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*State Analysed*: The State of California

*Objective*: I intend to analyse the state’s Renewable Portfolio Standards, arguing that the most aggressive measures the state is taking are ultimately the most effective, and that, based on evidence from the state, continuing to move towards a 60% renewable energy portfolio by 2045 is attainable. However, it will not be without challenges: as RPS is still relatively nascent, it faces several short-to-medium-term challenges brought by stakeholders. Since RPS universally applies across the state to fundamental infrastructure, it implicitly involves a myriad of stakeholders with competing and overlapping agendas. All of these concerns will have to be carefully considered with the ultimate goal of a future electricity grid powered by renewable sources in mind.

In the following, I will analyze California’s Renewable Portfolio standard, examining the effect it has on the grid makeup and subsequent electricity delivery and prices. The RPS policy aims to impel retail sellers and publicly owned utilities to procure 60% of electricity from renewable sources by 2030 and ultimately reach 100% by 2045.

1. **Context**

*Social:* California’s energy background is one steeped of innovation and diversity; as the world’s fifth largest economy by itself, the state has vast energy demands that, with the specter of climate change ever growing, it can no longer expect to meet through conventional fossil fuels. Electricity generation needs to become cleaner, given that it contributes to 16% of the state’s GHG emissions.[[1]](#endnote-1) Fortunately, the state has two innate advantages, one social and one spatial: the former, a progressive culture that is generally amenable to alternative forms of energy provision, whilst the latter is a large natural resource base coupled with economic power. In the case of the former, Vogel (1995) has asserted California impels other states to meet the regulatory bar the state has set;[[2]](#endnote-2) furthermore, voters have policy expectations, meaning that electability can rest upon a bare minimum of expected environmental policies. For example, the state allocated significant funding to educational agencies who both apply and diffuse energy saving measures.[[3]](#endnote-3)

*Current Energy Portfolio:* California has a large electricity appetite, producing 11.4TW alone in 2015.[[4]](#endnote-4) The state’s energy grid has historically tried to optimize itself; according to the California Energy Commission (CEC), doing so has saved the state $100bn, or 70k GW, over forty years.[[5]](#endnote-5) More recently, the impetus to do so has increased, with the state voting in 2018 that, by 2030, retail electricity use will be powered by 60% renewables; the 30% target for 2020 was met in 2018 (reaching 34%).[[6]](#endnote-6) The charge has largely been led, according to a separate CEC report, by the rapid proliferation of PV technology. Solar now accounts for 69% of all renewable generation, and 57% of total grid capacity (as of 2018).[[7]](#endnote-7) In fact, solar has seen exponential uptake, growing 490% in the last five years.[[8]](#endnote-8) Much of this success is thanks to the California Solar Initiative, which has seen the state install one million solar rooves.[[9]](#endnote-9) This success has been further augmented through the offering of subsidies at declining rate to early adopters, incubating the PV industry to market competitivity.[[10]](#endnote-10) Gas is a major facet of the portfolio, accounting for just under half of electricity production, and it is worth noting that it has contributed to recent ecological disasters in the state.[[11]](#endnote-11) The state also has limited existing nuclear capacity, yet possesses large potential for its deployment. As of 2013, the state had a capacity of 4360MW; in recent years, however, it has been left with just one plant at Diablo Canyon, owing to anti-nuclear sentiment.[[12]](#endnote-12) Economics, too, suggest that this source in the state may not be cost-effective, as the cost of producing nuclear power per kilowatt/hour was projected to more than double. The plant will close by 2025, at the cost of $3.8bn, with the energy shortfall being met by natural gas.[[13]](#endnote-13) Hydroelectric dams do not qualify under RPS, even though the grid relies heavily on it, owing to the effects of climate change on water levels.[[14]](#endnote-14)

*Economic*: The state is highly developed economically, with a GDP of $2.7 trillion in 2018. In this sense, contextually, business and environmental policy like the Renewables Portfolio Standard (RPS) go hand in hand. It is a large scale undertaking that requires input from all stakeholders, economic or otherwise. In fact, it would appear that economic interests are quite amenable to a policy like RPS. A look at the state’s legislative digest,[[15]](#endnote-15) for instance, shows that bill in which the RPS was contained – Senate Bill 100 – passed comfortably, with the broad support of business; only power utility companies registered their opposition. Between, 2012-2018, for example, the state amended the corporate tax code so as to fund the Clean Energy Jobs Act, resulting in significant savings in energy costs and fossil fuels usage.[[16]](#endnote-16) The state also has the fourth largest cap-and-trade system in the world to induce business into GHG emission compliance.[[17]](#endnote-17) At the retail level, electricity utilities are legally mandated to make changes in the pursuit of the RPS, being obliged to incorporate RPS into their policies via a Least-Cost Best-Fit (LCBF) methodology that takes into account economic/quantitative considerations, and social/qualitative considerations.[[18]](#endnote-18) RPS seems to have been an economic success, in that early widespread fears of contract failure[[19]](#endnote-19) and lack of uptake[[20]](#endnote-20) have proven largely unfounded.

That said, California is vulnerable to recessions owing to its dependence on revenue from high income tax payers, and economists expect that the state will suffer a recession in the near future. This could hamper efforts to transform its energy portfolio to a non-fossil fuel base which is a typically expensive process.

*Political:* The state wields large amounts of political autonomy within the federal structure, enabling it to determine its own energy goals and policy largely irrespective of overarching national equivalents. Moreover, the state has augmented this potency through a variety of initiatives and interactions with neighboring and like-minded liberal states that can allow it to further determine its own energy provision. This is particularly useful if a particular administration is hostile to its policies; the Ninth District Court, for instance, routinely rules in favor of the policies of these states to stay federal intervention from the Trump administration. Demographically, the population of 39.5 million votes Democratic overall, and has a large concentration of wealth in the hands of a liberal elite that often are instrumental in the shaping and implementation of public policy. Further, renewables projects tend to focus in low income areas in order to provide jobs.

*Structural:* A policy like the RPS will only have support in so far as it produces tangible benefits to the individual consumer. Thus, there must be a focus on cost of power for Californians; “People are willing to do the right thing for the environment – as long it is easy.”[[21]](#endnote-21) This highlights the imperative for a state-led, top-down transformation of the energy portfolio in an economy where consumerism and productivism are dominant concerns. Strong legislation and agencies are needed.

A second is the PG&E bankruptcy, which threatens the success of the RPS plan for two reasons. The first is that the company holds the most contracts for renewable energy in the state, meaning that the bankruptcy calls into question the viability of these contracts that are integral to the RPS. This means that the costs incurred to company must be socialized, inhibiting the RPS as a whole by imperiling contracts. On one hand, the state argued this step was necessary, with Governor Newsome condemning what he termed an “inverse condemnation”[[22]](#endnote-22) liability policy; on the other, the public tends to oppose high-profile bailouts of large corporations. Second, to compound the issue, for all its compliance, the company actively opposes the RPS goals by lobbying against it.[[23]](#endnote-23)

Third is the issue of electricity independence: the state imports a third of its electricity,[[24]](#endnote-24) and even when fossil fuels are fully phased out, the RPS plan allows for imported energy from the North American continent (i.e. Mexico and the Pacific Northwest) to meet targets – improving the type of energy used but not acknowledging the structural dependence the state has on energy importation.[[25]](#endnote-25) As of 2016, the state imports 33% of its electricity.[[26]](#endnote-26) The reason this is controversial is because it reflects a structural problem: the state has the highest electricity prices in the Western U.S., making importation from cheaper neighbors (often using fossil fuels) attractive, contributing to 6% of the state’s total emissions.[[27]](#endnote-27) This compounded by the fact that it has the most unreliable grid in the Union, leading in outages.[[28]](#endnote-28)

Finally comes an issue specific to the RPS plan itself: the problem of overproduction of renewable electricity through PVs, illustrated in CAISO’s ‘duck curve’. This elucidates the problem of minimum generation inherent in solar power and shows how subsequent responsive curtailment of PV power ultimately reduces grid efficiency. One can identify this as a policy weakness of RPS based on a report from the National Renewable Energy Laboratory.[[29]](#endnote-29)

1. **Energy Policy Objectives**

*Socio-Economic/Environmental :* Economically,the state is using RPS to transition the electricity grid to renewable sources whilst also “using advancements in technology to provide the same or better level of energy service to a consumer, while using less energy”[[30]](#endnote-30) in the pursuit of energy efficiency. To do so entails saving double the current cumulative saving of energy, to achieve the “most aggressive appliance of energy and water efficiency in the nation”[[31]](#endnote-31) by 2030, all whilst creating a reliable grid with stable prices.[[32]](#endnote-32) Land use will change as a result, with a focus on land development for renewables.[[33]](#endnote-33) The state has pursued a more aggressive RPS policy based on recommendations that, say, a target of 50% or higher is more effective.[[34]](#endnote-34) Even more, the policy was amended in 2018 to set the 2030 target at 60%,[[35]](#endnote-35) and 100% by 2045. \*

Socially, the policy has explicit aims: reducing ambient air pollution, thereby improving health and productivity. Although RPS entails a short-term social cost in the form of an electricity price hike of about 6%,[[36]](#endnote-36) the long-term security and stability nominally provided by RPS will ultimately render renewables the most cost effective and socially equitable option. Indeed, cost-benefit analyses are clear: the upfront social costs exist, with California standing to make at least $102.8 million social net loss;[[37]](#endnote-37) however, the aggressive RPS target takes a ‘rip-off-the-band-aid’ approach, since the social savings from reducing GHGs by potentially 35.8 million tons. This aspect of the program is particularly important from a social standpoint because carbon released in the atmosphere in the past has a ‘boomerang’ effect in the future, meaning that the costs of socializing GHGs can only go up.[[38]](#endnote-38) In addition, it has been estimated that for every dollar invested in the research and development of renewable energy technology, Californians ultimately save $350.[[39]](#endnote-39)

*Governmental/Regulatory:* The California state legislature identifies the major stakeholders here as a) the California Energy Commission, b) the California Air Resources Board, and c) the California Public Utilities Commission.[[40]](#endnote-40) (3) All three agencies are mandated to incorporate RPS into their policies, imparting significant responsibilities as result. In particular, the CPUC and the CEC interact closely to ensure RPS compliance among utilities.[[41]](#endnote-41) These agencies have been coordinating closely with the 4) California Independent System Operator to enforce effective regulation and market standards since 2005.[[42]](#endnote-42) Responsibilities include providing a diverse and reliable energy system; protecting customers from unequitable prices hikes; providing policy coherency between these agencies towards RPS; and providing reports to the Legislature to ensure RPS compliance.[[43]](#endnote-43) An explicit social responsibility for them is to, “Detail questions for project developers about how the project will impact disadvantaged communities, including the location of the project in proximity to DACs and how the proposed facility will provide benefits to adjacent DACs.”[[44]](#endnote-44) To account for environmental stakeholders, the 5) Department of Fish and Game coordinates with the CEC via the Renewable Energy Action Team.[[45]](#endnote-45) All agencies are historically well-coordinated, with high expectations of efficacy,[[46]](#endnote-46) and stringent regulatory oversight.[[47]](#endnote-47)

There are two problems I identify facing these bodies. The first is that adoption of the RPS will increase annual costs by $21 million – costs which must be absorbed by these agencies.[[48]](#endnote-48) Furthermore, the agencies are tasked with enacting and enforcing what is acknowledged by the state as a vague policy – necessarily vague, owing to energy policy dynamism; RPS has intricate end goals but is lighter on the details in the medium term. This is necessary in that a long-term perspective is required to begin divestment in non-renewables so as to prevent future “stranded assets”; however, the risk of this can result in “parties arguing for intricate procurement details when the broader strategy has barely been hinted at in electricity planning.”[[49]](#endnote-49)

1. **Appendix A: Stakeholder Influence Map**

*Region:* California

*Policy Objective:* 100% Renewable Electricity Grid

*Stakeholders:* The Public; CARB; CEC; CPUC; CAISO; public/private retail sellers; developers.

*Policy Snapshots:* a) 2010 (consolidated RPS) b) 2010 (RPS renewal) c) 2018 (accelerated RPS).

2010: Chosen because it is after RPS had been established, consolidated. Regulatory bodies are coordinated, with less public influence now policy consultation is over. RPS targets have been met.

2018: Brings RPS into contemporary perspective, being made more aggressive. Evidence suggests the policy is highly successful. Regulatory bodies therefore increasing in power and integration and public interest in green action increases. Furthermore, private utilities grow in influence and power owing to the socialization of costs from the PG&E bankruptcy, which jeopardizes RPS and renewables contracts. Nuclear power gains somewhat traction owing to increasing arguments in its favor.

2030: Next milestone in RPS progress; expectation that regulatory bodies will be wholly coordinated, power and size. CAISO will also grow owing as the grid expands. I predict public interest will be even more salient as climate change ideas become more important; since RPS goals for 2030 have already been met, they will likely become more aggressive – it is wholly possible that the 2045 target of 60%, for example, will be made even higher. Public and private utilities will grow in size, entering more and more renewable contracts as the renewables market grows and becomes more cost effective than fossil fuels.

1. **Policy Analysis and Recommendation**

The policy objective of RPS, as a regulatory policy, is to make California’s electricity grid powered by 100% renewable sources by 2045. Although 100% seems a high target and 2045 seems fairly soon, the policy has been in successful implementation since 2005 owing to its dynamic nature. Given that more or less everybody uses electricity, the policy entails a necessarily large number of stakeholders. In the following analysis, the efficacy of RPS shall be evaluated in relation to these stakeholders. The table in Fig. 1. depicts what this writer has identified as the major issues facing the policy, and their applicability to individual stakeholders in relation to RPS.

Being government agencies and regulatory bodies, the CPUC, CARB, CEC, and CAISO have a particularly significant role to play in ensuring the success of RPS. As such, roles are interrelated, as shown in the stakeholder map above, and the issues that these bodies face are often intersectional. For example, all four must contend with (and are responsible for, to some degree) electricity prices that are the seventh highest in the Union.[[50]](#endnote-50) High electricity prices are not an issue directly facing the bodies per se (as such bodies exist regardless of price) but they may be interpreted as reflective of a more systemic failing on the part of such agencies. Being arbiters of both the grid itself and the rules that govern it, questions must be asked of California’s public agencies who charge such prices whilst simultaneously overseeing an electricity infrastructure that is considered the least reliable in the U.S., easily leading in blackouts.[[51]](#endnote-51) CAISO, which operates the majority of the grid, may be scrutinized here, as the issue of curtailment seems to be only escalating as more renewable sources come online,[[52]](#endnote-52) while the use of fossil fuel sources to alleviate intermittency issues has also been criticized as counterproductive.[[53]](#endnote-53) That said, the importance of these bodies in ensuring that RPS standards are met should not be understated. The CPUC, in particular, is seen as indispensable, to the point that there is concern that, as the business of privately-owned utilities decline, the remit of its regulatory scope will also diminish.[[54]](#endnote-54)

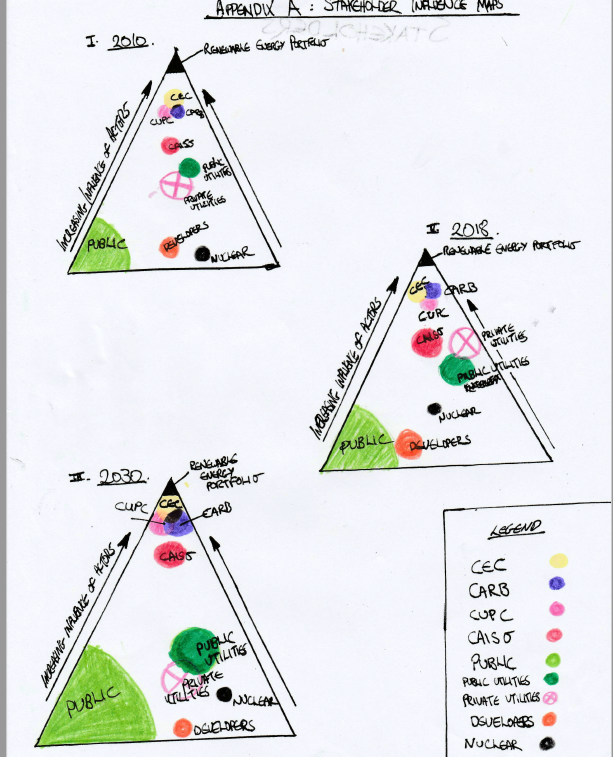
The decline of public utilities’ share in the electricity market is resultant of electricity prices pushed upwards by RPS requirements, with customers increasingly switching to less expensive, publicly-owned providers operated by municipalities. Privately owned utilities resisted RPS, especially SB 100, on the basis that it singled [[55]](#endnote-55)out their sector and (correctly) that consumer prices would be adversely affected. However, their declining influence is reflected by the fact that RPS is being fully implemented regardless. With a potential loss of 60 to 90% of demand over the next eight to 10 years,[[56]](#endnote-56) utility companies facing this existential threat should adopt RPS to the full extent so as to stay competitive from an economic standpoint; they should also exploit the ‘green’ connotations of RPS in advertising so as to remain publicly salient. The need to do this reflects the declining influence of electricity utilities which, though vocal in their concerns surrounding the initial formulation of RPS policy, have less leverage in a policy that is instituted rather than in the process of consultation. The political capital for RPS, clearly, has existed since at least 2005. One area where utilities do exert influence, however, is an inadvertent consequence of the faith the policy places in the ability of these utilities to uphold renewable contracts. As climate change increases the risk of events that can cripple these utilities, contingency plans to support flailing companies with contracts must be in place if current levels of renewables procurement are to continue.

Moreover, the prospect of contract failure impacts developers, who increasingly must consider, specifically, if their development is going to be as valuable if the infrastructure within it fails. In addition, increased renewable electricity infrastructure as a result of RPS has significant implications for land developers. Such developments create economic benefits through efficient land use; a wind farm, for example, also has agricultural and PV potential.[[57]](#endnote-57) On the other hand, developers should also consider that such infrastructure is land-consuming. A nuclear power plant, it has been argued, requires 300 times less land than a conventional solar farm,[[58]](#endnote-58) but developers should consider that panels can be installed on homes, homes which have wind turbines beside them, and so on. Land use for developers attempting to take advantage of the pivot to renewables under RPS should, therefore, remember that their land use potential is multifaceted. Whilst accommodating RPS, developers should consider how to use it this their advantage, by using their land strategically in either the development of their own renewable electricity supplies or procuring sources that cost-effectively and consistently power their developments.

Finally, the near all-encompassing stakeholder that is the public deserves careful and protracted consideration. As discussed above, the net social benefits of mitigating both climate change and fluctuating energy markets outweigh the costs of implementing RPS. However, this stakeholder is, as the table in Appendix B demonstrates, the most sensitive to the issues that arise from RPS and, although it has supported the policy throughout, did express criticism towards the transparency surrounding the policy in its initial formulation.[[59]](#endnote-59) The more manifest issues with which the public are confronted are the high electricity prices under RPS, as well as unreliable electricity provision. Part of the reason the Californian public pays such high prices is because of curtailment, which ultimately drives electricity prices upwards.[[60]](#endnote-60) These are the issues that the public as a stakeholder must contend with as a consumer. Less tangibly, however, as humans, the public must consider impacts of RPS. For example, environmentally-conscious stakeholders have criticized the policy’s reliance on fossil fuels to solve intermittency problems (when the renewable electricity grid fails to meet demand). Such an approach could serve to create a net gain in GHG emissions even as the electricity grid becomes increasingly powered by renewable sources, as happened in Germany.[[61]](#endnote-61) Most interestingly, in the short to medium term, RPS presents the public with the prospect of contract failure, as it has done so since 2005.[[62]](#endnote-62) On one hand, failure to deliver on renewable contracts can jeopardize jobs (and even the policy itself) if utility companies such as PG&E file for bankruptcy. In this instance, the CPUC (and, by extension, the public) would absorb the costs of such a failure so as to salvage contracts and, therefore, the policy.[[63]](#endnote-63) On the other hand, however, it is the companies that hold these contracts that can actually undermine the policy through irresponsible practices; for instance, PG&E may have caused the fires that now threaten the company with bankruptcy and, by extension, the public with economic and environmental damages.[[64]](#endnote-64) As RPS becomes more instituted and adverse weather events increase, the public should ensure that RPS continues to remain stringent, while pushing back against the companies that may hold undue sway over the policy.

*Fig. 1.: Stakeholder’s concerns surrounding RPS are often intersectional.*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | ***Issue with RPS*** |  |  |  |  |
|  |  | **High Electricity Prices** | **Reliance on Fossil Fuels due to Intermittency** | **Grid Reliability** | **Curtailment** | **GHG Increases** | **Utility Loss of Business** | **Transparency in Policy Formulation** | **Ability to Deliver Contract** |
|  |  |  |  |  |  |  |  |  |  |
|  | **Public Utilities** |  |  |  |  |  |  |  |  |
| ***Stakeholder*** | **Private Utilities** |  |  |  |  |  |  |  |  |
|  | **Developers** |  |  |  |  |  |  |  |  |
|  | **Public** |  |  |  |  |  |  |  |  |
|  | **CARB/CPUC/CEC** |  |  |  |  |  |  |  |  |
|  | **CAISO** |  |  |  |  |  |  |  |  |

*Fig 1. Stakeholders’ concerns surrounding RPS have a large degree of overlap.*

Appendix B: Endnotes

1. California's Greenhouse Gas Emission Inventory. (2018). [↑](#endnote-ref-1)
2. Vogel, D. (1999). Environmental Regulation and Economic Integration. [↑](#endnote-ref-2)
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4. California's Electricity | California and Nuclear Energy Opinion - World Nuclear Association. [↑](#endnote-ref-4)
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6. Ibid. [↑](#endnote-ref-6)
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8. Idem, p. 2. [↑](#endnote-ref-8)
9. Idem, p. 7. [↑](#endnote-ref-9)
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31. California Energy Commission - Tracking Progress: Efficiency. (2019), p. 5. [↑](#endnote-ref-31)
32. Idem, p. 3. [↑](#endnote-ref-32)
33. Ibid. [↑](#endnote-ref-33)
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    Assignment 2 Comments

    Clarity and quality - 27/30

    Writing clarity is generally quite high and the document is well structured. One structure change is to move the current energy portfolio section earlier, as it is helpful to understand what the grid is currently before trying to understand how it will/should change. Stylistically, introducing some of the issues and topics, like the RPS, would better align with the purpose of the assignment. Defining at some point that you’re looking at electricity only, and not energy more broadly, is also important, and should include some acknowledgement of what proportion of GHGs electricity is actually responsible for. Some misunderstandings on terminology of more technical aspects, while not your background, please do continue the effort to expand your knowledge here.

    Overall analysis of context (comprehensiveness) - 18/20

    Coverage of the socio-political context is very well done. A big improvement in the communication of electricity sources.

    Discussion of energy policy objectives - 13/15

    Pretty comprehensive. In assignment 3, please do increase the focus on counterarguments as well. It’s fine to take a position, but write like a scientist, not a lawyer.

    Stakeholder influencer map - 13/15

    References provided for all data and to support the discussion - 10/10

    Quality of sources - 9/10

    Total - 90/100 [↑](#endnote-ref-64)