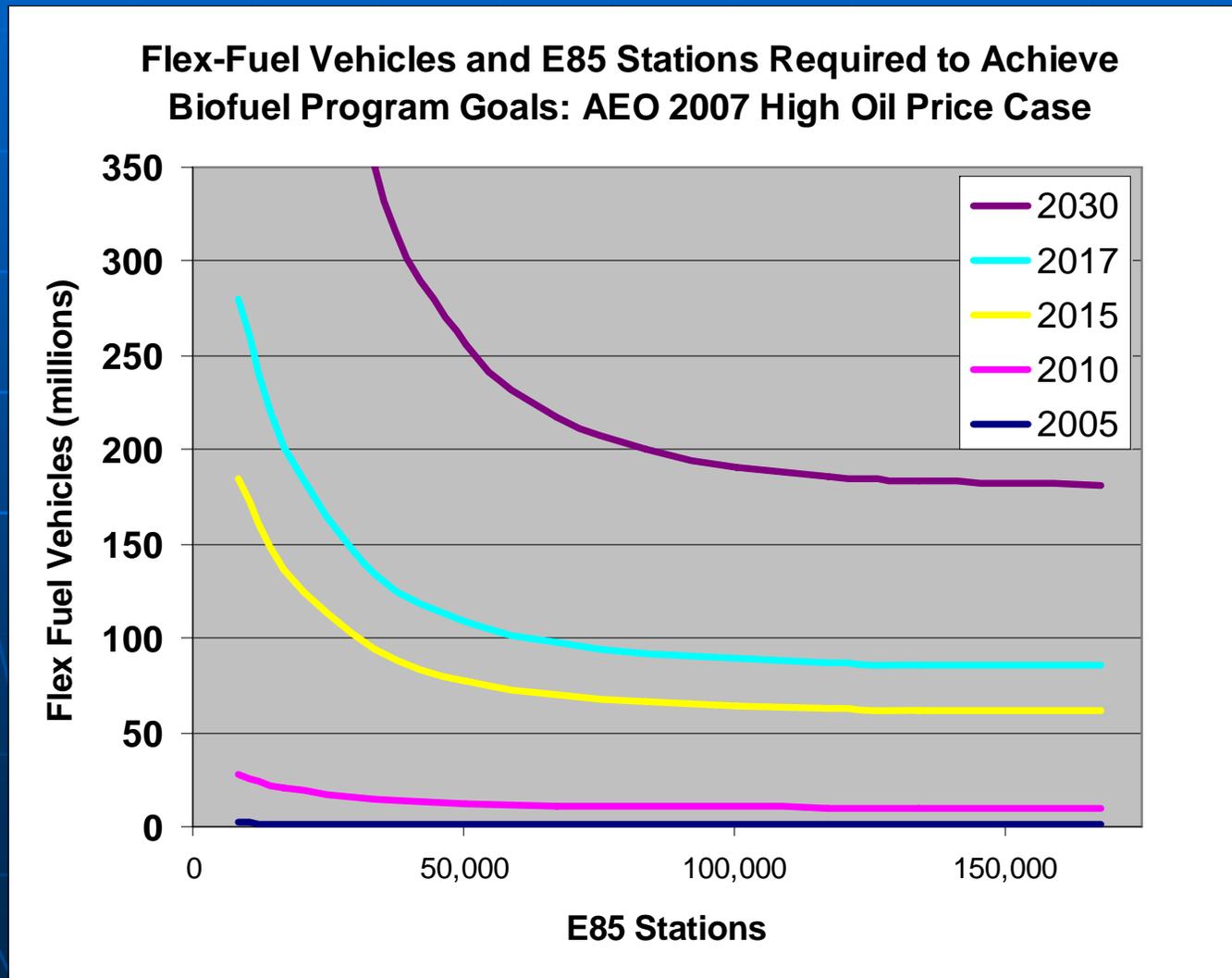
In the High oil price case the two fuels end up costing about the same per unit of energy.



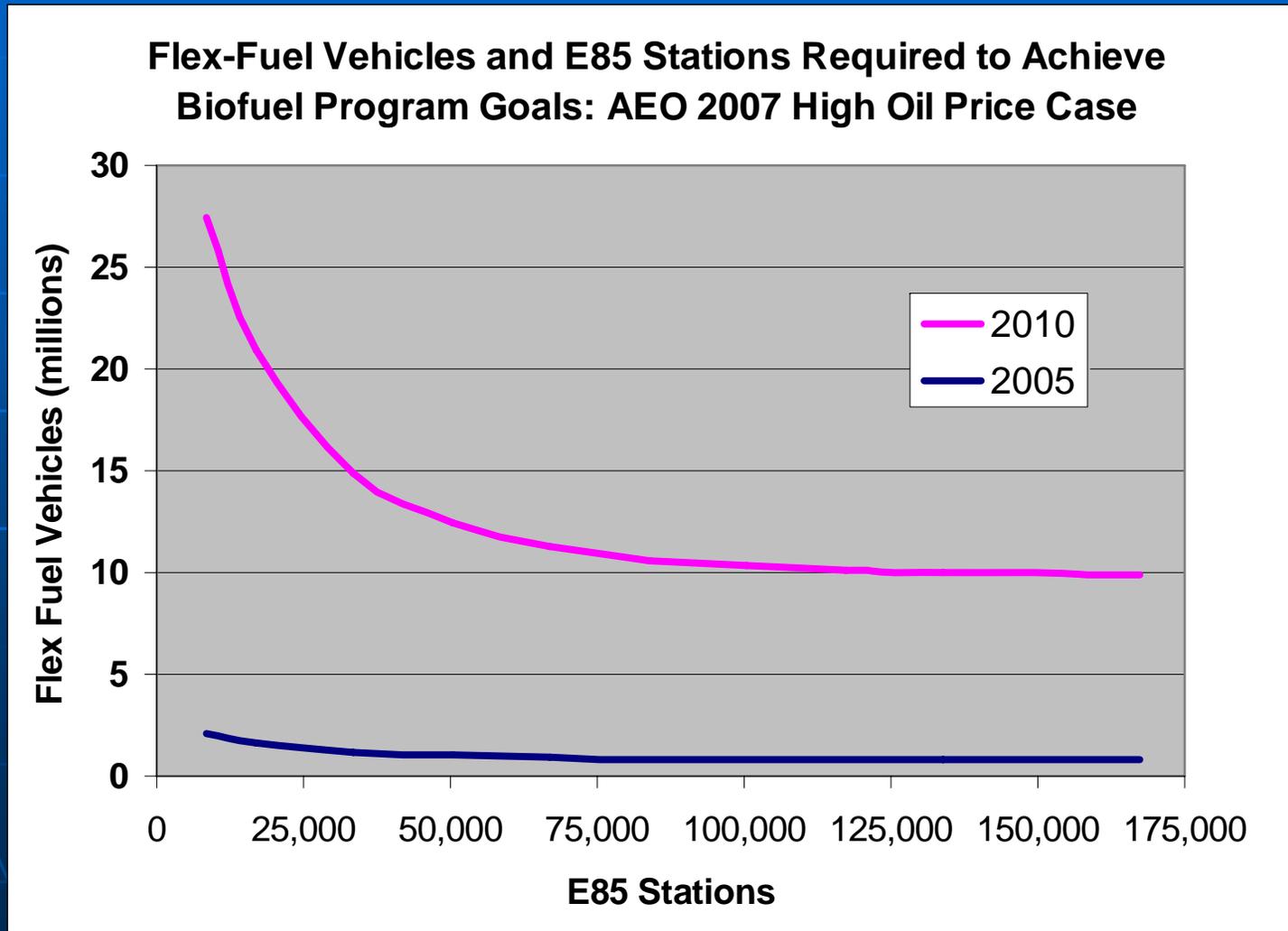
Given a price disadvantage, the 2030 goal appears to be infeasible using only E85.



At an equal price per unit of energy the 2030 goal would require most vehicles to be FFVs and most stations to offer E85.



Given about 5 million FFVs on the road in 2007, it will be difficult to meet the near-term goal with only E10 and E85 due to the lack of E85 stations.

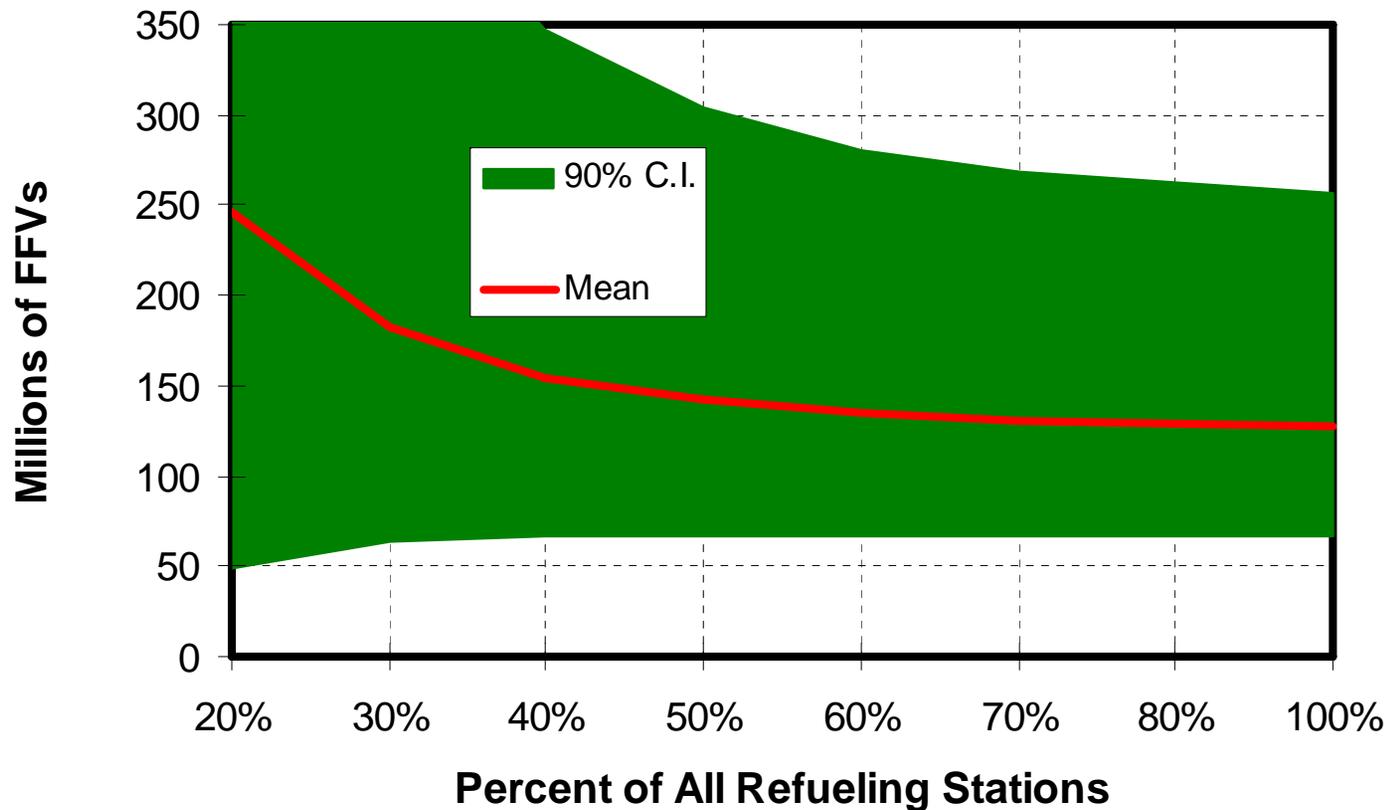


Sensitivity analysis indicates that these conclusions are, in general, robust.

- Price elasticity from -2 to -8 at 5%.
- 50/50 probability of High v. Low oil prices.
- Value of time spent refueling \$10 to \$30/hr.
- E85 fuel economy benefit of 0% to 10%.
- Value of fuel availability varied by a factor of 2.

To have any chance of meeting the 2017 goals a massive effort to produce FFVs and add stations would be required.

Sensitivity Analysis of Numbers of FFVs and E85 Stations Needed to Meet 2017 Biofuel Goals for Light-duty Vehicles



What's plan B?

- Given the flexibility of FFVs, regional E85 markets are feasible.
- Higher than 10% blends are under consideration.
- There are alternative biofuels (e.g., butanol, F-T gasoline).
- Subsidies and low-carbon fuel standards are also options.

Thank you.