Carbon Charge Residuals: Allocation Options

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- Replaced table on slide 19
- Corrected text on slide 20

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Agenda

- Presentation Objectives
- Carbon residuals and example
- Market design first principles
- Residual allocation description and examples
  - Load Ratio Share
  - Cost Levelizing
  - Proportional Allocation
- Annual residual allocation examples for the NYCA

Presentation objective

- Summarize three approaches to allocation: Load Ratio Share, Cost Levelizing, and Proportional Allocation, with the latter two based on the carbon effect on each zone's LBMPs
- Illustrate how each approach may affect customer costs throughout the state
- Receive stakeholder feedback on carbon residual allocation approaches
- Does not discuss allocation by LSEs to customers, which would be under PSC jurisdiction

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Allocation of Carbon Charge Residuals to Loads

- **Charging suppliers for their carbon emissions would result in carbon charge residuals, to be allocated to loads**
  - NYISO would allocate these residuals to load serving entities (LSEs) as an offset to their energy charges in weekly settlements
  - How NYISO allocates these residuals will affect the net costs customers pay throughout the state; the key question is how to allocate in relation to different zones' LBMP effects from carbon
  - Allocation would not affect revenues to generators, who would receive the LBMP including the carbon effect

How carbon residuals occur

Row	Parameter	Eqn.	Load	Suppliers
[1]	Energy (MWh; + is gen)		-100	100
[2]	LBMP, incl. carbon ($/MWh)		$35	$35
[3]	Energy bill ($; + is a payment)	[1] * [2]	-$3,500	+$3,500
[4]	CO_2 emissions to serve load (tons)		n/a	25
[5]	CO_2 price ($/ton)		n/a	$50
[6]	Residual to load & CO_2 charge to gens ($)	[4] * [5]	$1,250	-$1,250
[7]	Net energy rate ($/MWh)	([3] + [6])/[1]	$22.50	$22.50
[8]	Net energy bill ($)	[3] + [6]	-$2,250	+$2,250

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Market Design First Principles

Mechanisms should be evaluated against at least two design objectives:

- **Economic Efficiency: Align LBMPs with the marginal cost of serving load, to incentivize customers to reduce emissions when economic to do so (accounting for externalities).**
  - Strictly speaking, this criterion might suggest not allocating any carbon residuals/funds to customers, or at least not in a way that relates to volume of consumption, so that they pay for the full social cost of marginal production.
  - But one can at least aim to signal the relatively high cost of consuming at times and places with higher marginal emissions.
- **Equity of Cost Burden: Avoid major cost shifts among customers.**
  - Carbon charges will impact customers costs, and the allocation of carbon residuals/funds will moderate that impact
  - Impacts and net impacts (net of allocated residuals/funds) will likely vary by zone
  - Net impacts may also vary by customer class, and socio-economic status, but that is outside the scope of NYISO allocation among LSEs.

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Load Ratio Share Allocation

Approach

- Return carbon charge residuals to all LSEs on a load ratio share basis
- Load Ratio Share Allocation results in LSEs receiving the same refunds on a $/MWh basis

Efficiency and Equity Outcomes

- Equity: Could create equity concerns by causing greater differences in the net cost of carbon pricing across LSEs
- Efficiency: Would provide LSEs with a price signal more reflective of the carbon implications of their consumption

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Example: Load Ratio Share Allocation

Load Ratio Share Allocation results in both LSEs receiving the same refunds on a $/MWh basis, resulting in LSE B facing higher net carbon costs than LSE A

			LSE A [a]	LSE B [b]	Totals [c]
LSE Description					
Location			Upstate	Downstate	
Load	*MWh*	[1]	10	15	25
MER	*tons/MWh*	[2]	0.3	0.4	
LSE Gross Carbon Payments					
Carbon Charge	*$/ton*	[3]	$50	$50	
Carbon Effect on LBMPs	***$/MWh***	**[4] = [2] x [3]**	**$15.0**	**$20.0**	
Dollars	*$*	[5] = [4] x [1]	$150	$300	$450
LSE Allocated Residuals					
Total Dollars to Allocate	*$*	[6]			$200
Share of Total Load	*%*	[7] = [1] / [1c]	40%	60%	
Allocated Refund	*$*	[8] = [7] x [6]	$80	$120	$200
Allocated Refund per MWh	***$/MWh***	**[9] = [8] / [1]**	**$8.0**	**$8.0**	
LSE Net Carbon Payments					
Net Carbon Payments	*$*	[10] = [5] - [8]	$70	$180	$250
Net Carbon Payments per MWh	***$/MWh***	**[11] = [10] / [1] = [4] - [9]**	**$7.0**	**$12.0**	

Note: Examples to not account for effect on REC and ZEC prices or any “dynamic effects” of carbon-induced changes in investment, retirement, and demand described in the 2017 Brattle report. These effects will be included in the Issue Track 5 Consumer Impact.

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Cost Levelizing Allocation

Approach

- Refund collected carbon charges to compensate for zonal differences in the carbon component of the LBMP
- Zones with the highest carbon component of LBMPs would be allocated the most until differences are levelized

Efficiency and Equity Outcomes

- Equity: Most equitable of three approaches (likely results in all LSEs paying the same net costs of carbon pricing)
- Efficiency: Would eliminate the differential price signal to reduce consumption (and emissions) more in zones with higher MERs

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Example: Cost Levelizing Allocation

Cost Levelizing Allocation results in more residuals allocated to LSE B, equalizing net carbon payments across LSE A and LSE B.

			LSE A [a]	LSE B [b]	Totals [c]
LSE Description					
Location			Upstate	Downstate	
Load	*MWh*	[1]	10	15	25
MER	*tons/MWh*	[2]	0.3	0.4	
LSE Gross Carbon Payments					
Carbon Charge	*$/ton*	[3]	$50	$50	
Carbon Effect on LBMPs	***$/MWh***	**[4] = [2] x [3]**	**$15.0**	**$20.0**	
Dollars	*$*	[5] = [4] x [1]	$150	$300	$450
LSE Allocated Residuals					
Total Dollars to Allocate	*$*	[6]			$200
Allocation to Levelize Net Payments	*$*	[7] = ([4b] - [4a]) x [1b]		$75	
Remaining Carbon Charges	*$*	[8] = [6] - [7]			$125
Allocation to Further Reduce Net Payments	*$*	[9] = [8] x [1] / ([1c])	$50	$75	
Allocated Refund	*$*	[10] = [7] + [9]	$50	$150	$200
Allocated Refund per MWh	***$/MWh***	**[11] = [10] / [1]**	**$5.0**	**$10.0**	
LSE Net Carbon Payments					
Net Carbon Payments	*$*	[12] = [5] - [10]	$100	$150	$250
Net Carbon Payments per MWh	***$/MWh***	**[13] = [12] / [1] = [4] - [11]**	**$10.0**	**$10.0**	

Note: Examples to not account for effect on REC and ZEC prices or any "dynamic effects" of carbon-induced changes in investment, retirement, and demand described in the 2017 Brattle report. These effects will be included in the Issue Track 5 Consumer Impact.

Proportional Allocation

Approach

- Return carbon charge residuals to all LSEs based on the proportional effect carbon prices have on their gross payments for energy (i.e., the product of the carbon effect on applicable zonal LBMPs and their MWh of load)

Efficiency and Equity Outcomes

- Would return more revenues to LSEs that face higher $/MWh cost impacts, but would not go so far as levelizing these cost impacts
- Provides some balance between two competing objectives economic efficiency and equity of cost burden, as this approach would maintain some of the differential price signals to reduce consumption (and emissions) more in zones with higher marginal emission rates

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Example: Proportional Allocation

Proportional Allocation allocates more residuals to LSE B than LSE A, but refunds only partially offset LSE B's higher gross costs

			LSE A [a]	LSE B [b]	Totals [c]
LSE Description					
Location			Upstate	Downstate	
Load	*MWh*	[1]	10	15	25
MER	*tons/MWh*	[2]	0.3	0.4	
LSE Gross Carbon Payments					
Carbon Charge	*$/ton*	[3]	$50	$50	
Carbon Effect on LBMPs	***$/MWh***	**[4] = [2] x [3]**	**$15.0**	**$20.0**	
Dollars	*$*	[5] = [4] x [1]	$150	$300	$450
LSE Allocated Residuals					
Total Dollars to Allocate	*$*	[6]			$200
Share of Gross Carbon Payments	*%*	[7] = [5] / [5c]	33%	67%	
Allocated Refund	*$*	[8] = [7] x [6]	$67	$133	$200
Allocated Refund per MWh	***$/MWh***	**[9] = [8] / [1]**	**$6.7**	**$8.9**	
LSE Net Carbon Payments					
Net Carbon Payments	*$*	[10] = [5] - [8]	$83	$167	$250
Net Carbon Payments per MWh	***$/MWh***	**[11] = [10] / [1] = [4] - [9]**	**$8.3**	**$11.1**	

Note: Examples to not account for effect on REC and ZEC prices or any "dynamic effects" of carbon-induced changes in investment, retirement, and demand described in the 2017 Brattle report. These effects will be included in the Issue Track 5 Consumer Impact.

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Indicative Findings for 2025

- The prior slides illustrate the effects of allocation approach decisions via illustrative examples
- The following slides provide indicative findings for 2025 and a sensitivity, leveraging analysis from the 2017 Report
  - These slides calculate returns using total annual carbon charge residuals
  - To the extent that residuals are returned weekly, the same methods could still apply
  - However, weeks with greater residuals (e.g., periods with higher than average carbon emissions) would realize greater load credits than weeks with fewer residuals (e.g., periods with lower than average carbon emissions)
- Through Issue Track 5, the IPPTF will re-estimate allocation implications for LSE bills under all three approaches. These estimates will account for effect on REC and ZEC prices or any "dynamic effects" of carbon-induced changes in investment, retirement, and demand described

Allocation Comparison: 2025 Base Case

- Gross Energy Payments of ~$11 billion before carbon charge applied
  - Upstate: $3 billion (5.78 ¢/kWh)
  - Downstate: $8 billion (7.93 ¢/kWh)
- Unchanged by allocation approach

		Load Ratio Share	Proportional	Levelizing
LSE Gross Energy Payments Before Carbon Adder				
Upstate	*($ million)*	$3,089	$3,089	$3,089
Downstate	*($ million)*	$8,189	$8,189	$8,189
NYCA Total	***($ million)***	**$11,278**	**$11,278**	**$11,278**
Upstate	*(¢/kWh)*	5.78	5.78	5.78
Downstate	*(¢/kWh)*	7.93	7.93	7.93

Sources and Notes:

Examples derived from findings of 2025 analysis in 2017 Brattle Report, Section VII.

Assumptions: MERs: 0.42 tons/MWh Upstate, 0.48 Downstate, Total Emissions: 37 million tons. Total carbon charges collected at $40/ton: $1,477 million

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Allocation Comparison: 2025 Base Case

- Gross carbon payments calculated as Load-wtd average Marginal Emission Rate x Load
- NYCA-wide total payments of $2,940 million
  - $924 million Upstate (1.73 ¢/kWh)
  - $2,015 million Downstate (1.95 ¢/kWh)
- Unchanged by allocation approach

		Load Ratio Share	Proportional	Levelizing
LSE Gross Energy Payments Before Carbon Adder				
Upstate	*($ million)*	$3,089	$3,089	$3,089
Downstate	*($ million)*	$8,189	$8,189	$8,189
NYCA Total	***($ million)***	**$11,278**	**$11,278**	**$11,278**
Upstate	*(¢/kWh)*	5.78	5.78	5.78
Downstate	*(¢/kWh)*	7.93	7.93	7.93
LSE Gross Carbon Payments				
Upstate	*($ million)*	$924	$924	$924
Downstate	*($ million)*	$2,015	$2,015	$2,015
NYCA Total	***($ million)***	**$2,940**	**$2,940**	**$2,940**
Upstate	*(¢/kWh)*	1.73	1.73	1.73
Downstate	*(¢/kWh)*	1.95	1.95	1.95

Sources and Notes:
Examples derived from findings of 2025 analysis in 2017 Brattle Report, Section VII.
Assumptions: MERs: 0.42 tons/MWh Upstate, 0.48 Downstate, Total Emissions: 37 million tons. Total carbon charges collected at $40/ton: $1,477 million

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Allocation Comparison: 2025 Base Case

- **Total carbon residuals of $1,477 million to be allocated to NYCA load**
- **Upstate/Downstate allocation varies based on allocation approach**
  - Load Ratio Share: Equal allocation of 0.94 ¢/kWh
  - Proportional: Allocation of 0.87 ¢/kWh Upstate, 0.98 ¢/kWh Downstate
  - Levelized: Allocation of 0.80 ¢/kWh Upstate, 1.02 ¢/kWh Downstate
- **Choice of approach shifts Upstate vs. Downstate allocation by ~$80 million**

		Load Ratio Share	Proportional	Levelizing
LSE Gross Energy Payments Before Carbon Adder				
Upstate	*($ million)*	$3,089	$3,089	$3,089
Downstate	*($ million)*	$8,189	$8,189	$8,189
NYCA Total	***($ million)***	**$11,278**	**$11,278**	**$11,278**
Upstate	*(¢/kWh)*	5.78	5.78	5.78
Downstate	*(¢/kWh)*	7.93	7.93	7.93
LSE Gross Carbon Payments				
Upstate	*($ million)*	$924	$924	$924
Downstate	*($ million)*	$2,015	$2,015	$2,015
NYCA Total	***($ million)***	**$2,940**	**$2,940**	**$2,940**
Upstate	*(¢/kWh)*	1.73	1.73	1.73
Downstate	*(¢/kWh)*	1.95	1.95	1.95
LSE Allocated Residuals				
Upstate	*($ million)*	$504	$465	$426
Downstate	*($ million)*	$973	$1,013	$1,051
NYCA Total	***($ million)***	**$1,477**	**$1,477**	**$1,477**
Upstate	*(¢/kWh)*	0.94	0.87	0.80
Downstate	*(¢/kWh)*	0.94	0.98	1.02

Equal ¢/kWh

Equal on a proportional basis:
$465 / $924 = 50%
$1,013 / $2,015 = 50%

Net carbon payments equal on a ¢/kWh basis (see next slide)

Sources and Notes:
Examples derived from findings of 2025 analysis in 2017 Brattle Report, Section VII.
Assumptions: MERs: 0.42 tons/MWh Upstate, 0.48 Downstate, Total Emissions: 37 million tons. Total carbon charges collected at $40/ton: $1,477 million

Allocation Comparison: 2025 Base Case

- Total net carbon payments of $1,463 across NYCA
- Upstate/Downstate net payments vary based on allocation approach
  - Load Ratio Share: Net payments of 0.79 ¢/kWh Upstate, 1.01 ¢/kWh Downstate
  - Proportional: Net payments of 0.86 ¢/kWh Upstate, 0.97 ¢/kWh Downstate
  - Levelized: Equal net payments of 0.93 ¢/kWh Upstate/Downstate
- Choice of approach shifts Upstate vs. Downstate net payments by ~$80 million

		Load Ratio Share	Proportional	Levelizing
LSE Gross Energy Payments Before Carbon Adder				
Upstate	*($ million)*	$3,089	$3,089	$3,089
Downstate	*($ million)*	$8,189	$8,189	$8,189
NYCA Total	***($ million)***	**$11,278**	**$11,278**	**$11,278**
Upstate	*(¢/kWh)*	5.78	5.78	5.78
Downstate	*(¢/kWh)*	7.93	7.93	7.93
LSE Gross Carbon Payments				
Upstate	*($ million)*	$924	$924	$924
Downstate	*($ million)*	$2,015	$2,015	$2,015
NYCA Total	***($ million)***	**$2,940**	**$2,940**	**$2,940**
Upstate	*(¢/kWh)*	1.73	1.73	1.73
Downstate	*(¢/kWh)*	1.95	1.95	1.95
LSE Allocated Residuals				
Upstate	*($ million)*	$504	$465	$426
Downstate	*($ million)*	$973	$1,013	$1,051
NYCA Total	***($ million)***	**$1,477**	**$1,477**	**$1,477**
Upstate	*(¢/kWh)*	0.94	0.87	0.80
Downstate	*(¢/kWh)*	0.94	0.98	1.02
LSE Net Carbon Payments (excluding offsets from RECs/ZECs and dynamic effects)				
Upstate	*($ million)*	$421	$460	$499
Downstate	*($ million)*	$1,042	$1,003	$964
NYCA Total	***($ million)***	**$1,463**	**$1,463**	**$1,463**
Upstate	*(¢/kWh)*	0.79	0.86	0.93
Downstate	*(¢/kWh)*	1.01	0.97	0.93

Net carbon payments equal on a ¢/kWh basis

Sources and Notes:

Examples derived from findings of 2025 analysis in 2017 Brattle Report, Section VII.

Assumptions: MERs: 0.42 tons/MWh Upstate, 0.48 Downstate, Total Emissions: 37 million tons. Total carbon charges collected at $40/ton: $1,477 million

Allocation Comparison: 2025 Base Case

- Total energy payments after carbon payments and residuals allocation will depend on allocation approach:
  - Upstate: Between 6.57 and 6.71 ¢/kWh, an increase of 14% - 16%
  - Downstate: Between 8.86 and 8.93 ¢/kWh, an increase of 12% - 13%
- This discussion focuses solely on allocation and LBMP effects. Total bill impacts would be less than shown if accounting for lower REC/ZEC prices and "dynamic effects" of carbon-induced changes in investment, retirement, and demand

		Load Ratio Share	Proportional	Levelizing
LSE Gross Energy Payments Before Carbon Adder				
Upstate	*($ million)*	$3,089	$3,089	$3,089
Downstate	*($ million)*	$8,189	$8,189	$8,189
NYCA Total	***($ million)***	**$11,278**	**$11,278**	**$11,278**
Upstate	*(¢/kWh)*	5.78	5.78	5.78
Downstate	*(¢/kWh)*	7.93	7.93	7.93
LSE Gross Carbon Payments				
Upstate	*($ million)*	$924	$924	$924
Downstate	*($ million)*	$2,015	$2,015	$2,015
NYCA Total	***($ million)***	**$2,940**	**$2,940**	**$2,940**
Upstate	*(¢/kWh)*	1.73	1.73	1.73
Downstate	*(¢/kWh)*	1.95	1.95	1.95
LSE Allocated Residuals				
Upstate	*($ million)*	$504	$465	$426
Downstate	*($ million)*	$973	$1,013	$1,051
NYCA Total	***($ million)***	**$1,477**	**$1,477**	**$1,477**
Upstate	*(¢/kWh)*	0.94	0.87	0.80
Downstate	*(¢/kWh)*	0.94	0.98	1.02
LSE Net Carbon Payments (excluding offsets from RECs/ZECs and dynamic effects)				
Upstate	*($ million)*	$421	$460	$499
Downstate	*($ million)*	$1,042	$1,003	$964
NYCA Total	***($ million)***	**$1,463**	**$1,463**	**$1,463**
Upstate	*(¢/kWh)*	0.79	0.86	0.93
Downstate	*(¢/kWh)*	1.01	0.97	0.93
Increase in LSEs' Total Energy Payments from Carbon Payments Minus Allocated Residuals				
Upstate	*($ million)*	$3,510	$3,549	$3,588
Downstate	*($ million)*	$9,231	$9,192	$9,153
NYCA Total	***($ million)***	**$12,741**	**$12,741**	**$12,741**
Upstate	*(¢/kWh)*	6.57	6.64	6.71
Downstate	*(¢/kWh)*	8.93	8.90	8.86

Sources and Notes:
Examples derived from findings of 2025 analysis in 2017 Brattle Report, Section VII.
Assumptions: MERs: 0.42 tons/MWh Upstate, 0.48 Downstate, Total Emissions: 37 million tons. Total carbon charges collected at $40/ton: $1,477 million

Allocation Comparison: Low Upstate MER Comparison

- Approaches compared in alternative scenario with lower Upstate MERs
  - E.g. due to “bottled” upstate renewables
  - Assumed Upstate MER of 0.35 tons/MWh (vs 0.42 in previous example)
  - Brattle report suggests avg. upstate MERs could fall to 0.35 tons/MWh before renewables locate Downstate or new transmission becomes economical
- Choice of approach shifts Upstate vs. Downstate residual allocation by ~$190 million (vs $80 million in 2025 Base Case)
- This discussion focuses solely on allocation and LBMP effects. Total bill impacts would be less than shown if accounting for lower REC/ZEC prices and “dynamic effects”

		Load Ratio Share	Proportional	Levelizing
LSE Gross Energy Payments Before Carbon Adder				
Upstate	*($ million)*	$3,089	$3,089	$3,089
Downstate	*($ million)*	$8,189	$8,189	$8,189
NYCA Total	***($ million)***	**$11,278**	**$11,278**	**$11,278**
Upstate	*(¢/kWh)*	5.78	5.78	5.78
Downstate	*(¢/kWh)*	7.93	7.93	7.93
LSE Gross Carbon Payments				
Upstate	*($ million)*	$748	$748	$748
Downstate	*($ million)*	$2,015	$2,015	$2,015
NYCA Total	***($ million)***	**$2,764**	**$2,764**	**$2,764**
Upstate	*(¢/kWh)*	1.40	1.40	1.40
Downstate	*(¢/kWh)*	1.95	1.95	1.95
LSE Allocated Residuals				
Upstate	*($ million)*	$504	$400	$310
Downstate	*($ million)*	$973	$1,077	$1,167
NYCA Total	***($ million)***	**$1,477**	**$1,477**	**$1,477**
Upstate	*(¢/kWh)*	0.94	0.75	0.58
Downstate	*(¢/kWh)*	0.94	1.04	1.13
LSE Net Carbon Payments (excluding offsets from RECs/ZECs and dynamic effects)				
Upstate	*($ million)*	$245	$348	$439
Downstate	*($ million)*	$1,042	$938	$848
NYCA Total	***($ million)***	**$1,287**	**$1,287**	**$1,287**
Upstate	*(¢/kWh)*	0.46	0.65	0.82
Downstate	*(¢/kWh)*	1.01	0.91	0.82
Increase in LSEs' Total Energy Payments from Carbon Payments Minus Allocated Residuals				
Upstate	*($ million)*	$3,334	$3,438	$3,528
Downstate	*($ million)*	$9,231	$9,127	$9,037
NYCA Total	***($ million)***	**$12,741**	**$12,565**	**$12,565**
Upstate	*(¢/kWh)*	6.24	6.43	6.60
Downstate	*(¢/kWh)*	8.93	8.83	8.75

Sources and Notes:
Examples derived from findings of 2025 analysis in 2017 Brattle Report, Section VII.
Assumptions: MERs: 0.42 tons/MWh Upstate, 0.48 Downstate, Total Emissions: 37 million tons. Total carbon charges collected at $40/ton: $1,477 million

Choice of allocation approach

- **The Straw Proposal proposes Cost Levelizing Allocation**
  - The NYISO continues to propose the Cost Levelizing Allocation
  - Produces the most similar cost burden in terms of $/MWh of carbon charge
  - Limits the additional differential price signal from carbon adder to reduce consumption
    - Higher MER zones would not necessarily see an incentive to reduce consumption relative to lower MER zones
- **Should LSE allocated residuals be allowed to exceed that LSE's gross carbon payments?**
- **What criteria are stakeholders looking for in terms of equity ~~vs.~~ of cost burden?**

Questions?

We are here to help. Let us know if we can add anything.

Feedback?

- Questions and/or comments can be sent to IPP_feedback@nyiso.com

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system

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