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AN ASSESSMENT: CALIFORNIA'S IN-STATE RNG SUPPLY FOR TRANSPORTATION, 2020 - 2024

A survey of the existing and developing RNG production capacity in California for use in motor vehicles

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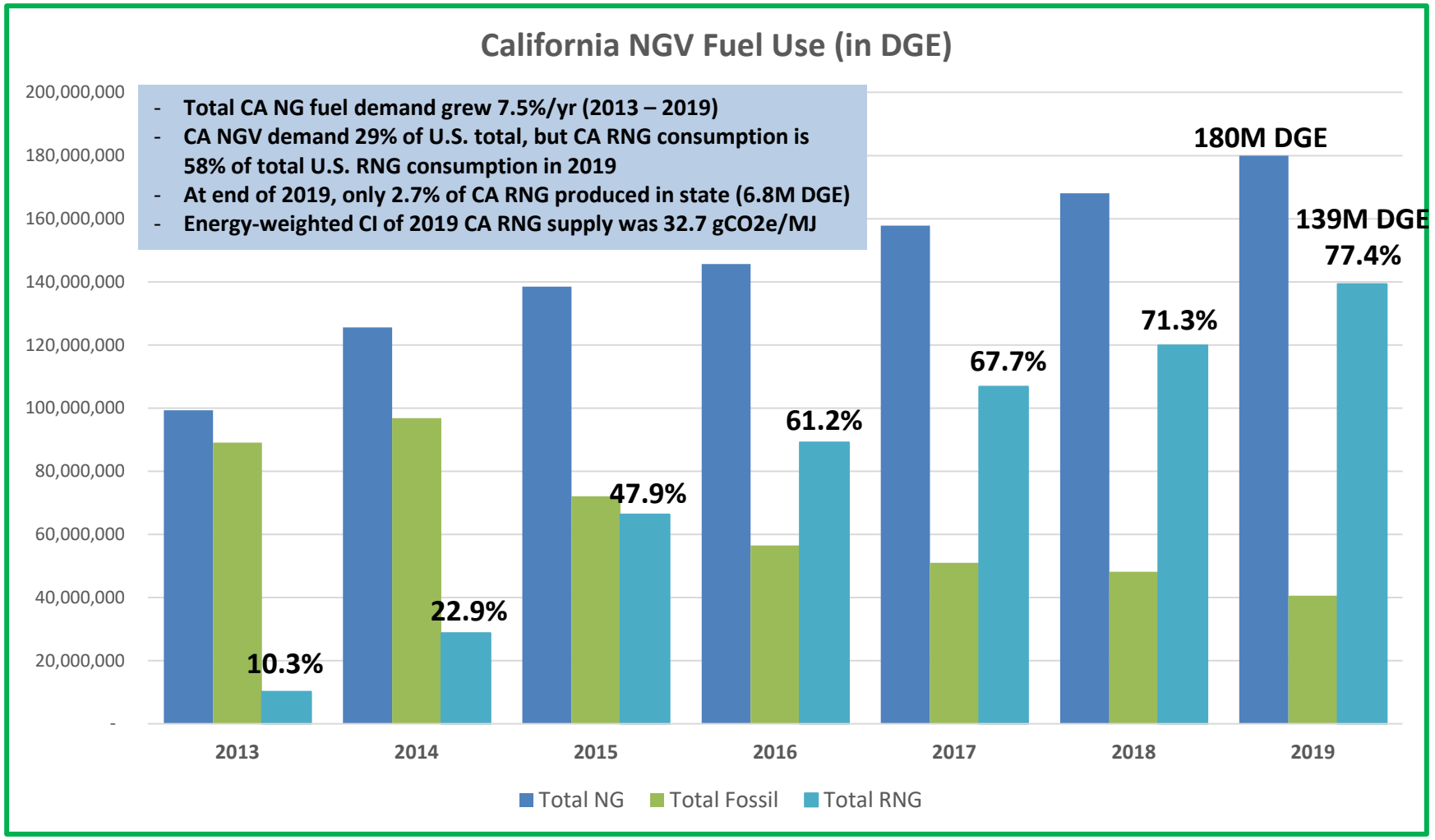
Growth in RNG Share of CA CNG/LNG



Methodology

- Study set out to provide most accurate assessment of current and future in-state RNG supply
- Differs from past assessments:
  - Not theoretical; tally of existing or developing projects
  - Focuses solely on RNG for transportation
- Surveyed RNG project developers/operators, government agencies, relevant trade associations, natural gas utilities, fuel marketers and other pertinent stakeholders
- Collected data from existing public sources, such as DDRDP and AgStar

Screening Projects for Inclusion in this Inventory

A project was included if it:

- received grant funding or other incentives from a state or local government agency;
- received other debt or equity financing from private entities;
- secured feedstock and/or offtake agreements;
- entered into or completed CEQA review;
- applied for and received permits from relevant regulatory agencies;
- can substantiate that significant private resources have been expended for the development of the project; and,
- can demonstrate other attributes that indicate that the project is vested and in the process of development.

Findings:
California RNG Facilities by Sector (Jan. 1, 2024)

Sector	# of Facilities
Dairy	137
Landfill	8
HSAD	7
Gasification	1
Wastewater	7
Total	**160**

Findings:
Projected Annual RNG Production by Sector (Jan. 1, 2024)

Sector	%	MMBTU	SCF	GGE	DGE
Landfill	38.4%	6,087,775	5,935,084,199	51,745,235	45,729,776
Dairy	36.6%	5,797,281	5,628,428,291	49,191,380	43,564,503
HSAD	10.5%	1,669,325	1,628,800,738	14,193,660	12,538,192
Gasification	10.4%	1,650,000	1,601,941,748	14,000,663	12,399,162
Wastewater	4.0%	646,134	640,436,841	5,482,605	4,767,849
Total		15,850,515	15,434,691,818	134,613,543	118,999,483

- Snapshot as of July 1, 2020
- Landfill gas will make up the plurality
- Dairy RNG close behind, and will likely become the plurality after DDRDP grants announced in October 2020 (estimate will increase by 10% - 15%)
- The other three sectors make up a quarter of the 1/1/24 inventory

New In-State RNG Supply by Quarter; Cumulative Energy Weighted Carbon Intensity

Year	Quarter	Annualized Energy Production (MMBTU/year)	RNG added by end of the Quarter (MMBTU)	Annual Energy Production (DGE)	RNG added by end of the Quarter (DGE)	Energy-weighted average CI of total production within the quarter (gCO2e/MJ)
2019	4	502,176	-	3,773,670	-	-193.95
2020	1	784,678	282,502	5,896,573	2,122,902	-133.63
	2	2,961,273	2,176,596	22,252,914	16,356,342	-133.55
	3	3,307,846	346,573	24,855,017	2,602,103	-147.64
	4	4,292,846	985,000	32,256,941	7,401,924	-148.19
2021	1	5,512,279	1,219,433	41,420,548	9,163,606	-176.84
	2	5,568,170	55,891	41,840,548	420,000	-174.62
	3	5,568,170	-	41,840,548	-	-174.62
	4	7,515,999	1,947,829	56,477,789	14,637,241	-201.34
2022	1	10,557,035	3,041,036	79,330,092	22,852,303	-130.56
	2	10,630,035	73,000	79,878,661	548,569	-131.57
	3	10,630,035	-	79,878,661	-	-131.57
	4	11,034,239	404,204	82,916,108	3,037,447	-136.93
2023	1	11,034,239	-	82,916,108	-	-136.93
	2	11,034,239	-	82,916,108	-	-136.93
	3	11,034,239	-	82,916,108	-	-136.93
	4	11,034,239	4,816,276	82,916,108	36,083,375	-101.74
For all 2024		15,850,515	15,348,340	118,999,483	115,225,812	-101.74

Findings:
Economic Investment

- Able to secure cost data for 129 of 160 facilities
- Average investment: $7.9 million
- Extrapolated to 31 facilities with missing cost data = $235 million
- Total projected investment = $1.2 billion
- 77% of investment from private sector

Public Funding Secured	Private Match	Total Investment
$223,835,745	$751,949,125	$975,784,870

Findings:
Potential Environmental Benefits

- Assumes that, beginning 1/1/24, CA RNG used in MY 2020 NZE NGVs
- Assumes these vehicles replace MY 2020 diesel trucks

Time Frame	Projected GHG Reduction (MTCO2e)	Projected NOx Reduction (tons)	Projected DPM Reductions (tons)
One Year	3,424,156	1,387	8.62
Ten Years	34,241,560	13,870	86.2
Fifteen Years	51,362,336	20,802	129.27

A Cost Effectiveness Scenario

119 million DGE is enough to fuel 13,731 NZE NG trucks annually (using EMFAC 2017 fuel consumption averages);

- Assuming the HVIP average incentive for a Near Zero Emission natural gas truck ($45K), it would cost California $618 million to get these new trucks on the road;
- Assuming that these trucks stayed on the road for 15 years (the HVIP assumption for useful life), they would generate the following total emissions reductions:
  - 51.4 million metric tons of CO2e
  - 20.8 thousand tons of NOx
  - 129 tons of diesel PM
- The cost effectiveness of these emission reductions would be:
  - $12.03/MT of CO2e
  - $29,700/ton of NOx
- For comparison, the cost effectiveness of emission reductions from the average heavy-duty battery electric truck that received a HVIP voucher on the 2019 wait list was:
  - $546/MT of CO2e
  - $299,400/ton of NOx

Thank You!