TITLE 24, PART 6 | 2025 CODE CYCLE

Elevator Energy Efficiency

Codes and Standards Enhancement (CASE) Proposal
Residential and Nonresidential | Covered Process

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Utility Sponsored Stakeholder Meeting – Round 2

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Agenda

- Overview of Code Change Proposal
- Summary of Stakeholder Feedback
- Cost-effectiveness, Energy Savings and Statewide Impacts
- Data Gaps and Additional Feedback Requested
- Next Steps

Code Change Proposal

- Code Change Proposal
  - Evolution from Round 1 and Stakeholder Feedback
- Code Change Language

Proposed Code Changes – Evolution of our Measure

Original Proposal:

- Involved adopting and adapting ASHRAE 90.1 standards for elevator energy efficiency
- Utilized an ISO grade of efficiency that was dependent on operational parameters.
  - ISO 25745-2-2015 graded efficiency as a function of travel time, use, idle time, and idle power consumption.

Current Proposal:

- Revised code adapted and improved from New York City's elevator code
- All new passenger elevators in new buildings with a rise of 33 feet and greater and a capacity of 4000 pounds or less will be traction type with a regen motor.
  - Exception: If there is insufficient building load to absorb regenerated power, regen drives are not required.

Summary of Feedback Received

- Statewide CASE Team requested first cost and maintenance cost data
- Stakeholder responded that the ASHRAE 90.1 elevator standards depend on the building type and elevator use more than the elevator equipment provided.
- Stakeholders responded ASHRAE 90.1 would add costs and complexity to the design process
- Stakeholders raised concerns regarding the verification of the ASHRAE 90.1 elevators standards.
- Stakeholders expressed ASHRAE 90.1 elevator standards would burden the building designers and not provide a clear path for elevator manufacturers for compliance.

Barriers and Solutions

Were there any elevator codes used elsewhere that would drive energy savings?

- Yes, NY Reach Codes (and NYC codes) for elevators:
  - Chapter C4 – Commercial Energy Efficiency C405.8

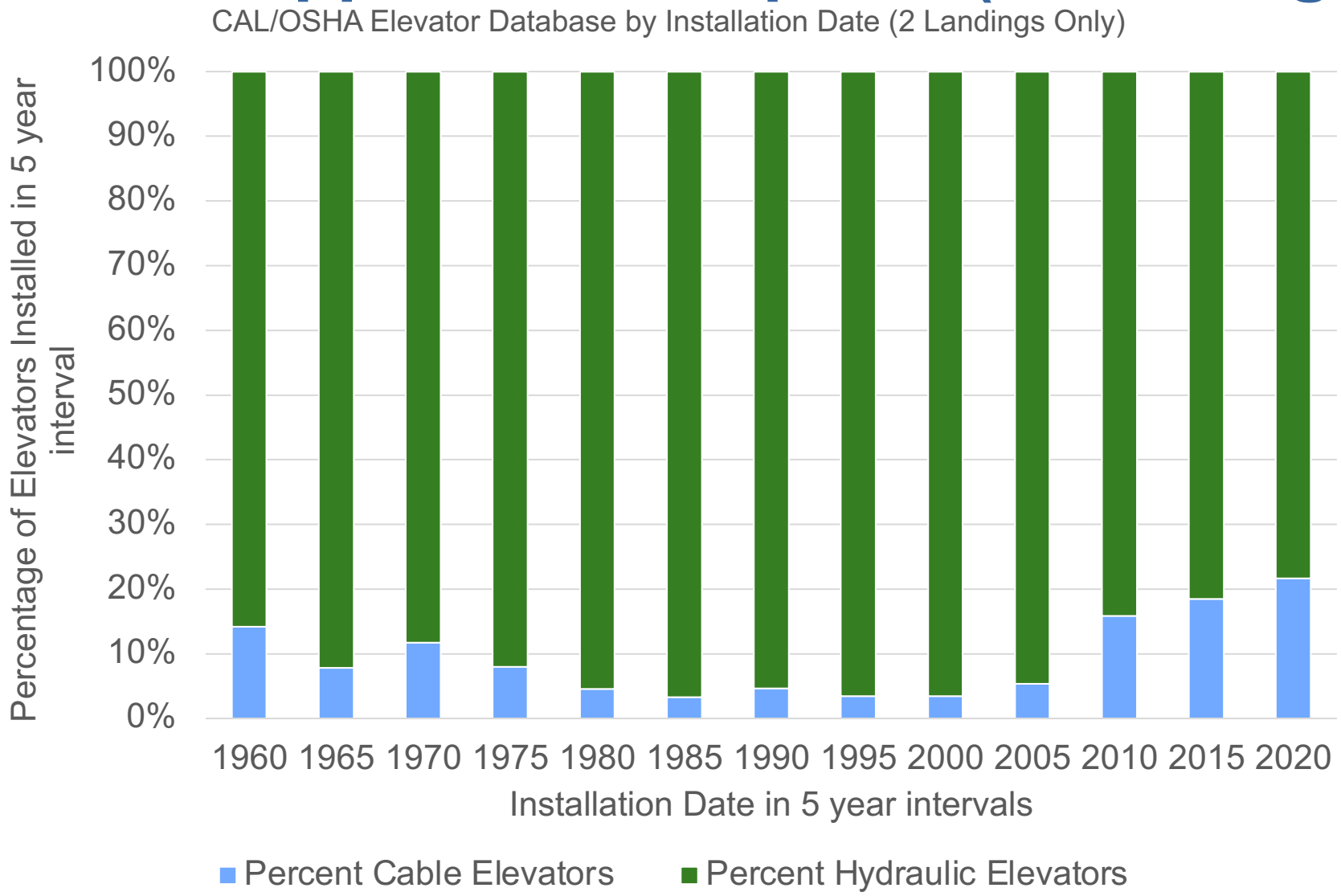
How can this code be building use-agnostic?

- Making mandatory equipment requirements based on rise height and function.

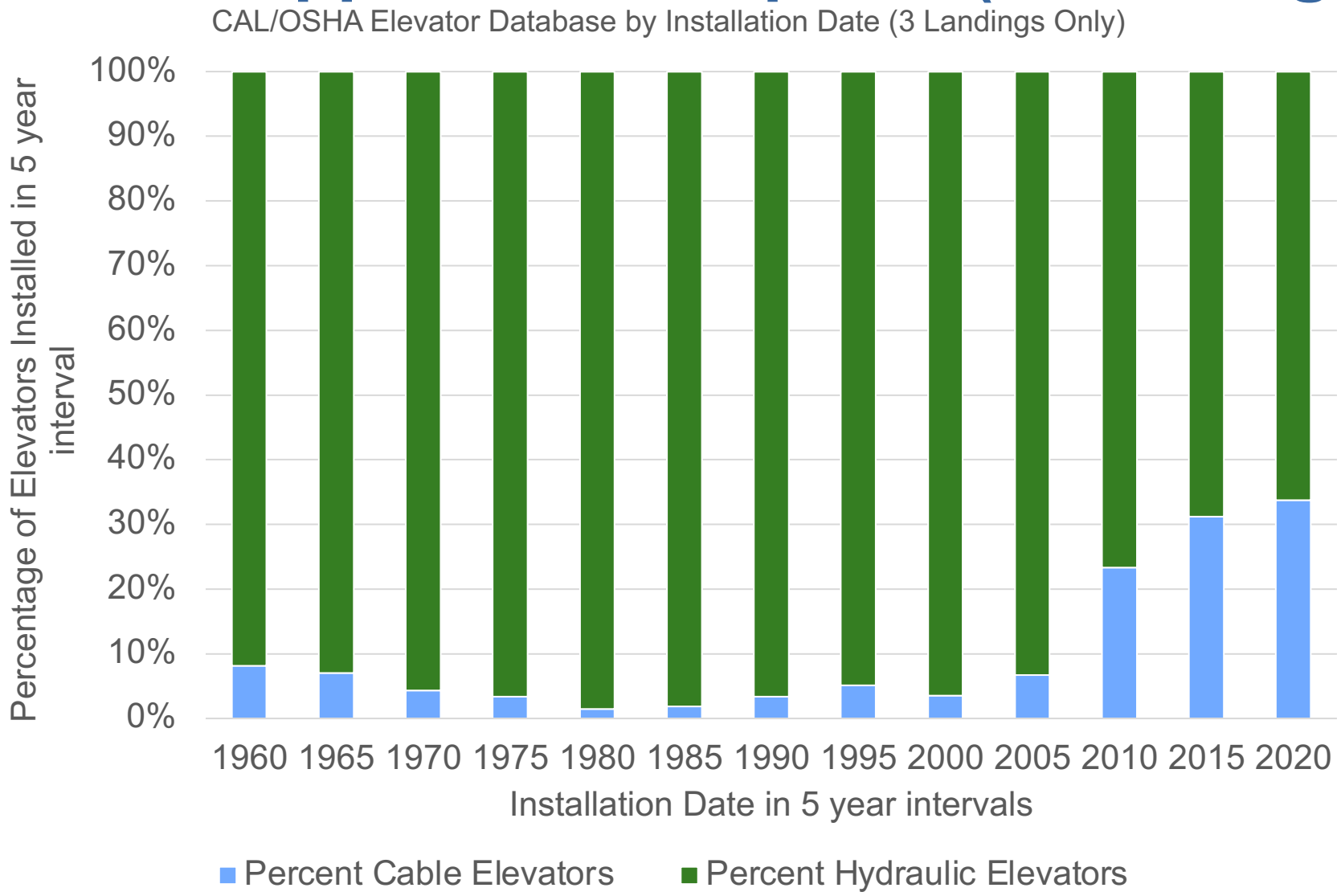
How do we get stakeholders engaged?

- The move to MRL traction elevators and away from hydraulic systems is already occurring in the marketplace.

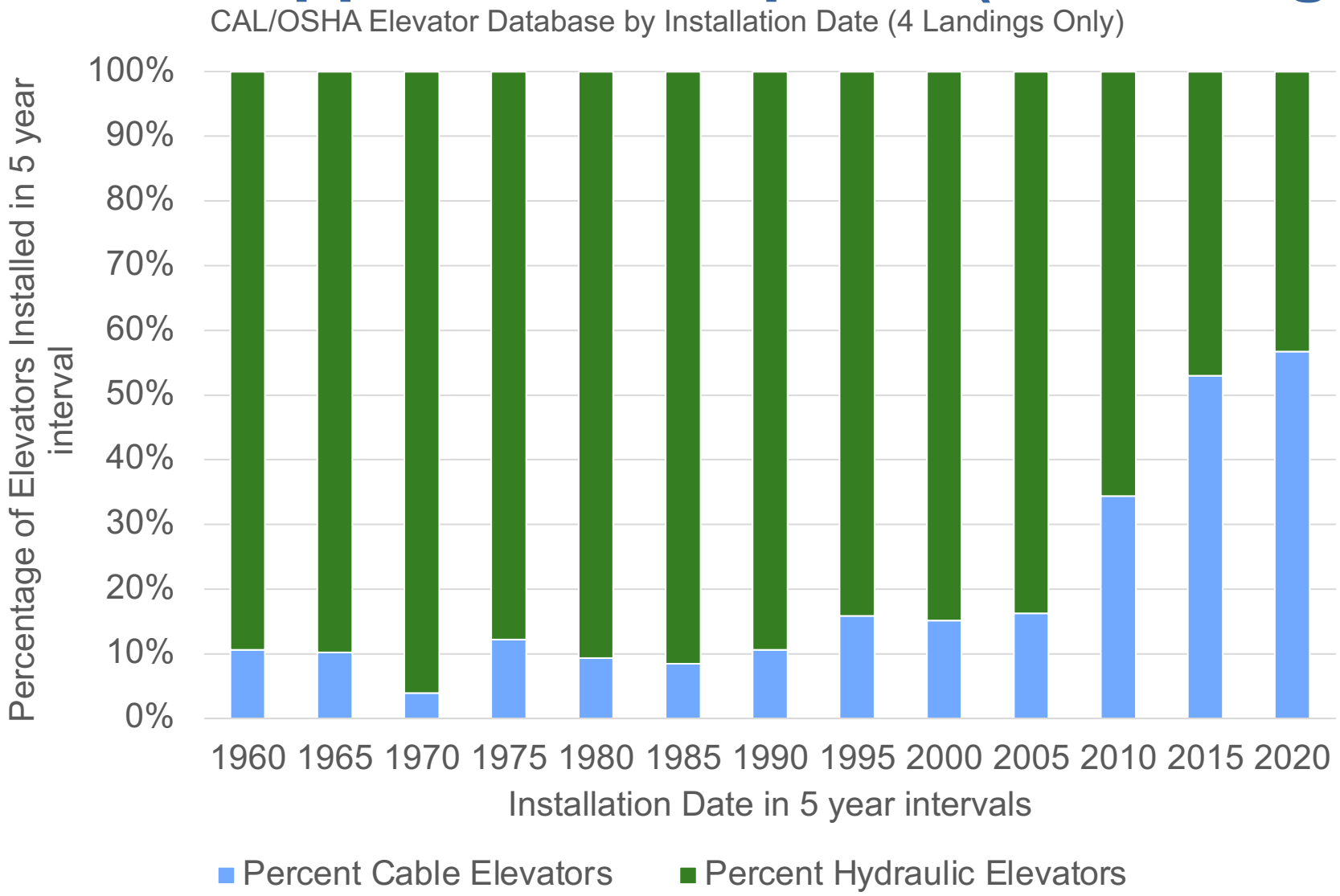
Market Trends Support Our Proposal (2 Landings)



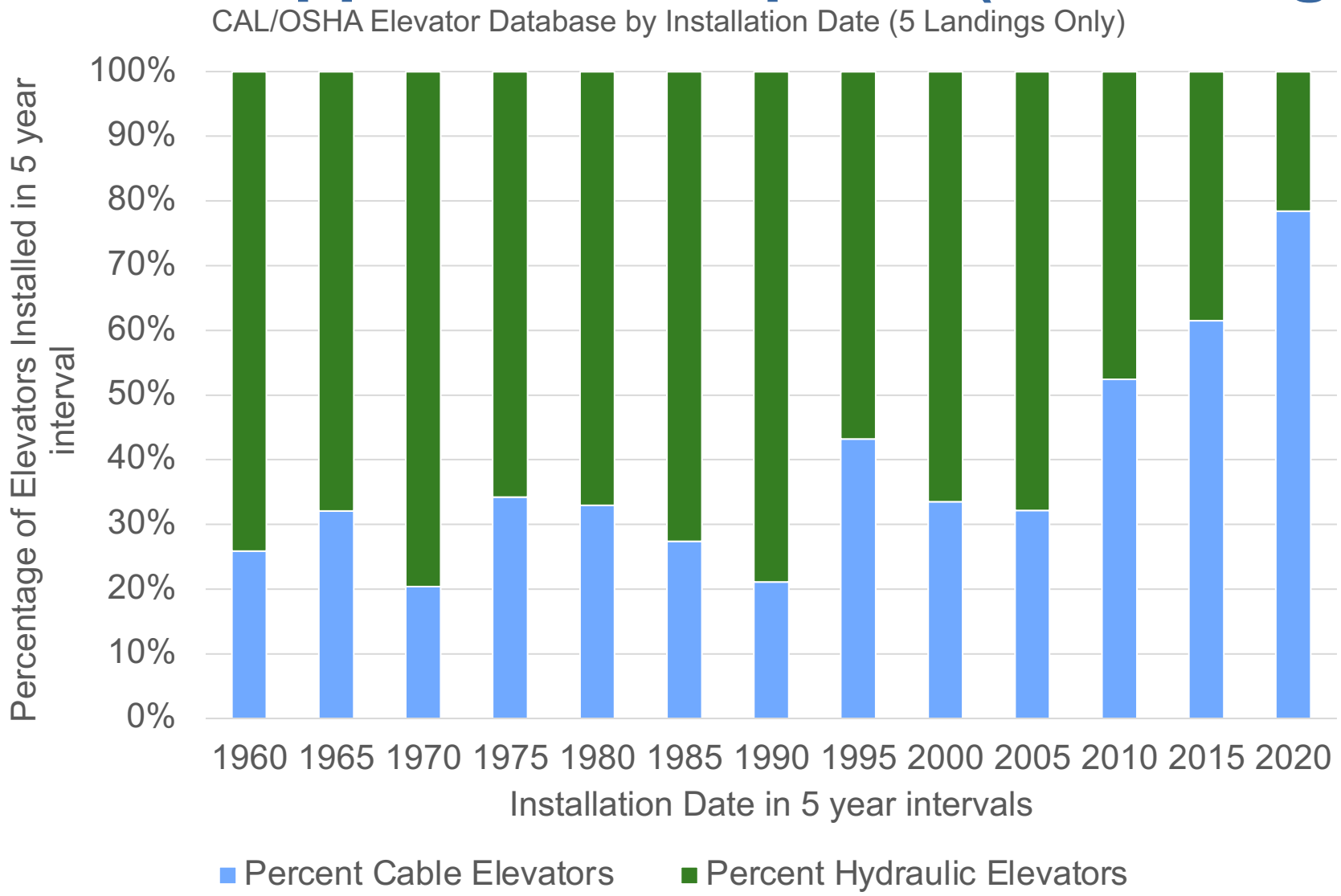
Market Trends Support Our Proposal (3 Landings)



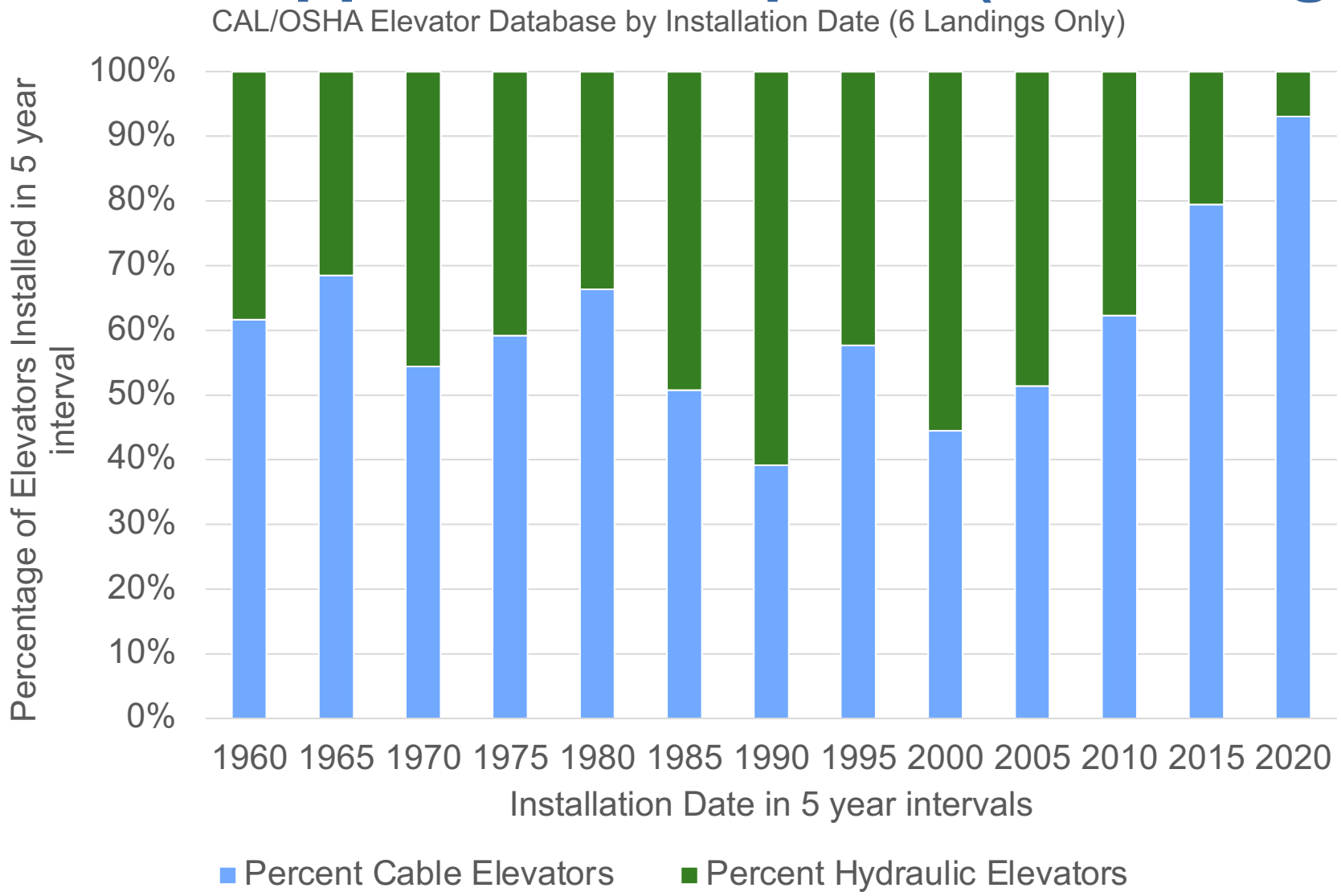
Market Trends Support Our Proposal (4 Landings)



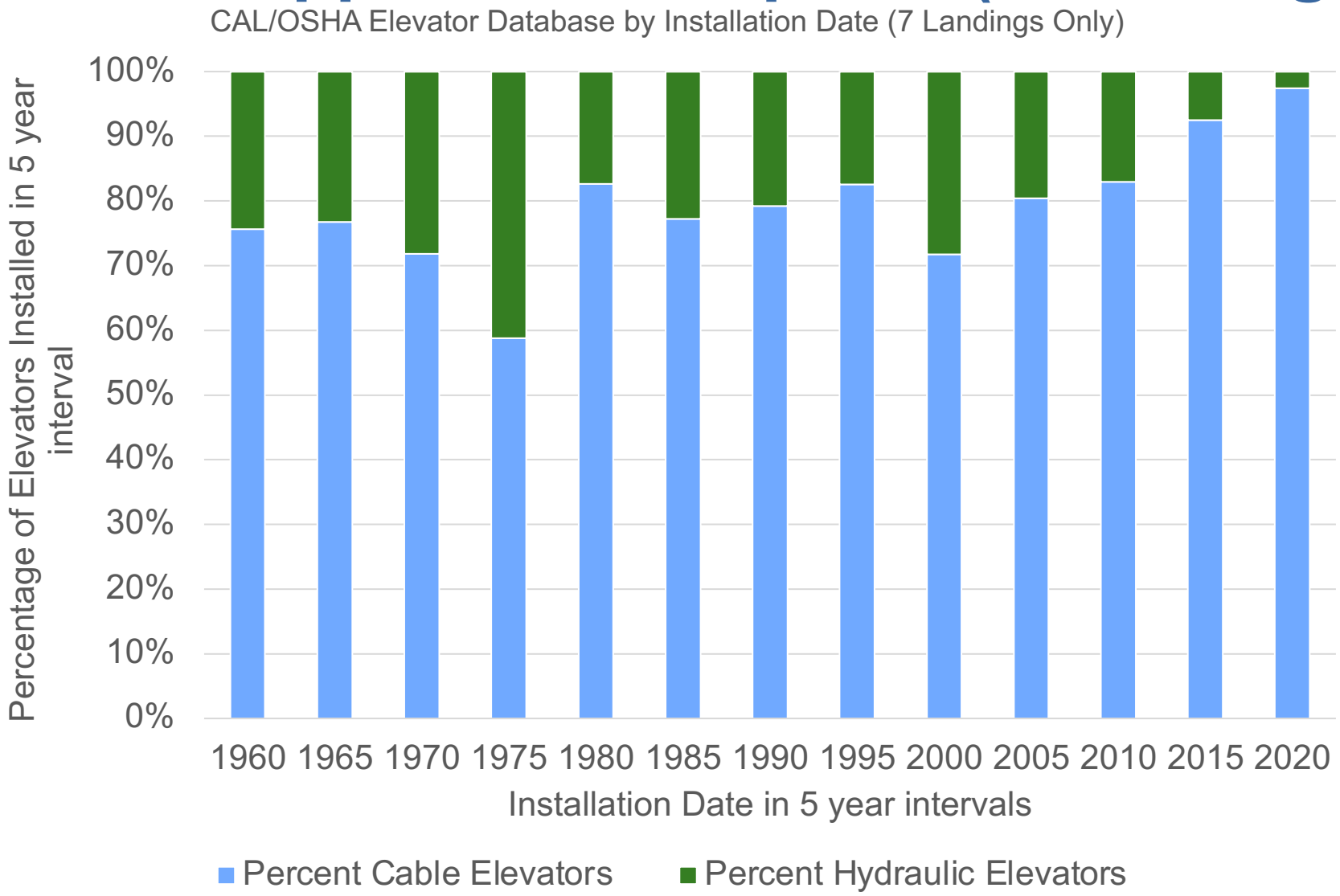
Market Trends Support Our Proposal (5 Landings)



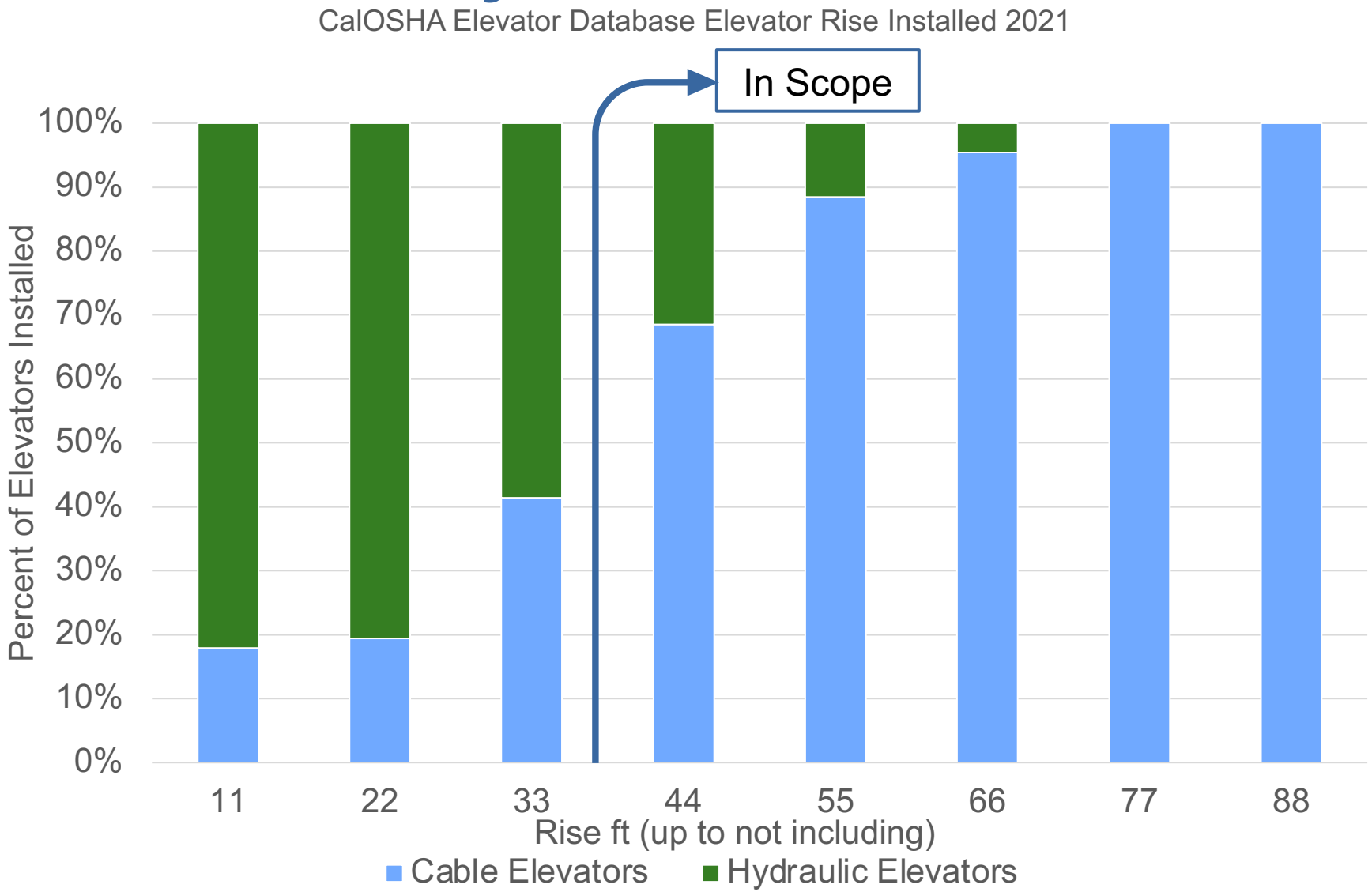
Market Trends Support Our Proposal (6 Landings)



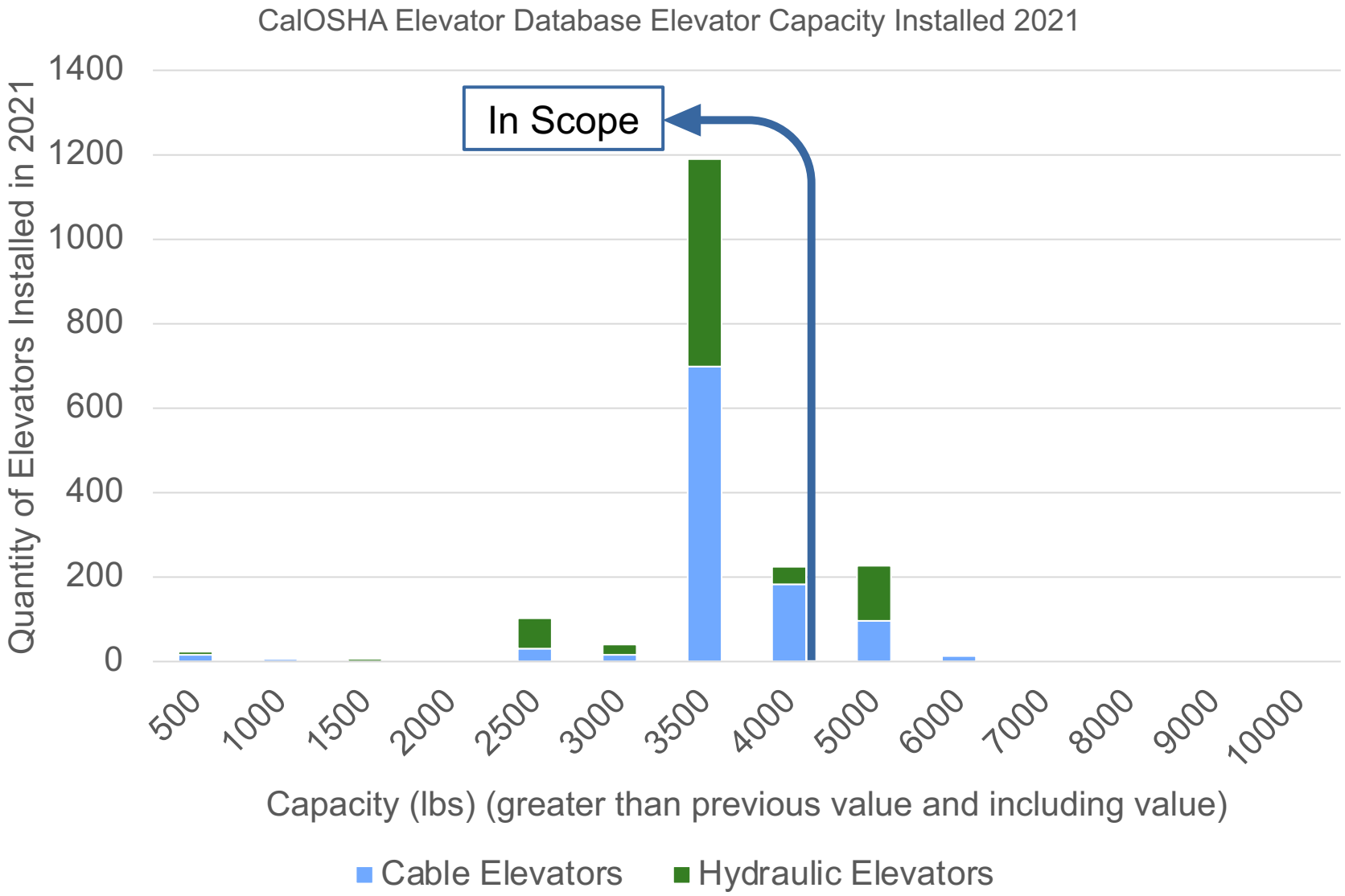
Market Trends Support Our Proposal (7 Landings)



Proposal Allows for Hydraulics



Comparison of Capacity to Scope



Draft Code Change Language

Added to 120.6(f) – Mandatory requirements for elevators

1. Power conversion system. New passenger elevators with capacities 4,000 pounds or less, with a rise of 33 feet or more, in new buildings shall have a power conversion system that complies with the following requirements:

A. Hydraulic elevators shall not be used.

B. Traction elevators shall be either:

i. A geared traction machine with AC Induction motor, or

ii. AC Gearless Traction permanent magnet synchronous machine, or alternative technologies that have equal or better efficiency

C. Regenerative Drive. Potential energy released during motion shall be recovered with a regenerative drive that supplies electrical energy to the building electrical system. Drives must meet or exceed a 96% power factor.

EXCEPTION to 120.6(f)1C: Where the Electrical Engineer of Record has calculated that there is insufficient building load to absorb the regenerated power under normal or standby power operation, regenerative drives are not required. This exception shall only be used after efforts have been made to modify the elevator system, including the use of alternate drives that allow for the diversion of regenerated energy, operating elevators at slower speed during standby power operation, and reducing the number of elevators in service during standby power operation.

Are the changes to the code language clear in what is required for the power conversion system for passenger elevators with a rise of 33 feet and greater?

Poll

Do you have any experience with regen systems?

Cost Effectiveness

Methodology and Assumptions

Energy Saving Methodology

- Analysis led by VDA Elevator Consulting
- Elevate, an elevator traffic analysis software from Peters Research
- Number of elevators, speed, and capacity based on industry practices and building prototype
- Analysis compared baseline to minimal compliant scenario
- Savings from more efficient conveyance and reduced building cooling load due to less waste heat

Are the energy savings reasonable for a hydraulic elevator to traction elevator with a regenerative drive?

Are the energy savings reasonable for a traction elevator to traction elevator with regenerative drive conversion?

Prototype Name	Number of Stories	Elevators per Prototype	Baseline Description	Measure Description	Per Building Energy Savings (kWh/yr)
Loaded Corridor Apt	3	2	Hydraulic with no regeneration	Traction with regeneration	44,000
Office Medium	3	2	Hydraulic with no regeneration	Traction with regeneration	49,000
Parking Garage	3	2	Hydraulic with no regeneration	Traction with regeneration	56,000
Hotel Small	4	2	Hydraulic with no regeneration	Traction with regeneration	47,000
Mid-Rise Multifamily	5	2	Traction with no regeneration	Traction with regeneration	7,100
High-rise Multifamily	10	2	Traction with no regeneration	Traction with regeneration	7,400
Office Large	12	7	Traction with no regeneration	Traction with regeneration	55,000

Incremental Cost Per Building Prototype

Over 30 Year Period of Analysis

	Incremental First Cost	
Shorter	Loaded Corridor Apt	$120,000
	Office Medium	$50,000
	Parking Garage	$50,000
	Hotel Small	$50,000
Taller	Mid-Rise Multifamily	$8,000
	High-rise Multifamily	$8,000
	Office Large	$28,000

Incremental Maintenance Cost 30 years	
Loaded Corr. Apt; Office Medium; Hotel Small	$34,000
Parking Garage	$28,000
Mid-Rise Multifamily; High-rise Multifamily	$0
Office Large	$0

Incremental Modernization Costs and Value for Hydraulic to Traction	
Modernization expense, year 25	$181,000
Residual value of modernization at year 30 *assuming straight-line depreciation over 25 year life*	$125,000

Baselines:

- Hydraulic assumed for shorter buildings
- Traction without regenerative drive assumed for taller buildings

Are the incremental first cost and maintenance costs reasonable for the hydraulic to traction and traction to traction/regeneration?

Cost Effectiveness (Across All Climate Zones)

- Cost to convert shorter buildings from hydraulic to traction drove difference in cost-effectiveness vs. taller buildings
- Cost-effectiveness did not vary much across climate zones – Statewide Averages below.

Building Prototype	**Benefits** Life Cycle Energy Cost Savings + Residual Value of Modernization **(2026 PV$)**	**Costs** Incremental First Costs + Increased Life Cycle Maintenance Cost **(2026 PV$)**	**B/C Benefit-to-Cost Ratio**
Loaded Corridor Apartment	370,000	340,000	1.1
Office Medium	390,000	270,000	1.4
Parking Garage	440,000	270,000	1.6
Small Hotel	390,000	270,000	1.4
MidRise Multi-family	35,000	8,000	4.4
HighRise Multi-family	36,000	8,000	4.5
Office Large	280,000	28,000	10.0

Statewide Impacts

Methodology and Assumptions

- Statewide Energy Impacts Methodology and Results

Statewide Impacts of Buildings Impacted in First-Year

Building Prototype	Per Prototype LSC Electricity Savings (2026 PV$)	Statewide New Construction & Additions Impacted by Proposed Change in 2026 (# of Buildings	Statewide 30-year Life Cycle Energy Cost Savings (Million 2026 PV$)	First Year Statewide Site Electricity Savings (GWh/yr)	First Year Statewide Peak Demand Reduction (MW)	First Year Source Energy (million kbtu/yr)
Loaded Corridor Apt	250,000	490	120.0	22.0	2.4	36.0
Office Medium	270,000	290	78.0	14.0	1.4	23.0
Parking Garage	310,000	88	27.0	4.9	0.5	8.0
Hotel Small	260,000	160	43.0	7.7	0.8	13.0
Mid-Rise Multifamily	35,000	350	12.0	2.5	0.0	2.7
High-rise Multifamily	36,000	23	0.8	0.2	0.0	0.2
Office Large	280,000	30	8.2	1.6	0.0	2.0
Total		1431	289	53	5.0	85

Proposal would provide significant energy and environmental benefits to Californians

Statewide Impacts of Buildings Impacted in First-Year

- Significant reduction in GHG emissions due to reduced demand for electricity generation
- Reduced emissions are annual emissions reductions of one year's new construction

Measure	Electricity Savings (GWh/yr)	Reduced GHG Emissions from Electricity Savings (Metric Tons CO2e/yr)	Monetary Value of Reduced GHG Emissions ($/yr)
Elevator Energy Efficiency	53	4,500	550,000
TOTAL	53	4,500	550,000

Proposal would provide significant reduction in GHG emissions

Poll

Open ended Question: What changes to the proposal would you suggest to improve cost-effectiveness for building owners or help elevator installers?

Discussion and Next Steps

We want to hear from you!

- Provide **any last comments or feedback** on this presentation now verbally or over the GoTo Webinar Questions Pane
- More information on pre-rulemaking for the 2025 Energy Code at https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency

Comments on this measure are due by May 31, 2023. Please send comments to info@title24stakeholders.com and copy CASE Authors (see contact info on following slide).

Thank You

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