California Energy Commission Staff Workshop for the 2010-2011 Alternative Fuels Investment Plan

September 14-15, 2009

SWAN Biomass Company

Initial Comments

Presentation Outline

- Background issues
- Comments on CEC-600-2009-012-SD
  - Can California meet its RFP2 obligations?
  - Where should Biorefineries be located?
  - Are RFP2 and GHG goals compatible?
- Challenges ahead

Background Issues

- SWAN is a facilitator of technology through its Licenses
  - Provides Licensee with
    - The right to practice our technology
    - Process design packages
    - Technical assistance
    - Technology upgrades
    - Guidance in quickly switching from feedstock to feedstock
  - The company Avoids Build-Own-Operate-Maintain commitments whenever possible—it does not want to compete with its Licensees
  - The company supports the work of qualified engineering firms chosen by Licensees

Background Issues, Continued

- SWAN has more pilot plant experience than anyone else in the private sector and does not need another pilot plant.
  - NREL CRADA—proof of concept, multiple feedstocks tested to rate their potential, extended runs conducted.
  - NREL Work For Others contracts—Data not shared with NREL. This is a fundamental reason why NREL cannot authoritatively comment on SWAN technology.
  - Biomass Conversion Center of Excellence—Tech Service

Background Issues, Continued

- Much of the pilot plant experience was based on feedstocks obtained in California:
  - Wheat straw
  - Barley straw
  - Oat straw
  - Rice straw
  - Sugar and energy cane
- Other feedstocks are similar to those found in California:
  - Various types of hardwood (similar to California short rotation woody crops, wood waste, fire break refuse, orchard waste, other agriculture wastes, etc.)
  - Post-sorting MSW residuals
  - Corn fiber (useful for assessing retrofit possibilities for corn-based facilities)

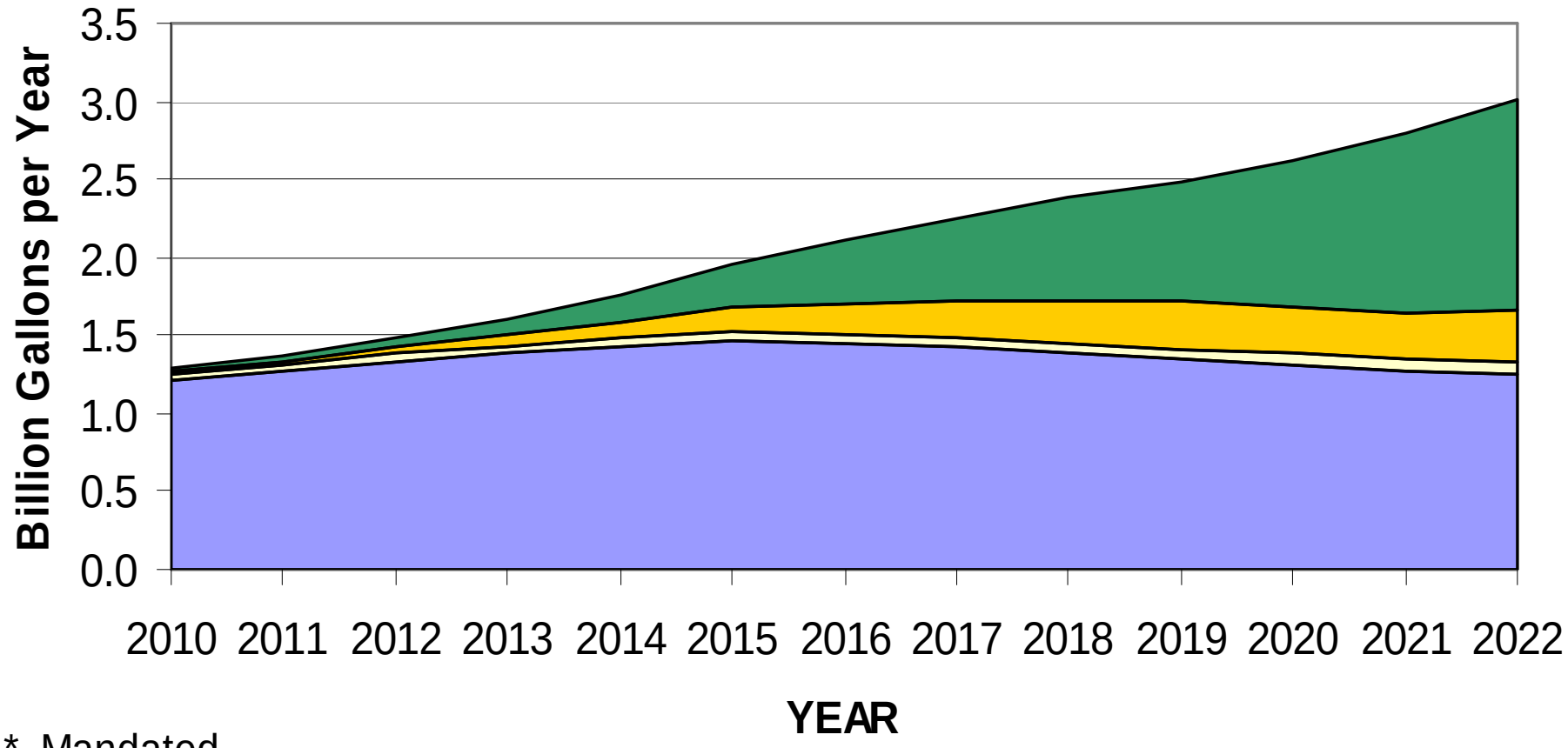
Background Issues, Continued

- The breadth and complexity of feedstocks already assessed allow efficient assessment of new feedstocks, e.g. sorghum (we are having discussions with an entity developing genetically modified varieties for increased yield and salt resistance, and are looking forward to analyzing the sorghum produced by Steve Kaffka and others in California)

Background Issues, Continued

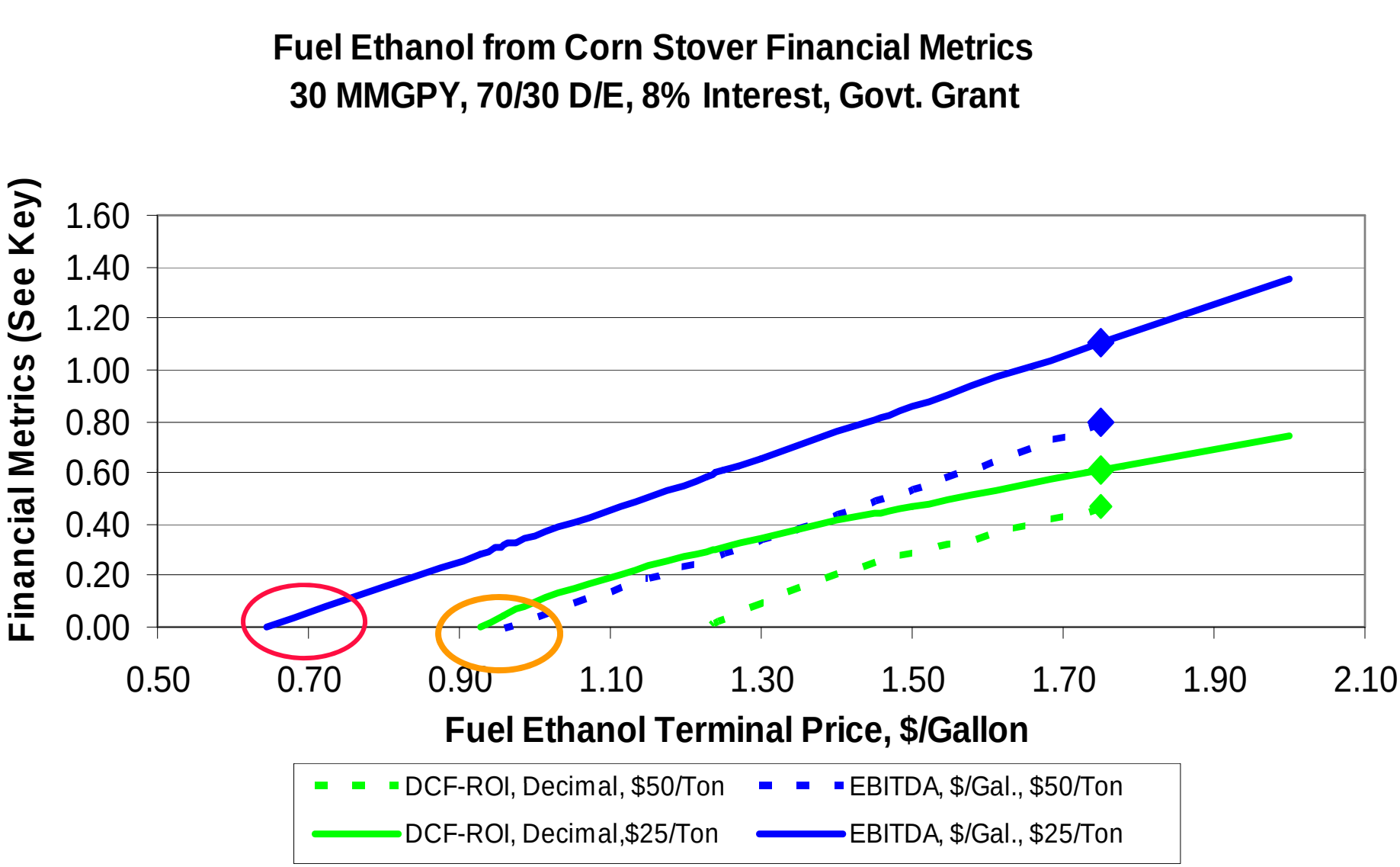
- A commercial demonstration Biorefinery is the next step.
  - A process design package has been prepared with an FEL-3 level of accuracy.
  - Licensees are involved in permitting.
  - Funding sources are being developed.
- The mandate for cellulose-based ethanol has made this step an urgent one.

Renewable Fuels Required to Meet California RFP2 Mandates--CEC Projection 9/2009

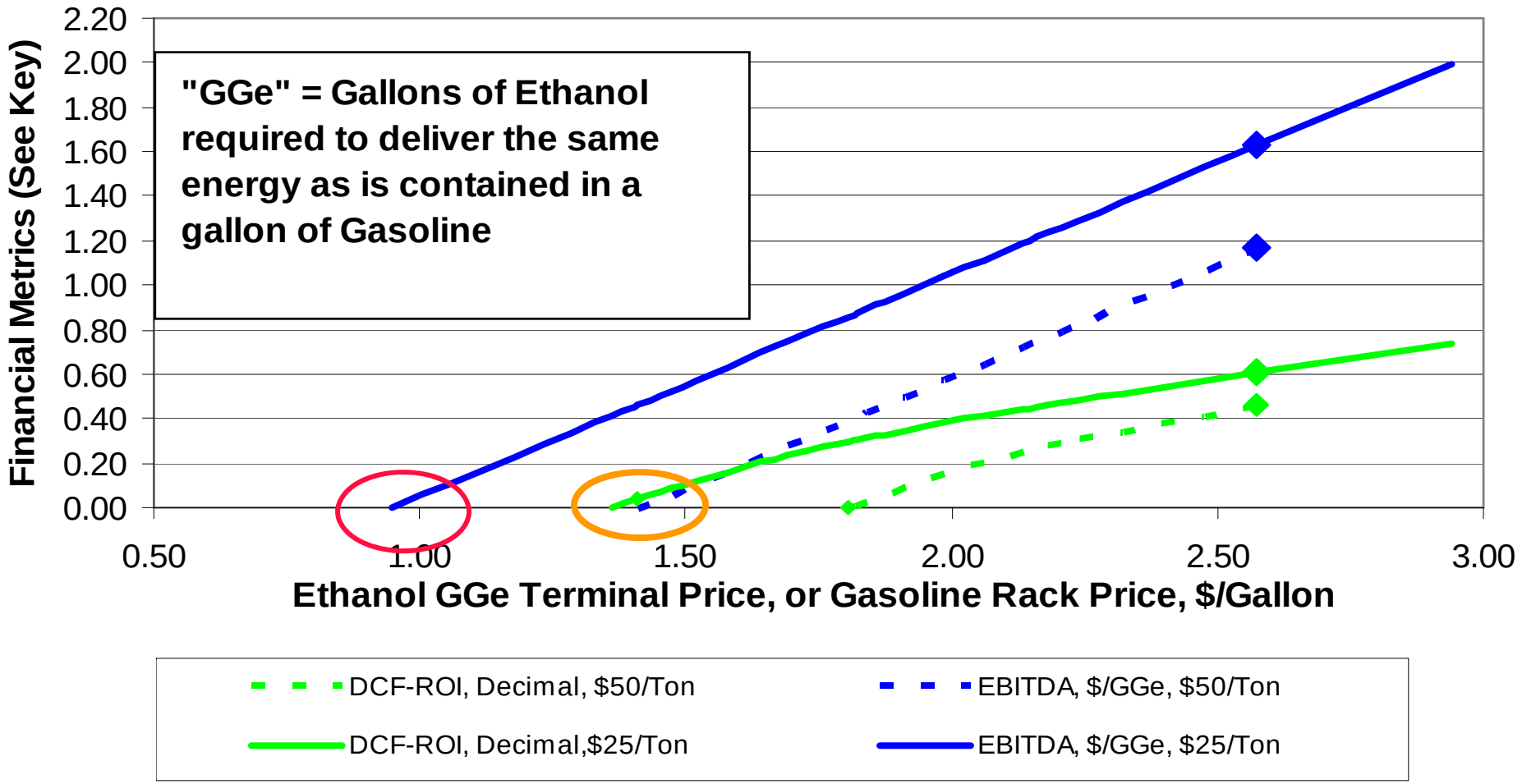


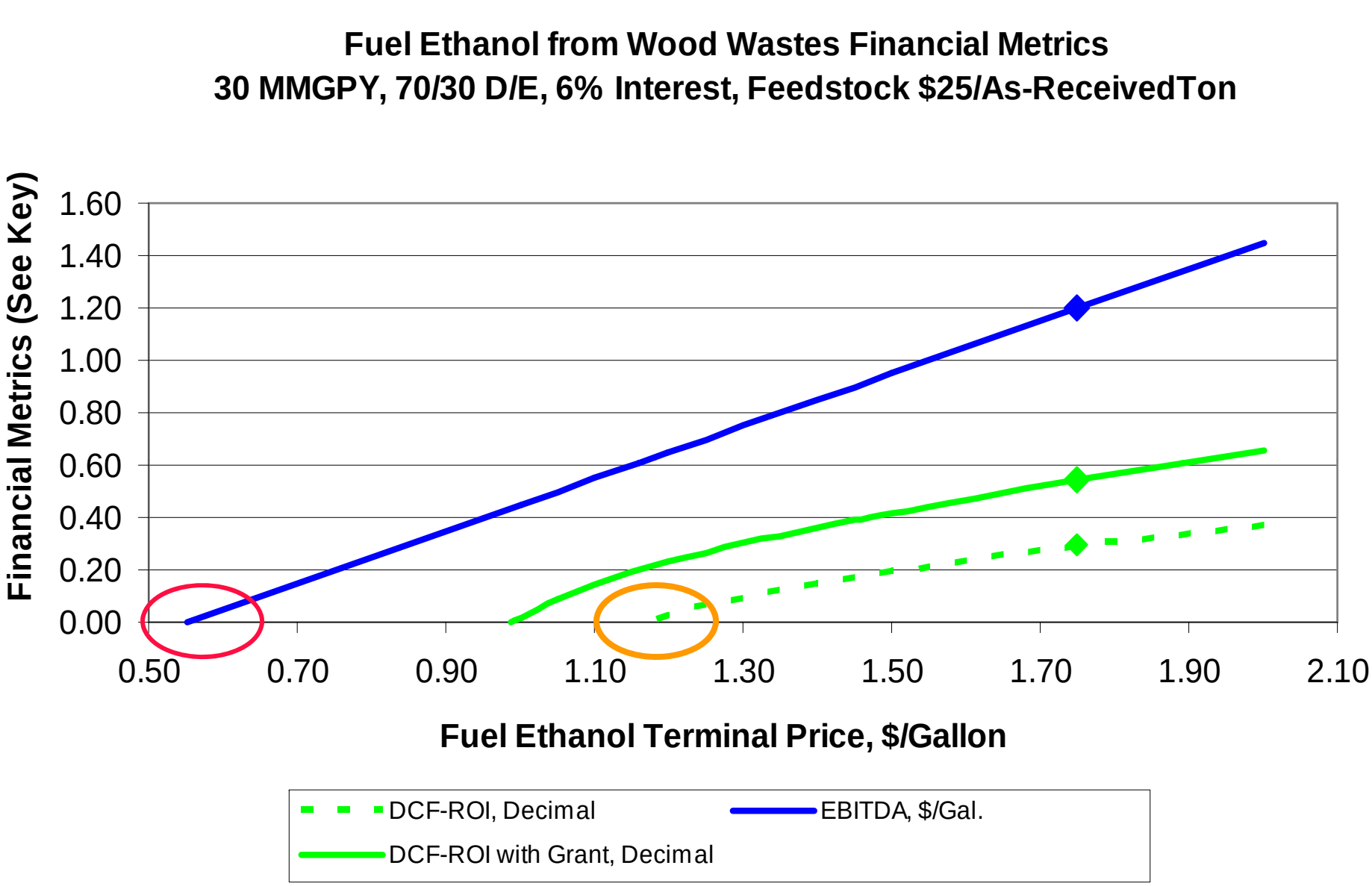
Preliminary Conclusions

- The supply of/demand for starch based fuel ethanol is expected to weaken beginning in 2015
- Cellulosic ethanol Is expected to begin to grow in 2010 based on “fair share” principles reaching 1,345 million gallons by 2022
- This growth could be accommodated by 13-14 Biorefineries each with 100MM GPY, a reasonable objective in a 12 year time frame.
- The launching of a SWAN Biorefinery may alter these forecasts.


Fuel Ethanol from Corn Stover Financial Metrics
30 MMGPY, 70/30 D/E, 8% Interest, Govt. Grant
Financial Metrics (See Key)
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0.50
0.70
0.90
1.10
1.30
1.50
1.70
1.90
2.10
Fuel Ethanol Terminal Price, $/Gallon
DCF-ROI, Decimal, $50/Ton
EBITDA, $/Gal., $50/Ton
DCF-ROI, Decimal,$25/Ton
EBITDA, $/Gal., $25/Ton

Ethanol GGe from Corn Stover Financial Metrics
20.4 MM GGe per Year , 70/30 D/E, 8% Interest
GGe and Gasoline Terminology




Fuel Ethanol from Wood Wastes Financial Metrics
30 MMGPY, 70/30 D/E, 6% Interest, Feedstock $25/As-ReceivedTon
Financial Metrics (See Key)
1.60
1.40
1.20
1.00
0.80
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0.40
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Fuel Ethanol Terminal Price, $/Gallon
DCF-ROI, Decimal
EBITDA, $/Gal.
DCF-ROI with Grant, Decimal

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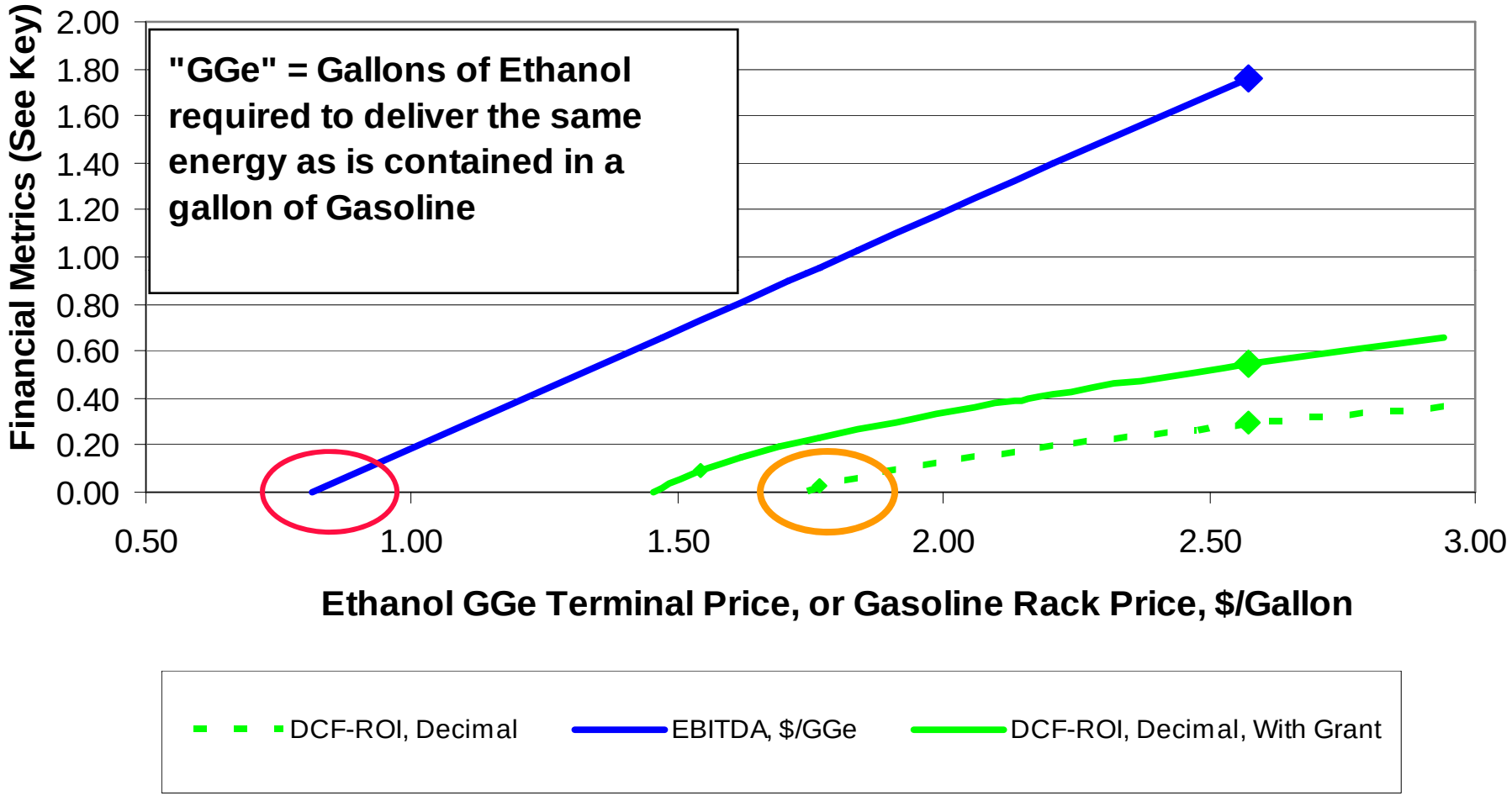
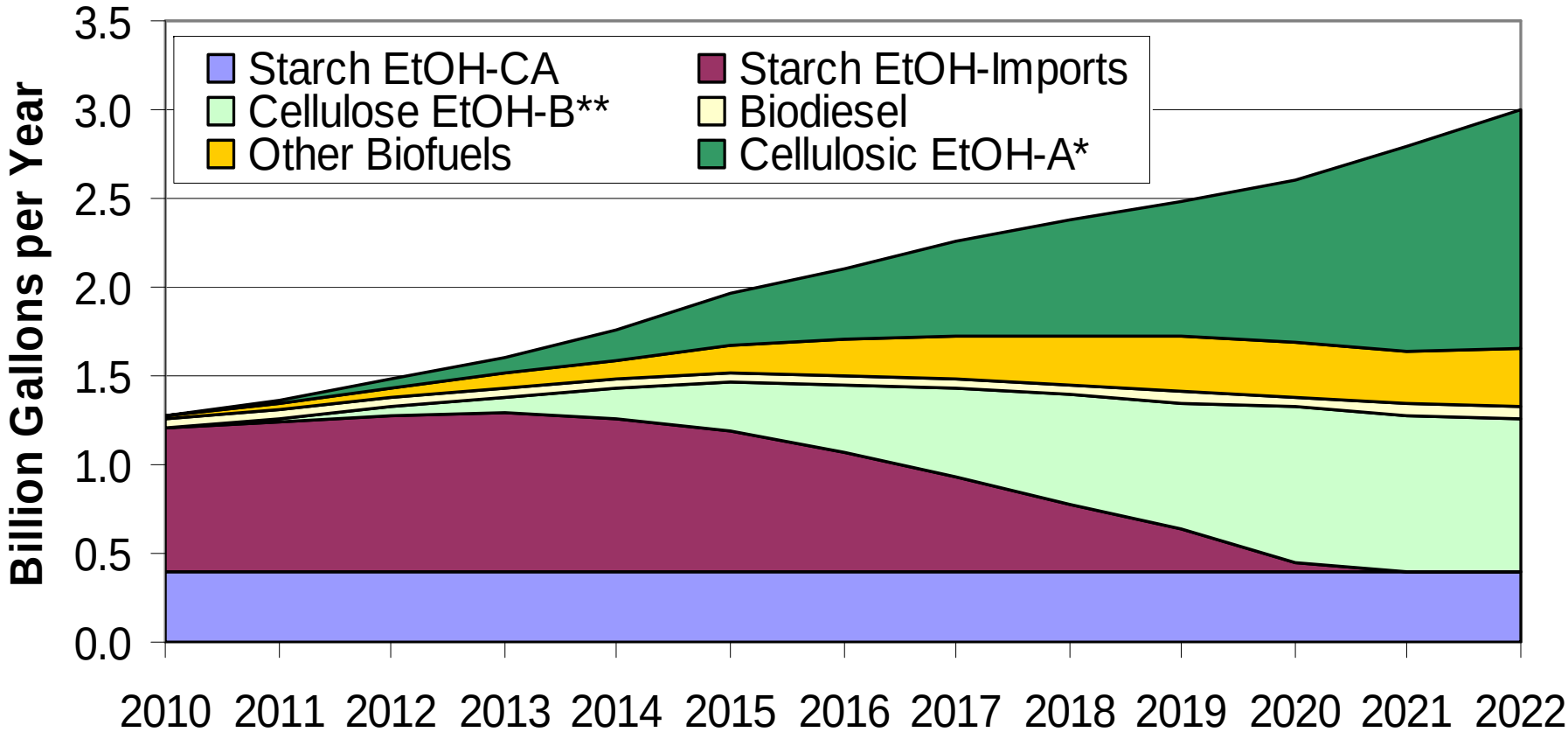


Revised Tentative Conclusions

- Cellulose-based ethanol will grow very profitably once the initial Biorefineries are established
- Marginal corn-based ethanol will shut down, encouraging the construction of more cellulose-based facilities
- The cycle will continue until only the wet mill, and depreciated, efficient dry mill corn based facilities survive.
- We will work with dry mills wanting to determine the impact cellulosic technology might have on their operations. The answer will depend on the configuration and condition of each facility.

Renewable Fuels Required to Meet California RFP2 Mandates--SWAN Projection 9/2009



* Mandated

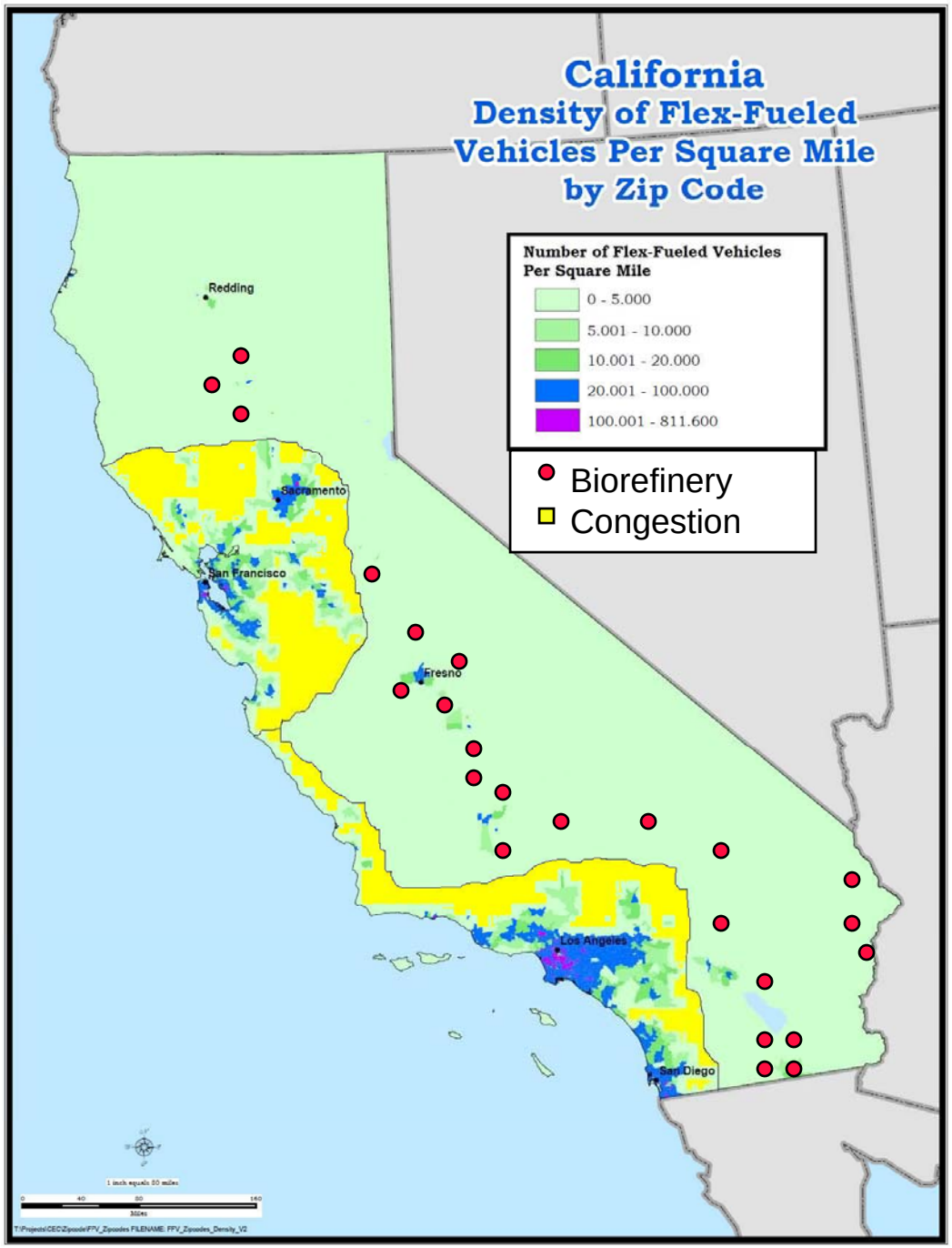
** Displacing Imports

Cellulose Process Economics Can be a Competitive Advantage

- The production of ethanol from cellulosic feedstocks may grow from the projected 1,345 MMGPY to about 2,206 MMGPY million gallons per year, requiring a total of about 22-24 facilities with 100 MMGPY capacity.
- The private sector will not need help (or a mandate) under this scenario—pursuit of profit can be the driving force.
- The increase can be handled easily by the construction strategy being used so long as it is initiated quickly.
- California has an opportunity to extend its ethanol capacity to meet those demands, or to cede that which it does not fill to low cost ethanol imported from domestic or foreign sources. If the challenge is met it can result in a substantial number of new jobs or saved old jobs.

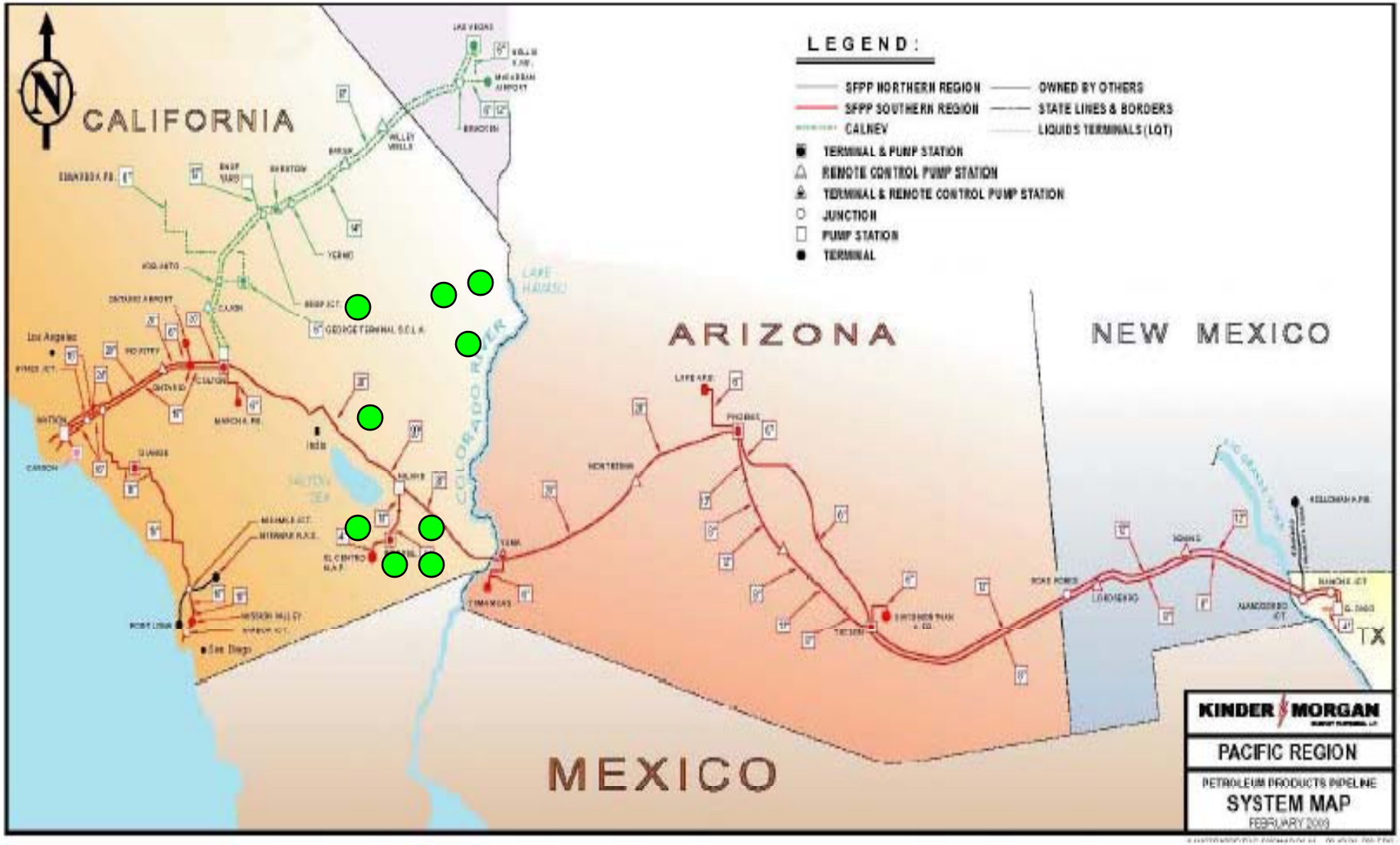
Where Should New Biorefineries be Located?

- An aggressive build out of Biorefineries could result is a new paradigm for economic expansion if the were located where the feedstock is rather than where the inventory of E85-capable vehicles is located.
- A network of Biorefineries so located is proposed to promote economic development there and to service the needs of coastal areas once local needs are (quickly) met.
- This scenario would lower the transportation component of “well-to-wheel” calculations, and relieve some of the projected congestion increases along the coast.
- This paradigm could be fostered by specifying that most E85 vehicles should be delivered to areas surrounding the central Biorefineries.



Sources: California Department of Motor Vehicle (DMV) data and Energy Commission analysis.

Logistics Issues: California Transportation Fuels for Nevada, Arizona, New Mexico



Source: Kinder Morgan Pipeline company.

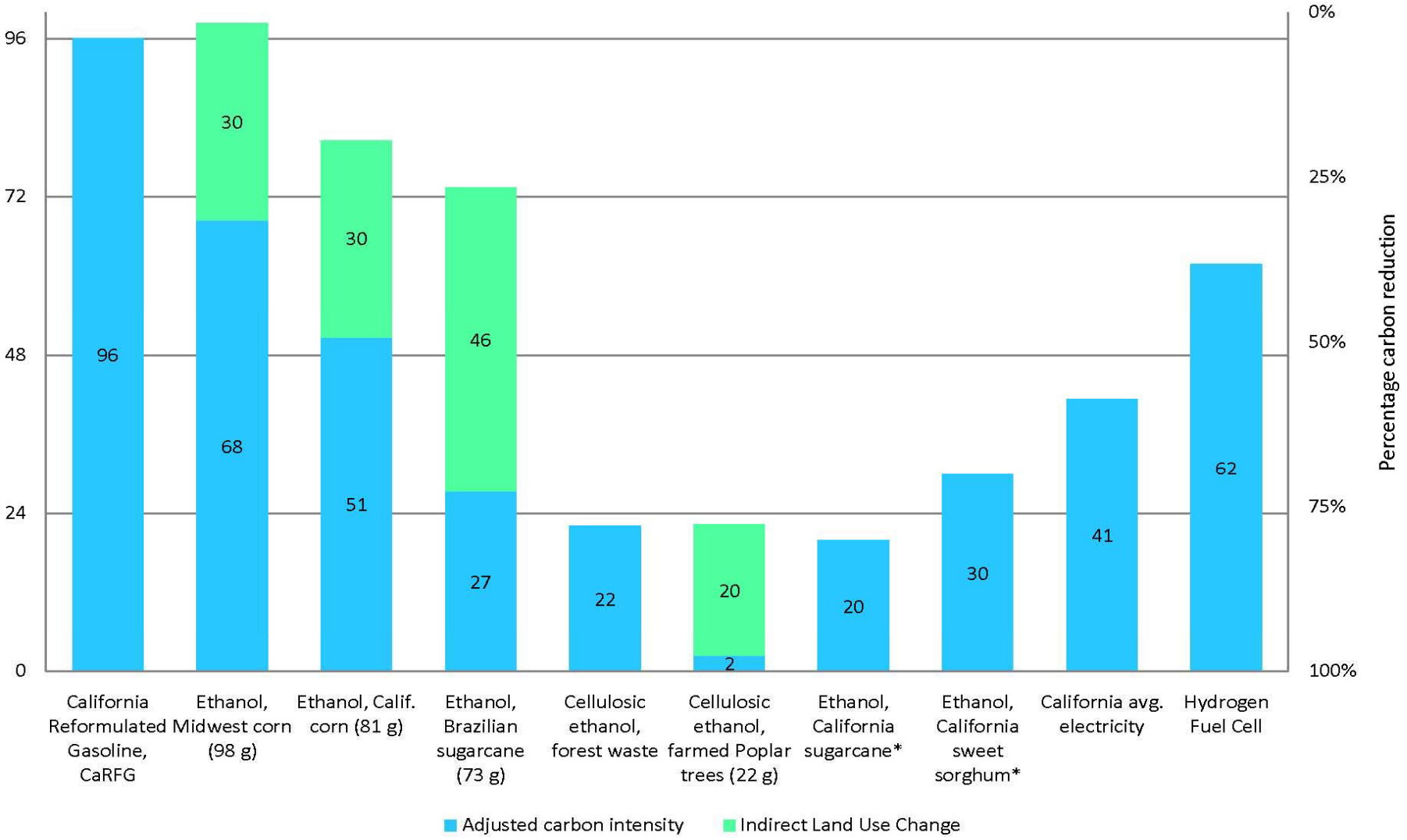
Will GHG reduction be Hindered?

- Based on the GREET analyses conducted by CARB and CEC, we think not.
- The first Biorefinery we build will be fairly basic, but subsequent ones should approach the design that we asked CEC to analyze.
- The strategy used to produce these results can be applied to many feedstocks.

Carbon Intensity for Gasoline & Substitutes, g CO2 e/MJ

(grams CO2 emitted per unit of energy adjusted for energy economy ratio [EER])

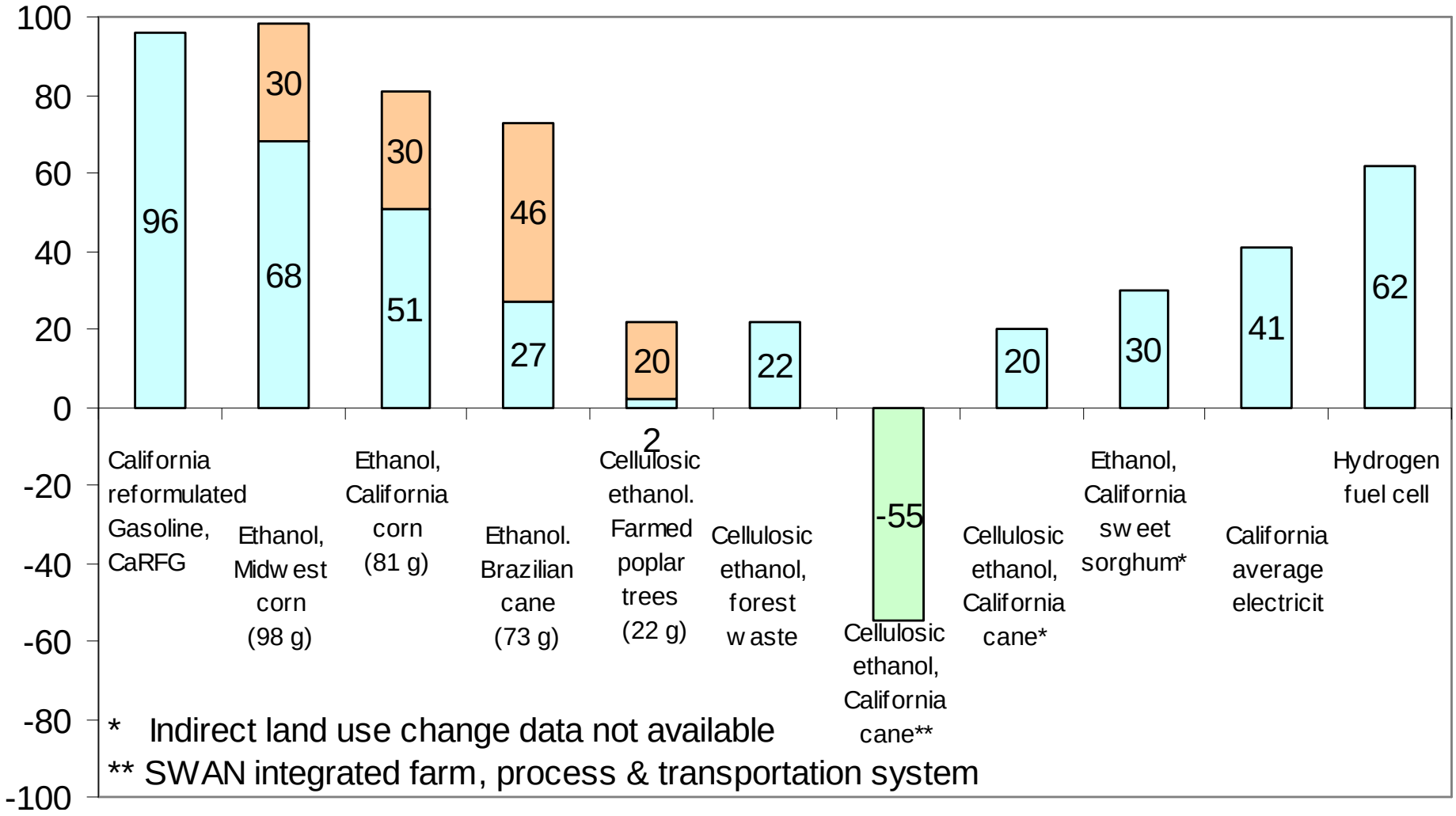
***staff estimate and indirect land use change not available**



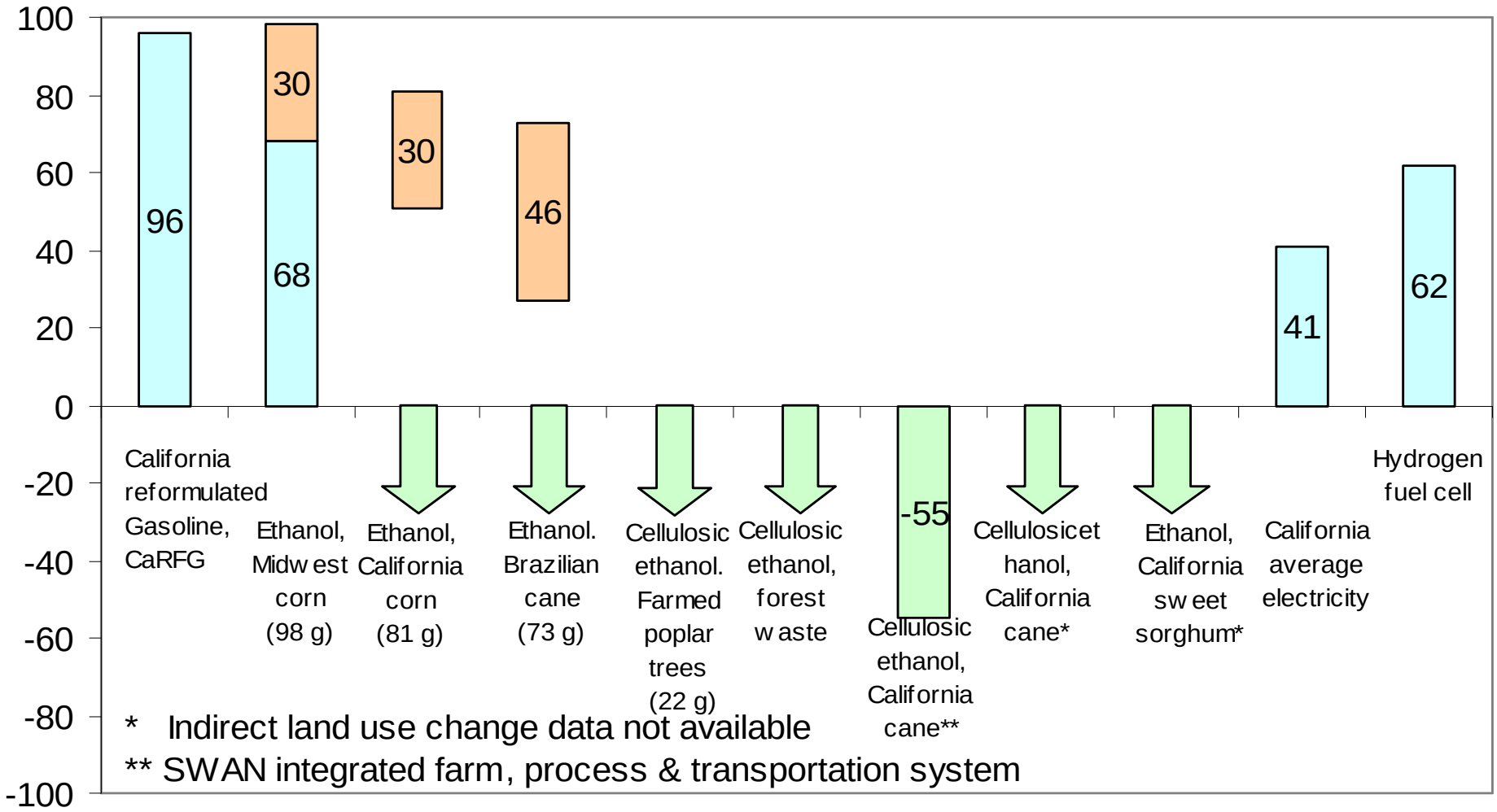
Prepared by CEC staff from ARB LCFS fuel life-cycle pathway documents

4/9/2009

Carbon Intensity for Gasoline & Substitutes, g CO_2e/MJ



Carbon Intensity for Gasoline & Substitutes, g CO_2e/MJ



Now, the Hard Part, the Challenge

- We all, under CEC's leadership, need to determine if the goals and forecasts presented are generally endorsed and if not, what corrections should be made.
- Then, again under CEC's leadership, we need to define a path that will successfully and efficiently reach our refined view of the future.

Process Product Versatility