DOCKETED

Docket Number:	15-IEPR-06
Project Title:	Renewable Energy
TN #:	204736
Document Title:	Sierra Club Comments on 2015 IEPR Report
Description:	N/A
Filer:	System
Organization:	Sierra Club/Kathryn Phillips
Submitter Role:	Public
Submission Date:	5/26/2015 4:07:00 PM
Docketed Date:	5/26/2015

Comment Received From: Kathryn Phillips
Submitted On: 5/26/2015
Docket Number: 15-IEPR-06

Sierra Club Comments on 15-IEPR-06

Additional submitted attachment is included below.

In the matter of,	) Docket No. 15-IEP-06 – Renewable Energy
2015 Integrated Energy Policy Report	) Subject: Workshop on Renewable Progress, Challenges and Opportunities

Comments submitted to: http://www.energy.ca.gov/2015_energpolicy/ via Submission of e-comment.
Cc: Angela.Gould@energy.ca.gov
Submitted: 5/26/15

Comments of Sierra Club California

Sierra Club California respectfully submits these comments in response to the 2015 IEPR Report; Workshop on Renewable Progress, Challenges and Opportunities held May 11, 2015.

Getting to a 33% RPS by 2020 is moving along well and has surprised early skeptics that it has progressed so well. Getting more renewables installed to reach a 50% RPS is eminently doable. In 2008, the RPS was 13% and at end of 2014 has reached about 25%. On average, we have added 2% to the RPS per year. Just extrapolating that growth rate would take us to 53% by 2030. There are many more developers, financiers, supportive policies and cost reductions for renewable technologies all providing an increasingly encouraging environment making even more growth for renewables possible.

When assessing challenges and opportunities to get to a 50% RPS by 2030, we must develop a vision of what that would look like then and how we can best transition to the new state. Part of the visioning also needs to consider what the trajectory needs to be in 2030 to take us to at least 80% RPS by no later than 2050.

I. **Following are a few of the key factors that will have a significant impact on what the grid of the future will look like.**

Fossil fuels will play a minor and diminishing role in electricity generation by 2030. At an RPS of 50%, the state will actually have a much higher percentage of electricity generation from GHG free resources. While we should not change the definition of a renewable resource to include large hydro, in fact large hydro (depending on climatic conditions) may well continue to provide about 8% of the state's electricity and behind the meter solar could well be providing 10% by then. This means that total fossil free generation would then be providing the overwhelming majority of electricity approaching 70%. And that's just 15 years away. Fossil generation will contribute a rapidly diminishing minority of generation.

By 2030, residential customers are forecast to be receiving the majority of their electricity from behind the meter generation with the grid supplying a minority of power. (This could also occur for commercial customers by 2034.) A key change occurring is the increasingly rapid adoption of behind the meter solar in the commercial and residential sectors. The Rocky Mountain Institute released a seminal report a year ago entitled, "The Economics of Grid Defection" (http://www.rmi.org/electricity_grid_defection) which was widely read and widely quoted. It has just released a new report entitled, "The Economics of Load Defection" (http://www.rmi.org/electricity_load_defection). This later report should be required reading for all electricity sector agency, utility and other stakeholder policy and decision makers. Its premise is that with the continued cost reductions of PV solar and battery storage contrasted with rising (e.g. 3% /year) grid power costs, that adoption of PV alone and then PV + battery storage will increase at an accelerating pace. This will have the impact of solar PV supplanting the grid for supplying the majority of customers' electricity. For example, they forecast (using conservative assumptions) that by 2030, the economically optimal generation mix for commercial customers in Los Angeles will be to get only about 70% of their power from the grid with 30% coming from the customers' self-generation. And by 2036 only about 20% of the optimal generation mix is expected to come from the grid! This will have a significant impact on reducing utilities revenue streams under current business models.

The Grid Model is changing from one predominated by utility owned/contracted centralized generation to a state where a large portion of generation (a majority?) will come from customer owned distributed generation infrastructure. The existing grid model of large centralized generation with electricity moving one way to end customers is rapidly transitioning to a future grid where most if not all generation is distributed and power can move in both directions throughout the grid to meet changing needs most cost effectively. The gird is changing from one in which essentially all the assets and infrastructure are owned and operated by the utilities and related partners to one in which a significant portion – maybe even a majority – of those grid assets are owned by end customers. In the hoped for new grid, end customers and the utilities will become partners working together to maximize reliability, security, safety and resilience, while minimizing GHG emissions, capital costs for infrastructure by both the customer and the utility and operating expense.

Modifications of the grid used to be largely controlled by the utilities and electricity agencies but now the utilities must respond to independent actions taken by customers.
Customers are now installing PV, Solar, DR enabled thermostats, electric vehicles, charging infrastructure, battery storage, implementing energy efficiency interventions, etc. at their will. This places unknown and unplanned impacts on load, voltage regulation, frequency regulation, the need for flexible resources, etc. and the utilities must now do their best to anticipate and prepare for them in advance. Utilities may need to do better modeling of these trends through data gathering, customer surveys, etc. to more accurately estimate what technologies are being acquired where and at what pace to meet needs.

S**ociety is increasingly valuing grid reliability, resilience and independence** – This is becoming a trend in our society shared by families, businesses and governmental jurisdictions alike that are driving behaviors that will change the grid independent of what grid operators plan. In the aftermath of Hurricane Sandy, many jurisdictions in the affected and surrounding areas are installing microgrids that could island and operate independent of a future grid outage.

Another example of this trend is in the first week following Tesla's recent announcement of their new stationary battery storage products, they received more than 38,000 requests for orders for their Powerwall residential product. This clearly shows a surprisingly high level of interest in this type of home battery storage product especially as a backup system for customers with solar PV systems. The interest from this early adopter group is most likely driven more by customer desire for greater resiliency than by cost effectiveness.

What are the implications of this?

1. Investing in new fossil generation is no longer financially viable over the long term and is counter-indicated in the state's quest to reduce GHG emissions.
    a. We should cease approving the construction of new baseload gas fired generation. These plants would otherwise quickly become stranded assets and much sooner than their expected financial lives much less than their physical lives. When existing gas fired plants are retired, they should not be re-powered with gas fired generation. There are already existing assets and others under construction that have a high likelihood of becoming stranded assets and so it would be unwise to further add to this inventory. Investing in new fossil generation now is an abrogation of responsibility of decision makers to its ratepayer customers.
    b. We should cease to approve the construction of any more gas fired peakers. There are now better, more functional and cost effective GHG emission free alternatives.

2. It may also be unwise to further invest in existing gas fired peakers to increase their flexibility or lower their minimum operating level ("Pmin"). Instead, those funds may be more wisely invested in low or no GHG emission flexible resources.

3. In light of significant new renewables development driven by the 50% RPS and simultaneous load reduction driven by customer installed generation, a fossil generation plant retirement plan should be developed by each utility. This plan can serve to decide which plants should be retired when and allow sufficient time to examine any modifications that may be needed on the grid currently served by those facilities.

4. Utility investments in their grids and transmission facilities need to be strategic and generally not focused on increasing load carrying capacity but switching to managing declining loads and an increase in the prevalence of distributed energy resources (DERs). Utilities should be asking the questions – "What will the requirements of the grid look like in 2030, where are we now and how can we transition to the new state as safely

and cost effectively as possible?" The answers to these questions will help guide investment decisions more apt to be the most cost effective in the long term. Programs are in place already making some progress in this direction including the IOU's Smartgrid Deployment plans as required under SB 17, (Padilla, 2009). In addition, the IOUs are now developing their Distribution Resource Plans as required under AB 327, (Perea, 2013). The comprehensives of these and other planning processes and pace of implementation will be critical to success.

5. Utility business models will need to change to find ways to engage in the new technologies and provide new services that can provide sustainable revenue streams as they provide value to their customer base.

6. The electricity grid is changing at an unprecedented pace and requires even more leadership from the state's agencies. It may be that these agencies need to examine what is now required from them and re-assess the way they are developing and implementing new regulations. Are they doing so fast enough to meet needs, are they integrated enough or too fragmented, do they have access to the expertise and do they have the human resources needed to get the job done in advance of the on-coming train?

II. Flexible Resources and Overgeneration - these are two related key issues that must be addressed in accommodating increased intermittent renewables.

The key premise of the oft discussed "Duck Chart" is that as we move closer to a 33% RPS the neck of the duck will continue to grow representing up to a daily evening upward ramp of 13,000 MW and that the belly of the duck will continue to drop lower thus increasing overgeneration.

There are many available, proven and cost effective solutions to this problem and a portfolio of these solutions is needed. A first step that can be taken is to stop the future worsening of the shape of the Duck by implementing new renewable resources in a way that does not add to the problem. Some of the actions that can be taken here include:

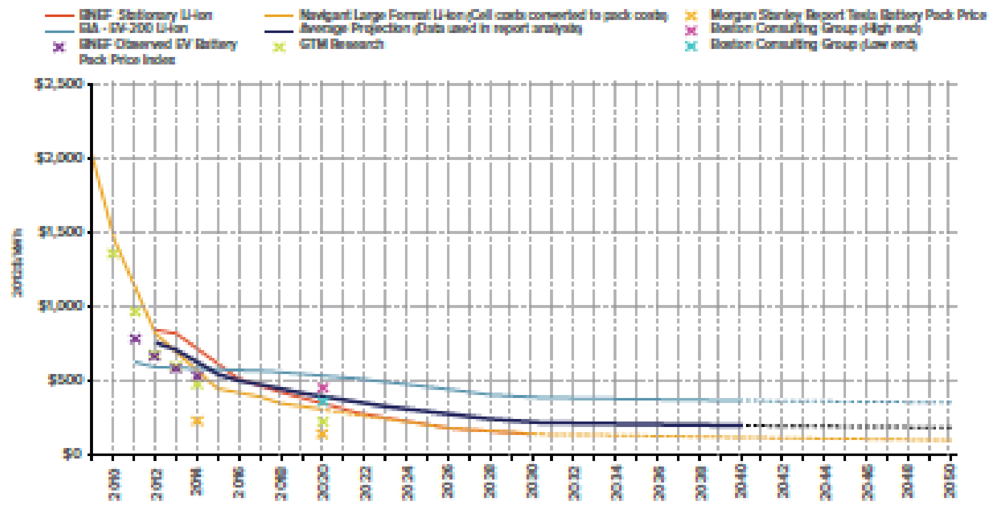
1. **Install flexible resources at the same time as and co-located with intermittent renewables.** For example, install battery storage along with new wind and solar. Currently, utilities must respond to newly installed intermittent renewables by providing more flexible resources. Instead of investing those funds centrally, provide incentives to wind and solar developers to install storage resources such as battery energy storage onsite at the same time the renewable facility is built. Along with required smart inverters, these resources can provide most of the ancillary services needed to manage their generation and not otherwise "export" these integration problems upstream to the utilities' central grid infrastructure. This solution should also apply to behind the meter solar where owners are required to install smart inverters and financially incented to install storage at the same time they install their solar systems. We recommend that the agencies explore developing specific new tariffs, policies and financial incentives to accomplish these objectives.

2. **Existing fossil based flexible resources need to be replaced with low or no GHG emission resources.** Today, there are more effective flexible capacity resources (EFC) available than would be needed to meet the 13,000 MW ramp shown in the Duck Chart. However, some of these will go away with OTC retirements. Not all of this EFC needs to be replaced. By installing new zero emission flexible resources as new renewables are installed and by taking other measures, the 13,000 MW ramp may not be realized and would not grow further as the RPS climbs to 50%. Existing fossil fueled flexible resources are a continual source of criteria pollutants and GHG emissions because they must run all the time.

   Retiring existing gas fired generation plants will reduce the "must run" generation that these plants and especially peakers produce. This will reduce the minimum generation in the grid and provide more room for peak renewable generation thus reducing overgeneration.

3. **There are a portfolio of preferred resource solutions** that can obviate the need for more flexible capacity or meet these needs including:
   a. **Storage –** battery, pumped hydro, compressed air, hydrogen production via electrolysis combined with fuel cell electricity production when needed, etc.
      i. The good news is that similar to what has happened with the costs of PV solar systems, battery storage costs are already starting to experience dramatic cost reductions and more are forecast.
         1. The Rocky Mountain Institute in its report entitled "The Economics of Grid Storage" contains the chart below on Lithium-ion battery pack prices. The costs have declined from over $1300/ KWh in 2010 to about $500 / KWh in 2015 and are forecast to get as low as about $100/ KWh by 2020.

FIGURE 21:
LITHIUM-ION BATTERY PACK PRICES: HISTORICAL AND FORECASTED



2. In a recent example of cost reductions, Tesla's new commercial stationary batteries are $250/ KWh and their residential battery product is at $350/ KWh. This is roughly half the reported current costs in the industry.
3. None of these battery cost forecasts consider the potential cost reductions from new battery technologies and chemistries even though billions of dollars worldwide are being aggressively invested in this type of research.

ii. **Hydrogen production** – using excess renewable electricity to produce hydrogen fuel (electrolysis) which can be stored and then dispatched to power fuel cells to make electricity when needed, can complement battery storage and other technologies to mitigate overgeneration and provide diversity of flexible resources. Electrolysis can produce large amounts of stored energy in the form of hydrogen fuel limited only by the size of storage tanks. And the costs of electrolysis are coming down. New technologies introduced this year are cutting capital costs / kilogram of hydrogen production by 50% for one leading vendor.

b. **Expanded Energy Imbalance Market (EIM) –** CAISO continues to make excellent progress in expanding the EIM further throughout the western states. PacifCorp is now on the road to potentially becoming a full participant in the CAISO.

c. **Demand Response –** DR can both lower load to reduce demand peaks and can raise load to absorb overgeneration to prevent curtailment. (Examples of "up" DR to offer a load to absorb excess generation can include turning on electric water heaters, chilling or heating water for industrial purposes, charging electric vehicles, turning on electric space heating, pumping water, etc.) The volume of assets available for demand response will increase with time. For example, the volume of electric vehicles is transitioning at an accelerating rate to electrification not only in the light duty transportation sector but also in the medium and heavy duty sector such as in buses, garbage trucks, delivery trucks, etc. As zero net energy homes become required by 2020 and new commercial buildings are increasingly built as ZNE, new DR enabled electrical loads will become available such as for water and space heating and with battery energy storage installed with PV systems. The growth of commercial battery storage to mitigate demand charges will make these resources available to aggregators and utilities when polices, tariffs and price signals are put in place to monetize and drive these benefits. More aggressive and urgent action on the part of the CPUC, CEC and CAISO are needed to put these new DR polices in place. While California has been and is a national leader in so many areas, this is one key area where the state is falling behind and missing a significant opportunity.

d. **Diversified renewables portfolio** – We recommend that consideration be given to the benefits – economic and others – that a diversified portfolio gives to the grid. While solar is now growing very rapidly and we are strong supporters of solar, a portfolio of more, appropriately-sited wind can complement the generation profile of solar. Further, technologies such as geothermal and concentrating solar power with several hours of thermal storage can provide emission free renewable generation without requiring additional flexible resources.

III. **RPS Structure** – We support keeping the existing RPS framework using the current definitions of renewable resources, including interim RPS targets within 2-3 year compliance periods, etc. The existing structure is well understood, has created a robust renewables market, engaged good financing, provided market certainty, created new industries, created good jobs within the state and has been very successful in accomplishing its GHG reduction objectives. Maintaining this structure will promote all of these benefits continuing in a seamless and uninterrupted way. The time it would take and ambiguity it would create to try and develop a substantially new structure risks disrupting all of these positive trends. The utilities have been promoting a "Clean Energy Standard" structure which as we understand it could include other strategies to lower GHG emissions but as a substitute for the full achievement of at least a 50% RPS effectively lowering the RPS. We don't object to additional appropriately designed program features that would, for example, incent utilities to further support the electrification of the transportation sector or improvements in building energy efficiency that is more holistic and measurably provable but only if they are in addition to the 50% RPS which clearly defines how much of grid power must be produced by renewable resources.

IV. More progress is needed on renewables installed on state lands – In November, 2011, the CEC produced a document entitled, "Developing Renewable Generation on State Property"**.** This report laid out a program to develop significant additional renewables on state buildings and state controlled lands. As reported in the 5/11/15 workshop, while progress has been made on state buildings, relatively little has been made on state lands. We recommend that the CEC revisit this report, update the plan and make a new commitment to achieve it through appropriately sited renewable projects. A special emphasis should be given to distributed generation projects which are often closer to load, faster to implement and have potentially less environmental damage.

Respectfully submitted,

Ray Pingle
Lead Volunteer, 2015 IEPR Report Project
Sierra Club California

Kathryn Phillips
Director
Sierra Club California