

# LCFS Auto Adjustment Mechanisms

22 May 2023

Colin Murphy Ph.D.

Deputy Director – UC Davis Policy Institute for Energy, Environment, and the Economy



# Acknowledgements and Disclaimers

I want to recognize the contributions of the Low Carbon Fuel Policy Research Initiative to this work.

- Dr. Julie Witcover
- Dr. Jin Wook Ro
- Pedro Liedo Orozco
- Ray Kang

Neither the Policy Institute for Energy, Environment, and the Economy, nor any other part of UC Davis take a formal position in favor or opposed to specific program design elements. Any errors or opinions expressed are solely those of the lead author (Dr. Murphy)

Modeling presented here is funded by the STEPS+ Energy Futures program, as well as a California Resilient and Innovative Mobility Initiative (RIMI)– Carbon Neutrality pillar research grant.

# Topics of Discussion

1. Trigger Mechanisms
2. Reduction Mechanisms
3. Timing of Overall Program Ambition

# Problem:

- Successful implementation of LCFS requires setting targets many years in advance, due to the long lead times on low carbon fuel supply development.
- Targets must be ambitious enough to create significant projected demand for innovative, low-carbon fuels, but not so ambitious as to result in inadequate, or onerously expensive LCFS credits.
- While CARB has rulemaking authority, administrative and legal constraints don't always allow for rapid response to emergent market trends
- Cost-containment provisions (credit clearance market, advance crediting) mitigate risk of credit insufficiency, but no equivalent capacity exists to mitigate risk of credit oversupply

# Trigger Mechanism

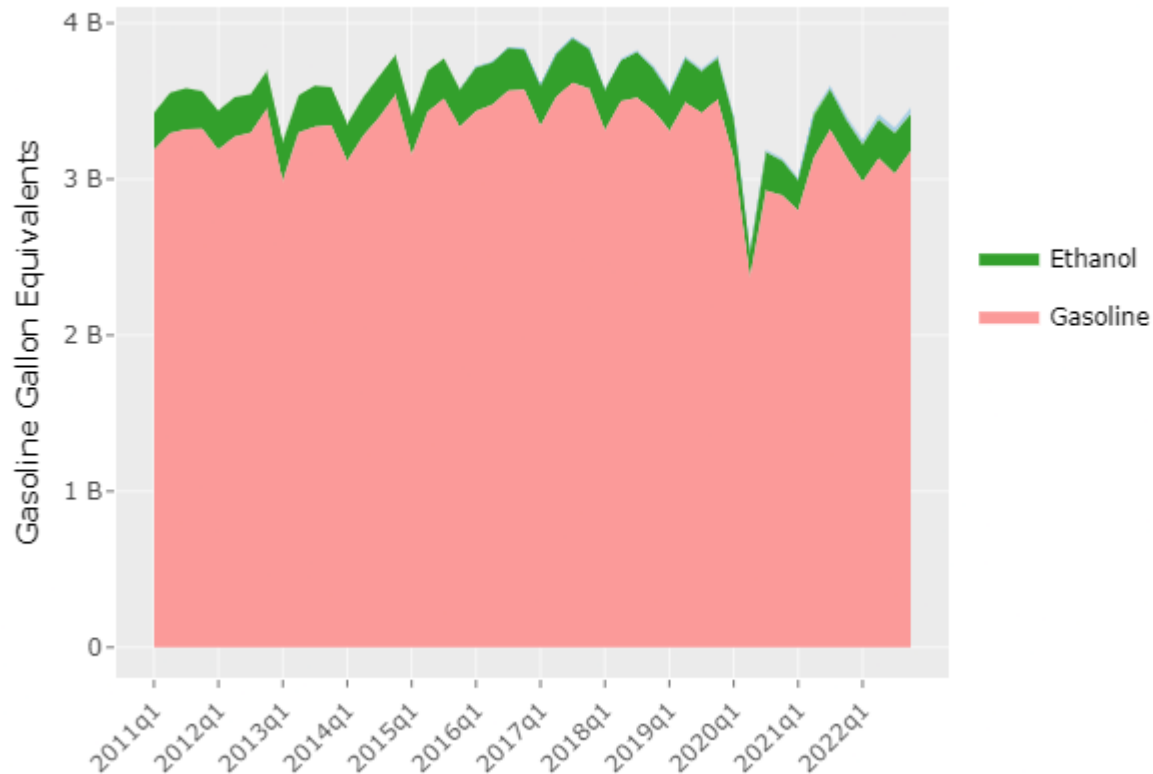
No modeling tools exist to effectively explore effect of different triggers.

Some proposals include:

- Annual Credit Balance
- Cumulative Credit Bank
- Credit Price
- Energy-weighted average CI of delivered fuels

# Credit/Deficit Variability is Normal and Seasonal

CA LCFS : Fuel Energy for Gasoline , Quarterly basis



Source: [UCD LCFS Web Data Tool](#)

Target acceleration mechanism may be subject to both transient shocks and lasting market disruptions. We may not know which is happening at the time.

Transient or lasting market disruptions may occur simultaneously with seasonal or long-term trends.

Too sensitive a trigger results in unwarranted action.

Possible solution: Longer look-back period for acceleration trigger, possibly as part of multi-criteria decision mechanism. E.g.:

Trigger acceleration IF

Prior year Credits/Deficits  $>1.1$

AND

Prior 3 years Credits/Deficits  $>1.05$

# The Credit Bank Serves a Useful Function

Credit bank reflects past decisions by LCFS market participants, and creates a valuable buffer against future external market shocks.

Banked credits represent reductions made in advance of targets, providing additional value to slow climate change.

Current cumulative credit bank through 2022: 15 million

Annual deficit generation in 2022: 20 million

Projected 2030 deficit generation (30% Target): 40 million

# Mechanism Design

Several proposed mechanisms, but generally 2 categories:

- “Target adder” – When mechanism is triggered, add specified amount to target.  
E.g 15% CI reduction target becomes 16% under a 1% adder
- “Pull-forward” – When mechanism is triggered, advance an additional year on the compliance schedule
  - E.g. In 2024, complete 2023 data indicates target threshold is met, program would adopt 2026 target on Jan 1, 2025.

Mechanisms can also be temporary or permanent, i.e. program returns to originally planned compliance schedule in subsequent years, or mechanism permanently alters the compliance schedule.



# Modeling

Using 27.5% target scenario from recent FPSM scenario modeling study as base.

FPSM holds fuel volumes static, no market response

Scenario: In 2026, full-year data from 2025 triggers acceleration, which takes effect in 2027.

## Scenarios Analyzed:

- 27.5% 2030 LCFS Target – Baseline, chosen as example of oversupplied market
- Front-loaded 27.5% - Same post-2030 trajectory as baseline, but earlier pre-2030 ambition
- Pull forward permanent – Skip 2027 target resume trajectory, one year advanced
- Pull forward temporary – Skip 2027 target, repeat same target in 2028, resume original trajectory
- 1% / 2% Adder – Permanently adds 1 or 2 percentage points to future LCFS targets in 2027
- Trigger-and-Release – Skips 2027 target, resumes trajectory until 1 year of net deficits, then repeats that year

# Acceleration Mechanism Scenarios

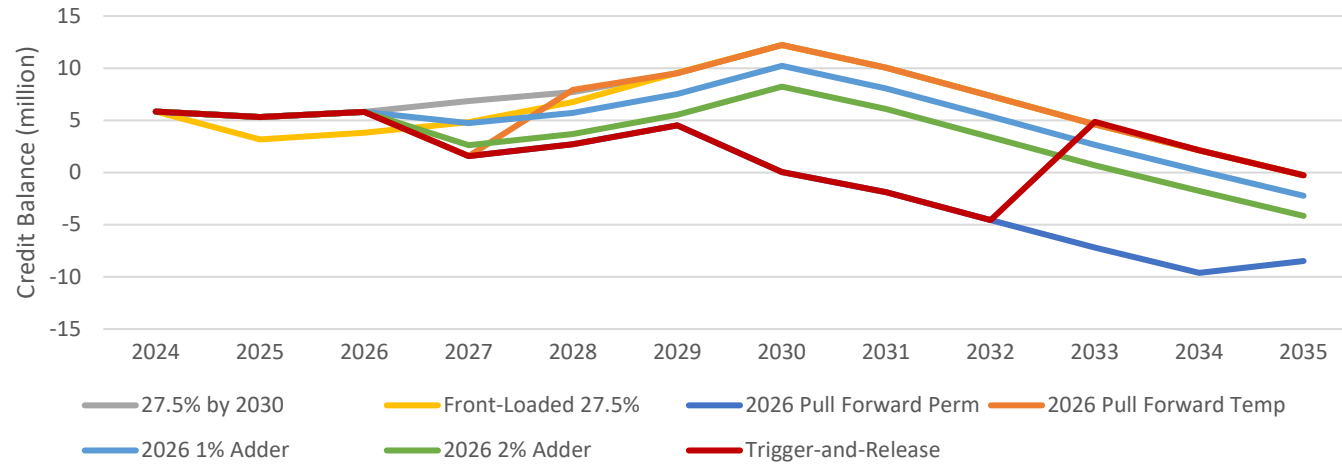
Target trajectories:

Target	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
27.5% by 2030	11.25%	14.00%	16.00%	18.00%	20.00%	22.50%	25.00%	27.50%	33.50%	39.50%	45.50%	51.50%	57.50%
Front-Loaded 27.5%	11.25%	14.00%	17.00%	19.00%	21.00%	23.00%	25.00%	27.50%	33.50%	39.50%	45.50%	51.50%	57.50%
2026 Pull Forward Perm	11.25%	14.00%	16.00%	18.00%	22.50%	25.00%	27.50%	33.50%	39.50%	45.50%	51.50%	57.50%	61.75%
2026 Pull Forward Temp	11.25%	14.00%	16.00%	18.00%	22.50%	22.50%	25.00%	27.50%	33.50%	39.50%	45.50%	51.50%	57.50%
2026 1% Adder	11.25%	14.00%	16.00%	18.00%	21.00%	23.50%	26.00%	28.50%	34.50%	40.50%	46.50%	52.50%	58.50%
2026 2% Adder	11.25%	14.00%	16.00%	18.00%	22.00%	24.50%	27.00%	29.50%	35.50%	41.50%	47.50%	53.50%	59.50%
Trigger-and-Release	11.25%	14.00%	16.00%	18.00%	22.50%	25.00%	27.50%	33.50%	39.50%	45.50%	45.50%	51.50%	57.50%

Extremely rapid target acceleration required as ZEV sales fractions approach 100%, otherwise massive credit surpluses. All scenarios assume 6 percentage point per year post-2030 LCFS target increase for comparison (except trigger-and-release).

# Comparing Target Trajectories

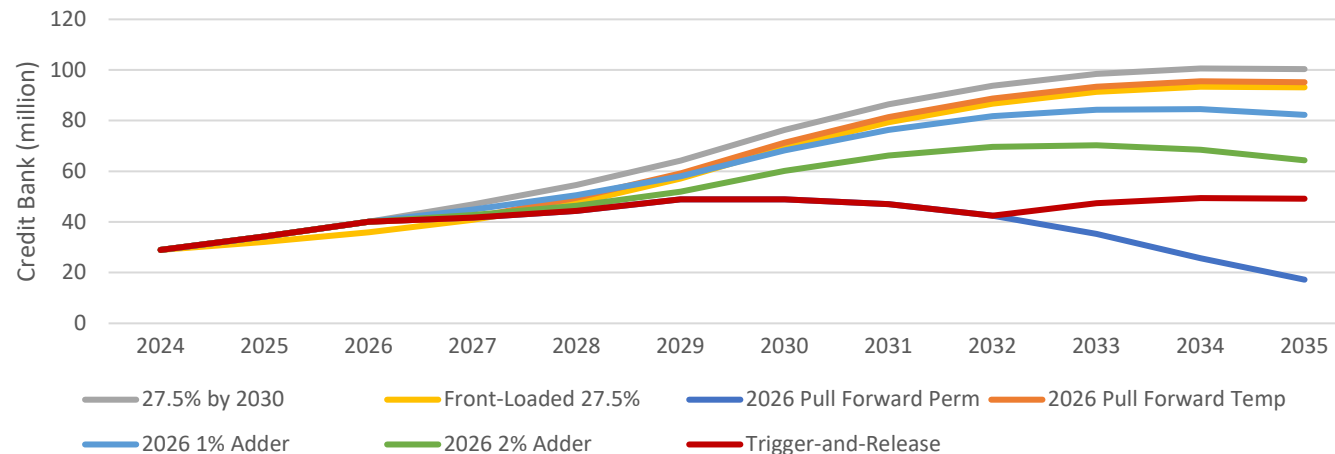
Credit Balances by Year



Permanent pull-forward brings rapid acceleration period onto market before ZEV transition has progressed enough to support it. Significant risk of persistent credit shortage.

Temporary measures make minimal difference (assuming no broad market shift).

Banked Credits by Year



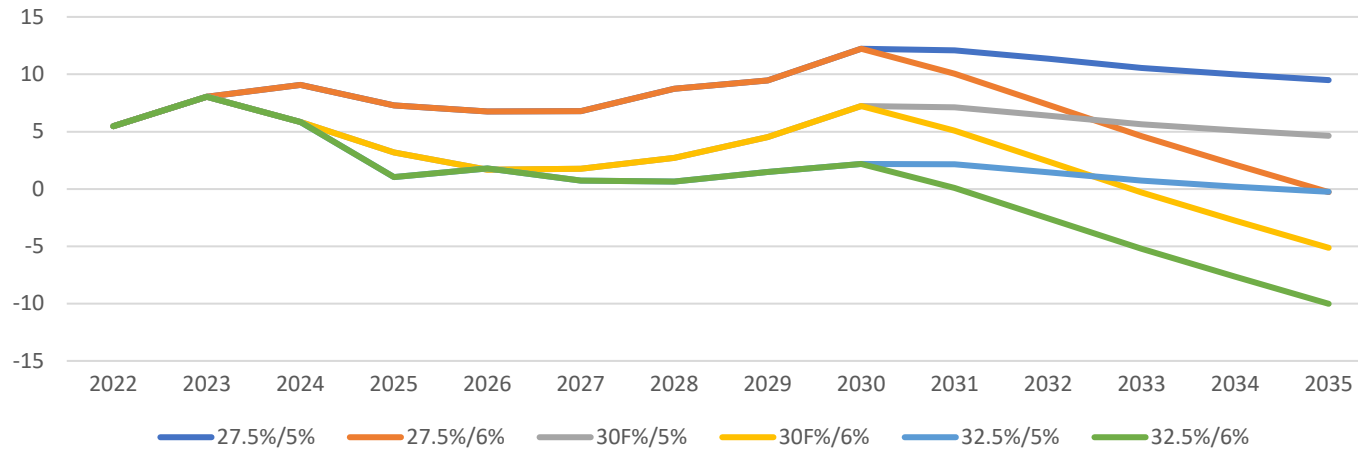
	Credit Bank (millions)			
	2030	Δ	2035	Δ
27.5% by 2030 (baseline)	76		100	
Front-Loaded 27.5% by 2030	69	-7	93	-7
2026 Pull Forward Perm	49	-27	17	-83
2026 Pull Forward Temp	71	-5	95	-5
2026 1% Adder	68	-8	82	-18
2026 2% Adder	60	-16	64	-36
Trigger-and-Release	49	-27	49	-51

# Thoughts on Acceleration Mechanism

- Permanent pull-forward seems extremely dangerous, given need for very rapid acceleration of targets once ZEV transition justifies it.
- 1 year temporary pull-forward impact seems to be limited to a few million credits. Is this enough?
  - Trigger-and-release has potential value here: accelerate targets but release if/when market can't keep up.
- Critical question: Does credit surplus in year X mean a surplus is more likely in year X+1?
  - If yes: then temporary action is a poor match for the likely market conditions and multi-year approaches likely to be more effective.
  - If no: then single year approaches (e.g. temporary pull-forward) more likely to suffice, w/ less risk of long-run complications

# Ambition, Pre- and Post-2030

Credit Balances by Year

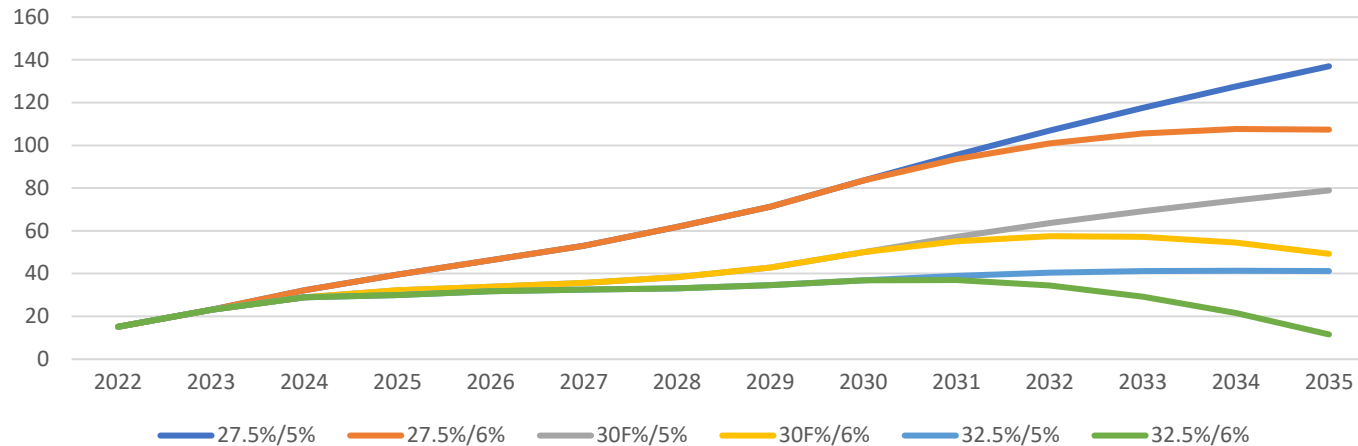


Comparing similar 2030 target trajectories from forthcoming FPSM report, w/ 5% and 6% annual post-2030 target increases

Difference between 5% and 6% annual post-2030 target growth is about 60 million credits in 2035.

All else equal, less early ambition means post-2030 targets can accelerate more rapidly without depleting bank, and vice versa.

Banked Credits by Year



## Estimated fraction of gasoline ICE in LDV fleet

2030	2032	2034	2036
77%	69%	59%	49%

# We Are Happy to Answer Questions!

Colin Murphy Ph.D.

[cwmurphy@ucdavis.edu](mailto:cwmurphy@ucdavis.edu)

[policyinstitute.ucdavis.edu](http://policyinstitute.ucdavis.edu)

Twitter: @scianalysis

*To receive updates regarding the Institute of Transportation Studies research, policy briefs and related work, sign up on our listserv via this link: [its.ucdavis.edu/join-our-mailing-list/](https://its.ucdavis.edu/join-our-mailing-list/).*