

Advanced Ethanol Production In California Workshop



August 1, 2012

California Energy Commission
Sacramento, California

HARTENERGY

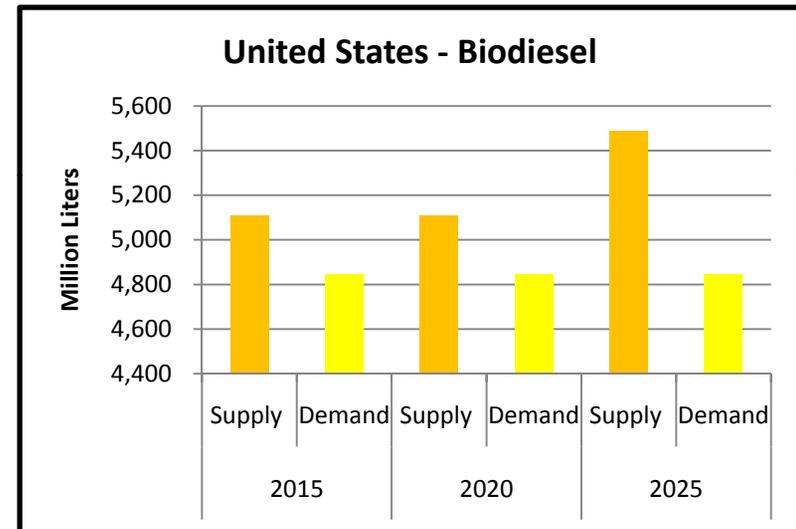
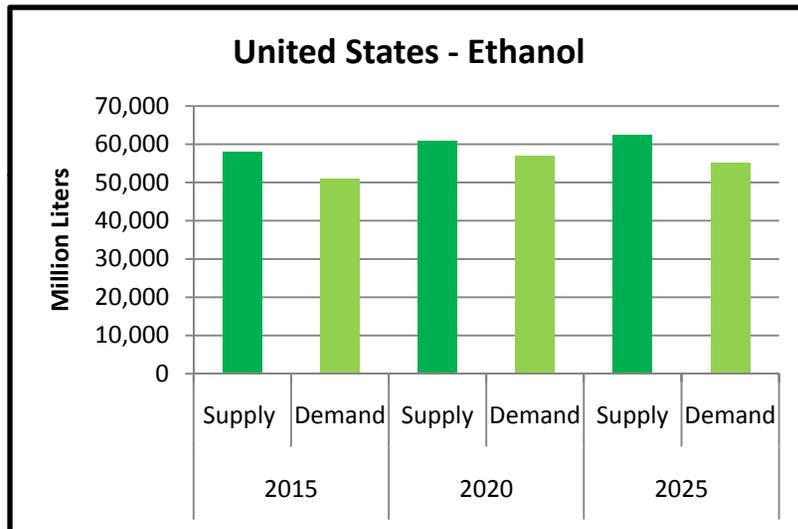


Presentation Outline

- **U.S. biofuel supply & demand forecast**
- **California biofuel supply & demand forecast**
- **Brazilian ethanol balance**
- **Next generation biofuel capacity**
- **Ethanol exports**
- **Ethanol net imports**
- **Conclusions**

Global Biofuels Outlook: United States

| Projected Blend Levels | 2015 | 2020 | 2025 |
|--------------------------------------|------|------|------|
| Ethanol | 12% | 14% | 15% |
| Biodiesel (on-off road; heating oil) | 2.0% | 2.0% | 2.0% |

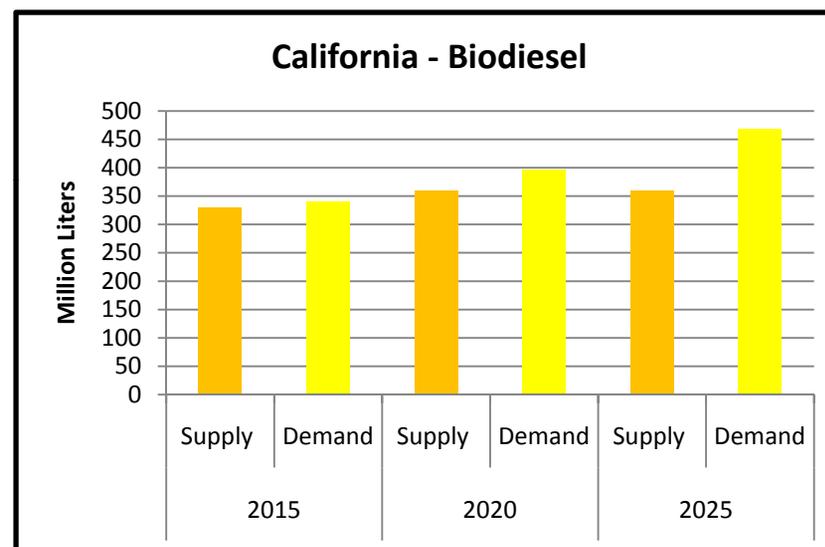
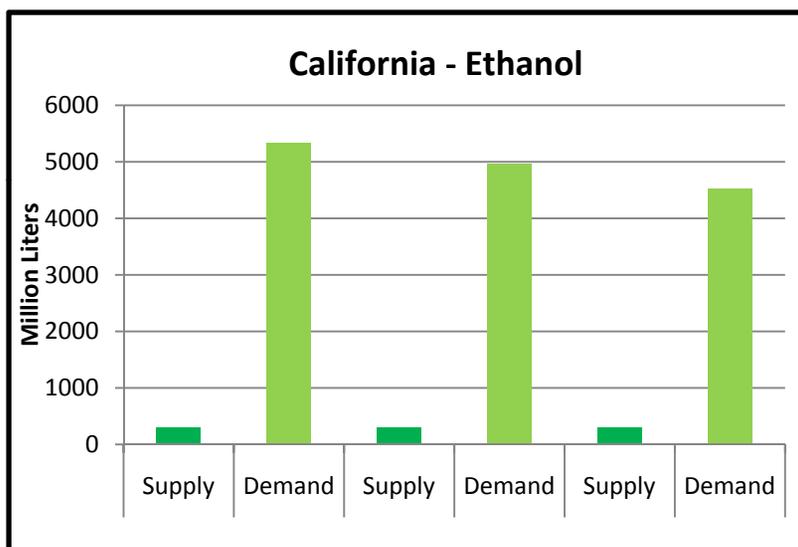


Key findings:

- Ethanol demand increases depend on E15 penetration and restructure to RFS2 program; corn-ethanol production stable; cellulosic ethanol forecast at only 1 billion gallons.
- Biodiesel demand also depends on RFS2 program mandates; supply forecast to increase for advanced biofuels category and LCFS.

Global Biofuels Outlook: California

| Projected Blend Levels | 2015 | 2020 | 2025 |
|--------------------------------------|-------|-------|-------|
| Ethanol | 10.0% | 10.0% | 10.0% |
| Biodiesel (on-off road; heating oil) | 3.0% | 3.5% | 4.0% |

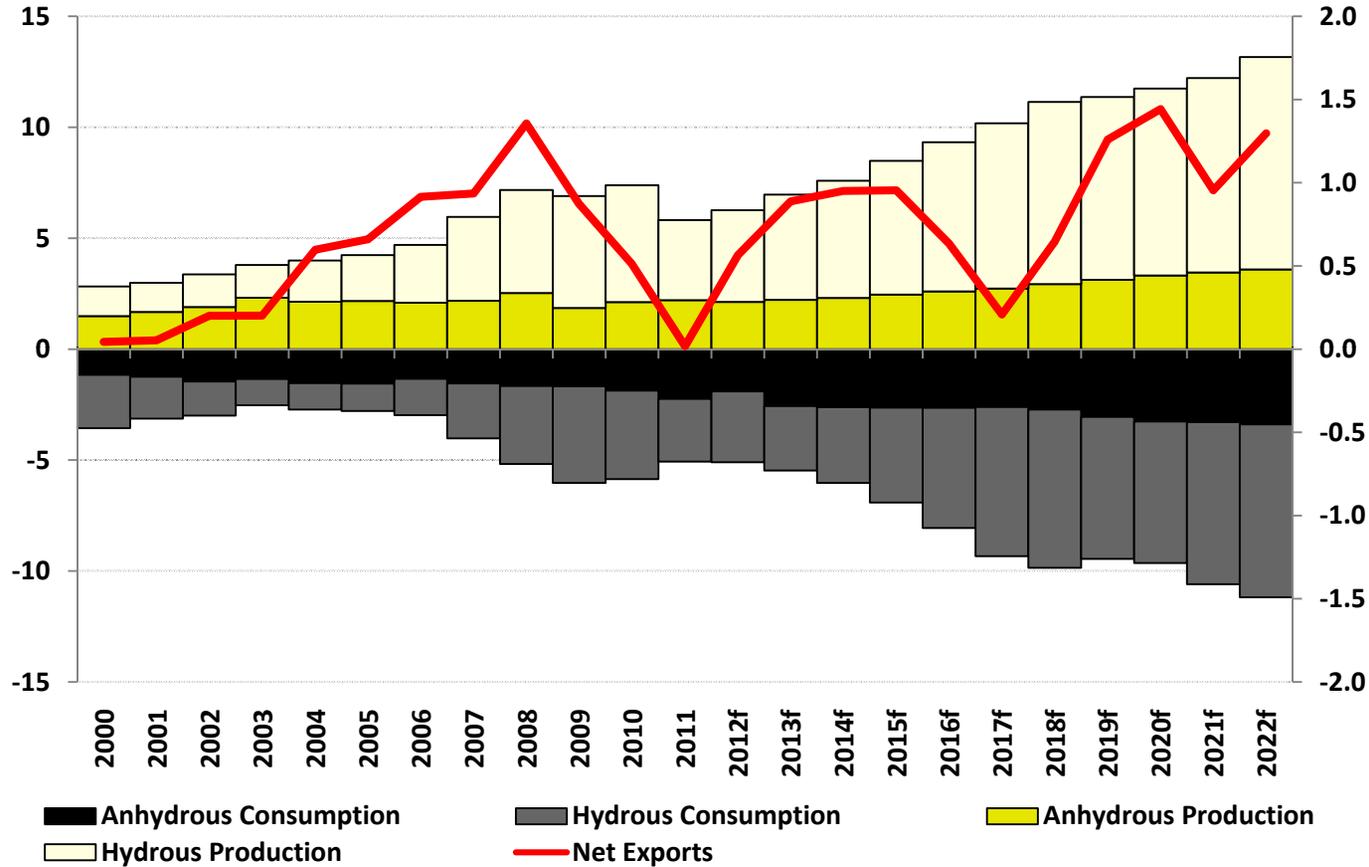


Key changes:

- LCFS requirements will remove most ethanol supplies by 2015; in-state production uncertain to qualify; demand levels assume E10 blending retained.
- Biodiesel blending will be needed for LCFS ; in-state production expands but feedstock costs remain prohibitive; out-of-state imports expected.

Brazil: Ethanol Balance

BILLION GALLONS

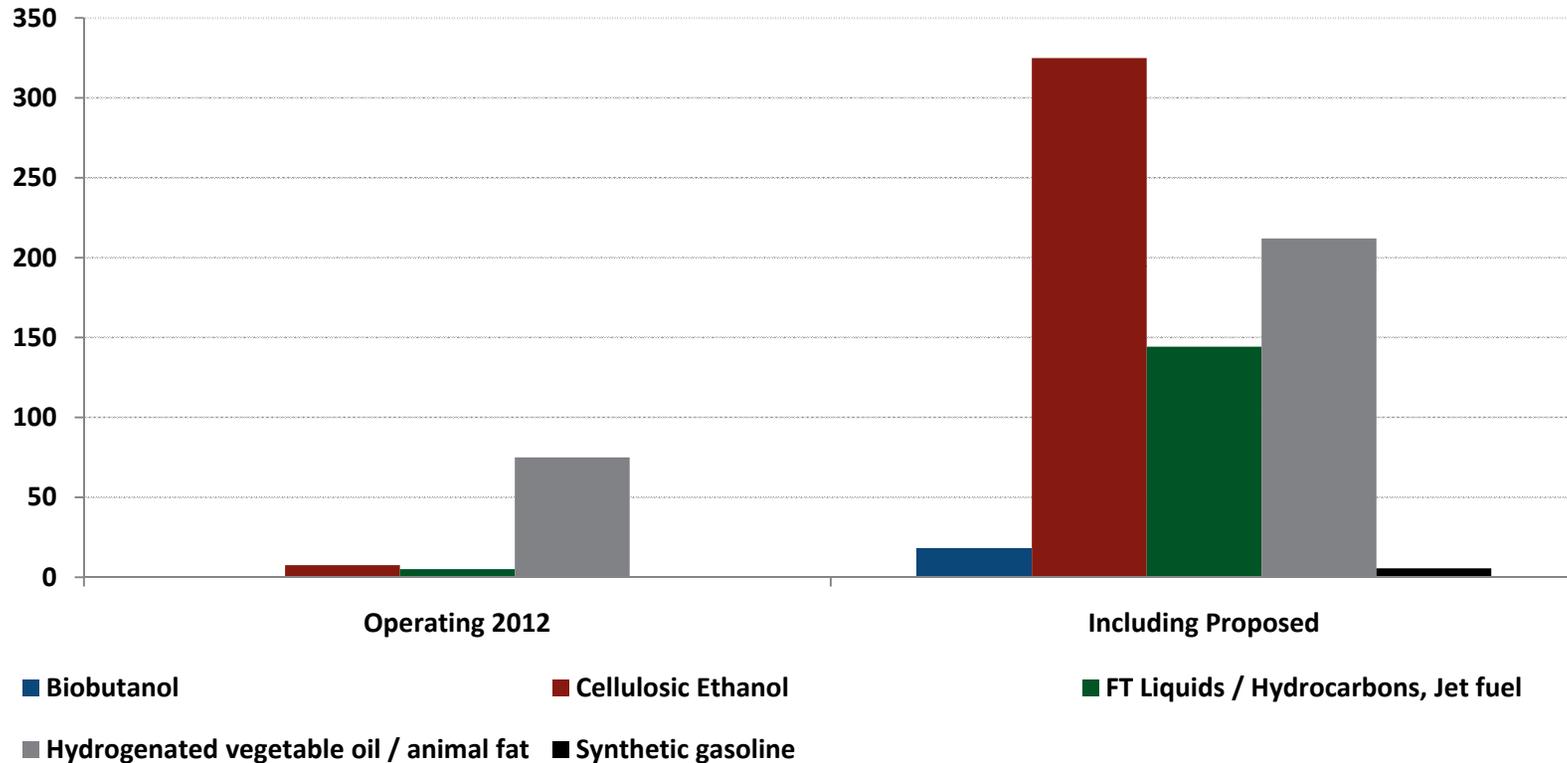


Source: U.S. & Brazil: Ethanol Outlook to 2022, April 2012

U.S.: Next-Generation Biofuels

Capacities of Operating and Proposed Projects Using Cellulosic Feedstock

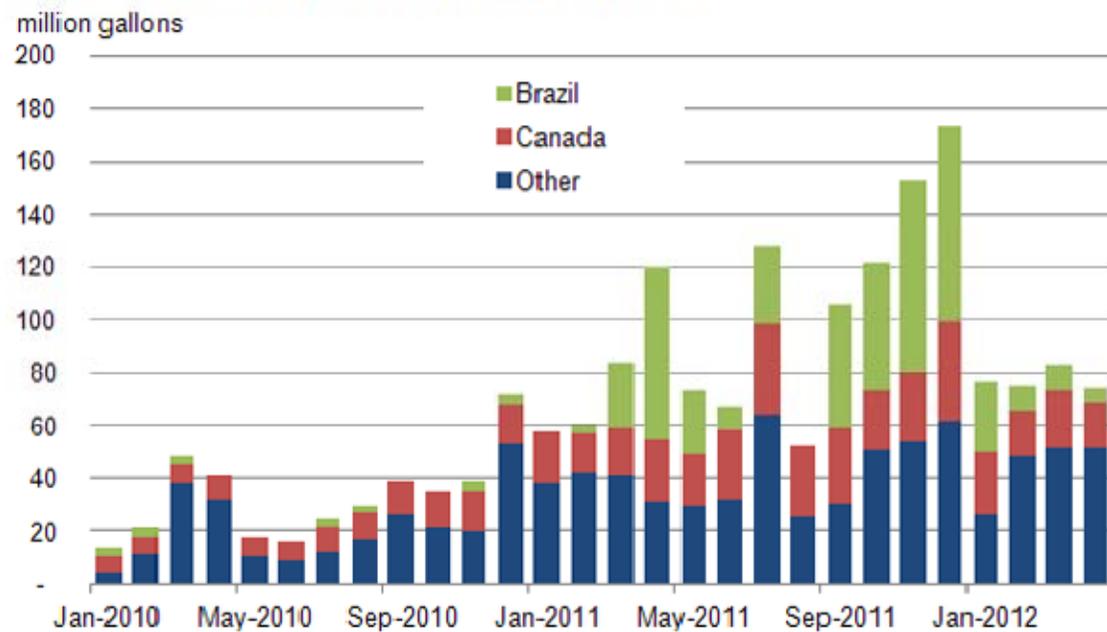
MILLION GALLONS PER YEAR



Source: U.S. & Brazil: Ethanol Outlook to 2022, April 2012

U.S. Ethanol Exports: 2010 – 2012 (EIA)

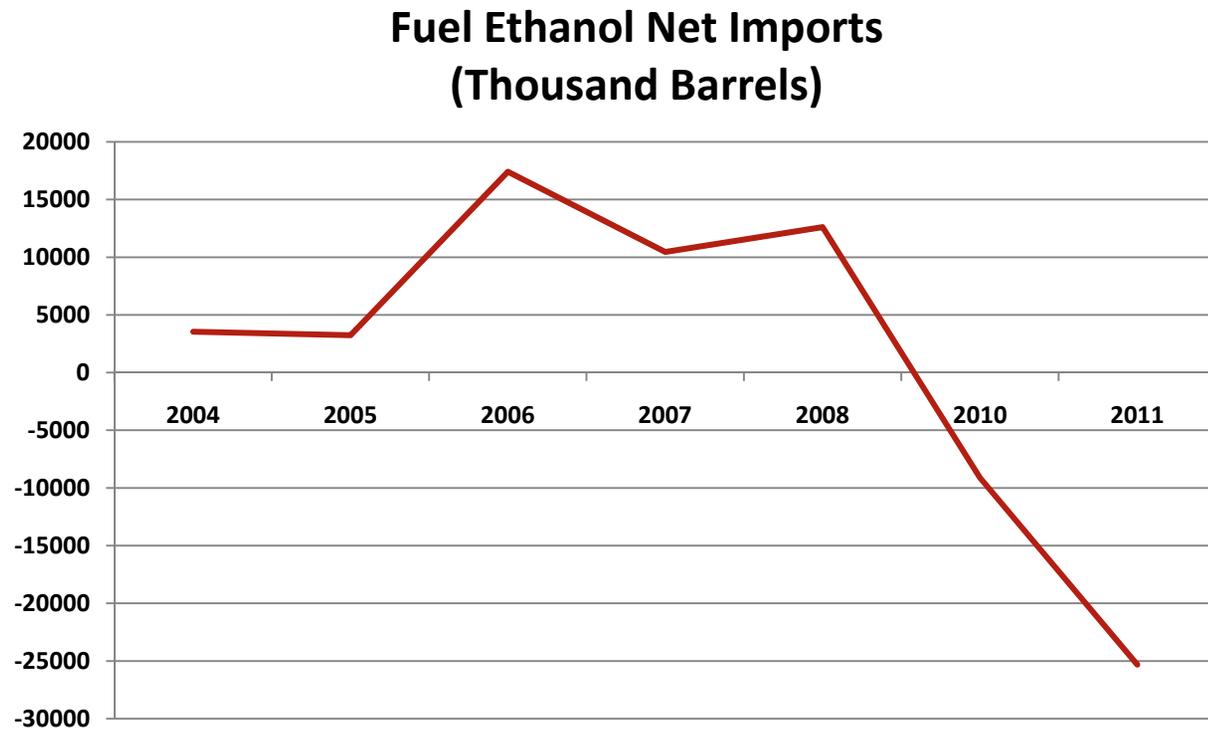
Figure 1. Monthly U.S. Ethanol Exports



Source: U.S. Energy Information Administration.



U.S. Ethanol Net Imports: 2004 - 2011

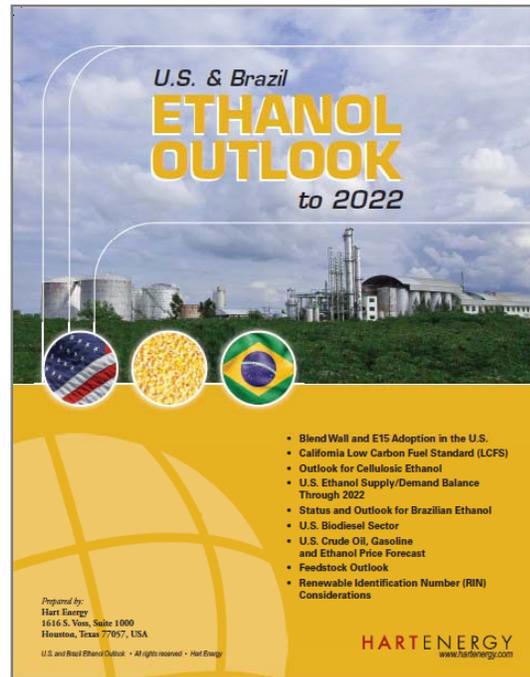


U.S. has become major global ethanol supplier

Conclusions

- Conventional ethanol S&D in general balance
- RFS2 program reform unclear
- LCFS will require greatly expanded advanced biofuels & other low-CI options
- Next generation biofuels capacity expansion
- Brazilian ethanol availability depends on domestic demands & global sugar markets
- E15 expansion forecast – expansion uncertain

Thank You



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