NJWEA 2017 | Atlantic City, NJ

# Got Gas? Use it for Vehicle Fuel under the Updated Renewable Fuel Standard

May 8, 2017


**John Willis, P.E. BCEE**
David Babson
Cynthia Finley
Steven Marshall, P.E.

# Presentation Outline

- Renewable Fuel Standard (RFS) and Cellulosic Determination
- RIN Pricing and EPA's Past Efforts
- St. Petersburg Class-A Digestion and Energy Upgrades
  - Project Scope Overview
  - Summary of Budget Economics
  - Impact of Cellulosic Determination and Current RIN Pricing
- Why the RFS is Likely to Continue
- Conclusions


# Renewable Fuel Standard (RFS) and Cellulosic Determination

# RFS Program Structure

- Created under the Energy Policy Act of 2005 (EPAct)
- Energy Independence and Security Act of 2007 (EISA) further amended the CAA by expanding RFS program
- EPA implemented RFS program in consultation with the US Department of Agriculture and the Department of Energy

# Pathways II Improved on Pathways I

- Pathways I originally classified Biogas (from Landfills, sewage and waste treatment plants, manure digesters) as for D5 (Advanced) RINs
- RFS Pathways II was published on July 18, 2014
- Pathway Q provided designation as D3 (cellulosic) RINs for any:
  - "Renewable Compressed Natural Gas, Renewable Liquefied Natural Gas, Renewable Electricity"
  - produced from "Biogas from landfills, municipal wastewater treatment facility digesters, agricultural digesters, and separated MSW digesters; and biogas from the cellulosic components of biomass processed in other waste digesters."

# Many wonder what happens to RINs after 2022?

- In order to understand why, we look at RFS-2 Table I.A.1-1…
  - What's the "magic" with 2022?



Table I.A.1-1

Renewable Fuel Volume Requirements for RFS2 (billion gallons)

| | Cellulosic biofuel requirement | Biomass-based diesel requirement | Advanced biofuel requirement | Total renewable fuel requirement |
|---|---|---|---|---|
| 2009 | n/a | 0.5 | 0.6 | 11.1 |
| 2010 | 0.1 | 0.65 | 0.95 | 12.95 |
| 2011 | 0.25 | 0.80 | 1.35 | 13.95 |
| 2012 | 0.5 | 1.0 | 2.0 | 15.2 |
| 2013 | 1.0 | a | 2.75 | 16.55 |
| 2014 | 1.75 | a | 3.75 | 18.15 |
| 2015 | 3.0 | a | 5.5 | 20.5 |
| 2016 | 4.25 | a | 7.25 | 22.25 |
| 2017 | 5.5 | a | 9.0 | 24.0 |
| 2018 | 7.0 | a | 11.0 | 26.0 |
| 2019 | 8.5 | a | 13.0 | 28.0 |
| 2020 | 10.5 | a | 15.0 | 30.0 |
| 2021 | 13.5 | a | 18.0 | 33.0 |
| 2022 | 16.0 | a | 21.0 | 36.0 |
| 2023+ | b | b | B | b |

[a] To be determined by EPA through a future rulemaking, but no less than 1.0 billion gallons.

[b] To be determined by EPA through a future rulemaking.

BILLING CODE 6560-50-C

40 CFR Part 80
Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule (RFS-2)

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2022 is where the table ends…
A virtual "cliff"



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  - What's the "magic" with 2022?
  - There's a footnote! One that suggests that it's "up to EPA"…
  - **It's wrong to assume "that's never any good ☹"**



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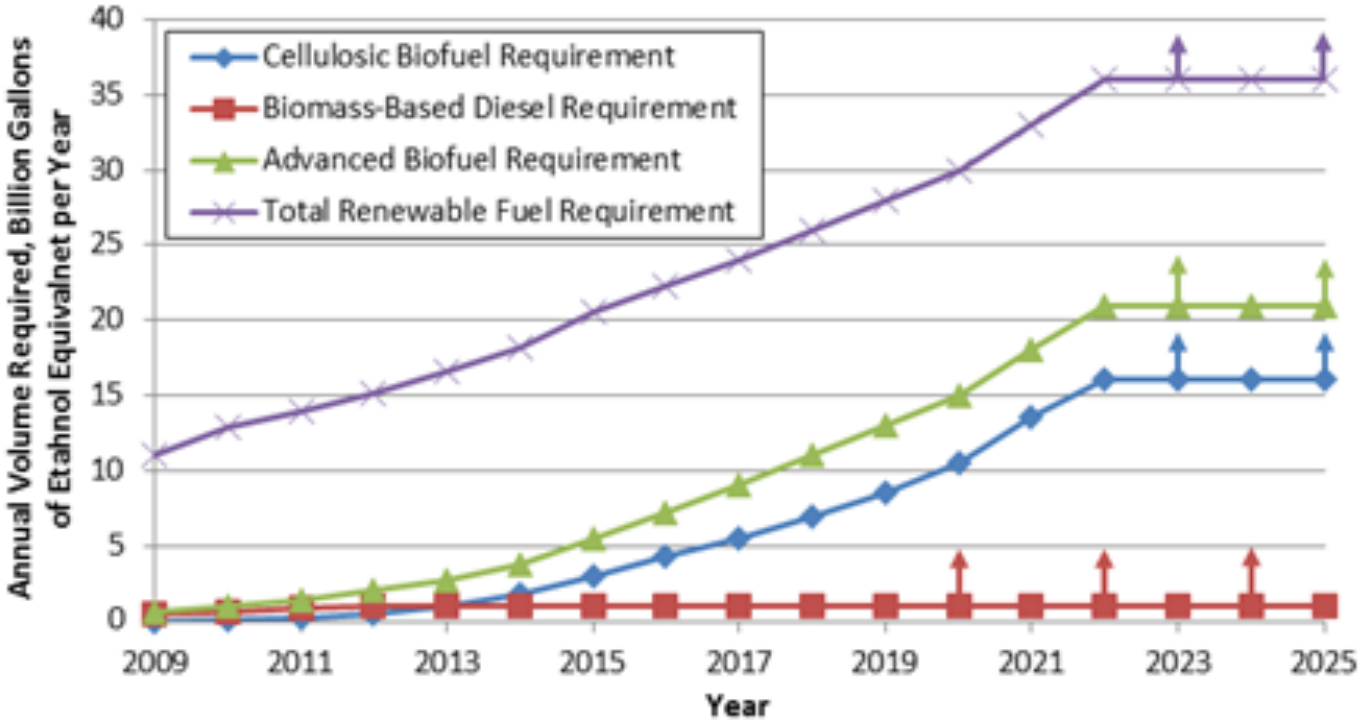
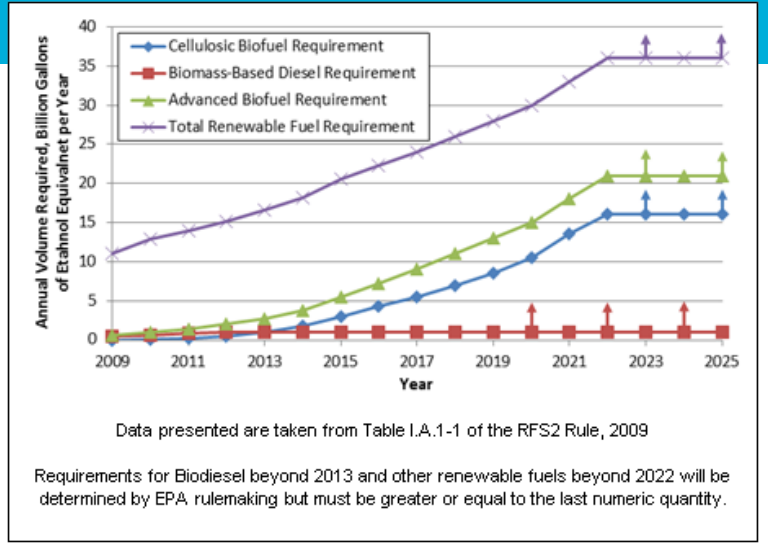
# Reconfiguring the Table as a Graph of Required Volumes and Percentages




Data presented are taken from Table I.A.1-1 of the RFS2 Rule, 2009

Requirements for Biodiesel beyond 2013 and other renewable fuels beyond 2022 will be determined by EPA rulemaking but must be greater or equal to the last numeric quantity.

# What happens after 2022? Read the Rule…

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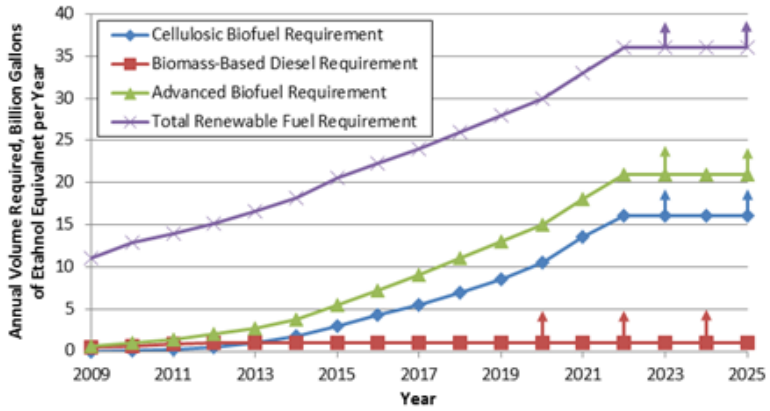
Requirements for Biodiesel beyond 2013 and other renewable fuels beyond 2022 will be determined by EPA rulemaking but must be greater or equal to the last numeric quantity.

"The statutorily-prescribed phase-in period ends in 2012 for biomass-based diesel and in 2022 for cellulosic biofuel, advanced biofuel, and total renewable fuel. Beyond these years, EISA requires EPA to determine the applicable volumes based on a review of the implementation of the program up to that time, and an analysis of a wide variety of factors such as the impact of the production of renewable fuels on the environment, energy security, infrastructure, costs, and other factors. For these future standards, EPA must promulgate rules establishing the applicable volumes no later than 14 months before the first year for which such applicable volumes would apply. For biomass-based diesel, this would mean that final rules would need to be issued by October 31, 2011 for application starting on January 1, 2013. In today's rulemaking, we are not suggesting any specific volume requirements for biomass-based diesel for 2013 and beyond that would be appropriate under the statutory criteria that we must consider. Likewise, we are not suggesting any specific volume requirements for the other three renewable fuel categories for 2023 and beyond. However, the statute requires that the biomass-based diesel volume in 2013 and beyond must be no less than 1.0 billion gallons, and that advanced biofuels in 2023 and beyond must represent at a minimum the same percentage of total renewable fuel as it does in 2022.

# Is there an example as to "What EPA might do" after 2022?

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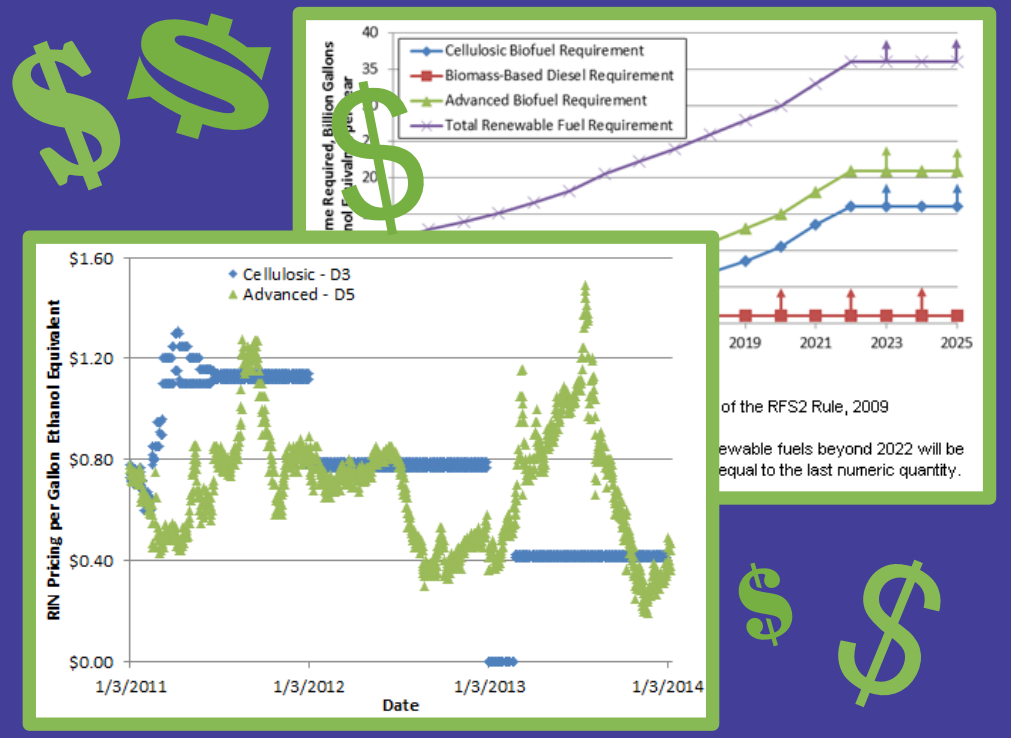
# Past History: Biodiesel…

| Fuel Type | Legislated 2013 Renewable Volumes, million gal | EPA-Revised 2013 Volumes[a], million gal | EPA-Revised 2013 Percentage of Fuel Sold | Legislated 2014 Renewable Volumes, million gal | EPA-Revised 2014 Volumes[b], million gal | EPA-Revised 2014 Percentage of Fuel Sold |
|---|---|---|---|---|---|---|
| Cellulosic Biofuel | 1,000 | 6.0 | 0.010% | 1,750 | 17.0 | 0.010% |
| Biomass-Based Diesel | 1,000 | 1,280 | 1.13% | 1,000 | 1,280 | 1.16% |
| Advanced Biofuel | 2,750 | 2,750 | 1.62% | 3,750 | 2,200 | 1.33% |
| Renewable Fuel | 16,550 | 16,550 | 9.74% | 18,150 | 15,210 | 9.20% |

[a]Data from EPA-420-F-13-042, August 2013

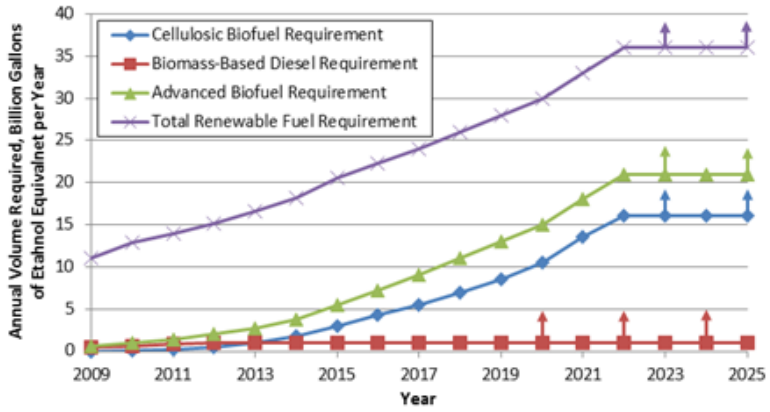
[b]Data from EPA-420-F-13-048, November 2013

RFS2 requires that the Administrator sets the standards based on these volumes each November for the following year based in part on information provided from the Energy Information Agency (EIA).




# RIN Pricing and EPA's Past Efforts

# What happens if there's not enough Renewable Fuel?

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# Past History: Cellulosic…

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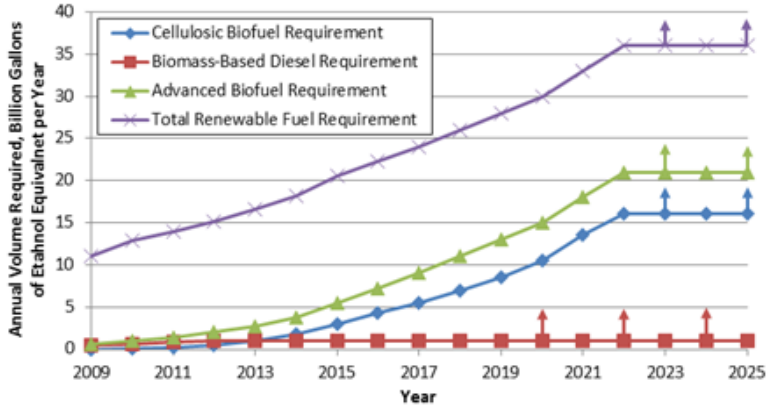


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# Past History: Advanced…

RFS2 requires that the Administrator sets the standards based on these volumes each November for the following year based in part on information provided from the Energy Information Agency (EIA)

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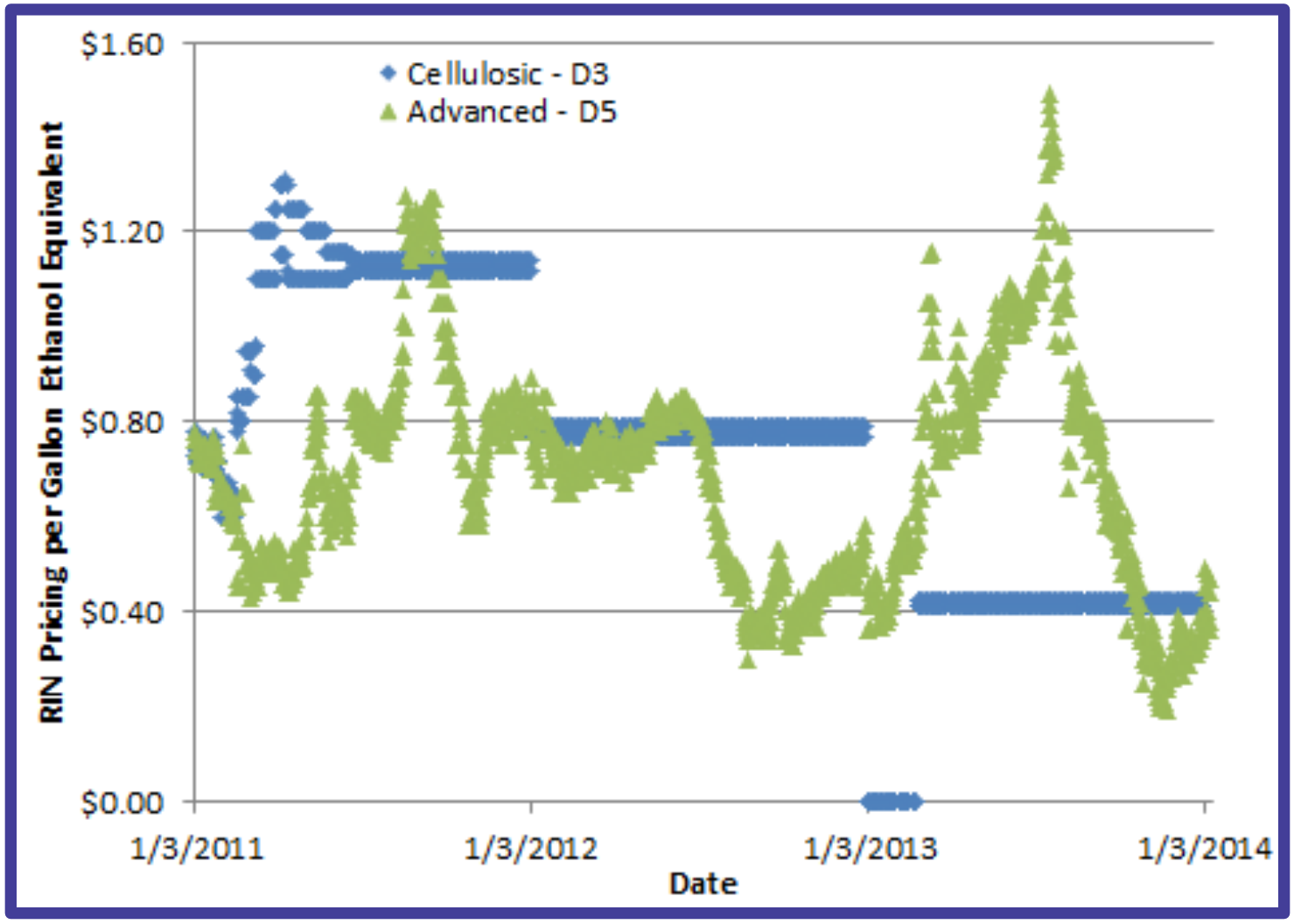
# Advanced RIN Pricing (OPIS & EPA)



# EPA-Determined Volumes set Market: Multiple times and has been done retroactively

| | 2014 | | | 2015 | |
|---|---|---|---|---|---|
| Fuel Type | Legislated Volumes, million gal | EPA-Revised Volumes, million gal | EPA-Revised Percentage of Fuel Sold | Legislated Volumes, million gal | EPA-Revised Volumes, million gal | EPA-Revised Percentage of Fuel Sold |
| Cellulosic Biofuel | 1,750 | 33.0 | 0.019% | 3,000 | 106 | 0.059% |
| Advanced Biofuel | 3,750 | 2,680 | 1.52% | 5,500 | 2,900 | 1.61% |
| Renewable Fuel | 18,150 | 15,930 | 9.02% | 20,500 | 16,300 | 9.04% |
| Data from TABLES I.A-1; I.A-3; and I.B.5-1 in 40 CFR part 80, RIN 2060-AS22 (June 2015) | | | | | | |

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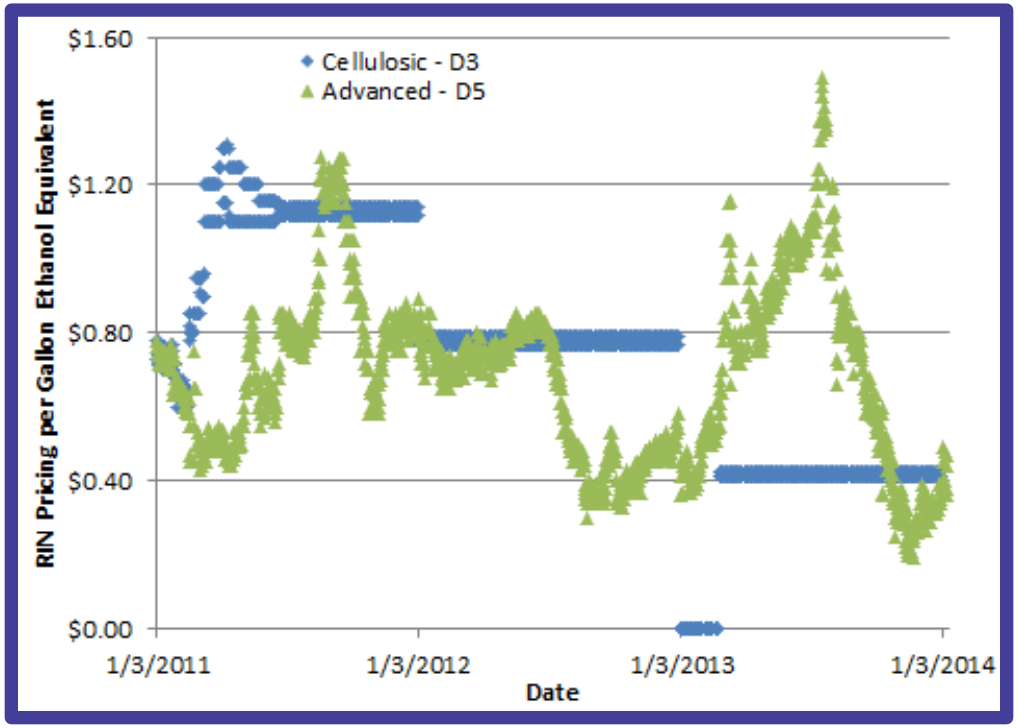
# What are the Current Requirements?

| | 2014 | | | 2015 | | | 2016 | | |
|---|---|---|---|---|---|---|---|---|---|
| Fuel Type | Legislated Volumes, million gal | EPA-Revised Volumes, million gal | EPA-Revised Percentage of Fuel Sold | Legislated Volumes, million gal | EPA-Revised Volumes, million gal | EPA-Revised Percentage of Fuel Sold | Legislated Volumes, million gal | EPA-Revised Volumes, million gal | EPA-Revised Percentage of Fuel Sold |
| Cellulosic Biofuel | 1,750 | 33.0 | 0.019% | 3,000 | 106 | 0.059% | 3,000 | 206 | 0.114% |
| Advanced Biofuel | 3,750 | 2,680 | 1.52% | 5,500 | 2,900 | 1.61% | 7,250 | 3,400 | 1.88% |
| Renewable Fuel | 18,150 | 15,930 | 9.02% | 20,500 | 16,300 | 9.04% | 22,250 | 17,400 | 9.63% |
| Data from TABLES I.A-1; I.A-3; and I.B.5-1 in 40 CFR part 80, RIN 2060-AS22 (June 2015) | | | | | | | | | |

**In 2022:**

Advanced = 21 Billion Gallons / Year

Cellulosic = 16 Billion Gallons / Year



# What are Future RIN Prices Going to be???

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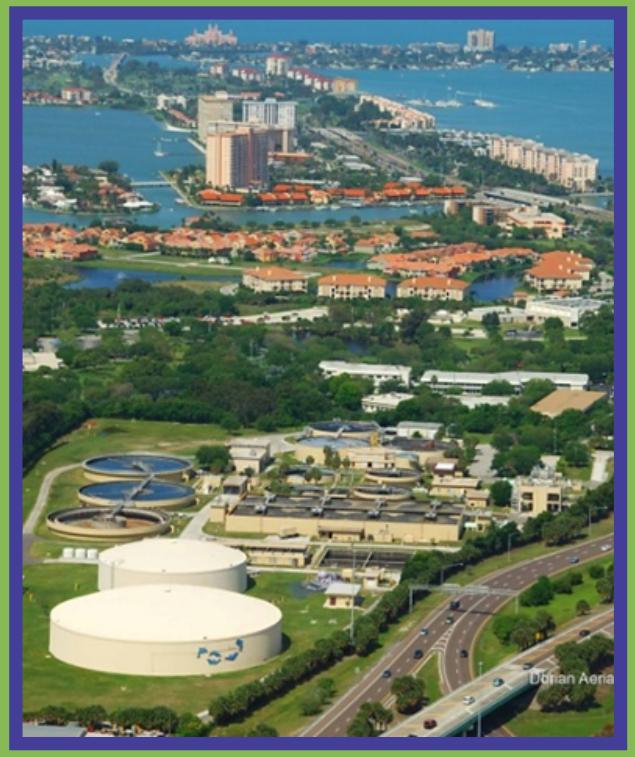
Can’t see that well but should be a lot more than $0.00

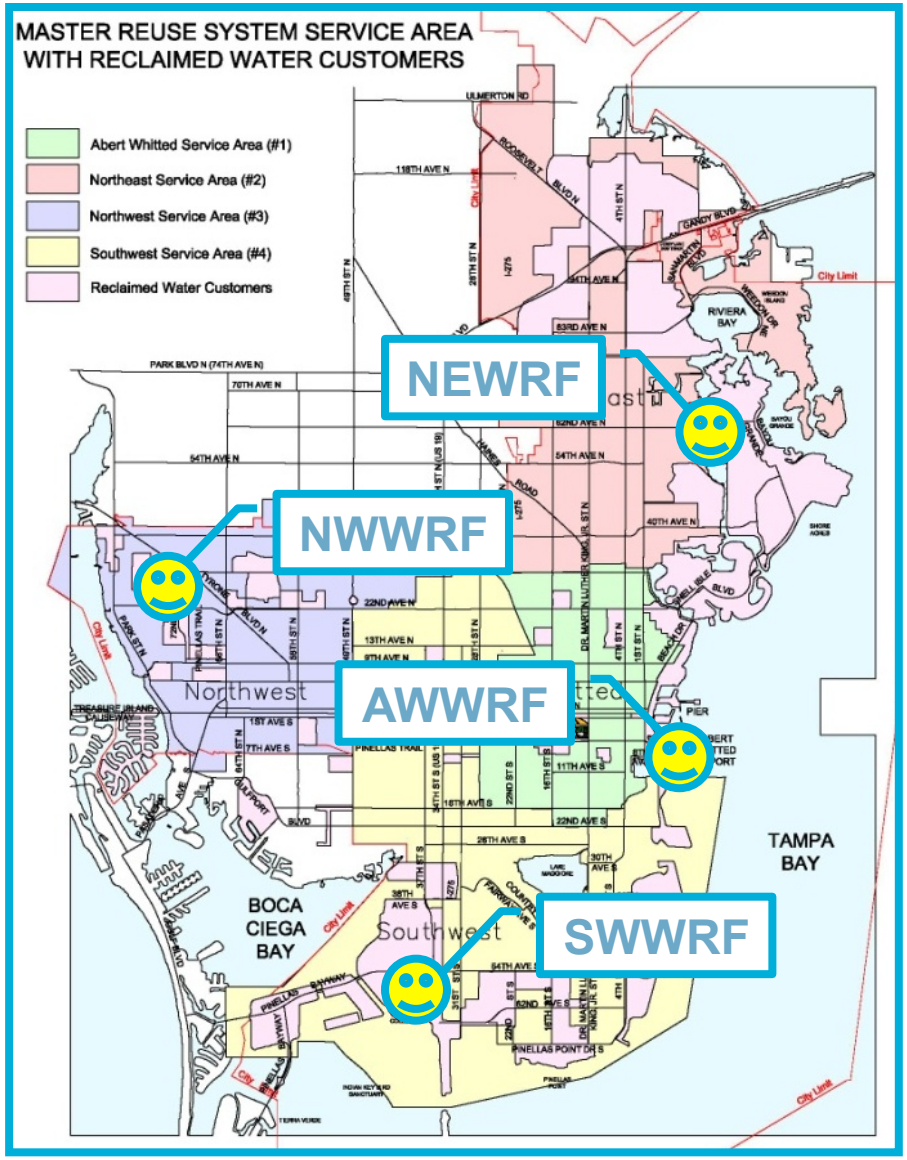
# St. Petersburg Class-A Digestion and Energy Upgrades



# System Overview

- 316,627 served
- 35 mgd wastewater flow
- 4 WRFs
- 9.35¢/kWh for power
- 10,000 dry tpy WAS
- 6,200 dry tpy biosolids

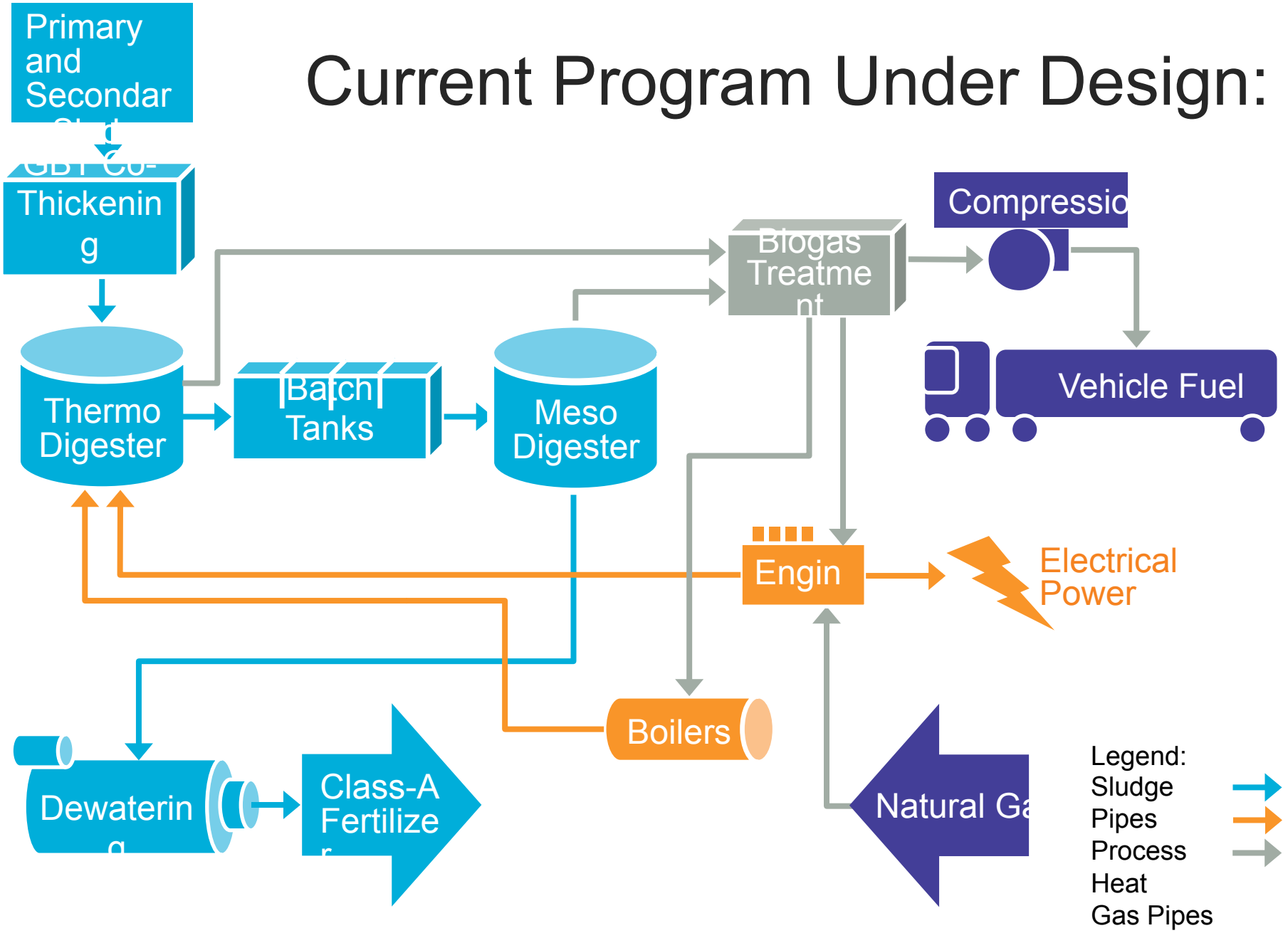
**Business Case Evaluation (BCE) evaluated over 35 options**



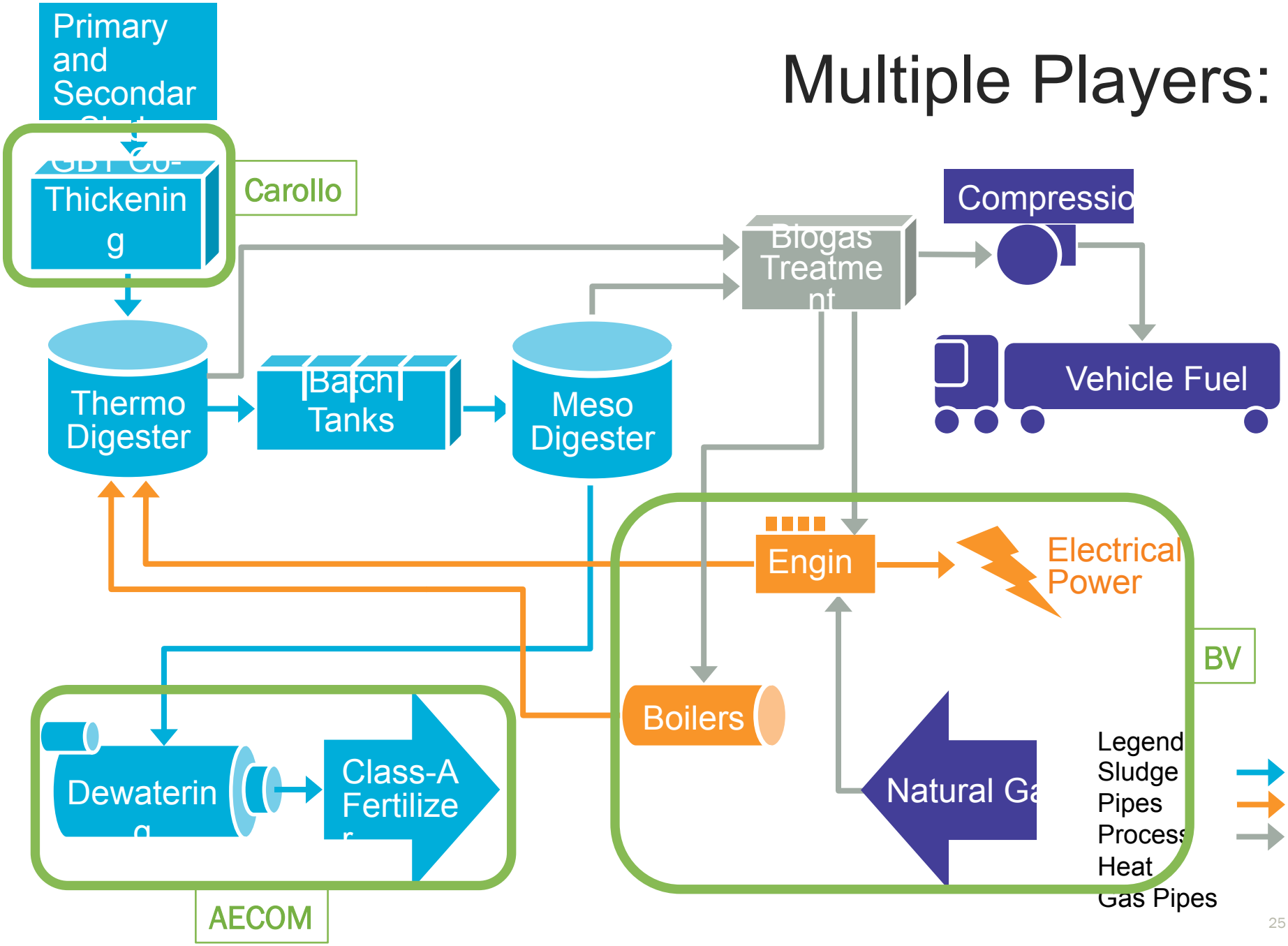
# Starting with the Conclusion

- Project Under Development
  - Consolidates solids handling at the SWWRF
  - Produces Class-AA biosolids using EPA-Batch TPAD
  - Completely powers the plant using new, natural-gas-fueled engines that supply 100% of thermophilic digester heat
  - Produces ~1,700 diesel-gallon-equivalents (DGE)/day of renewable CNG for use in the City's sanitation trucks

# Current Program Under Design:



# Multiple Players:



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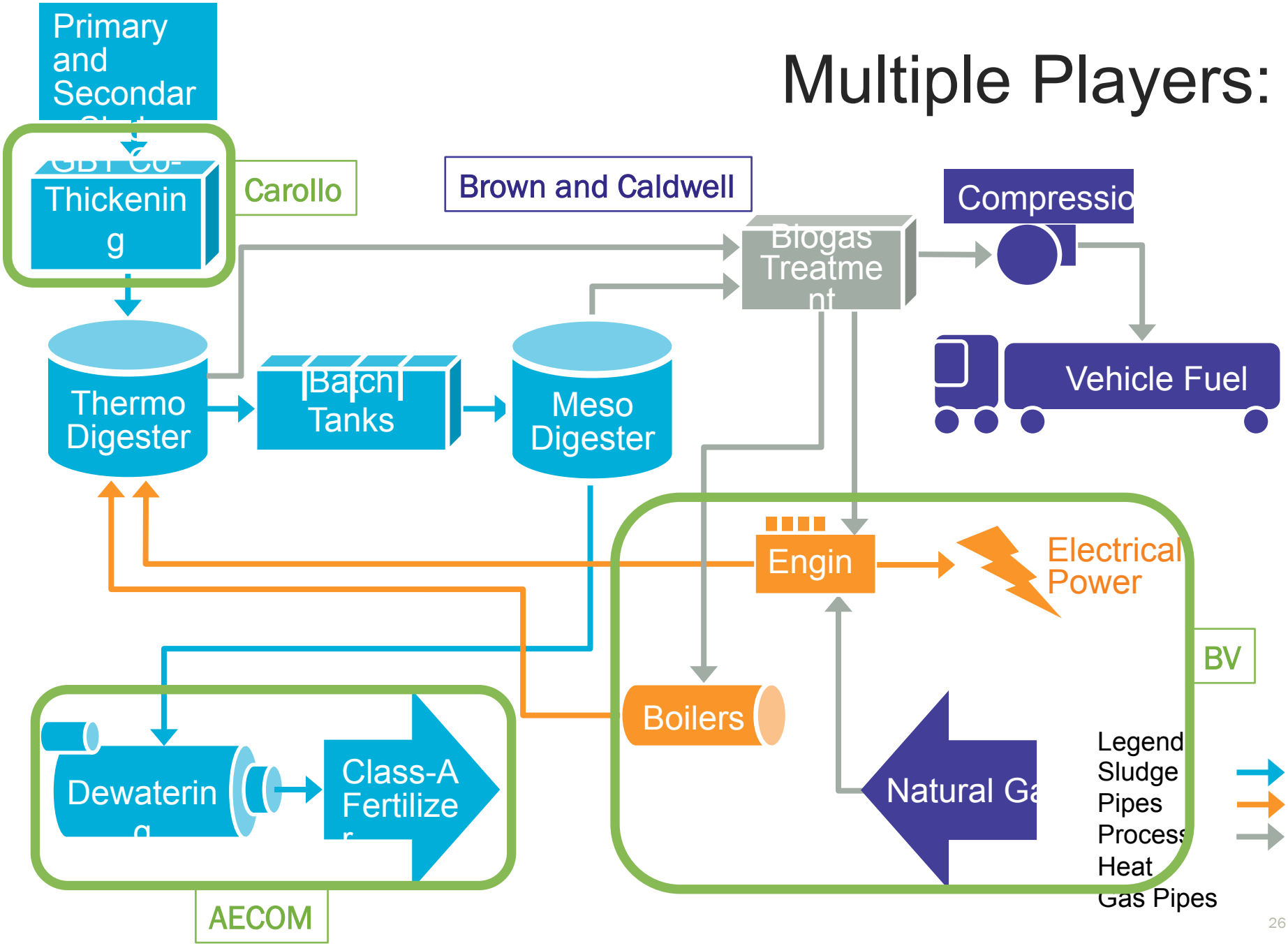

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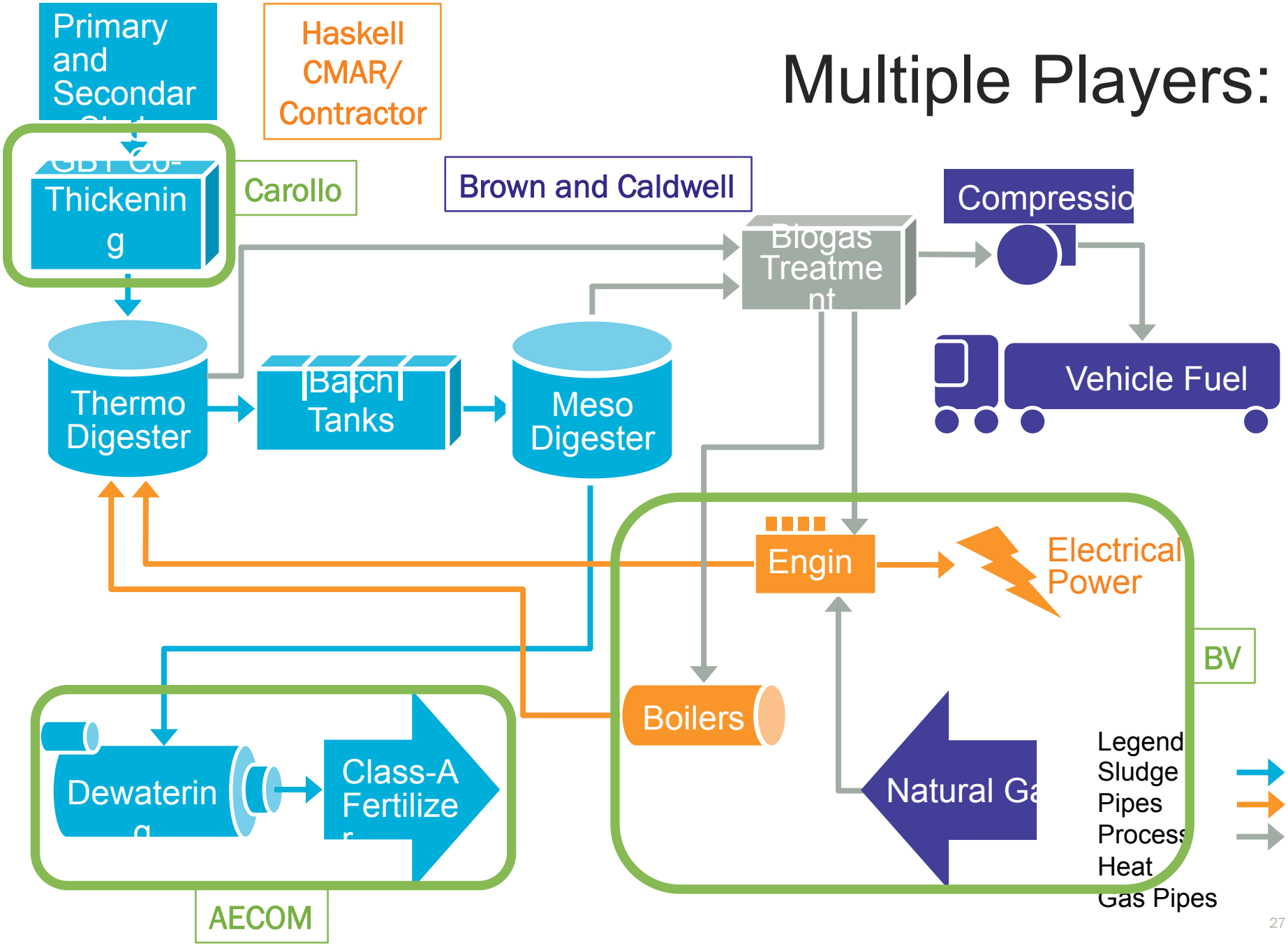

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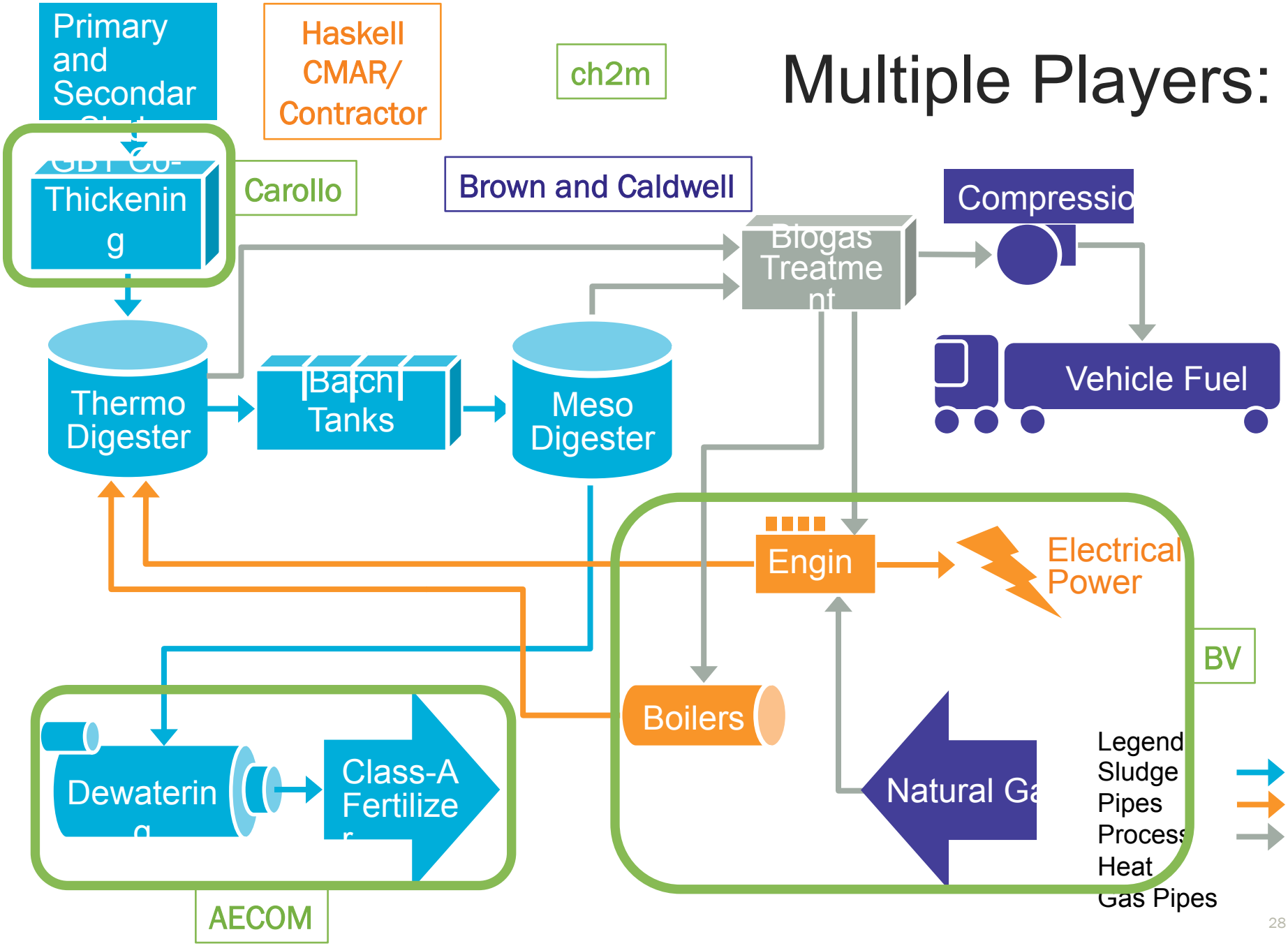

# Overall Project Economics

| | 20-Year PW |
|---|---|
| • Project Under Development | |
| • $90M in construction that offsets prior $53M in solids CIP | -$37M |
| • Consolidates solids handling at the SWWRF; breaks even by saving labor, adding polymer, adding iron dosing | $0 |
| • Produces Class-AA biosolids according to Florida Biosolids Rule (Chapter 62-640); saves ~$1.3M/yr | +$23M |
| • Completely powers the plant using new, natural-gas-fueled engines that also supply 100% of thermophilic digester heating needs; saves ~$300k/yr | +$5M |
| • Provides additional liquid-stream efficiency, peak flow capacity, and resiliency | $0 |
| • Produces 1,700GDE/day of rCNG for use by the City's sanitation truck fleet | ???? |

# Original (2013) Vehicle Fuel Economics Enhanced Return on Investment

- Predicted ~1,700gpd **diesel-gallon-equivalent** production matches Sanitation Truck consumption
- ~$2.75/gallon “sale”
- Plus $0.62/gallon for Advanced RINs

Waste Management CNG Refuse Haulers in Seattle

# So what is Renewable Fuel worth to St. Pete?

| Scenario | GDE/D | Est. Date | Fuel Price, $/DGE | Annual Fuel Revenue | RIN Class | RIN Price, $/EGE | RIN Price, $/DGE | Assumed Pecent Realized | Annual RIN Revenue | Total Annual Revenue |
|---|---|---|---|---|---|---|---|---|---|---|
| Initial Plan, Full-Value | 1,600 | Apr-13 | $2.75 | $1,606,000 | D5 | $0.62 | $1.06 | 100% | $362,080 | $1,968,080 |
| Initial Plan, Discounted-Value | 1,600 | Apr-13 | $2.75 | $1,606,000 | D5 | $0.62 | $1.06 | 80% | $289,664 | $1,895,664 |

Or ~$34M PW so overall project SAVES $25M

# So what is Renewable Fuel worth to St. Pete?

| Scenario | GDE/D | Est. Date | Fuel Price, $/DGE | Annual Fuel Revenue | RIN Class | RIN Price, $/EGE | RIN Price, $/DGE | Assumed Pecent Realized | Annual RIN Revenue | Total Annual Revenue |
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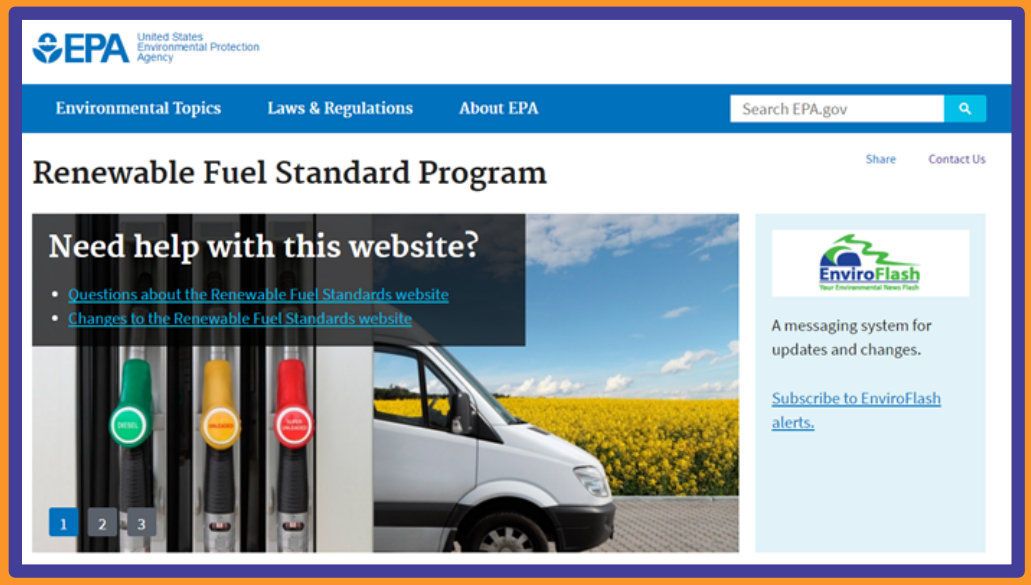
| Initial Plan, Discounted-Value | 1,600 | Apr-13 | $2.75 | $1,606,000 | D5 | $0.62 | $1.06 | 80% | $289,664 | $1,895,664 |
| Past Summer with D3 at Waiver Price, Full-Value | 1,600 | Jan-17 | $1.90 | $1,109,600 | D3 | $1.83 | $3.11 | 100% | $1,068,720 | $2,178,320 |
| Past Summer with D3 at Waiver Price, Discounted-Value | 1,600 | Jan-17 | $1.90 | $1,109,600 | D3 | $1.83 | $3.11 | 80% | $854,976 | $1,964,576 |

Or ~$36M PW so overall project SAVES $27M

# So what is Renewable Fuel worth to St. Pete?

| Scenario | GDE/D | Est. Date | Fuel Price, $/DGE | Annual Fuel Revenue | RIN Class | RIN Price, $/EGE | RIN Price, $/DGE | Assumed Pecent Realized | Annual RIN Revenue | Total Annual Revenue |
|---|---|---|---|---|---|---|---|---|---|---|
| Initial Plan, Full-Value | 1,600 | Apr-13 | $2.75 | $1,606,000 | D5 | $0.62 | $1.06 | 100% | $362,080 | $1,968,080 |
| Initial Plan, Discounted-Value | 1,600 | Apr-13 | $2.75 | $1,606,000 | D5 | $0.62 | $1.06 | 80% | $289,664 | $1,895,664 |
| Past Summer with D3 at Waiver Price, Full-Value | 1,600 | Jan-17 | $1.90 | $1,109,600 | D3 | $1.83 | $3.11 | 100% | $1,068,720 | $2,178,320 |
| Past Summer with D3 at Waiver Price, Discounted-Value | 1,600 | Jan-17 | $1.90 | $1,109,600 | D3 | $1.83 | $3.11 | 80% | $854,976 | $1,964,576 |
| Today, Full-Value | 1,600 | Jan-17 | $1.90 | $1,109,600 | D3 | $2.50 | $4.25 | 100% | $1,460,000 | $2,569,600 |
| Today, Discounted-Value | 1,600 | Jan-17 | $1.90 | $1,109,600 | D3 | $2.50 | $4.25 | 80% | $1,168,000 | $2,277,600 |

Or ~$47M PW so overall project SAVES $38M




# Why the RFS is Likely to Continue

# Why expect the RFS to Continue?

1. The Federal Rules are set to self-perpetuate

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| RIN Category | Legislated 2016 EGE Obligation, Mgal/yr[a] | EPA-Revised 2016 EGE Obligation, Mgal/yr[b] | Assumed Displaced Fuel Type | Fuel Price, $/gal[c] | Fuel Price, $/EGE | Annual Fuel Revenue, M$/yr | RIN Bid Price, $/EGE[d] | Annual RIN Revenue, M$/yr | Total Annual Revenue, M$/yr |
|---|---|---|---|---|---|---|---|---|---|
| D3 - Cellulosic | 4,250 | 206 | CNG as GDE | $2.00 | $1.18 | $242 | $1.86 | $383 | $625 |
| D4 - Biodiesel | 1,000 | 1,800 | Diesel | $2.40 | $1.41 | $2,539 | $0.95 | $1,710 | $4,249 |
| D5 - Advanced | 7,250 | 3,400 | Ethanol | $1.38 | $1.38 | $4,692 | $0.92 | $3,128 | $7,820 |
| Total Renewable | 22,250 | 17,400 | Ethanol | | | | | | |
| D6 - Corn Ethanol | 9,750 | 11,994 | Ethanol | $1.38 | $1.38 | $16,552 | $0.87 | $10,435 | $26,987 |
| Total Value | 22,250 | 17,400 | | | $1.38 | $24,024 | $0.90 | $15,656 | $39,680 |

**Notes:**
a. 40 CFR Part 80 Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule (R
b. 40 CFR part 80 Renewable Fuel Standard Program: Standards for 2014, 2015, and 2016 and Biomass-based Diesel V
c. US Energy Information Administration (http://www.eia.gov/petroleum/gasdiesel/ on 8-5-2016; US-wide averages are cite
d. PFL Daily (Aug. 4, 2016): 2016 Bid Price for respective D-designation

# Why expect the RFS to Continue?

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| RIN Category | Legislated 2016 EGE Obligation, Mgal/yr[a] | EPA-Revised 2016 EGE Obligation, Mgal/yr[b] | Assumed Displaced Fuel Type | Fuel Price, $/gal[c] | Fuel Price, $/EGE | Annual Fuel Revenue, M$/yr | RIN Bid Price, $/EGE[d] | Annual RIN Revenue, M$/yr | Total Annual Revenue, M$/yr | % of RIN Revenue to each D-series | Who gets the RIN Revenue? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| D3 - Cellulosic | 4,250 | 206 | CNG as GDE | $2.00 | $1.18 | $242 | $1.86 | $383 | $625 | 1.6% | WW/SW |
| D4 - Biodiesel | 1,000 | 1,800 | Diesel | $2.40 | $1.41 | $2,539 | $0.95 | $1,710 | $4,249 | 10.7% | Industry |
| D5 - Advanced | 7,250 | 3,400 | Ethanol | $1.38 | $1.38 | $4,692 | $0.92 | $3,128 | $7,820 | 19.7% | Sugar Farmers/ Brazil |
| Total Renewable | 22,250 | 17,400 | Ethanol | | | | | | | | |
| D6 - Corn Ethanol | 9,750 | 11,994 | Ethanol | $1.38 | $1.38 | $16,552 | $0.87 | $10,435 | $26,987 | 68.0% | Farmers |
| Total Value | 22,250 | 17,400 | | | $1.38 | $24,024 | $0.90 | $15,656 | $39,680 | 39% | |

**Notes:**
a. 40 CFR Part 80 Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program; Final Rule (RFS-2) Paragraph II.E.3 (200
b. 40 CFR part 80 Renewable Fuel Standard Program: Standards for 2014, 2015, and 2016 and Biomass-based Diesel Volume for 2017 (2015)
c. US Energy Information Administration (http://www.eia.gov/petroleum/gasdiesel/ on 8-5-2016; US-wide averages are cited for gas and diesel)
d. PFL Daily (Aug. 4, 2016): 2016 Bid Price for respective D-designation

~2 B$/yr to environmental interests and ~21 B$/yr to farmers

# Why expect the RFS to Continue?

1. The Federal Rules are set to self-perpetuate
2. It **IS** a lot of money to **various interests**
3. It's NOT a lot of money to the Petroleum Industry

# Why expect the RFS to Continue?

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2. It **IS** a lot of money to **various interests**
3. It's **NOT** a lot of money to the **Petroleum Industry**

| Commodity | Product "Moved", Bgal/yr[a] | Assumed Fuel Type | Price, $/gal[d] | Annual Revenue (negative values are costs), B$/yr | % of Petroleum Industry Total Revenue |
|---|---|---|---|---|---|
| Gasoline Sold in the USA[a] | 140 | Gas | $1.38 | $194 | 65% |
| Diesel Sold in the USA[b] | 49 | Diesel | $2.40 | $117 | 39% |
| Ethanol Sold in the USA[c] | 12.0 | Various | $1.38 | $17 | 6% |
| RIN Obligations[c] | 22.3 | Various | -$1.38 | -$31 | -10% |
| Fuel-Sold Totals (w/o RINs): | 189 | | $1.64 | $310 | 110% |
| Totals adjusted for RINs: | 189 | | $1.57 | $296 | 100% |

**Notes:**
a. 2015 annual gasoline cosumption from https://www.eia.gov/tools/faqs/faq.cfm?id=23&t=10 accessed on 8-6-2015
b. From "note a" then ratioed by 22%-to-56% based on EIA graph of Fuel used for U.S.Tranportation, 2013
c. From EPA-Revised 2016 EGE Obligation from Previous "RFS Producer's Stake" Table
d. US Energy Information Administration (http://www.eia.gov/petroleum/gasdiesel/ on 8-5-2016; US-wide averages for gas and diesel)

# The Current Laws, are the Current Laws

# The Current Laws, are the Current Laws But are Always Subject to Change…

- Point of Obligation: Refineries vs. Terminals

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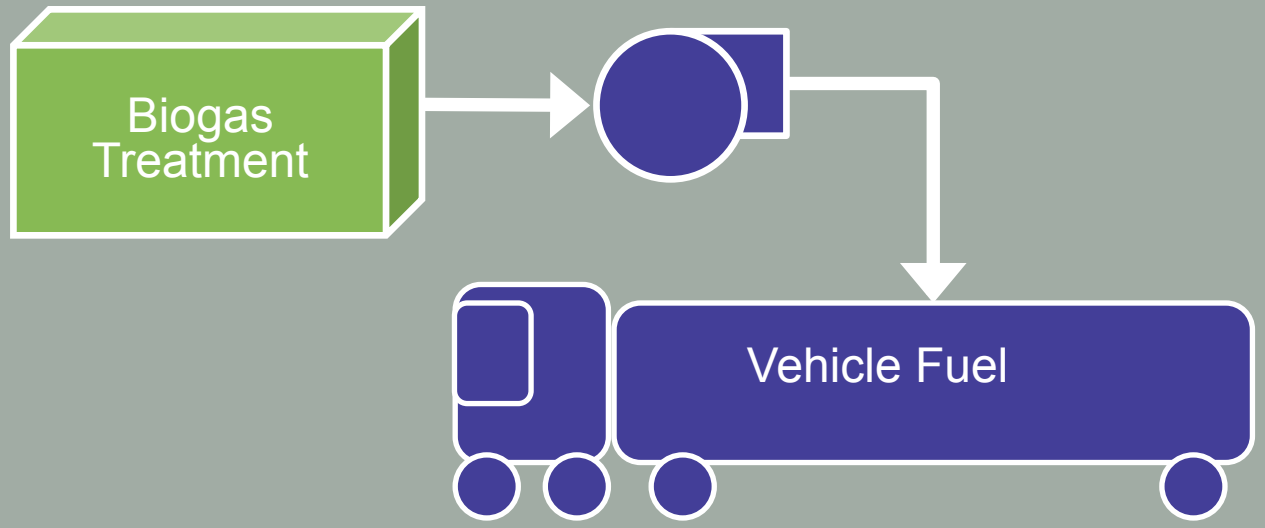
## White House: No RFS Executive Order

White House Spokesperson Says No Pending RFS Executive Order; E15 Bills Offered in Congress




# Conclusions

# What are Future RIN Prices Going to be???

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Can’t see that well but should be a lot more than $0.00

# Conclusions

- Cellulosic Classification makes digester-gas vehicle fuel even more attractive
- The Rule is designed to self perpetuate
- Finding a consistent, large-volume fuel use by fewer big vehicles makes these projects easier to justify
- Being a "Water Resource Recovery Facility" can

Restock your $$Green$$

# Thank You

John Willis, P.E., BCEE
770-361-6431
Jwillis@BrwnCald.com

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AUSTRALIA
Advanced Water Management Centre
www.awmc.uq.edu.au

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