

California Environmental Protection Agency



Air Resources Board

Workshop on
Low Carbon Fuel Standard
***Proposed Compliance Curves and
Cost Compliance Provision***

October 27, 2014

Compliance Curve Agenda

- Potential compliance curves
- Illustrative example
 - Fuel volumes
 - Fuel CIs
 - Credits earned and spent
- Discussion throughout

Compliance Curves

- 10 percent by 2020
- Compliance period: 2016 – 2020
- Basis:
 - Availability of fuels
 - Availability of banked credits (not to exhaustion)
 - Giddy up

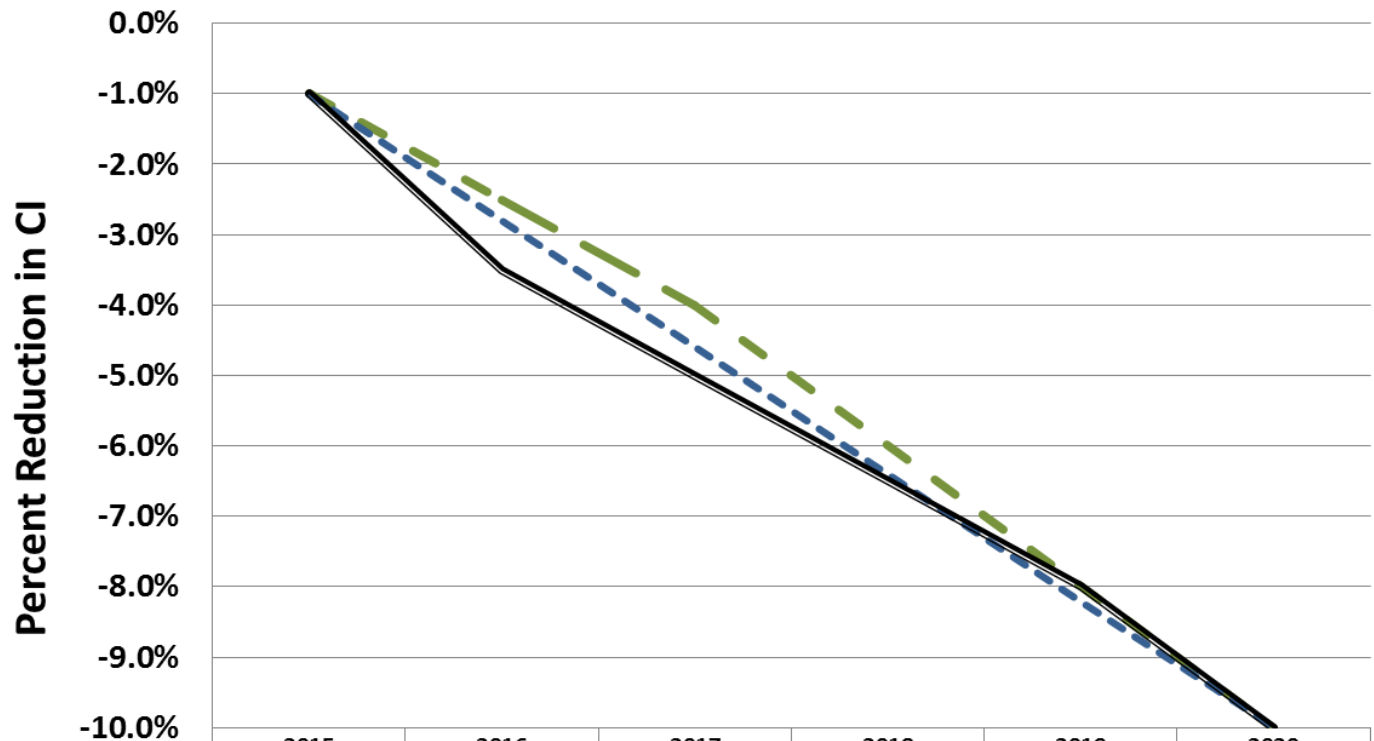
Compliance Curves (Cont.)

Three Potential Approaches Considered

- Return to existing compliance curve
- Draw straight line to 2020
- Develop more gradual path

Potential Compliance Curves

Alternative Compliance Curves Under Consideration



More Gradual Path to 10% in 2020	-1.0%	-2.5%	-4.0%	-6.0%	-8.0%	-10.0%
Straight Line to 10% in 2020	-1.0%	-2.8%	-4.6%	-6.4%	-8.2%	-10.0%
Base Case - 10% in 2020	-1.0%	-3.5%	-5.0%	-6.5%	-8.0%	-10.0%

Illustrative Compliance Scenario

- LCFS remains fuel-neutral and performance-based
- Scenario based on plausible, illustrative fuel volume availability
- Each regulated party can choose preferred path to compliance

Key CIs for Establishing Baselines

<u>Fuel</u>	<u>CI (gCO₂/MJ)</u>
CARBOB	100.49
CaRFG	99.49
CARB Diesel	102.73

ZEV Assumptions

Year	Total ZEVs	FCVs	LCFS Credits (MMT)
2014	120,000	1,000	0.35
2015	200,000	2,000	0.58
2016	300,000	4,000	0.83
2017	400,000	10,000	1.07
2018	500,000	20,000	1.29
2019	625,000	30,000	1.56
2020	750,000	40,000	1.80

Fuel Volumes for Gasoline Standard

(Illustrative - Straight Line)

Biofuel	Units	12 mos.	2015	2016	2017	2018	2019	2020
Corn Ethanol	mm gal	1,212	1,200	1,100	1,000	825	750	700
Cane Ethanol	mm gal	73	150	200	250	350	400	400
Sorghum/Corn Ethanol	mm gal	117	100	100	100	100	100	100
Sorghum/Corn/Wheat Slurry Ethanol	mm gal	48	50	50	75	75	75	75
Cellulosic Ethanol	mm gal	0	0	5	15	50	75	100
Molasses Ethanol	mm gal	6	20	40	40	60	60	60
Renewable Gasoline	mm gal	0	0	0	0	5	15	25
Hydrogen	mm DGE	0	0.6	1.1	2.7	5.5	8.2	10.9
-Electricity for LDVs	1000 MWH	119	660	985	1,300	1,600	2,000	2,400

CIs for Gasoline Standard

(Illustrative)

Biofuel	2016	2017	2018	2019	2020
Corn Ethanol	75.0	73.5	72.0	70.6	69.2
Cane Ethanol	50.0	49.0	48.0	47.1	46.1
Sorghum/Corn Ethanol	75.0	73.5	72.0	70.6	69.2
Sorghum/Corn/Wheat Slurry Ethanol	64.0	62.7	61.5	60.2	59.0
Cellulosic Ethanol	20.0	20.0	20.0	20.0	20.0
Molasses Ethanol	22.1	22.1	22.1	22.1	22.1
Renewable Gasoline	35.0	35.0	35.0	35.0	35.0

Fuel Volumes for Diesel Standard

(Illustrative - Straight Line)

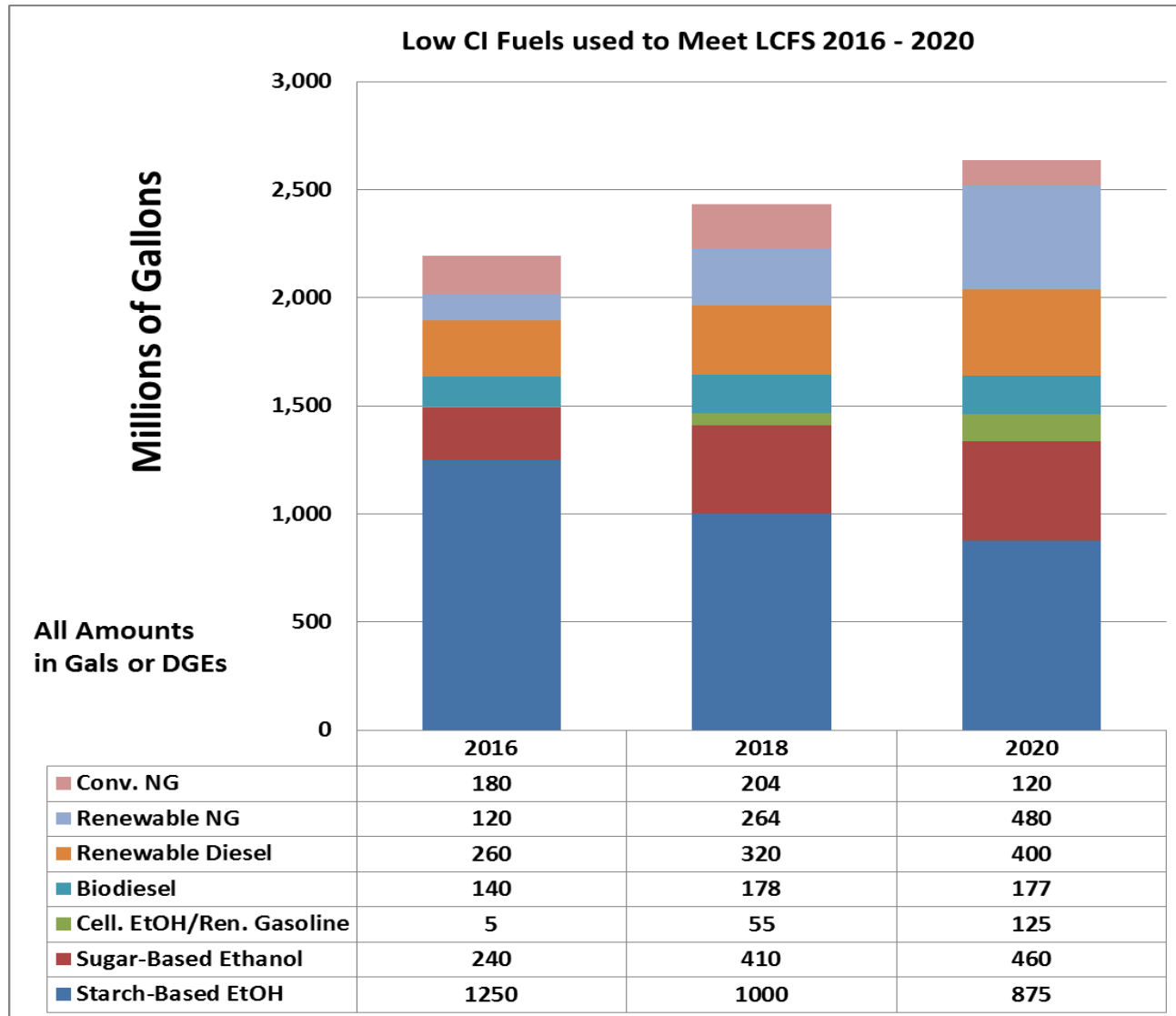
Biofuel	Units	12 mos.	2015	2016	2017	2018	2019	2020
Soy Biodiesel	mm gal	3	5	15	15	13	12	12
Waste Grease Biodiesel	mm gal	37	40	50	55	60	60	60
Corn Oil Biodiesel	mm gal	21	40	60	75	90	90	90
Tallow Biodiesel	mm gal	5	10	10	10	10	10	10
Canola Biodiesel	mm gal	7	5	5	5	5	5	5
Renewable Diesel	mm gal	139	180	260	290	320	360	400
Natural Gas	mm DGE	130	155	180	205	205	190	120
Renewable Natural Gas	mm DGE	17	95	120	155	265	360	480
—Electricity (HDV/Rail)	1000 MWH	0	0	894	894	894	894	894

CIs for Diesel Standard (Illustrative)

Biofuel	2016	2017	2018	2019	2020
Soy Biodiesel	50.0	49.5	49.0	48.5	48.0
Waste Grease Biodiesel	15.0	15.0	15.0	15.0	15.0
Corn Oil Biodiesel	4.0	4.0	4.0	4.0	4.0
Tallow Biodiesel	37.2	37.2	37.2	37.2	37.2
Canola Biodiesel	73.2	73.2	73.2	73.2	73.2
Renewable Diesel	35.0	35.0	35.0	35.0	35.0
LNG	90.9	90.0	89.1	88.2	87.4
CNG	77.9	77.1	76.3	75.5	74.8
Renewable LNG	37.7	37.3	37.0	36.6	36.2
Renewable CNG	34.6	34.2	33.9	33.6	33.2

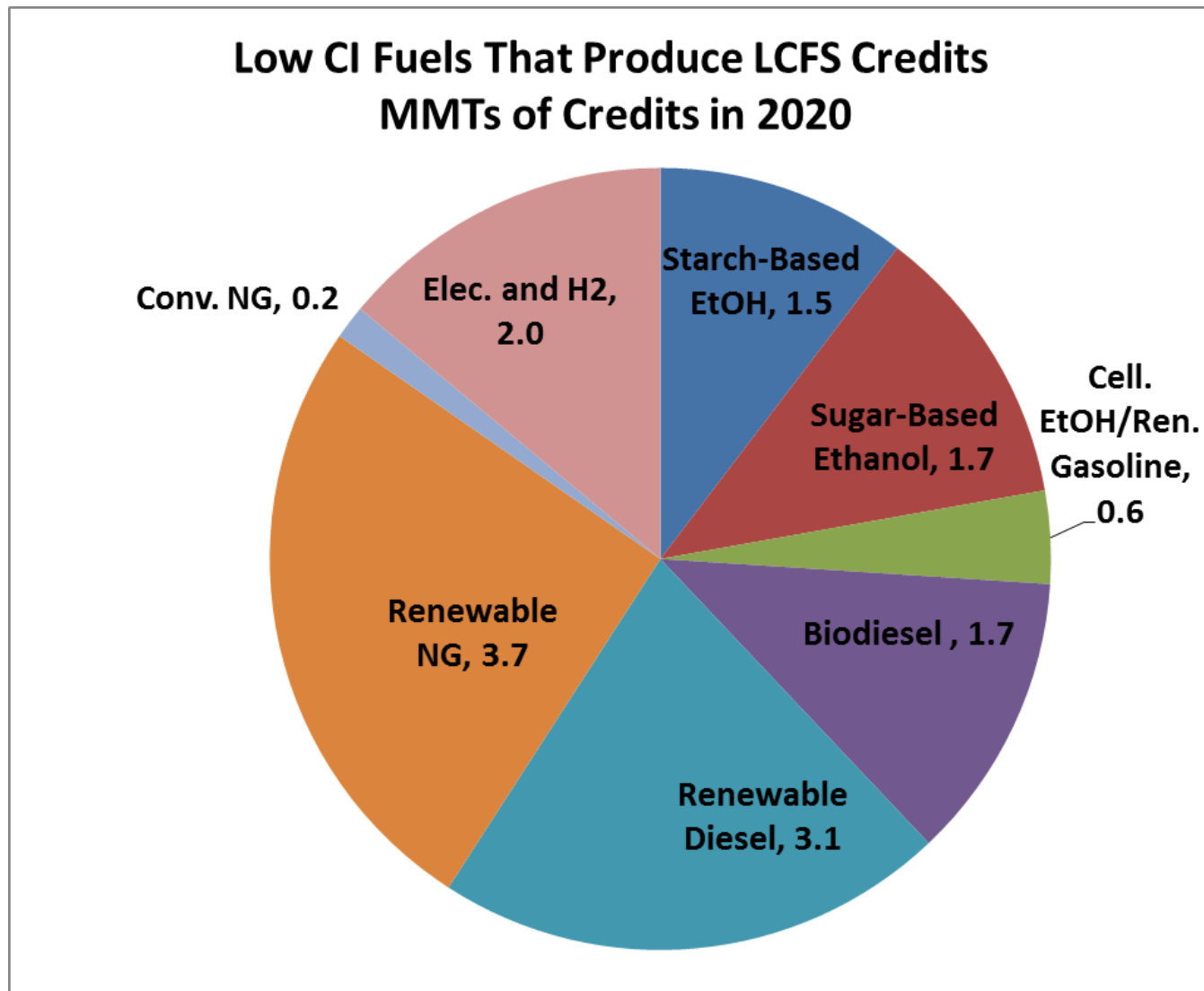
Low-CI Biofuels 2016 – 2020

(Illustrative)



2020 Credits from Low-CI Fuels

(Illustrative)



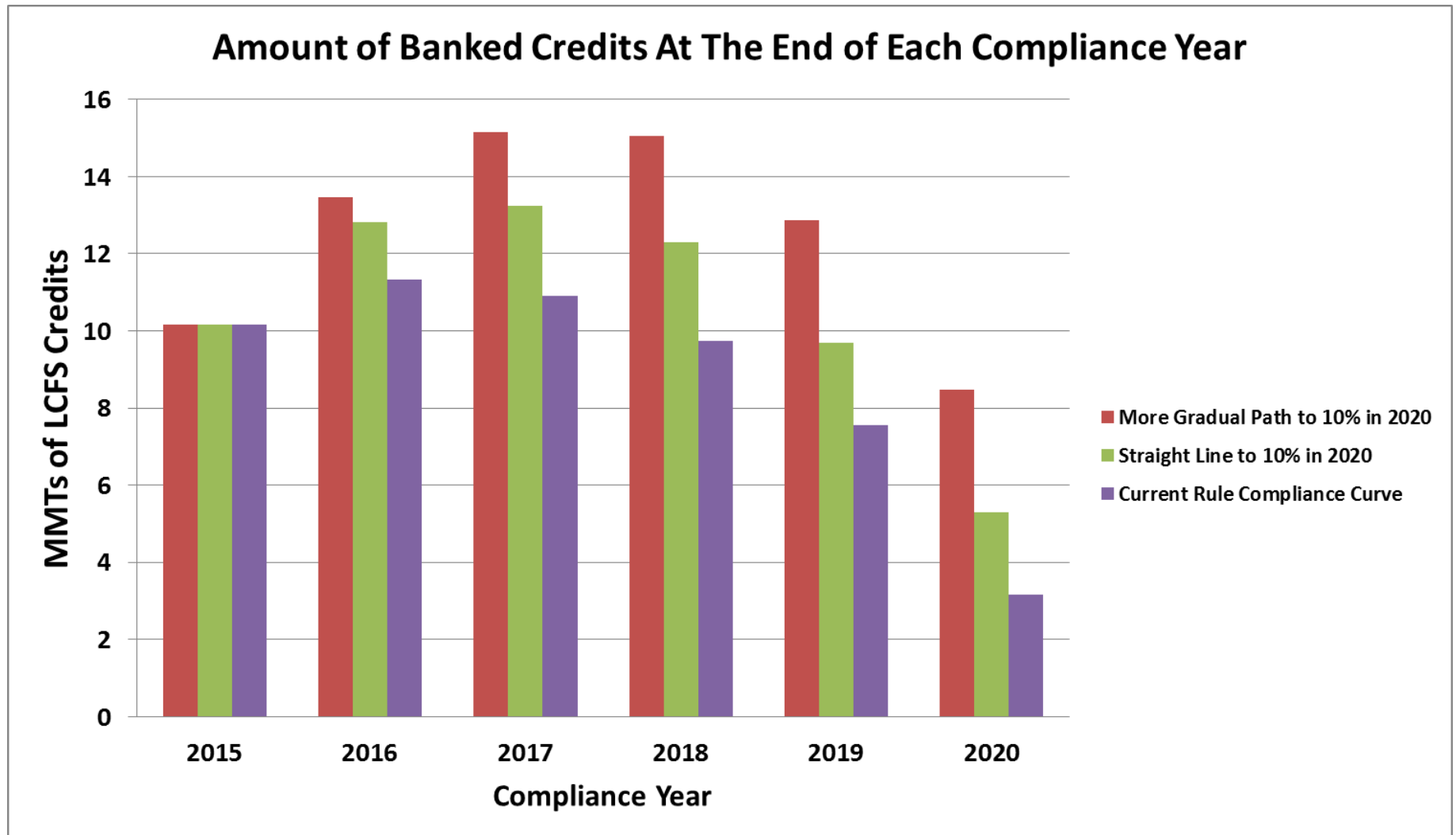
Banked Credits

(Illustrative)

- After 2014 Q2, 3.5 million “excess” credits in the system
- Through 2015 Q4, expected to exceed 10 million excess credits
- With illustrative fuel volumes and CIs, excess credits may continue to rise for another year or two
- Excess credits drawn down over time, but not exhausted

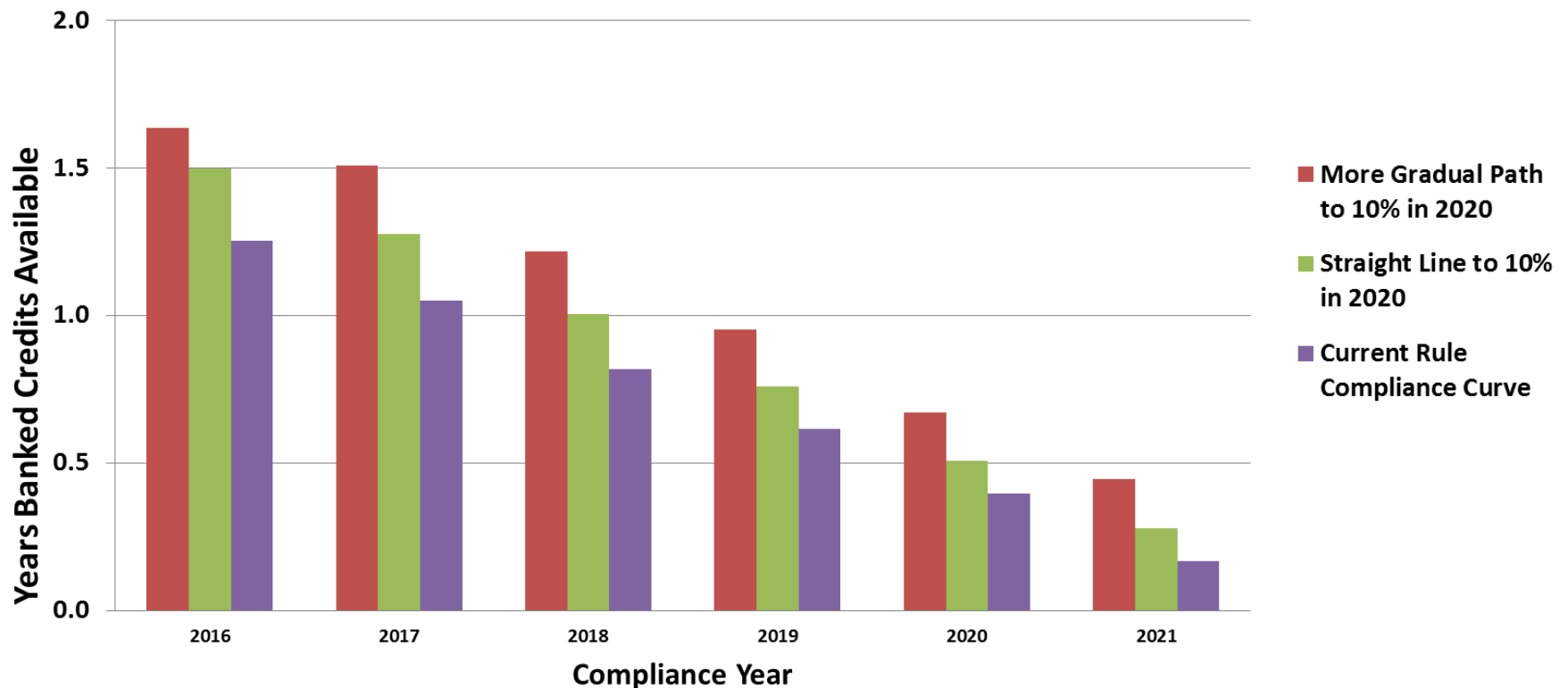
Earning/Spending Credits

(Illustrative)



“Years of Credit” in Bank (Illustrative)

**Supply of Banked Credits At Beginning of Year
(Years of Credit = Credits Carried Over/Expected Deficits)**



Summary

- Target remains the same: 10 percent by 2020
- Several pathways to get there
- Proposed compliance curves supported by:
 - Reasonable assumptions regarding fuel volumes and CIs
 - Continued draw-down of banked credits

Questions?

Cost Containment

1. Selection of Approach

- **Need for Cost Containment**
- Credit Window
- Credit Clearance

2. Proposed Threshold

3. Proposed Interest Rate

4. Discussion of Floor

Need for Cost Containment Provision

- Currently, regulated parties must meet carbon intensity standards each year
- Enables compliance in the event of tight credit supply in order to avoid the possibility of a low-probability but high-impact price spike
 - ARB does not anticipate the prices will get this high
 - Clear, predictable cost containment provision reduces the risk of the market prices reaching the ceiling price
 - Even speculation of a shortage can destabilize the market
 - Uncertainty adversely affects conventional and low-CI fuel suppliers
 - Cost containment protects regulated parties and consumers

Purpose of Cost Containment Provision

- Purpose:
 - Ensure that the LCFS achieves maximum GHG emissions reductions within a reasonable and predictable range of costs
- Goals:
 - Provides additional compliance options
 - Strengthens incentives to invest in low-CI fuels
 - Increases certainty regarding the maximum cost of compliance

Cost Containment

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Credit Window

Credit Window would allow regulated parties to purchase and retire compliance-only credits

- ARB would offer credits for sale at a pre-determined price
- Regulated parties purchase credits needed for that year's compliance
- Funds collected from the sale of compliance credits would be distributed to low-CI fuel producers to further incentivize production

Credit Window (Cont.)

- Staff not proposing the Credit Window as the preferred approach
- Challenges associated with the Credit Window:
 - ARB-issued credits would not represent real CI reductions
 - Problematic for ARB to sell LCFS credits
 - Unclear whether low-CI fuel producers would receive the revenues from ARB-issued credits
 - Does not fully address the Board's concerns of stranded credits

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Credit Clearance

- Credit Clearance option is preferred approach
- Provides a compliance mechanism in the event of tight credit supply
 - Regulated parties can carry remaining deficits after purchasing their *pro rata* share of credits pledged to the year-end clearance market
 - Improves market confidence in the durability of the regulation
- Automatic process at year-end to determine if there are insufficient credits available for compliance
 - Clearance market transactions would only occur if there are insufficient credits available for compliance
- Clearance credits would be offered at or below a pre-determined price
 - Provides strong and transparent price cap year-round

Comparison of the Options

Design Feature	Credit Clearance	Credit Window
CCP credits represent real CI reductions	Yes	No
ARB collects funds	No	Yes
Easy to develop and implement	Yes	No
Establish confidence in credit prices		
Certainty regarding cost of compliance	Increased	Increased
Recipient of revenues from CCP	Low-CI fuel producers	Uncertain
Preserve Environmental Benefits		
Extract maximum environmental benefits in the current year	Yes	Uncertain
LCFS targets are fully met in the long-term	Yes	No
Strengthens incentives to produce and invest in low-CI fuels	Yes	Yes

Credit Clearance

Benefits to Regulated Parties

Conventional Fuel Suppliers

- Maintains limit on credit prices
- Decreases risk of serious price spike
- Increases certainty regarding the maximum cost of compliance
- Enables compliance using credits generated by low-CI fuels available in the market
- Accumulated deficits are likely to be repaid below the capped price

Low-Carbon Fuel Suppliers

- Maintains limit on credit prices
- Decreases risk of serious price spike
- Improves market durability, increasing investor confidence and increasing supplies of low-CI fuels
- Ensures that producers and investors can more confidently assess the market value for low-CI fuels and credits, stimulating investments

Cost Containment

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2. **Proposed Threshold**

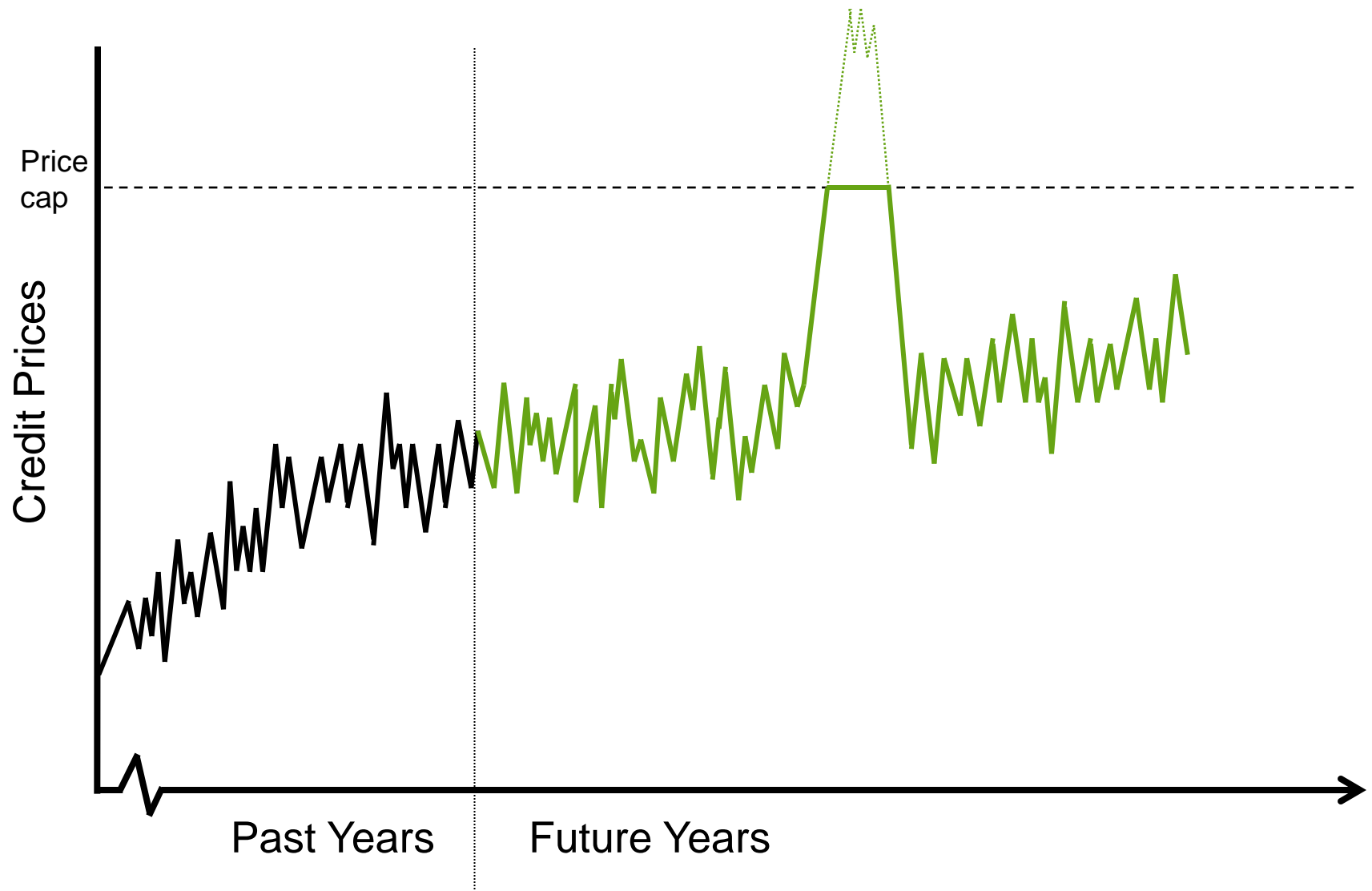
3. Proposed Interest Rate

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Price Threshold

- Price cap will be implemented through year-end clearance market
 - Sellers pledging credits must agree to sell at or below pre-established price
- Price cap will enhance the operation of LCFS credit market
 - Will cap the prices of LCFS credits all year
 - Limits effects of extreme volatility and/or supply shortages
 - Strong, transparent price cap will improve confidence in durability of regulation under all scenarios

Price Cap



Price Threshold

- Staff proposes a price cap of \$200/credit (1 MTCO₂e) in 2016
 - National LCFS Study
 - Aligns with British Columbia's *Renewable and Low Carbon Fuel Regulation* Administrative Penalties
- Important that price cap remains constant in real dollars
 - Price cap will adjust for inflation based on CPI in subsequent years
 - Addresses hoarding concerns because credits will not be worth more in later years

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2. Proposed Threshold

3. Proposed Interest Rate

4. Discussion of Floor

Interest Rate

- Accumulated deficits will be charged small annual interest rate to incent timely repayment
- Staff proposes setting the interest rate at 3 percent
 - Interest is applied in terms of deficits and would be added to regulated party's accumulated deficits at year-end
- Example: a regulated party with 100 accumulated deficits would be charged “interest” of 3 additional deficits for that year

Interest Rate Examples

Scenario 1

	year 1	year 2	year 3	year 4	year 5	Cumulative
Deficits Carried Over	0	1,000	0	0	0	1,000
Deficits Repaid	0	0	0	250	803	1,053
Interest charged*	0	0	30	23	0	53
Total Accumulated Deficits	0	1,000	1,030	803	0	

*Interest is applied as additional deficits, which are added to the regulated party's accumulated deficits account.

Interest Rate Examples (Cont.)

Scenario 2

	year 1	year 2	year 3	year 4	year 5	Cumulative
Deficits Carried Over	1,000	700	0	0	0	1,700
Deficits Repaid	0	0	0	500	1,320	1,820
Interest charged*	0	30	52	38	0	120
Total Accumulated Deficits	1,000	1,730	1,782	1,320	0	

*Interest is applied as additional deficits, which are added to the regulated party's accumulated deficits account.

Cost Containment

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Price Floor

Benefits

- Stimulate investments in low-CI fuels
- Provide clear market signal regarding the minimum credit price
- Lenders have more confidence in value of LCFS credits
- Facilitate long-term business planning for low-CI fuel producers

Potential Drawbacks

- Risk of setting floor at incorrect level:
 - Too high: lost gains from trade
 - Too low: may not deliver intended benefits
- May artificially inflate cost of compliance
 - May not deliver additional environmental benefits

Price Floor (Cont.)

- If LCFS is working as planned, would a floor be necessary?
 - If LCFS credit prices are low, sufficient credits/fuels are in the market
 - If LCFS credit prices are well above any proposed floor price, what additional value does a floor provide?
- What is the appropriate price floor threshold to achieve the intended benefits?
 - September 2014 LCFS credit prices ranged from \$24 - \$29
 - Where should the floor price be set?

Price Floor (Cont.)

Potential approach to implement if floor is considered: disallow trades in LRT at sub-floor prices

- Would require all credit trades have reported values
- No \$0 credit transactions (i.e., bundled credits), which account for nearly 1-in-5 credit transactions

Questions?

Next Steps

- Feedback due November 17, 2014
- Submit via email to Katrina Sideco at ksideco@arb.ca.gov
- Staff report – December 2014
- Board Hearing – February 2015

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Thank You