

A Selection of Options and Opportunities

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2022 Reach Codes: A Selection of Potential Options and Opportunities

The California Codes and Standards program is working in partnership with the California Energy Commission (CEC), local governments, and many others toward achieving the state's Zero Net Energy (ZNE) and greenhouse gas reductions policy goals. The State's 2022 Building Energy Efficiency (<u>Title 24, Part 6</u>) and CALGreen (<u>Title 24, Part 11</u>) Standards have introduced new requirements, including partial electrification, electric-readiness, more aggressive EV charging requirements, efficiency improvements and opportunities for energy storage. The Codes and Standards team has identified additional opportunities for jurisdictions to adopt local ordinances (reach codes) that exceed minimum state requirements and accelerate decarbonization. Any jurisdiction that chooses to implement more stringent standards now will reap the benefits of these policies early and gain valuable experience in advance of future changes.

The table below provides a high-level summary of the local ordinance opportunities in each market sector and which have been adopted in the 2022 code cycle, followed by a brief description of each potential ordinance option for both residential and nonresidential occupancies. All ordinances that require CEC approval (amending Title 24, Part 6) must be supported by an analysis documenting the cost-effectiveness of the requirements. Analyses have been completed for new and existing single family, multifamily and nonresidential buildings. These analyses and related materials may be found at LocalEnergyCodes.com. The list below of reach code opportunities is not a comprehensive list; the intent is to provide a range of options for discussion with local stakeholders.

Reach codes opportunities are sorted into the following categories:

Major Renovations as New Construction

All-Electric New Construction

Energy Efficiency and Renewables in New Construction

Energy Efficiency, Renewables, Electric Appliances, and Electric Readiness in Existing Buildings

EV Charging

Energy Plus Water Efficiency

Embodied Carbon

Scope/Measure		Timing of Reach Code			Project Types		
		At Construction/Entitlement		Other Trigger (Time of Sale, Date- Certain)	Single Family	Multifamily	Nonresidential
		New	Addition/ Remodel/ Renovation	Existing Building			
New Construction Definition			x		X	X	x
Electrification	All-Electric	Х			Х	Х	Х
	Electric Replacements		Х		Х		
	Electric Readiness		Х		Х	Х	Х
Energy Efficiency,	Whole Building	Х			Х	Х	Х
enewables and Water	Single Measures	X	Х		X	X	X
Efficiency	Rental Properties			Х	Х	Χ	
Process Loads	Commercial Kitchens	Х	Х			Χ	X
(Equipment)	Elevators/Escalators	Х	Х			Х	Х
EV Charging		X	X		Χ	X	X
Embodied Carbon	Low-carbon concrete	Х	Х		Х	Х	х
	Efficient framing	Х			Х	Χ	Х
	Recycled Content	Х	X				
	C&D Recycling	Х	Х		Χ	Χ	Х
Disclosure and Building Performance	Disclosure	·		Х	Х	Х	х
	Performance			X		Х	Х

Major Renovations as New Construction

The Energy Code requirements for newly constructed buildings are stricter than the requirements for additions and alterations. Major renovations that meet pre-defined thresholds may be considered new construction and subject to the same requirements as newly constructed buildings. The definition of this threshold varies across jurisdictions, and sometimes within a jurisdiction, depending on the project scope. Some jurisdictions have amended the Energy Code or the Building Code to make those requirements for new buildings also apply to very substantial remodels. See the Substantial Remodels and New Construction Definitions document for more information.

All-Electric New Construction

In most buildings, the 2022 Energy Code baseline assumes that either space heating or water heating is provided by heat pumps. Although buildings may be constructed that use gas for both space and water heating, they must install other efficiency and/or renewable measures to offset the incremental energy and emissions impacts of the gas loads. Furthermore, electric circuits must be installed to facilitate the anticipated future installation of electric equipment, to make the building "electric-ready". These new requirements will make the transition to all-electric construction simpler and more affordable.

More than 60 local governments now require that newly constructed buildings have no gas appliances or only limited gas end uses, resulting in significant Greenhouse Gas (GHG) emission reductions. These requirements have been codified as amendments to CALGreen, the Energy Code, or other sections of local code. Where exceptions are allowed, electric-readiness can be required. All-electric construction has been found to be cost-effective in most building types. All-electric buildings tend to be less expensive to construct due to savings from gas plumbing and gas utility interconnections. To extend the benefits, an all-electric reach code could require additional efficiency as well. Although improving the efficiency of all-electric buildings beyond minimum state requirements can increase initial costs, most efficiency measures improve cost-effectiveness, further reduce emissions, and reduce lifetime operating costs. More efficient buildings also tend to be more comfortable and more resilient. For example, a tighter envelope can provide several occupant benefits such as narrowing internal temperature swings and improving indoor air quality in an emergency event or if the home is located in an area with poor outdoor air quality.

Visit the <u>Cost-Effectiveness Explorer</u> to see the potential impacts in your jurisdiction. Model ordinance language is available at <u>LocalEnergyCodes.com</u>.

Energy Efficiency and Renewables in New Construction

Whole Building Energy Performance Method

Whole Building or Performance-based reach codes specify the minimum performance requirements for new construction projects but leave the individual measure and feature selection to the designer/builder. This method requires simulating the building performance using CEC-approved software and allows applicants the greatest flexibility to accommodate a wide variety of building designs. Specific performance and measure requirements are based on project scope, building type and the type of energy systems in the design. A reach code may refer directly to the CALGreen voluntary tiers or may set different cost-effective performance levels and require different prerequisite measures.

Single Family Residential Whole Building Performance Method

The 2022 State Energy Code established three compliance metrics for single family homes; the design must satisfy all three. All are computed in the CEC-approved compliance software and are reported in the compliance documents. The metrics are expressed as Energy Design Ratings (EDRs), an abstract scale wherein

lower values represent lower energy consumption. The first metric, EDR1, is total source energy. This is the energy used at the site, plus energy that is used in its generation and any energy lost during transmission, distribution, and storage. EDR2-Total is similar but represents total time-dependent valuation (TDV) energy, which incorporates other constraints, such as dispatchability (e.g., solar and wind energy are not always available) and transmission bottlenecks. EDR2-Efficiency (or EDR2-Eff) is EDR2-Total less on-site generation (where applicable).

Projects can reduce EDR scores using a combination of improved envelope, electrification, space and water heating efficiencies, renewables, battery storage and advanced battery controls.

A reach code amending the Energy Code could establish a higher compliance margin for any or all of the three EDR metrics. It could also establish different margins for all-electric and mixed-fuel buildings. The Single Family New Construction Cost-Effectiveness Study documents cost-effective compliance margins in each climate zone. Visit the Cost-Effectiveness Explorer to see the potential impacts in your jurisdiction. Model ordinance language is available at LocalEnergyCodes.com.

A reach code could also adopt the voluntary CALGreen performance requirement, which specifies an EDR1 (source energy) compliance margin for each climate zone. See the <u>2022 Single Family and CALGreen Fact Sheet</u> for more information.

Nonresidential and Multifamily Whole Building Performance Method

Similar to single family new construction, the energy code establishes three performance compliance metrics for nonresidential, multifamily and hotel/motel buildings. The metrics align with the single family metrics, and are expressed as total source energy, TDV Efficiency, and TDV Total.

A reach code amending the Energy Code could require projects to achieve a compliance margin that has been found to be cost-effective. Studies documenting cost-effective margins are available for new <u>nonresidential</u> and <u>multifamily</u> buildings.

Alternatively, a reach code adopting CALGreen Tier 1 or Tier 2 requirements could establish a compliance margin from 5-15% (depending upon occupancy). Similar to the single family structure, the Tiers set performance requirements and identify specific measures for inclusion. An amendment can directly reference the CALGreen requirements or alter them to align with cost-effectiveness study results or other jurisdiction priorities. All amendments to the Energy Code must be supported by a cost-effectiveness analysis.

Specific Measures for Building and Process Loads

Reach Codes may also prescribe specific measures provided they have been shown to be cost-effective in the local climate zone(s). <u>Cost-effectiveness studies</u> identify a variety of such measures for both new and existing buildings as well as <u>controlled environment horticulture</u> buildings. These studies include efficiency, solar photovoltaics, energy storage and electrification measures. The voluntary sections of CALGreen include a variety of measures that could potentially be required in newly constructed buildings, although jurisdictions are not limited to this list and may adopt different measures entirely.

Voluntary CALGreen Low-Rise Residential Prescriptive Energy Measures - Section A4.203.1.2

- Roof Deck insulation, or ducts in conditioned space
- High Performance Walls
- Compact Hot Water Distribution
- Drain Water Heat Recovery
- High performance windows
- Heat pump water heater demand management
- Battery storage system and controls

Heat pump space and water heating

Voluntary CALGreen Nonresidential, High-Rise Residential and Hotel/Motel Prescriptive Energy Measures¹ - Sections A5.203.1, A5.212 and A5.213

- Outdoor lighting
- Service water heating in restaurants
- Warehouse dock seal doors
- Daylight design power adjustments
- Exhaust air heat recovery
- Elevator light and fan controls
- Regenerative drive systems for elevators and escalators
- Energy efficient steel framing

Many of the measures listed above require cost-effectiveness documentation to support a code amendment, though some are included in the completed cost-effectiveness studies.

Solar PV and Battery Storage

The 2022 Energy Code requires solar PV on new buildings (with some exceptions) of all occupancies. This requirement is prescriptively required for all occupancies and is factored into the energy performance budget. The minimum system capacity required varies based on occupancy and the availability of roof space, with single family mixed-fuel homes required to offset most of their electric load. Battery storage is also required for nonresidential, hotel/motel and high-rise residential buildings. The size of the storage system is prescriptively specified as a function the solar PV capacity and occupancy. Infrastructure for future battery storage is mandated in new single-family occupancies.

Additional PV and storage could be required through an amendment to the Energy Code (Part 6); however, exceptions may be necessary to address capacity limitations (i.e., shading, roof space, or typical snow coverage) or buildings for which the minimum state requirement is sufficient to offset annual site electricity consumption.

Because of the limited availability of roof space for PV in taller buildings, <u>San Francisco</u> is allowing large buildings to meet renewable requirements by purchasing renewably-generated power.

Energy Efficiency, Renewables, Electric Appliances and Electric Readiness in Existing Buildings

Requirements for Additions and Alterations

The Energy Code requires certain improvements for additions and alterations, which are generally limited to the systems and spaces being modified. Amendments to the Energy Code could require more extensive improvements for projects meeting a certain threshold.

Studies documenting cost-effective measures and packages of measures have been completed for existing <u>single</u> <u>family</u> buildings, <u>low-rise multifamily</u> buildings (3 stories or less), and <u>nonresidential/high-rise residential</u> buildings.

The Energy Code could be amended to prescriptively require that some or all cost-effective measures be installed for projects that meet a certain threshold (based on project scope, valuation, or a combination of these). Only measures that have been found to be cost-effective may be required.

¹ There are no voluntary prescriptive measures for low-rise multifamily in CALGreen.

Alternatively, applicants could be required to install measures that save an equivalent amount of energy (or fraction thereof) as the set of measures that has been found to be cost-effective. Under this approach, applicants could choose from a broad set of measures, including electric appliances, solar PV (plus electric readiness) and cool roofs to satisfy the requirements. For example, a cost-effective set of measures might include attic insulation, air sealing and duct sealing, but a homeowner could elect to install a heat pump water heater or PV plus electric appliance prewiring instead, achieving similar energy savings. Visit the Cost-Effectiveness Explorer to what see the Flexible Compliance Path could look like in your climate zone. Note, this mechanism is appropriate for single family buildings; it may be difficult to administer in multifamily buildings and nonresidential buildings.

Jurisdictions may consider requiring electric-readiness, in the form of circuits and panel upgrades, for certain project scopes or requiring conversion to electric appliances when gas appliances are being replaced during a renovation, or when new appliances are installed to serve an addition. See the <u>All-Electric Appliance Replacements</u> section below.

Requirements for Residential Rental Properties

Reach codes have been implemented in jurisdictions such as <u>Boulder (CO)</u>, <u>Burlington (VT)</u> and <u>Gainesville (FL)</u> to require existing rental housing be upgraded to improve energy performance by certain time-based deadlines (also under consideration in <u>Ann Arbor, MI</u>). Time-based triggers ensure an ordinance will eventually impact all rental housing, rather than triggering requirements only upon renovation or title transfer. Such an ordinance can be designed to enhance tenant comfort, support Climate Action Plans, and energy savings goals.

Tenant protections may be needed as a companion to rental mandates to address issues of displacement and pass-through costs. See the <u>ACEEE Energy Equity for Renters Toolkit</u> for suggestions.

See the <u>Disclosure and Building Performance Standards</u> section for additional opportunities for multifamily buildings.

Information Disclosure (Audits and Benchmarking)

Small Residential Buildings (Audits)

Jurisdictions may adopt ordinances requiring energy audits at the time of listing for sale, lease, or upon additions and alterations. These audits can inform current and prospective owners of opportunities for energy and water savings and can create incentives for landlords to upgrade rental properties. Energy audit requirements can also be used to qualify for Energy Efficient Mortgages, leveraging financing for energy efficiency housing by factoring in utility costs to the traditional "PITI" (principal, interest, taxes and insurance) formula.

The most common residential audits in California are the <u>California HERS II (HERS)</u> system, which uses diagnostic testing to determine performance and is used to verify Energy Code compliance, and the <u>Federal Home Energy Score</u> (<u>HES</u>), a more generic rating process. The <u>Bay Area Regional Energy Network</u> uses the Home Energy Score to qualify homes for whole home upgrade rebates and is collaborating with the cities of Piedmont and Carlsbad to use the Home Energy Score as an alternative compliance pathway for compliance with prescriptive requirements for additions and alterations. <u>Berkeley</u> requires that 1-4 unit residential buildings complete and disclose a Home Energy Score audit results upon listing for sale.

Nonresidential and Multifamily Buildings (Benchmarking)

The California Building Energy Benchmarking Program requires owners of large commercial (>50,000 square feet) and multifamily buildings (17 units or more and >50,000 square feet) to report energy use to the California Energy Commission annually. The energy usage is normalized for building size, occupancy, and climate to generate an ENERGY STAR® score -- a metric from 1 to 100 that demonstrates a building's energy efficiency compared to similar buildings. A score of 50 indicates the national average energy performance. The ENERGY STAR® score is publicly available so that tenants and prospective buyers may assess opportunities for improvements. It is important to note that benchmarking is not an audit, it is simply a metric that assesses total energy use relative to floor space, occupancy, and climate zone. Nevertheless, it can be an important indicator of opportunities for improvement. Local

governments may adopt stricter ordinances, typically requiring buildings smaller than 50,000 square feet to comply with benchmarking requirements. <u>Berkeley</u> requires benchmarking of buildings over 15,000 square feet. Some cities have additional requirements for low-scoring buildings. <u>San Francisco's benchmarking requirement</u> includes audits for under-performing buildings.

Building Performance Standards (BPS)

<u>Building Performance Standards</u> build upon benchmarking requirements, requiring low-scoring or poor-performing buildings to upgrade, usually by a specified date (date-certain). BPS typically specify a timeline within which buildings must either achieve a specified EPA Portfolio Manager score, an energy use intensity (EUI) threshold, or improve the overall performance by a specified percentage. <u>Chula Vista</u>, <u>Brisbane</u>, and <u>San Jose</u> require energy and water performance and prescriptive upgrades for under-performing nonresidential and multifamily buildings by specific dates according to building size. <u>Los Angeles</u> requires benchmarking and retro-commissioning of under-performing nonresidential and multifamily buildings every five years.

Electric Appliance Replacements/Readiness

Some local jurisdictions have adopted requirements to upgrade to electric appliances or electric readiness during certain additions and alterations. Palo Alto adopted an amendment to CALGreen for existing residential building remodels or additions where the gas water heater is being replaced or a new water heater is added to require that the new water heater be a heat pump. Portola Valley's amendment to CALGreen requires electric-readiness, including a reverse cycle air conditioning condensing unit (heat pump) for projects involving panel upgrades or replacement of air conditioning condenser units. The City of San Mateo requires an electric water heater if the appliance is replaced or relocated as part of an addition or alteration, an electric space heater whenever an air conditioner in conjunction with a space heater is being replaced or relocated, and electric readiness during kitchen and laundry room additions, alterations, and electrical panel upgrades.

EV Charging

The 2022 CALGreen code includes <u>mandatory requirements</u> for EV chargers and readiness for all newly constructed buildings and certain additions and alterations. The code also has voluntary Tier 1 and Tier 2 requirements that jurisdictions could adopt as reach codes. Jurisdictions could also adopt amendments to CALGreen to specify custom requirements. Currently, the California Building Standards Commission is <u>considering mid-cycle changes</u> to the EV requirements, which may become effective in July 2024.

The code defines different levels of EV charging capability and readiness.

- **EV Capable** is a space that has a raceway and service panel capacity for a future charging circuit (208/240 volt/40 amp)
- **EV Ready** is a space with a receptacle or charger on a 208/240 volt, 40 amp circuit for single family buildings or a 208/240 volt, 20 amp circuit for multifamily, hotel and motel developments
- Level 2 Charger is an installed charger on a 208/240 volt, 40 amp circuit
- **Heavy Duty Vehicle Ready** is a loading space with raceway and service panel capacity for a future high-capacity charger (200-400 kVa)

Single Family Requirements

CALGreen and the Energy Code require that private garages in new single family homes and duplexes are EV Capable, that is, have 208/240 volt, 40 amp electrical capacity and raceway in place for a future EV charger.

Adoption of the voluntary CALGreen Tier 1 would upgrade the requirement to EV Ready, i.e., circuitry with either a receptacle or installed charger. CALGreen could also be amended to require EV Capable or EV Ready in existing garages for certain project scopes, such as panel upgrades.

Multifamily Residential and Hotels/Motels

CALGreen requires EV Capable and EV Ready spaces for new multifamily and hotel/motel developments and for added or altered spaces in existing multifamily developments.

Adoption of the voluntary CALGreen Tier 1 or Tier 2 requirements would increase the number of required EV Capable and EV Ready spaces. CALGreen could also be amended to specify customized requirements.

CALGreen EV Requirements: Residential, Hotel Motel					
	Occupancy	Measure	Mandatory	Voluntary Tiers	
	Gecapaticy		ivialidatory	Tier 1	Tier 2
New Buildings	Cinal a Family	EV Capable	Req.		
	Single Family	EV Ready		Req.	Req.
	Small (<20 units) Multifamily, Hotels/Motels	EV Capable	10%		
		EV Ready	25%	35%	40%
	Large (≥20 units) Multifamily, Hotels/Motels	EV Capable	10%		
		EV Ready	25%	35%	40%
		Level 2 Chargers	5%	10%	15%
Additions or Alterations to Parking	Multifamily	EV Capable	10%		

Nonresidential New Construction

CALGreen mandates a minimum number of EV Capable parking spaces and spaces with chargers in new nonresidential developments. Projects with less than 10 spaces are exempt. Off-street truck loading spaces in certain occupancies must be Heavy Duty Vehicle Ready.

Adoption of the voluntary CALGreen Tier 1 or Tier 2 requirements would eliminate the exemption for buildings with less than 10 spaces and increase the number of required EV Capable spaces and spaces with chargers installed. CALGreen could also be amended to specify customized requirements, including requirements for certain project scopes in existing buildings.

CALGreen EV Requirements: Nonresidential (see table in CALGreen for specific values)					
	Measure	Mandatory	Voluntary Tiers		
	Wicasarc	ivialidatory	Tier 1	Tier 2	
	EV Capable	+/- 15%	+/- 20%	+/-30%	
	Lv Capable		2 minimum	3 minimum	
Parking Spaces	Level 2 Charger	+/- 5%	+/- 10%	+/- 15%	
Parking spaces	Total EV Spaces	+/- 20% <10 spaces exempt	+/-30%	+/- 45%	
Off-Street Loading Spaces: Warehouse,	200-400 KVA panel and raceway	Required			
Grocery, Retail	capacity				

Energy Plus Water Efficiency

Water consumption directly and indirectly impacts energy use, either for water heating or for pumping and treatment. Jurisdictions may consider adopting measures that have been found to be <u>cost-effective</u>, adopting voluntary cost-effective measures from CALGreen, amending the plumbing code to allow an alternative pipe-sizing methodology or requiring alternative water sources. <u>Benchmarking and BPS</u> can also target water conservation.

CALGreen

CALGreen includes several voluntary measures that could be adopted as mandatory to save both energy and water. However, note that appliances with federally-mandated minimum efficiency standards are subject to preemption requirements.

CALGreen Voluntary Water Conservation Measures				
Reference	Measure			
Residential, Hotels/Motels				
A4.203.1	1 Plumb a compact hot water distribution system			
A4.303.1	1 Limit kitchen faucet flow rates to 1.5 gpm			
	Provide alternative water supply: Plumb indoor water use for non-potable water			
A4.303.2	supply (i.e. recycled water) for water closets, urinal, and other allowed uses			
A4.303.3	Install an ENERGY STAR® dishwasher or clothes washer			
A4.303.4	Install waterless urinals			
A4.303.5	Install on-demand hot water recirculation system			
A4.304.3	Install submeters for landscaping			
	Dual plumb to support alternative water supply: Dual plumb building for			
A4.305.2	recycled water/ gray water and potable water			
Nonresidential/High-Rise Residential				
A5.303.2	Achieve 12, 20 or 25% water savings (performance or prescriptive)			
	Install efficient appliances and fixtures: Clothes washers, dishwashers, ice			
	makers, food steamers, water softeners, combination ovens, food waste			
A5.303.3				
A5.303.4	Install waterless urinals			
A5.303.5	Dual plumb for recycled water for toilets			
A5.304.1	Install rainwater catchment			
A5.304.2	Submeter irrigation			
A5.304.2	Install potable water elimination for landscaping			
A5.304.6	Restore landscaping (new site)			
A5.304.7	Restore landscaping (existing site)			
A5.304.8	Install graywater irrigation			
A5.305.1	Install nonpotable water system			
	Plumb irrigation for non-potable water supply (rainwater, graywater, water			
	treated for irrigation by a water district, or recycled water)			
A5.305.2	Install water efficient landscaping			
A5.305.3	Use recycled water for irrigation			

Alternative Pipe Sizing Methodology

While fixtures and appliances have become more water-efficient over time, the pipe sizing requirements under the plumbing code have not changed in 80 years. Right-sizing water pipes can reduce hot water delivery times, saving both energy and water. It can also reduce public health and safety risks and improve water quality due to shorter water dwell times in plumbing systems. Jurisdictions may wish to consider early adoption of an <u>alternative pipe sizing method</u>. The 2021 Uniform Plumbing Code (UPC) includes an alternative method (<u>Appendix M</u>) for calculating peak water demand in residential buildings, which would allow smaller diameter piping. The State of California is in the process of authorizing the use of this alternative methodology, but local jurisdictions have the authority to adopt it now as a voluntary alternative to the current State requirement. San Jose, Stockton, and Foster City have adopted the UPC Appendix M Peak Water Demand Calculator as a voluntary measure.

Alternative Water Sources

<u>San Francisco's health code</u> requires that large projects (100,000 square feet or more) employ alternative water sources for non-potable water. Sources specifically include graywater, on-site treated non-potable water, rainwater, stormwater, foundation drainage, and blackwater.

Embodied Carbon

In addition to the GHG emissions from building operations, emissions from the manufacture, transport and installation of building materials as well as demolition and disposal at the end of the building's life are a significant portion of a building's life-cycle emissions. CALGreen has voluntary requirements (A4.4 and A5.4) for materials that can reduce the amount of GHG emissions associated with construction, including low-carbon concrete, efficient framing, recycling material content, durability and enhanced construction and demolition recycling.

Currently, the California Building Standards Commission is <u>considering mid-cycle changes</u> to require embodied carbon reporting, which may become effective in July 2024. The State is also exploring additional measures, including regionally sourced materials, low-carbon materials, reuse of existing structures, and whole building life-cycle assessments. <u>Marin County</u> and <u>Palo Alto</u> have adopted specific amendments to the building code to require low-carbon concrete for all concrete installations.

Get In Touch

The adoption of reach codes can differentiate jurisdictions as efficiency leaders and help accelerate the adoption of new equipment, technologies, code compliance, and energy savings strategies.

As part of the Statewide Codes & Standards Program, the Reach Codes Subprogram is a resource available to any local jurisdiction located throughout the state of California.

Our experts develop robust toolkits as well as provide specific technical assistance to local jurisdictions (cities and counties) considering adopting energy reach codes. These include cost-effectiveness research and analysis, model ordinance language and other code development and implementation tools, and specific technical assistance throughout the code adoption process.

If you are interested in finding out more about local energy reach codes, the Reach Codes Team stands ready to assist jurisdictions at any stage of a reach code project.



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