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Limiting the Cost of Renewables: Lessons for California

Climate Policy Initiative

Brendan Pierpont

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Descriptors

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Contact	Brendan Pierpont, San Francisco Office, brendan@cpisf.org

About CPI

Climate Policy Initiative (CPI) is a policy effectiveness analysis and advisory organization whose mission is to assess, diagnose, and support the efforts of key governments around the world to achieve low-carbon growth.

CPI is headquartered in San Francisco and has offices around the world, which are affiliated with distinguished research institutions. Offices include: CPI at Tsinghua, affiliated with the School of Public Policy and Management at Tsinghua University; CPI Berlin, affiliated with the Department for Energy, Transportation, and the Environment at DIW Berlin; CPI Rio, affiliated with Pontifical Catholic University of Rio (PUC-Rio); and CPI Venice, affiliated with Fondazione Eni Enrico Mattei (FEEM). CPI is an independent, not-for-profit organization that receives long-term funding from George Soros.

Executive summary

Motivation and background

California has ambitious long-term goals of reducing greenhouse gas emissions to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.[1] In pursuit of these goals, the state has adopted a mix of policies, including an aggressive Renewable Portfolio Standard (RPS) that requires 33 percent of electricity sales in 2020 to come from renewable sources.[2] California's investor-owned utilities (IOUs) purchase renewable electricity through a range of market-based procurement programs and strategies, designed to help the state meet these ambitious goals cost-effectively.

As part of California's 33 percent RPS, state electricity regulators at the California Public Utilities Commission (CPUC) are required to develop a mechanism to limit the cost of the policy. This cost limitation is intended to assuage concerns about costs, and mitigate the risk that the cost of the policy is higher than anticipated.

To support CPUC in the development of a cost limit for California's RPS, Climate Policy Initiative (CPI) reviewed experience in a number of states with cost limits in renewable energy policies. Our qualitative analysis reveals several general lessons about cost limits and their role in renewable energy policy, and points to recommendations for California.

General findings

The tools used by U.S. states to limit costs (see table ES1) vary substantially in their design and implementation. From this diverse experience, we identify several key findings about the role of cost limits in RPS policies and their effectiveness:

Properly structured cost limits insure against the risk of unacceptably high policy costs; cost limits essentially create a "release valve" that limits renewable energy deployment when costs are higher than a predetermined level.

This insurance is not free; cost limits create uncertainty in the achievement of renewable energy targets, and may lead to higher procurement costs because of unintended effects on the market.

The level at which cost limits are set is not always consistent with the ambition of the policy; cost limits are sometimes politically determined rather than based on the expected cost of reaching targets. When inconsistent with cost expectations, cost limits can conflict with policy goals or fail to insure against high costs.

Cost limits that are ambiguously defined or overly complex may fail to insure against unacceptably high costs; ambiguous rules, significant complexity, and inconsistent implementation create opportunities for a cost limit to be avoided by market actors or regulators.

1 California Assembly Bill 32; California Executive Order S-3-05.

2 California Senate Bill 1x 2.

Recommendations for implementing a cost limit in California

There is no perfect tool for limiting the cost of RPS policies, and the appropriate design of a cost limit depends on the policy and market context in which it is used. California regulators should consider the following recommendations when designing and implementing a cost limit:

Do not rely on the cost limit to drive policy cost-effectiveness; there is little evidence from other states that cost limits minimize costs of procuring renewable energy. In some cases cost limits can lead renewable energy generators to offer higher prices than they might otherwise.

Set the cost limit to be consistent with expected RPS costs and the risks California ratepayers are willing to bear to meet RPS targets; some jurisdictions have not based cost limits on expected policy costs, and many have not factored in uncertainty in rates of project failure, technology costs, federal support policies, or other key risks when setting cost limits.

Avoid public contract-level cost limits and benchmarks for competitive procurement; in some jurisdictions these have been treated by the renewable energy market as a price floor, rather than a price ceiling – although confidential benchmarks have proven useful in some auction mechanisms.

Use a clearly-defined and simple mechanism to limit costs; ambiguity and complexity can create opportunities for a cost limit to be avoided, and/or lead to substantial regulatory burdens and market uncertainty.

Define the consequences of reaching the cost limit to be consistent with policy objectives; these consequences – and who bears them – will influence the response from market participants, policymakers, or the public, and thereby policy outcomes.

Include a predictable mechanism for reviewing the cost limit; this can allow the cost limit to adapt to changes in policy objectives, escalating renewable energy targets, or unexpected changes in market conditions.

While cost limits are widely used by states seeking to manage the risk of unacceptably high costs, they are often complex, can be burdensome to implement, and can lead to unintended impacts on the renewable energy market. California regulators should design and implement the state's cost limitation carefully to avoid these unintended consequences, meaningfully insure against high costs, and support California's ambitious climate and energy policies.

Table ES 1: Approaches used by states to limit costs

States use a wide variety of tools to limit the cost of RPS policies. In general, deregulated markets that rely heavily on tradable renewable energy credits (RECs) tend to favor alternative compliance payments, while many states with regulated, vertically integrated utilities use retail rate impact caps or other approaches. The effectiveness of these cost limits depends in part on the market and regulatory context in which they are used. These approaches and our qualitative evaluation are described in greater detail in the body of this paper.

Approach		Insures against high costs	Minimizes policy costs	Supports policy targets
Alternative compliance payment (ACP)	Electricity suppliers make a payment to meet compliance obligations, rather than retiring RECs, creating a de facto REC price ceiling – mostly used in the context of tradable REC markets	●	◒	◒
Contract price cap	Cost of individual contracts for bundled energy and renewable energy credits limited by statute or regulation	◒	○	○
Retail rate or revenue requirement impact cap	Maximum allowable increase in retail rates, or maximum impact on regulated utilities' revenue requirements set by statute or regulation	◒	◒	◒
Renewable energy fund cap	Cost of achieving policy objectives limited by pre-determined amount of available funding	○	◒	●

● Performs well ◒ Mixed performance ○ Performs poorly

Contents

1. Introduction

California has ambitious long-term goals of reducing greenhouse gas emissions to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.[3] In pursuit of these goals, the state has adopted a mix of policies, including an aggressive Renewable Portfolio Standard (RPS) that requires 33 percent of electricity sales in 2020 to come from renewable sources.[4] California's investor-owned utilities (IOUs) purchase renewable electricity through a range of market-based procurement programs and strategies, designed to help the state meet these ambitious goals cost-effectively.

As part of California's 33 percent RPS, state electricity regulators at the California Public Utilities Commission (CPUC) are required to develop a mechanism to limit the cost of the policy. This cost limitation is intended to assuage concerns about costs, and mitigate the risk that the cost of the policy is higher than anticipated.

To support CPUC in the development of a cost limitation for California's RPS, Climate Policy Initiative (CPI) reviewed experience in a number of states with costs limits in renewable energy policies. Our qualitative analysis reveals several general lessons about cost limits and their role in renewable energy policy, and points to recommendations for California.

Section 2 of this paper discusses cost limits in the context of other activities designed to minimize the cost of policy, and describes different types of cost limits. Section 3 presents a framework for evaluating the effectiveness of cost limits. Section 4 evaluates cost limits using this framework. Finally, Section 5 draws on the approaches examined to point to key lessons for a cost limit on renewables in California.

3 California Assembly Bill 32; California Executive Order S-3-05.

4 California Senate Bill 1x 2.

2. The role of cost limits

2.1 Cost limits in context

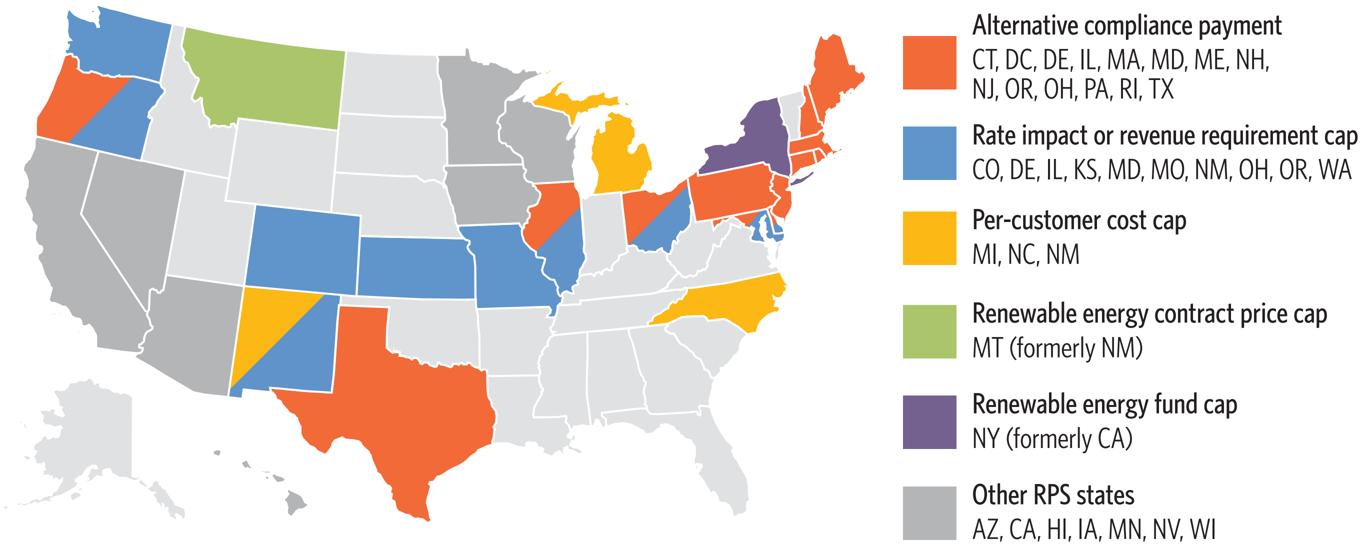
Cost limits are typically accompanied by a wide range of policy, planning, regulatory and market processes that influence the cost of meeting renewable energy objectives. This section discusses three distinct types of activity: managing and balancing the various costs and benefits of policy, reducing and minimizing the cost of policy, and the topic of this paper, limiting the cost of policy.

Managing the costs and benefits of policy – Policymakers and regulators manage the costs (technology costs, system and grid costs, ratepayer and social costs, etc.) and benefits (emissions reductions, economic development, energy source diversity, etc.) of renewable energy using a wide range of approaches. These include setting renewable energy targets, planning processes, regulation, markets, and other mechanisms. In many jurisdictions in the United States and abroad, policymakers rely on competitive markets to manage many of the costs of meeting renewable energy policy goals. Where the price renewable energy generators receive is set administratively, policymakers often use program caps or price adjustments to manage costs.[5]

Minimizing costs – Policymakers and regulators undertake a range of actions to minimize the cost of delivering on policy goals, which can include specific tools to evaluate renewable energy projects and portfolios, rules allowing only those projects with the lowest cost of available options (sometimes costs of energy alone, or including system and integration costs), and market and auction mechanisms designed to minimize costs. As Grace, Donovan and Melnick (2011) suggest, least-cost approaches can conflict with policy features designed to realize particular benefits (e.g. technology carve-outs) or reduce risk (e.g. requirements that renewable energy deliveries be "firm"), and it is also important that policy accounts for both costs and benefits of renewable energy sources.

5 Kreycik, Couture, and Cory (2011).

Figure 1 – US RPS states and primary approaches to limit costs



Source: Stockmayer, Finch, Komor, Mignogna (2012), Wiser and Barbose (2011), DSIRE Database

Limiting costs – Cost limits are often used (in combination with the above activities) as insurance against unacceptably high costs – to mitigate the risk that costs may be higher than ratepayers, policymakers or regulators are willing to accept. Cost limits may also be used to increase political acceptance of a policy.

2.2 Types of cost limit

Previous research has categorized cost limits into several distinct types:[6] alternative compliance payments, rate or revenue requirement impact limits, customer cost caps, contract price caps, renewable energy fund caps, and others. These approaches, as well as some of the pros and cons of these approaches, have been described in several key pieces of research, including Stockmayer, Finch, Komor, Mignogna (2012), NARUC (2011), Clean Energy States Alliance (2012), and Wiser and Barbose (2008 and 2011). Figure 1 summarizes where certain types of cost limit are used across the US.

6 Stockmayer, Finch, Komor, Mignogna (2012), NARUC (2011), Wiser and Barbose (2011), Union of Concerned Scientists "Renewable Electricity Standards Toolkit."

Alternative compliance payment

In states with alternative compliance payments (ACPs), electricity suppliers that do not retire sufficient renewable energy credits (RECs) may make a financial payment to comply with the RPS, creating a price ceiling for RECs. ACPs are considered to be a legitimate form of compliance, rather than a penalty for non-compliance.

ACP prices vary substantially by state and by technology, and are typically established by state regulators, sometimes based on statutory guidelines set by state legislatures. In cases where a state has a carve-out for solar energy, a separate ACP is usually established for solar RECs, at a higher price to reflect the higher costs of solar energy.[7]

ACPs are common in competitive electricity markets, where RECs are standardized contracts that are procured in a competitive market, unbundled from energy. However, ACPs can be used for compliance in Oregon, where unbundled RECs can be used for up to 20 percent of utilities' compliance obligations. In this instance, the ACP is only one of several options for compliance, and must be compared both to the price of unbundled

7 NARUC (2011), p. 73.

RECs and the REC price implicit in bundled contracts.

In a number of states, electricity suppliers can recover the costs of ACPs from ratepayers, and ACP funds can be used to fund new renewable energy projects. In other states, the costs of ACPs cannot be recovered from ratepayers and are borne by electricity suppliers, so the ACPs act as penalties for not meeting renewable energy targets via RECs. Electricity suppliers' investors are likely to be more averse to non-recoverable costs or penalties, which may increase their reliance on real RECs to meet compliance obligations.

Table 1: States using alternative compliance payments

ACP with automatic cost recovery	ACP with possible cost recovery	ACP with no cost recovery
Illinois	Delaware	Connecticut
Massachusetts	Maryland	Ohio
Maine	Oregon	Pennsylvania
New Hampshire	Washington DC	Texas
New Jersey		
Rhode Island		

Sources: Stockmayer, Finch, Komor, Mignogna (2012), Wiser and Barbose (2011), DSIRE Database.

Contract price cap

Montana and New Mexico have had a maximum allowable contract price at which utilities can procure renewable energy resources. In Montana, regulated utilities are not required to take power from a renewable energy resource whose price exceeds that of any other available generating resource by 15 percent, in effect only allowing those renewable resources priced very close to electricity from fossil fuels.[8]

In New Mexico, contract price caps were set administratively for different technology categories.[9] However, these caps were removed in 2008, due to objections that the caps no longer represented the cost of procuring renewable energy, excluded ancillary costs, and potentially limited electricity suppliers from meeting RPS requirements.

Some auction-based procurement programs use benchmark prices to test the reasonableness of prices offered by renewable energy resources. For example, Illinois electricity suppliers conduct an auction process to procure renewable energy credits, and use a confidential benchmark REC price (based on regional renewable energy resources) as a price limit when screening bids.[10]

Retail rate or revenue requirement impact cap

Policymakers in many states define their cost limit as a maximum increase in retail rates allowable to cover the cost of achieving RPS objectives. This increase can be expressed as a percentage change in retail rates over a particular time period (e.g. a 2% maximum percentage change in retail rates per year), or a percentage of retail rates that can be collected to cover the incremental costs of renewable energy (e.g. a surcharge that cannot exceed 2% of the total electricity bill).

Similarly, several states (Ohio, Oregon, Kansas and Washington[11]) cap the percentage of utilities' total revenue requirements[12] that can be used to cover the incremental costs of renewable energy in a given year. Since revenue requirements represent the total amount of revenue a utility needs to receive in order to cover their costs, a revenue requirement cap can be translated into a "retail rate equivalent" cap.

As noted above, these approaches typically apply to the incremental (rather than total) cost

8 Stockmayer, Finch, Komor, Mignogna (2012).

9 NARUC (2011), Union of Concerned Scientists "Renewable Electricity Standards Toolkit."

10 Illinois State University Center for Renewable Energy (2011).

11 NARUC (2011)

12 A revenue requirement is the total amount of revenue that a regulated utility must recover from ratepayers to cover its total costs, as well as a regulated rate of return.

of renewable energy. The cost counted towards the cost limit therefore depends heavily on the assumptions made about the baseline (or counterfactual) cost of electricity. In many cases, the prevailing cost of energy, cost of electricity from a hypothetical new natural gas-fired power plant, or the cost of energy from a hypothetical non-RPS electricity modeling scenario are used as a baseline. These baselines, and therefore the costs counted towards a cost limit, are typically dependent on a range of assumptions, including the price of fossil fuels.

Table 2: States using retail rate or revenue requirement impact caps

Retail rate impact cap	Revenue requirement impact cap	Solar carve-out rate impact cap
Colorado Illinois Missouri New Mexico	Kansas Ohio Oregon Washington	Delaware Maryland

Sources: Stockmayer, Finch, Komor, Mignogna (2012), Wiser and Barbose (2011), DSIRE Database.

Maryland and Delaware have provisions that limit the total costs that can be expended on complying with solar carve-outs, rather than aggregate RPS goals, expressed as a percentage of retail rates.[13] etail rate or revenue-based caps tend to be used in regulated electricity markets, where both procurement costs and retail rates are subject to regulatory approval. However, the approach has been applied in several competitive electricity markets as well.

Customer cost cap

Several states have adopted a cost limit in terms of dollars per customer, for each customer class. This approach is similar to the retail rate impact limitation – setting a maximum increase in costs recoverable from ratepayers. This approach covers renewable energy costs from a fixed surcharge, rather than a charge proportional to energy use.

Dollar-per-customer cost caps have only been used in three states: North Carolina, Michigan, and New Mexico. In New Mexico, per-customer dollar limits for certain large customers are combined with a percentage-based cost limit.

Renewable energy fund cap

New York State's RPS is based on central procurement of "RPS Attributes," similar to RECs, by the New York State Energy Research and Development Authority (NYSERDA). This procurement is funded through a surcharge on utility bills. The surcharge (and total funding for the program) is set by regulators based on expectations of the cost of the program, and funding is divided into specific technology-related tiers.[14]

Before the California's adoption of a 33% RPS target in 2011, the state capped the amount of ratepayer funding – called "Above-Market Funds" (AMFs) – that could be used by the California Public Utilities Commission (CPUC) to cover the incremental costs of renewable energy above a market price benchmark.[15] These AMFs were not set based on the expected cost of meeting policy goals; instead they were calculated as a portion of the state's Public Goods Charge that was established and capped before the RPS was in effect.[16] This approach is described in more detail in section 5.

Other approaches

Several states have penalties for non-compliance, which are typically not recoverable through retail rates. These penalties can serve as a cost cap, and without cost recovery, the cost of penalties is borne by electricity suppliers and their investors, rather than ratepayers.

13 NARUC (2011), DSIRE database. – New Jersey also formerly had a rate impact cap tied to the state's solar carve-out.

14 DSIRE Database

15 CPUC, Resolution E-4199 (2009).

16 CPUC, Resolution E-3792 (2002).

Some states allow state energy regulators to use their discretion to balance achievement of renewable policy goals with providing for just and reasonable electricity rates for consumers.[17] A number of states have various "off-ramps," compliance waivers or compliance freezes that have the effect of limiting costs. These approaches, while not addressed in this paper, are described in greater length in Stockmayer, Finch, Komor, Mignogna (2012).

3. Evaluation framework

Cost limits are generally used because of concerns that a particular policy could have substantial impacts on electricity rates for consumers. However, cost caps can impact the effectiveness of renewable energy policy more broadly. Where used, cost caps must be designed carefully to avoid unintended consequences.

We evaluate cost limits based on three effectiveness criteria, which were chosen to reflect the effectiveness of cost limits in performing their intended function, as well as their impact on the effectiveness of the underlying renewable energy policy:

1. **Meaningfully insures against unacceptably high costs:** The primary goal of a cost limit is to provide a meaningful limit on the costs that can be incurred to meet policy goals. If the approach is designed or implemented in a way that allows costs to exceed the intended limit, or creates the risk of excessive future costs beyond the intended limit, the approach does not provide the intended insurance.
2. **Contributes to minimizing the cost of renewable energy policy:** In order to deliver on policy objectives – like the deployment and generation of renewable energy, support for new technologies, and reduction of greenhouse gas emissions – while limited by a cost constraint, it is important that the cost limit help minimize costs, ideally across the full spectrum of costs associated with the policy. If the cost limit incentivizes market participants and regulators to actively reduce costs, policy goals are more likely to be achieved within the cost constraint, or more ambitious policy can be pursued at the same cost.
3. **Supports achievement of renewable energy goals:** Cost limits should be consistent with the overarching goals of renewable energy policy, rather than in conflict with policy objectives. Cost constraints that do not account for the expected costs of achieving policy goals – and those that do not account for uncertainty around those expected costs – can hamper achievement of the environmental (and other) goals of policy.

There are a number of qualitative factors which can be observed from recent experience which provide insights for the likely effectiveness of policy. An ex-post quantitative evaluation of the effectiveness of cost caps may be useful to support the qualitative assessment in this paper, but limited policy experience and data constraints

Information sources

Several sources of information were used to evaluate the effectiveness of various cost-limiting approaches:

- Regulatory records, including compliance filings, comments and orders in regulatory proceedings used to determine how cost limits were structured, and what concerns and arguments were raised about the design or implementation of cost limits.
- Design details of RPS policies and cost limits were found in state renewable energy legislation and summaries of that legislation available through the DSIRE database and a database constructed by Union of Concerned Scientists.
- Third-party analysis and commentary on policy approaches were also used where they highlighted particular issues with the approaches evaluated.
- Conversations with state-level energy regulators and staff, as well as external policy analysts, were used to test assumptions, and gather a range of perspectives on cost limits.

17 NARUC (2011).

make robust quantitative evaluation challenging at this stage.

Appendix 1 describes a number of indicators – both characteristics of the design of policy as well as descriptors of how policy has been implemented – that may bear on the ability of cost limits to deliver on the policy objectives described above.

4. Evaluation of tools to limit costs

CPI applied the evaluation criteria described in section 3 to several common approaches used to limit the cost of renewable energy policy. From this evaluation (summarized in table 4), we have identified several key findings about the role of cost limits in RPS policies and their effectiveness.

Properly structured cost limits insure against the risk of unacceptably high policy costs; cost limits essentially create a "release valve" that limits renewable energy deployment when costs are higher than a predetermined level.

In particular, alternative compliance payments appear to have effectively insured against high REC prices in the context of tradable solar REC markets in New Jersey, and contract price caps have limited the procurement of higher-priced renewable energy contracts in New Mexico.

However, alternative compliance payments allow compliance obligations to be met without actually delivering renewable energy, and contract price caps have presented barriers to the achievement of renewable energy targets. These examples illustrate the trade-off between limiting costs and certain achievement of renewable energy targets.

This insurance is not free; cost limits create uncertainty in the achievement of renewable energy targets, and may lead to higher procurement costs because of unintended effects on the market.

In particular, public contract price limits in New Mexico have been treated by market participants as a price floor, rather than a price ceiling. In this case, the presence of the contract price limit led to higher renewable energy costs than might otherwise be realized.

In addition, uncertainty in the implementation, enforcement, and consequences of cost limits can create regulatory burdens and uncertainty for market participants. The additional costs associated with added regulatory processes or market uncertainty should be examined when designing or implementing a cost limit.

The level at which cost limits are set is not always consistent with the ambition of the policy; cost limits are sometimes politically determined rather than based on the expected cost of reaching targets. When inconsistent with cost expectations, cost limits can conflict with policy goals or fail to insure against high costs.

For example, retail rate impact caps in some states were set without consideration of expectations of the cost of the policy. Likewise, "above-market" fund caps in California were set based on available funding sources, rather than expected costs of implementing the state's renewable energy policy.

In many cases, cost limits that are inconsistent with cost expectations have failed to provide a binding limit on costs. Instead, new sources of ratepayer funding are identified, the cost limit is avoided by changing its interpretation or implementation, or the cost limit is ignored and exceeded. This is because regulators and market participants sometimes prioritize meeting the renewable energy target over a seemingly arbitrary cost limit.

Cost limits that are ambiguously defined or overly complex may fail to insure against unacceptably high costs; ambiguous rules, significant complexity, and inconsistent implementation create opportunities for a cost limit to be avoided by market actors or regulators.

Retail rate impact caps and renewable energy funding caps are often complex or defined ambiguously. For example, they often count incremental costs – and the baseline against which incremental costs are calculated is highly dependent on modeling or calculation assumptions. Calculation assumptions, including what costs count towards a cap, and what benefits can be subtracted, are often highly contested and in some cases litigated.

Likewise, rate impact caps can be inconsistently applied. For example, regulators sometimes change how electricity suppliers may count costs towards a cap, change the period over which a cap applies, or change how the cap is applied to specific projects. Review of cost caps can help ensure that the cost cap is protecting ratepayers against appropriate risks, while continuing to enable the achievement of policy objectives, particularly if policy objectives or the market environment change significantly. It is worth differentiating between ad-hoc changes to the interpretation or application of a cost cap – which can create uncertainty, and reduce the value of a cost limit by allowing costs to exceed intended limits – and a predictable review process for updating cost limits to better reflect policy objectives and market conditions.

This complexity, ambiguity and inconsistency can create opportunities for regulators and market participants to avoid the cost cap, defeating the purpose and value of the cost cap as an insurance mechanism. Where used, cost caps should be designed clearly, simply, and with predictable review points, to ensure that they limit costs as they are intended to, while remaining consistent with policy objectives.

The remainder of this section discusses each of these cost limit mechanisms in more detail.

Table 3 - Evaluation of state approaches to limit costs

Approach	Insures against high costs	Minimizes policy costs	Supports policy targets
Alternative compliance payment (ACP)	● • Simple, clear cost limit for RECs, easily translated into policy cost cap • Has limited the procurement of RECs in cases of REC shortage and high prices	◓ • Add little to cost-effectiveness of underlying market-based mechanisms and procurement strategies • Contain only the cost of buying RECs, leaving other market or institutional mechanisms to manage non-REC costs • Sets REC price in cases of shortage, potentially at a lower price than would occur otherwise	◓ • Allows for compliance that does not involve generation of renewable energy • Typically accompanied with flexibility mechanisms – like REC banking – which allow for more procurement in good market conditions
Contract price cap	◓ • Can provide a clear, well-defined price limit for bundled energy and REC contracts • Has limited procurement of renewable energy, even when fairly priced • Not typically adjusted for changes in technology costs or market conditions	○ • Prohibits high-cost resources from being procured • Public price caps are sometimes treated as a price floor, rather than a price ceiling by market participants (confidential benchmarks useful for some procurement, however) • Will not contain all costs (e.g. firming, shaping and integration costs) and can obscure benefits associated with resource diversity	○ • Price caps set below actual technology costs impede achievement of RPS goals
Retail rate or revenue requirement impact cap	◓ • Often ambiguously defined or overly complex, creating market uncertainty or allowing the cost limit to be exceeded in practice	◓ • Creates additional reason for regulators and market actors to focus on costs • Implementation typically complex and subject to mid-stream changes; this increases uncertainty for project developers and electricity suppliers, and may increase costs	◓ • Often set at a level determined politically, rather than based on expected costs • Some states have allowed costs to exceed the cap • Some states allow procurement beyond original renewable energy goals, up to the cost limit
Renewable energy fund cap	○ • Funding amounts usually increased, or new sources of ratepayer funding authorized, when costs exceed available funding	◓ • Implementation can be administratively burdensome, complex, and may increase uncertainty for market participants • Cap is typically limited to cost of RECs or bundled renewable energy contracts; indirect costs are sometimes managed through underlying market mechanisms	● • Practice of authorizing new funding for renewable energy when caps are exceeded indicates commitment to renewable energy target over funding limit

Table 4 – Evaluation of alternative compliance payments

Insures against high costs	Minimizes policy costs	Supports policy targets
●	◒	◒
• Simple, clear cost limit for RECs, easily translated into policy cost cap • Has limited the procurement of RECs in cases of REC shortage and high prices	• Add little to cost-effectiveness of underlying market-based mechanisms and procurement strategies • Contain only the cost of buying RECs, leaving other market or institutional mechanisms to manage non-REC costs • Sets REC price in cases of shortage, potentially at a lower price than would occur otherwise	• Allows for compliance that does not involve generation of renewable energy • Typically accompanied with flexibility mechanisms – like REC banking – which allow for more procurement in good market conditions

4.1 Alternative compliance payments

Meaningful insurance against high costs

Simple, clear cost limit for RECs, easily translated into policy cost cap

Alternative compliance payments set an "ultimate, clear price ceiling on compliance. The total maximum cost of the RPS can be estimated with reasonable accuracy."[18] Electricity suppliers have two options for compliance: procuring RECs, or an alternative compliance payment. Since both options are legitimate forms of compliance, electricity suppliers will not purchase RECs that cost more than the ACP, and the ACP provides an ultimate limit on the per-REC cost of compliance. In New Jersey, for example, all electricity suppliers either procured RECs or paid the appropriate ACP for the 2009-2010 compliance year, so all compliance costs were accounted for through one of these two mechanisms.[19]

18 NARUC (2011), p. 73. The total maximum cost referred to here is the total cost of compliance (through RECs and ACPs) and ignores secondary effects on the cost of energy, transmission, ancillary services or other costs of electric service.

19 NJ Board of Public Utilities (2011), p. 16. Virtually all of the Class I and Class II obligations were met through retirement of RECs. However, roughly 28 percent of the solar carve-out was met using the solar ACP. While most electricity suppliers met 20-25 percent of their solar obligation through SACPs, Atlantic City Electric used SACPs for only 9 percent of their obligation in the 2009-2010 year, while Jersey Central Power and Light relied on the SACP for over 54 percent of

Costs covered by ACPs

ACPs are typically used in competitive market environments, where RECs are traded on open exchanges, and electricity suppliers must purchase sufficient energy to meet demand, and sufficient RECs to meet regulatory obligations. In this context, the scope of costs contained by an alternative compliance is clearly defined as the cost of procuring standardized REC contracts. However, any additional costs or benefits from renewable energy – such as those associated with wholesale energy, capacity, ancillary services, transmission, or distribution – are not covered by the ACP. These are sometimes actively managed by electricity suppliers through market and regulatory mechanisms.

In Oregon, ACPs are used as a cost control measure in a regulated energy market environment, in addition to a revenue requirement-based cost cap. Electricity suppliers can choose to pay the ACP of $50 per MWh rather than procure renewable energy through regulated procurement activities. ACP funds are placed in an account which is used for energy efficiency and renewable energy support.[20] While Oregon's compliance schedule began in 2011, and actual compliance data has not yet been filed, neither of Oregon's two large investor-owned utilities plan to utilize the ACP in their RPS implementation plans, as

their compliance obligation.

20 DSIRE Database.

both anticipate sufficient supply of renewable energy to meet obligations.[21]

Challenges of setting ACPs

One of the primary challenges surrounding alternative compliance payments is determining the appropriate level to mitigate short-term spikes in the cost of RECs, while encouraging long-term market development and cost reductions. As Stockmayer, Finch, Komor, Mignogna (2012) discuss, "if the ACP price is too low, electricity providers as rational business entities may be encouraged to choose the alternative and not procure renewables. If too high, on the other hand, or if not-recoverable, the ACP merely becomes a penalty and not a safety valve."

States take different approaches to setting ACPs. New Jersey calculates their Solar ACPs based on the financial requirements of a solar energy project that generates a 12% rate of return for investors, plus $100 per MWh to incentivize compliance through real RECs. They incorporate an assumption that technology costs will decline over time, leading to declining schedule of ACPs.[22]

Management of uncertainty

In New Jersey, the current schedule of ACPs for solar extends through 2016. Some stakeholders have recommended that the New Jersey Board of Public Utilities (BPU) set solar ACPs for the remainder of the schedule in the near-term, to provide market certainty to project developers. However, once adopted, a schedule of ACPs for solar in New Jersey cannot be changed without new legislation.[23] New Jersey regulators can review the ACP levels, and make recommendations for future legislation, but don't have the authority to adapt ACPs in response to technology or market changes. However, the certainty of ACP levels, once set, may provide more certainty to market actors.

21 Portland General Electric (2010), Portland General Electric (2011), PacifiCorp (2009), PacifiCorp (2011).

22 State of New Jersey (2011), p. 88.

23 State of New Jersey (2011), p. 88.

Have limited the procurement of RECs in cases of REC shortage and high prices

For New Jersey's solar carve-out, 28 percent of electricity suppliers' obligation was met through alternative compliance payments in the 2009-2010 compliance year.[24] During this time, solar REC prices traded very close to, but did not exceed, the solar ACP.[25]

Contribution to minimizing the cost of renewable energy policy

Add little to cost-effectiveness of underlying market-based mechanisms and procurement strategies

Alternative compliance payments do not necessarily provide for cost-effective outcomes, beyond what is already driven by market-based mechanisms and other procurement strategies. Most jurisdictions that use ACPs rely on a competitive market for RECs, and in some cases REC auctions, to reduce costs. Since ACPs are an alternative to procuring RECs or renewable energy, they are not designed to drive market participants to procure lowest-cost RECs or renewables, but rather, they provide a maximum price that can be paid for RECs.

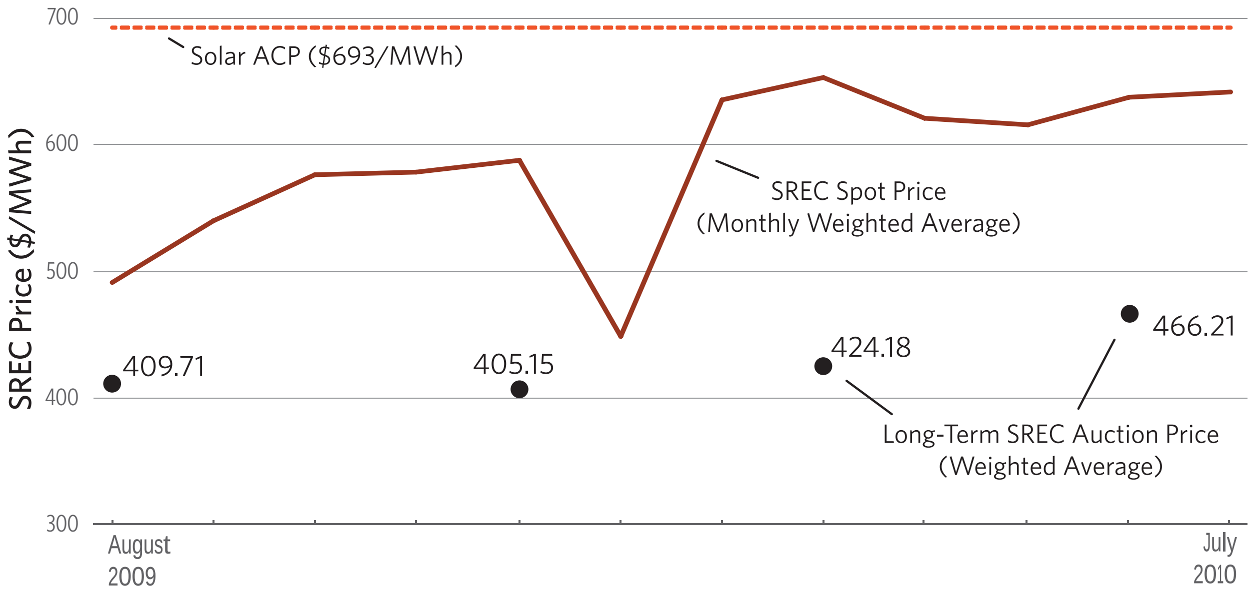
Contain only the cost of buying RECs, leaving other market or institutional mechanisms to manage non-REC costs

ACPs typically only control the cost of procuring RECs; other indirect costs associated with renewable energy are not covered by an ACP. Many jurisdictions that use ACPs have either competitive market mechanisms or regulatory tools that are designed to contain these indirect costs. In New Jersey, most indirect costs are handled by competitive markets, where electricity market participants buy and sell the energy, transmission services, ancillary services and reserve capacity that are needed for reliable operation. Oregon's ACPs are coupled with a revenue requirement impact limit, which explicitly includes indirect

24 NJ Board of Public Utilities (2011), p. 16.

25 Bird, Heeter, Kreycik (2011).

Figure 2 – ACPs, SREC Spot Prices, and Long-Term Auction Prices for NJ Solar – 2009/2010 Compliance Year



Sources: DSIRE Database, NJ Clean Energy – SREC Pricing Archive, NERA Economic Consulting (2011).

costs like transmission and firming of intermittent renewable energy.[26]

Sets REC price in cases of shortage, potentially at a lower price than would occur otherwise

Alternative compliance payments provide the market with a clearly visible highest price. In cases where REC suppliers (renewable energy generators) are generating fewer RECs than required for compliance[27], the price of RECs has historically stayed close to the alternative compliance payment.

During the 2009-2010 compliance year, spot prices of SRECs traded close to the solar ACP. [28] Spot prices during this period were much greater than the price of SRECs procured through a limited auction of long-term contracts.[29] Sellers of SRECs in the spot market during this period may have been able to extract higher-than-expected profits by selling SRECs at a price near the ACP for solar. Figure 2 shows the solar ACP, average spot prices of SRECs, and the prices of SREC procured through an auction process for long-term contracts.

Without the ACP, it is possible that sellers of SRECs in the spot market would have been able to charge much higher prices. However, significant quantitative analysis may be necessary to determine whether SREC prices were higher than they needed to be during this shortage, or to what extent the ACP limited the price of SRECs during this time.

Support of achievement of renewable energy goals

Allows for compliance that does not involve generation of renewable energy

By their nature, alternative compliance payments allow for compliance that does not involve building renewable energy. Lower ACPs may cause fewer RECs to be generated, and a greater portion of compliance will be met through alternative compliance payments. Further, if there are barriers to project development, as in New Jersey's solar REC market between 2009 and 2010, more electricity suppliers will comply with the RPS

26 Oregon Senate Bill 838, § 12, §20.

27 A circumstance which could be caused by barriers to project development and financing, or by exercise of market power.

28 Bird, Heeter, Kreycik (2011).

29 Bird, Heeter, Kreycik (2011); NERA Economic Consulting (2011). The SREC-Based Financing Program awarded contracts to 103 projects in the 2009-2010 compliance year, for a total of 17.4 MW

requirements via ACPs. In the 2009-2010 compliance year, roughly 28 percent of New Jersey's solar carve-out compliance obligation was met by ACP payments.[30]

However, ACPs are typically set higher than expected technology costs, to give electricity suppliers incentives to comply with their obligations using real RECs. As described above, New Jersey's ACP for solar includes a premium designed to push electricity suppliers towards procuring real SRECs.[31] However, a high ACP alone may not be enough to drive compliance through real RECs. As New Jersey's solar market experienced, electricity suppliers will pay high ACPs when there are not sufficient RECs available in the market.

Typically accompanied with flexibility mechanisms – like REC banking – which allow for more procurement in good market conditions

The tradable REC schemes in states where ACPs are used often allow for banking of RECs generated in one compliance year for use in a later year. This allows electricity supplier to procure more RECs than required when market conditions are good, and use them for compliance in future periods, if they expect higher REC costs in the future. When credits are banked, deployment outcomes may still be achieved, potentially at a reduced cost.

In addition, many states use the funds collected through ACPs to support new renewable energy projects. In theory, this will reduce the future cost of RECs, and expand the availability of RECs for compliance in future years. However, cost concerns have led policymakers some states, including New Jersey, to require that funds collected through solar ACPs be returned to ratepayers.[32] Stockmayer, Finch, Komor, Mignogna (2012) suggest that "if ACPs are not used, or not used efficiently, to fund renewable projects, they cannot be considered a cost curtailment mechanism. By not efficiently funding renewable projects today, faulty ACPs either inhibit the ultimate goals of the RPS or raise the costs of eventually meeting those goals by drawing out the process of compliance."

4.2 Individual contract price caps

Meaningful insurance against high costs

Can provide a clear, well-defined price limit for bundled energy and REC contracts

Caps on the prices of contracts for renewable energy can be clear and unambiguous. It is worth noting that often the regulators that wrote the rules implementing a contract price caps are the ones approving or rejecting specific contracts, and they may have authority to create exemptions or flexible interpretation of their rule, which could undermine the ability of the price cap to limit costs.[33]

Has limited procurement of renewable energy, even when fairly priced

In New Mexico, contract price caps, part of the state's "Reasonable Cost Threshold" (RCT), were originally set for individual technology classes. These caps, set in 2004, were $49/MWh for wind and hydro resources, $62.54/MWh for biomass and geothermal, and $150/MWh for solar over 10 kW in size. New Mexico's contract price caps were ultimately eliminated by regulators in 2008, largely because utilities and other stakeholders indicated that the technology-specific RCTs remained fixed as market conditions and technology costs changed rapidly. Some utilities doubted that they would be able to procure their required renewable energy under the cap.[34]

El Paso Electric Company, the one utility that remained supportive of the technology-specific RCT, indicated that they had received proposals for wind and biomass projects that were priced under this price cap. However, they indicated that solar energy bidders responding to their request for proposals had submitted bids that "have not

30 NJ Board of Public Utilities (2011).

31 State of New Jersey (2011), p. 88.

32 DSIRE Database.

33 Stockmayer, Finch, Komor, Mignogna (2012) suggest that ultimate discretion to determine whether resources are least cost lies with regulatory agencies, which can lead to uncertainty for market participants.

34 New Mexico Public Regulation Commission (2008).

Table 5 – Evaluation of contract price caps

Insures against high costs	Minimizes policy costs	Supports policy targets
◒	○	○
• Can provide a clear, well-defined price limit for bundled energy and REC contracts • Has limited procurement of renewable energy, even when fairly priced • Not typically adjusted for changes in technology costs or market conditions	• Prohibits high-cost resources from being procured • Public price caps are sometimes treated as a price floor, rather than a price ceiling by market participants (confidential benchmarks useful for some procurement, however) • Will not contain all costs (e.g. firming, shaping and integration costs) and can obscure benefits associated with resource diversity	• Price caps set below actual technology costs impede achievement of RPS goals

been either financially or operationally viable relative to the existing cap." They recommended an increase in the technology-specific RCT for solar.[35]

Not typically adjusted for changes in technology costs or market conditions

Several stakeholders in New Mexico criticized the technology-specific RCT because it had not changed to reflect changes in technology costs and market conditions. For instance, Public Service Company of New Mexico (PNM) suggested that "if retained, the technology RCTs should be adjusted because they do not reflect current or projected costs for those technologies and should be reviewed periodically."[36]

Contribution to minimizing the cost of renewable energy policy

Prohibits high-cost resources from being procured

Contract price limits may contribute to the cost-effectiveness of policy, to the extent that they prohibit higher-cost resources from being procured, and drive electricity suppliers to procure least-cost resources. When New Mexico regulators created a proceeding to examine the state's RCT, one utility suggested that "these RCTs provide a strong incentive to wholesale suppliers to offer renewable resources at attractive prices." [37]

However, the price of a contract may not reflect the full cost of integrating a particular resource, or benefits associated with certain projects. In the same proceeding, PNM commented that "The technology RCTs do not take into account the contribution of a project or technology to the utility's overall system, such as reliability and dispatch flexibility, or the additional cost of a technology that may require increased system regulation by gas-fired generators." [38]

Public price caps are sometimes treated as a price floor, rather than a price ceiling by market participants

Contract price limits are often made public, which may interfere with price discovery in competitive solicitations for renewables. Having a public cut-off price may cause suppliers of renewable energy to target a price at or just below the cap, even if their actual costs are lower. PNM observed that "some renewable energy providers have the perception that the technology RCTs essentially represent a floor on the cost of each technology rather than a cap," and that "elimination of the

35 El Paso Electric Company (2008).

36 Public Service Company of New Mexico (2008).

37 New Mexico Register (2008).

38 Public Service Company of New Mexico (2008).

technology RCTs would remove this artificial cost target".[39]

Some procurement programs that have a contract price limit keep the limit confidential, to avoid influencing bids. Illinois utilities procure RECs to meet their RPS obligation through an auction process. Bids to supply RECs are evaluated relative to a confidential benchmark price, which is developed by each electricity supplier based on the incremental cost of renewable energy projects in the region, net of forward energy costs and federal tax credits. This benchmark price is kept confidential from bidders in order to avoid influencing the prices they bid. Between 2008 and 2009, REC prices in Illinois nearly halved, which some attributed to the use of confidential price benchmarks.[40]

Will not contain all costs and can obscure benefits associated with resource diversity

Contract price limits are limited in the costs they can contain, since the price of a renewable energy contract does not always include the cost of firming or transmitting intermittent resources. As mentioned above, one utility New Mexico utility recommended against the continued use of contract price limits because "they do not take into consideration ancillary costs to the system," and suggested an alternative that would allow the cost of solar to be compared with the energy and capacity costs associated with a natural gas power plant. [41]

Support of achievement of renewable energy goals

Price caps set below actual technology costs impede achievement of RPS goals

Too severe a contract price limit, or a contract price limit that does not reflect the cost of renewable energy, may stifle the local market for renewable energy. This reduces the opportunities for a state to realize the longer-term cost reductions from scale and mature financing environment.

39 New Mexico Public Regulation Commission (2008).

40 Illinois State University Center for Renewable Energy (2011).

41 New Mexico Public Regulation Commission (2008).

This constraint was central to the objections of several New Mexico utilities to the contract price limits previously used as a "Reasonable Cost Threshold." Since inflexible cost caps were expected to be insufficient to allow renewables to be procured, the state Commission eliminated the contract price caps, in favor of an overall rate impact cap.[42]

4.3 Retail rate and revenue requirement impact caps

Meaningful insurance against high costs

Often ambiguously defined or overly complex, creating market uncertainty or allowing the cost limit to be exceeded in practice

As indicated in NARUC (2011) and Stockmayer, Finch, Komor, Mignogna (2012), retail rate impact caps require clear rules on which costs of compliance count towards the cap. Clear definitions of which expenditures count towards a cap leave less room for uncertainty, extended debate, or gaming by market actors, and as a result, the cap is less likely to be undermined by changing which expenditures are counted.

While only put into practice recently, Oregon's revenue requirement impact cap explicitly defines the scope of the cap in statute. Oregon allows up to four percent of a utility's revenue requirement to be used to cover the incremental costs of RPS compliance. Further, Oregon's statute explicitly requires that this four percent include all costs associated with RPS compliance, including costs of "firming, shaping and integrating" renewable electricity, leaving less room for interpretation around what indirect costs are to be included.[43] However, accounting for the indirect costs that are specifically triggered by renewable energy may be an area of uncertainty.

The rate impact limitation for Colorado's Renewable Energy Standard (RES) allows for utilities to collect a fee of up to two percent of customer bills to cover the incremental costs of renewable energy standard compliance. The

42 New Mexico Public Regulation Commission (2008).

43 Oregon Senate Bill 838, § 12, §20.

Table 6 – Evaluation of retail rate or revenue requirement impact cap

Insures against high costs	Minimizes policy costs	Supports policy targets
◒	◒	◒
• Often ambiguously defined or overly complex, creating market uncertainty or allowing the cost limit to be exceeded in practice	• Creates additional reason for regulators and market actors to focus on costs • Implementation typically complex and subject to mid-stream changes; this increases uncertainty for project developers and electricity suppliers, and may increase costs	• Often set at a level determined politically, rather than based on expected costs • Some states have allowed costs to exceed the cap • Some states allow procurement beyond original renewable energy goals, up to the cost limit

costs that count towards Colorado's cap are a continuous source of debate, and definitions have changed over time. For instance, as Mignogna (2011) suggests, Colorado's rate cap can be circumvented through waiving specific resources from the rate impact calculation, or reclassifying expenses as part of the baseline (rather than an incremental cost) or exempt from the rate cap.

PNM in New Mexico requested a waiver from compliance with the state's renewable portfolio standard for 2012, suggesting that "compliance with the full RPS, net of the reduction due to the large customer rate impact, cannot be achieved within the 2.25% RCT cost limitation."[44] However, state regulatory staff contested this calculation, indicating that given a more accurate estimate of retail sales in 2012, PNM can comply with the RPS within the rate impact limit.[45] This illustrates that varying assumptions can lead to widely different conclusions.

Calculation of incremental costs

Both Colorado and Oregon place a cap on the incremental costs of renewable energy, rather than on total costs. This leads to further uncertainty around the calculation of costs being contained.

Colorado requires forward-looking analysis for each utility that compares the utility's RES compliance plan with costs that would be borne without the RES policy.[46] Following this analysis, utilities must calculate the amount a particular project will draw on "Renewable Energy Standard Adjustment" (RESA) funds. This project-specific calculation can include netting out avoided energy and capacity costs and benefits.[47]

Oregon has identified a method for calculating avoided costs based on a "proxy plant," a natural gas combined cycle power plant. Renewable energy costs above the levelized cost of this proxy plant are counted towards the state's revenue requirement impact cap.[48] This approach provides a consistent benchmark for the calculation of incremental cost. However, using non-renewable resources as the cost benchmark exposes the calculated incremental cost to changes in the price of natural gas, which may be problematic if renewables are intended to protect ratepayers from fluctuating fuel costs.

Spending beyond cost cap

Regulators in Colorado allow the state's investor-owned utilities to spend beyond the statutory cap, drawing on a section of the state's renewable energy law that allows spending beyond the cap to be deferred to the next year. Utilities account

44 Public Service Company of New Mexico (2011).

45 New Mexico Public Service Commission Utility Division (2011).

46 Stockmayer, Finch, Komor, Mignogna (2012) note that this calculation assumes a carbon adder and capacity credit, which are hypothetical costs and credits, rather than real, measurable costs and credits.

47 Direct Testimony and Exhibits of Kent Scholl (2009).

48 Oregon Public Utilities Commission (2008).

for spending, as well as collection of RESA funds on an annual basis. Spending above collection of RESA is accounted for as a debt, which must be repaid by future collections of RESA funds. Some regulators in Colorado have raised concerns that the utilities are on track to procure renewable energy beyond the state RPS target, at a cost that exceeds the rate impact limit.[49]

Contribution to minimizing the cost of renewable energy policy

Creates additional reason for regulators and market actors to focus on costs

Rate impact caps can provide utilities and regulators another reason to pursue the lowest cost procurement options available. For instance, in Colorado, one utility used limited RESA funds as a reason that the state commission should approve a contract with a low-cost solar energy project. The project's impact on the utility's RESA account was compared to several other options for solar energy procurement, and a minimal cost was one of the reasons put forward for approval of the contract.[50]

However, review of costs is an important part of the regulatory process regardless of the presence of a cost limit. The cost limit only puts additional attention on costs where there are meaningful consequences for reaching a cost limit.

Management of indirect costs

Some implementations of rate impact caps have explicitly aimed to limit indirect costs associated with renewable energy. Oregon requires that the costs of firming, shaping and integrating electricity produced from renewable sources, as well as the additional transmission needed to accommodate renewables, are included in the calculation of incremental costs.[51] In Colorado, however, transmission costs associated with new renewable energy are captured by the state's Transmission Cost Adjustment, which is not subject to the rate impact cap.[52]

Implementation typically complex and subject to mid-stream changes; this increases uncertainty for project developers and electricity suppliers, and may increase costs

Stockmayer, Finch, Komor, Mignogna (2012) indicate that "depending on how they are administered, cost caps may be administratively burdensome, non-transparent, and insufficiently protective of consumers." As an example of complexity and uncertainty in implementing a cost cap, Missouri's Renewable Energy Standard included a rate impact limit of 1 percent. However, the time frame over which this rate impact would be allowed, or what costs would be counted towards this rate impact limit, were not clearly defined by the original law. The Missouri Public Service Commission wrote rules to implement this rate impact cap, which were subsequently heavily litigated, tying up substantial regulatory resources.[53]

In many other states, a rate impact cap adds an additional area for utilities to cover in their compliance plans, for regulators to scrutinize, and for intervening action by external stakeholders.

Support of achievement of renewable energy goals

Often set at a level determined politically, rather than based on expected costs

Cory and Swezey (2007) explain in a National Renewable Energy Laboratory Report that in many cases, "cost caps are based on how much of a cost burden the state is willing to place on ratepayers and not on a calculation of the actual cost of meeting the RPS." This point is evident in a number of states discussed in this section, including Colorado and Missouri, where rate impact limits have no clear tie to expectations of the cost of RPS compliance.

49 Mignogna (2011).

50 Direct Testimony and Exhibits of Kent Scholl (2009).

51 Oregon Senate Bill 838, § 12.

52 Reasoner (2010).

53 Commissioner Robert Kenney (2012).

Some states have allowed costs to exceed the cap in order to meet targets

Retail rate impact caps, as well as revenue requirement or per-customer bill impact caps, have not generally constrained achievement of policy goals, and sometimes have been exceeded in meeting targets. Over 2007-2010, Colorado met 99-100 percent of their renewable energy targets (though only 85 percent of distributed generation targets for 2010),[54] though some utilities exceeded their two percent rate impact limit on an annual basis. However, in annual compliance filings, Colorado utilities illustrate that, averaged over the period of the policy, their procurement path may meet state renewable energy targets below the two percent rate impact limit. [55]

Some states allow procurement beyond original renewable energy goals, up to the cost limit

Colorado allows procurement beyond the required renewable energy targets, as long as costs are within the two percent impact cap.[56] This could allow utilities to procure more than required, should market conditions be favorable. In practice, as mentioned above, Colorado utilities are on track to procure more renewable energy than the policy targets, but at a higher cost than the current rate impact limitation.[57]

4.4 Renewable energy fund cap

Meaningful insurance against high costs

Funding amounts usually been increased, or new sources of ratepayer funding authorized, when costs exceed available funding

If no ratepayer funding is available for renewables beyond the cap, only those renewables that can compete on a market basis, without additional ratepayer funding, will be built. In principle this provides a hard limit on the amount of ratepayer funds that can be spent on renewable energy. California's Above-Market Fund limit, for instance, was intended to maintain a "meaningful limitation on the costs of the RPS program," as well as to streamline approval processes and ensure that funds were available to pay for the incremental costs of renewables.[58]

In practice, the jurisdictions that have used a fund cap on renewable energy have found other sources of ratepayer funding, relaxed the funding cap, or adjusted the funds being collected to allow state renewable energy targets to be met. For instance, in California's 20 percent RPS, the above-market funds allocated to cover the incremental costs of new renewable energy, around

54 Wiser and Barbose (2011).

55 Xcel Energy anticipates that they will eliminate their negative renewable energy standard adjustment balance by 2017. Xcel Energy (2011), sec. 7, p. 6.

56 Colorado House Bill 10-1001, § 3.

57 Mignogna (2011)

58 CPUC, Resolution E-4199 (2009).

Table 7 – Evaluation of renewable energy fund cap

Insures against high costs	Minimizes policy costs	Supports policy targets
○	◒	●
• Funding amounts usually increased, or new sources of ratepayer funding authorized, when costs exceed available funding	• Implementation can be administratively burdensome, complex, and may increase uncertainty for market participants • Cap is typically limited to cost of RECs or bundled renewable energy contracts; indirect costs are sometimes managed through underlying market mechanisms	• Practice of authorizing new funding for renewable energy when caps are exceeded indicates commitment to renewable energy target over funding limit

$773 million, were fully allocated to projects by 2009, before the 20% goal was reached.[59] This was due in part to the fact that these funds were determined without considering total funding needs required to meet the RPS goals. Rather they were based on a portion of the state's Public Goods Charge, which was capped at year 2000 levels.[60] After they were exceeded, the California Public Utilities Commission continued to approve ratepayer funding for "above-market" contracts.[61]

Likewise, New York's central procurement of renewable energy is limited by the level of authorized funding for the program. Funding is fixed by the New York Public Service Commission, and is collected by retail electricity suppliers through a bill surcharge. The New York State Energy Research and Development Agency (NYSERDA) noted in their 2009 evaluation of the RPS that "adequate funding must be made available for additional Main Tier solicitations since that is the program responsible for the vast majority of the State's incremental renewable energy goal. If targets are not set in accordance with available funding, the target is not realistic."[62]

While the amount of funding constrains how much can be spent on renewable energy procurement, this amount has been changed when found to be too little to achieve goals. In 2010, the New York Public Service Commission raised the amount of funding authorized, after funding was found to be insufficient to meet renewable energy goals.[63]

In 2004, New York regulators authorized total funding based on estimates of costs of meeting a 25 percent goal by 2013. A 2009 evaluation of New York's RPS program found that "currently approved funding levels are inadequate to meet the 2013 targets," in part because of the low implied cost of "RPS Attributes," relative to prices paid through solicitation and visible in other regional REC markets.[64] The 2009 report found that if the authorized funding were dedicated to acquiring enough resources to meet 2013 goals, contracted prices for RPS Attributes would need to be $7 to $8 per MWh, below average prices seen New York and New England.

Contribution to minimizing the cost of renewable energy policy

Implementation can be administratively burdensome, complex, and may increase uncertainty for market participants

In a 2009 evaluation of New York State's RPS program, uncertainty about the scale and timing of future RPS solicitations, uncertainty about the volume to be purchased in a given procurement, and uncertainty about long-term demand for renewable energy in New York were all cited as limitations of the program.[65] Because of the state's central procurement approach, the demand for renewable energy in New York is tied to available funding.

Cap is typically limited to cost of RECs or bundled renewable energy contracts; indirect costs are sometimes managed through underlying market mechanisms

In California's above-market fund approach, indirect costs associated with renewable energy were explicitly excluded from the above-market fund cap. In response, the CPUC suggested a method where indirect costs would be considered separately from any request for above-market funds.[66]

Similarly, New York's program relies on the procurement of "RPS Attributes," similar to renewable energy credits. While payment for these attributes is critical for financing of renewable

59 DRA (2011).

60 CPUC, Resolution E-3792 (2002).

61 DRA (2011).

62 NYSERDA (2009), p. 55.

63 New York State Public Service Commission Website. As of NYSERDA's 2009 evaluation of the RPS program, total program funding was $746.4 million. An additional $200 million "main tier" solicitation was authorized in January 2010, and in April 2010, additional funding through 2015 was authorized for the "customer-sited tier." In December 2010, the New York Public Service Commission authorized NYSERDA to undertake "main tier" solicitations without having to receive Commission approval, provided that there is sufficient funding based on the schedule of collections.

64 NYSERDA (2009).

65 NYSERDA (2009).

66 CPUC, Resolution E-4199 (2009).

energy projects,[67] these attributes do not capture some of the indirect costs and benefits of renewable energy. However, New York's RPS program operates in the context of markets for wholesale energy, capacity and ancillary services, which electricity suppliers can use to minimize the costs of providing reliable electric service.

Support of achievement of renewable energy goals

Practice of authorizing new funding for renewable energy when caps are exceeded indicates commitment to renewable energy target over funding limit

Funding caps are often increased or new sources of funding are found when old limits are exceeded. Both the California and New York state experiences indicate the importance of basing funding amounts on the actual expected costs of meeting renewable energy targets, and allowing for some uncertainty around future costs. Otherwise, limited funding could constrain achievement of environmental goals of policy.

5. Lessons for California

5.1 California regulatory context

California has ambitious long-term goals of reducing greenhouse gas emissions to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.[68] In pursuit of these goals, the state has adopted a mix of policies, including an aggressive Renewable Portfolio Standard (RPS) that requires 33 percent of electricity sales in 2020 to come from renewable sources.[69]

California's RPS operates in a unique market and regulatory landscape, with a range of procurement tools not available in other jurisdictions. California's combination of regulated procurement of renewable energy, rules that favor bundled long-term contracts for energy and RECs, and the presence of robust wholesale energy markets requires careful consideration of what tools are compatible in the California regulatory and market context. For example, ACPs are typically used in the context of tradable REC markets in states with competitive wholesale and retail electricity markets, and may not fit cleanly into California renewable energy policy.

California's procurement tools generally focus on long-term contracting for bundled renewable energy and renewable energy credits, and apply competitive market forces with the purpose of minimizing costs. Some of the procurement programs used by California to meet the state's RPS include:[70]

- **Competitive RPS solicitations:** A utility issues a request for offers for renewable resources meeting certain criteria. Responses are reviewed for both cost and fit with utility system needs, and ultimately contracts are submitted to the CPUC for approval.
- **Bilateral RPS contracting:** Utilities can enter into bilateral contracts with renewable energy generators outside of the competitive solicitation process. However, bilateral contracts undergo the same review process for cost and fit by the CPUC.
- **Renewable auction mechanism:** Biannual auction for a contract with standard terms, available for system-side renewable energy resources up to 20 MW. Resources are selected starting with the lowest-priced qualifying bid, up to the total capacity allocated to a particular auction. The initial scope of the program covers 1000 MW of capacity over two years, divided into four auctions for each IOU.
- **Feed-in tariffs:** Fixed-price payments for energy produced by small (up to 1.5 MW) renewable energy resources, up to a total program capacity cap of 480 MW.
- **Other distributed generation programs** include auction programs for small to

67 NYSERDA (2009).

68 California Assembly Bill 32; California Executive Order S-3-05.

69 California Senate Bill 1x 2.

70 Based on DRA (2012).

medium distributed photovoltaic projects for each utility.

- **Utility ownership:** Utilities may build and own their own renewable energy resources in order to meet the renewable portfolio standard.

In addition, California offers several incentive programs for renewable energy, which currently do not count towards the RPS targets. These include the California Solar Initiative, Net Energy Metering, and others.

As indicated by the range of procurement tools, resource diversity is one of the objectives of California's RPS. However, the law contains no specific resource carve-outs, instead leaving regulators to determine the appropriate mix of resources and procure those resources cost-effectively.

5.2 Cost limits in California

Previous approach: market-price referent and above-market funds

In 2007, the California legislature passed Senate Bill (SB) 1036, which created a limit on the total costs of renewable energy procurement to meet the state's Renewable Portfolio Standard. At the time, the RPS goal was 20 percent of electricity sales from renewable sources by 2010, for investor-owned utilities (IOUs) in California.

SB 1036 defined the cost limitation as a total amount of funding available for renewable energy contracts, above the market price of electricity. The above-market funds (AMFs) represented a total of roughly $773 million of ratepayer funds, divided among the state's investor-owned utilities in proportion to energy sales[71]. AMFs were initially calculated as the sum of two components: [72]

- Funds transferred from the California Energy Commission (CEC) – called the "New Renewable Resources Account (NRRA)" which had previously been used to fund a renewable energy production incentive program – to the CPUC.
- An estimate of the NRRA funds that would have been collected as part of the state's public goods charge for renewable energy up to January 2012.

This method did not consider the total funding that would likely be needed to meet the state's renewable energy goals. Rather, the size of the NRRA and the estimate of funds that would be collected up to 2012 were based on a portion of the state's public goods charge, which was capped at year 2000 levels.[73]

The AMFs were then allocated to projects – which had generally been selected through competitive procurement processes – by calculating the difference between the renewable energy project's contract price, and the relevant Market Price Referent (MPR) – a benchmark market price for a long-term contract, based on the costs of building, owning and operating a natural gas-fired power plant. The MPR was updated regularly, based on updated cost information and natural gas price expectations.

This approach faced several key criticisms:

- The CPUC Division of Ratepayer Advocates (DRA) indicates that the above-market funds were fully allocated to projects by 2009.[74] Even though funds were fully allocated, utilities continue to procure renewable energy, and CPUC continued to approve above-market contracts to meet the state's long term RPS and climate policy goals.[75]
- The MPR may have distorted prices bid by market participants. As a CPUC Energy Division staff presentation suggested, "low-cost resources bid up to the MPR," and "high-cost resources bid down, despite inability to build at those prices

71 CPUC, Resolution E-4199 (2009).

72 California Senate Bill 1036 (2007).

73 CPUC, Resolution E-3792 (2002).

74 DRA (2011).

75 DRA (2011), California Public Utilities Commission (2009a).

(and return for approval of higher costs later)."[76]

- The cost limit treated renewable and non-renewable resources differently. Fossil fuel resources were not subject to a cost cap, and fossil contracts were "compared to comparable market prices to determine reasonableness."[77]

Requirements for new cost limitation approach

California strengthened the ambition of the state's RPS with Senate Bill 1x 2 in April 2011. The bill extended the RPS goal from 20 percent of retail electricity sales by the end of 2010 to 33 percent by the end of 2020, expanded the requirement to cover all California retail sellers and municipal utilities, and made a range of other changes. SB 1x 2 requires the California Public Utilities Commission to develop a limitation on the total costs that can be incurred by each investor-owned utility in meeting the RPS requirement.[78] According to the new law, California's utilities will not be required to procure renewable energy resources after their procurement costs exceed their cost limitations. However, the cost limit is subject to a review in 2016, which will determine whether the cost limit is adequate to meet the 33 percent target by 2020. [79]

Specifically, the new law requires that the commission relies on the following information when developing the cost cap:[80]

- The most recent renewable energy procurement plan of each utility
- Procurement costs that approximate expected costs of building, owning and operating renewable energy resources
- The potential that some planned resources are delayed or cancelled

76 California Public Utilities Commission (2009a).

77 California Public Utilities Commission (2009a).

78 California Senate Bill 1x 2, §20.

79 California Senate Bill 1x 2, §20.

80 California Senate Bill 1x 2, §20.

SB 1x 2 instructs the CPUC to ensure that the limitation is set at a level that prevents "disproportionate rate impacts,"[81] includes all procurement expenditures used to comply with the RPS, and excludes indirect expenses.[82]

Recommendations for implementing a cost limit in California

There is no perfect tool for limiting the cost of RPS policies. The U.S. state experiences examined in this paper reveal that cost limits can lead to market uncertainty, send distorting price signals to the market, or otherwise interfere with the effectiveness of state renewable energy policies.

Further, the appropriate design of a cost limit depends on the policy and market environment in which it is used. For example, ACPs provide effective insurance against high costs in some states, but they are designed as a release valve for prices in a competitive market for tradable RECs. ACPs may not be well-suited to limit the cost of regulated procurement through auctions or competitive solicitations, because they may affect bid prices as contract price limits have. Or, without explicit technology carve-outs, ACPs may create a barrier to realizing the benefits of a diverse mix of resources – a key objective of California's renewable energy policy.

Mindful of California's unique market and regulatory context, we have identified a number of lessons from the experience of other states on the design and implementation of cost limits that may be applicable in California. California regulators should consider the following recommendations when designing and implementing a cost limit:

Do not rely on the cost limit to drive policy cost-effectiveness

California regulators have expressed a strong interest in achieving goals cost-effectively.

81 The term "disproportionate rate impacts" is not clearly defined in the legislation, but interpretation of this term will certainly impact how the CPUC, IOUs and other stakeholders interpret the cost limitation.

82 Indirect expenses specifically described in the law include imbalance of energy charges, sale of excess generation, decreased generation from existing sources, transmission upgrades, and relicensing of utility-owned hydroelectric facilities.

However, there is little evidence from other states that cost limits drive down costs of procuring renewable energy. As New Mexico's Reasonable Cost Threshold and California's own experience with the Market Price Referent indicate, cost limitation mechanisms can lead renewable energy generators to offer higher prices than they might otherwise. In addition, the costs of implementing, tracking and enforcing a cost limit may be significant when cost limits are not clear or simple.

California uses a range of market-based mechanisms to procure renewable electricity cost-effectively. Based on other states' experiences, a cost limit does not replace these mechanisms, or necessarily deliver more cost-effective outcomes. More importantly, California regulators should be careful to design the cost limit so that it avoids market price interference, which could make these procurement tools less cost-effective.

Set the cost limit to be consistent with expected RPS costs and the risks California ratepayers are willing to bear to meet RPS targets

Some jurisdictions have not based cost limits on expected policy costs, and many cost limits do not reflect uncertainty in rates of project failure, technology costs, federal support policies, or other key risks to ratepayers.

California's cost limit should be consistent with the expected cost of meeting the 33 percent target by RPS, and achieving the desired diversity in renewable resources. The cost limit should also reflect the risks that ratepayers would be willing to bear to achieve policy objectives. When cost limits are not consistent with expected costs, they are often ignored in practice, or can become substantial constraints on the ability of a state to achieve renewable energy goals.

Avoid public contract-level cost limits and benchmarks for competitive procurement

In some jurisdictions these have been treated by the renewable energy market as a price floor, rather than a price ceiling. New Mexico utilities indicated that public contract price caps distorted the prices bid by generators, and California regulators have had similar concerns about the Market Price Referent benchmark price. Confidential benchmarks have proven useful in some auction mechanisms, such as the REC auction process used by Illinois investor-owned utilities.

Prices obtained through competitive and auction-based procurement may be particularly sensitive to the existence of contract-level price signals. Because of California's reliance on these procurement tools, it may be worthwhile to avoid public contract price caps or benchmarks that may be treated as a price floor by the market.

Use a clearly-defined and simple mechanism to limit costs

Ambiguity and complexity can create opportunities for a cost limit to be avoided, and/or lead to substantial regulatory burdens and market uncertainty. Colorado and Missouri have both faced difficulty defining which costs are limited and how the cost limit is enforced. In Colorado, utilities have spent beyond their annual cap, while in Missouri, uncertainty in the cost cap has held up implementation of the RPS policy more broadly.

While California's cost limitation must meet specific statutory requirements, and cover costs from a broad range of procurement tools, ambiguity and complexity should be minimized to ensure that the cost limit is meaningful and useful, and not an significant source of policy uncertainty.

Define the consequences of reaching the cost limit to be consistent with policy objectives

These consequences – and who bears them – will influence the response from market participants, policymakers, or the public, and thereby policy outcomes. Few states clearly define the consequences of reaching a cost limit. Most often, reaching a cost cap exempts electricity suppliers from their RPS obligations, and the public misses out on the benefits of achieving a renewable energy target. It is worth considering how the consequences of reaching a cost limit could be structured to drive cost-effectiveness, carbon emissions reductions, or other policy goals.

Include a predictable mechanism for reviewing the cost limit

This can allow the cost limit to adapt to changes in policy objectives, escalating renewable energy targets, or unexpected changes in market conditions. Many states have no explicit mechanism for reviewing a cost limit. This either results in a cost limit that has not adapted to market conditions (e.g. New Mexico's technology-specific Reasonable Cost Threshold), or ad-hoc changes to the implementation of policy (e.g. Colorado's rate impact limit). California regulators are required to evaluate the state's renewable cost limitation in 2016, which presents an opportunity to adjust to changes in market conditions or policy objectives.

Conclusion

While cost limits are widely used by states seeking to manage the risk of unacceptably high costs, they are often complex, can be burdensome to implement, and can lead to unintended impacts on the renewable energy market. This paper intended to help California avoid pitfalls and learn from the experience of other states, to increase the effectiveness of its own cost limitation. California regulators should design and implement the state's cost limitation carefully to avoid these unintended consequences, meaningfully insure against high costs, and support California's ambitious climate and energy policies.

Appendix 1 – Indicators of effectiveness of cost limits

The following table illustrates the scope of issues and questions we used while evaluating cost limits. This set of indicators was used to identify key issues associated with each type of cost limit, but not to determine an aggregate score or ranking. Because each type of cost limit faced a different set of issues, our analysis focuses on those issues we saw as most significant for each approach.

Insures against high costs	Minimizes policy costs	Supports policy targets
Cost limit is binding • Have costs exceed intended limit despite existence of cap? **Scope of costs clearly defined** • Do rules clearly define which costs are limited and how these costs are accounted for? **Rules have remained consistent through implementation process** • Have rules changed to allow future spending beyond cap? **Incentives of private actors are aligned with goal of cost limit** • Are market actors likely to exploit loopholes or game cost limit? **Predictable response when cost limit is reached** • What happens if cost cap is exceeded? No obligation to comply? Penalty on electricity suppliers? Review triggered? • Are consequences – and who bears them – linked to policy objectives? • Is regulatory response predictable or ad-hoc? **Predictable review process** • Is there a clearly defined schedule and scope for reviewing or adjusting cost cap to account for updated information? • How does cost limit adapt to changes in technology cost, development risk, financing, etc.?	**Drives more cost-effective outcomes** • Have market actors been seeking more cost-effective resources because of cost limit? • Has cost limit driven market behavior that imposes indirect costs? **Covers full range of relevant costs and benefits** • Does cost limit apply to full range of costs associated with renewable energy? • Does cost limit account for differential benefits of renewable energy projects? • Do other market / institutional mechanisms exist to manage full costs? **Provides incentives to reduce costs** • Are market actors actively reducing procurement costs because of cost limit? • Does cost limit create a bias towards incumbent technologies, or does it allow for new technologies with potentially lower long-term costs? **Supports efficient market operation** • Does cost limit create information barriers between market actors and regulators, or impose information costs? • Is implementation simple or burdensome in practice? • Does cost limit create a bias towards actors with market power? **Enables economies of scale and stable financing environment** • Clear, predictable market signals reducing policy / regulatory risk? • Has local market realized economies of scale? Can projects subject to cost limit easily secure financing?	**Enables achievement of deployment / GHG mitigation goals** • Are market actors procuring less renewable energy than required because of cost constraints? **Cost limits are set commensurate with targets** • Are estimates of costs to meet targets factored in when setting cost limits? • Are desired resource mix and other policy objectives considered when setting cost limits? • What is the gap between the cost limit and expected costs? **Under-procurement in the face of high costs balanced with higher procurement in the face of low costs** • What action is taken if cost limit is exceeded (e.g. compliance no longer required, or review triggered)? • Do regulated entities have incentives or opportunity to procure more renewables than required when costs are low, and bank for future compliance? **Cost limits allow for some degree of uncertainty in future costs** • Are cost limits set such that they anticipate some degree of uncertainty in future costs, such as technology costs or presence of support policies? • Are ratepayers bearing appropriate risks to enable achievement of targets? • Predictable review process to reconcile cost cap and target when policy or market environment change?

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