

The Case for Baseload and Flexible Renewables

**Diversity and Flexibility:** A diverse clean energy resource mix is absolutely necessary to achieve the state’s clean energy goals. California will succeed in its surge forward with an increased Renewables Portfolio Standard (RPS) and in accelerated achievement of its greenhouse gas (GHG) and short-lived climate (SLC) pollutant reduction goals in a balanced and cost-effective manner if it continues to integrate baseload and flexible renewables into the expanded RPS. Resources such as geothermal, bioenergy and solar or wind combined with energy storage are key to achieving a regionalized, resilient power mix that best allows the state to anticipate and adapt to needed changes across sectors while moving toward a fully renewable power mix. Utilizing already interconnected geothermal and bioenergy resources will also allow the state to make the best use of existing natural resources to address environmental, air quality and economic inclusion issues via significant, sustainable non-energy benefits. Increasing the footprint of solar/wind projects combined with energy storage, and incorporating energy storage facilities into other existing footprints will also serve to flatten out the variability of these other renewable resources.

**Geothermal:** Geothermal power is a clean energy resource that also provides significant water quality improvements in regions where the geothermal plants can recharge wastewater at high temperatures, helping to address the state’s clean water and water supply issues at the same time we are solving for reliable, renewable power. Located primarily in Lake and Imperial counties, existing geothermal resources also provide high paying, long term jobs in two of the highest unemployment and poorest counties of the state. In Imperial County existing and new geothermal resources will also contribute to addressing the state’s most significant regional environmental challenge, dust mitigation and water quality issues in the Salton Sea. Failure to incorporate geothermal resources into energy and procurement planning in the RPS would adversely impact electric system reliability and ultimately results in higher costs while also causing devastating environmental and economic impacts far beyond the electric sector.

**Bioenergy:** Bioenergy is another key resource to enhance grid reliability and resilience and is much more distributed across the state, enhancing the ability to address local reliability. While the state focuses on innovation and advancement with other renewable resources, there has been an unfortunate tendency to cast bioenergy aside based on outdated ideas about how electricity is generated from these resources and how its fuel stock is derived. While we embrace new technologies and improvements for solar and wind generation and increasingly invest in energy storage, we dismiss changes, innovation and advancement in bioenergy technologies and practices. The reality is that bioenergy (and biofuels for the transportation sector or as injectable fuel into pipelines) is adapting and is a true 21st century resource that provides broad environmental and economic benefit well beyond the electric sector.

Bioenergy is a cornerstone for circularity and sustainability in our energy, environmental and economic planning. The fuel stocks for bioenergy are forest, agricultural and landfill wood waste. California faces an ongoing tree mortality crisis with over 100 million dead and dying trees not just in our forests, but now spreading into our urban areas, and biomass has been determined by agencies across the board as the best end use for the mounting forest waste. In the agricultural sector, even as growers expand programs for soil treatment, composting and mulching, the bulky wood waste materials that are not diverted into bioenergy fuel are increasingly open burned. As a result of increased open burns, the air quality situation in the central valley has worsened significantly with the closure of bioenergy facilities and with the requirement that some of the plants that remain open there must receive so much of their fuel stock from high hazard forest waste.

Tree health is best maintained in both the agricultural and forest sectors by effective waste wood diversion and dead or unhealthy tree removal. Tree health is essential to effective absorption of storm water, another key environmental goal, especially as we address climate adaptation. There is no clear cutting of forests involved in producing bioenergy in California in 2017, and only suitable, untreated wood waste fuel is now used as an industry practice.

Finally, in compliment to composting, mulching and other recycling diversions at landfills, California will not achieve either its aggressive landfill diversion or its GHG and SLC reduction goals without continued and enhanced landfill diversion into bioenergy/biofuels. The avoided emissions from each of these sectors diverting into available bioenergy facilities are exponentially larger than the decreasing levels of onsite emissions at bioenergy facilities utilizing BACT and MACT control technologies and other sustainable practices. Measuring and monetizing non-energy benefits will create ongoing incentives for such diversion and further accelerate economic and environmental health in many disadvantaged regions of the state.

**Solar/Wind Combined with Energy Storage:** California first adopted an energy storage target in 2010 via legislation and has already moved forward with significant development of both utility scale and distributed energy storage. Siting energy storage at large scale solar or wind facilities allows generated power to be stored and deployed during the periods when it is not being generated – so output can be better matched to periods of energy demand. While energy storage is not considered a generation resource, it augments the grid value of solar and wind generation by smoothing out the intermittency of wind and solar. Cost-effectively integrating storage at the distribution level and onsite where these types of generation are located on a larger scale basis creates a more flexible resource that can store unused power in situations where there is real-time over-generation, and allow that power to be released onto the grid coincident with actual demand.

**Resiliency and Reliability Enhanced by Diverse Mix of Resources:** California has sufficient baseload and flexible renewables already interconnected to its grid in the form of geothermal, bioenergy (biomass and biogas), etc. to smooth out the current peaks and valleys in energy supply caused by the more intermittent nature of solar and wind generation. The state is also rapidly expanding its energy storage resources. Solving for ways to maximize the cost-effective deployment of these combined resources, especially when considering the non-energy environmental and economic benefits of many existing resources and the long term environmental benefits of coordinated integration of energy storage with varied renewable resources is key to ensuring grid resiliency and reliability as we move to a fully renewable power mix. Balancing grid scale and distributed resources and ensuring there is both economic and environmental equity and inclusion in regional planning of resources and resource use across the state is critical to ensuring long term sustainability of energy supply. Water, transportation, conservation, agricultural and other impacts of all resources need to be assessed across industries so we do not simply displace emissions in one sector and shift them to another, and we need to assess full lifecycle impacts/benefits of all resources to make the right environmental and economic choices for both the short and long term.

**Economic Inclusion:** All renewable energy resources are of high value from an energy and environmental perspective, especially when we assess lifecycle impacts. They also all provide significant economic benefit. It is important to note, however that resources such as geothermal and bioenergy/biofuel are uniquely positioned to fully incorporate economic inclusion into the state’s long term energy planning. The ancillary benefits to water quality and enhanced water supply, reduced risk of rampant wildfires that spew harmful carbon emissions and particulate matter into the air, more sustainable agricultural waste removal that also eliminates the need for noxious open burning, and collaborative work to divert non-compostable landfill wood waste into fuel for clean energy and transportation are significant. Use of these baseload and flexible renewable energy resources are crucial to incorporating circularity and sustainability planning across sectors while also enhancing electric system reliability and resilience. Similarly we need to assess and maximize the economic inclusion potential of flexible renewable/storage combinations and deploy resource mixes that enhance environmental and economic benefits well beyond the electric sector and reduce climate risk throughout the state.

**Monitoring:**  There is currently much study being done in California to assess the environmental benefits of bioenergy/biofuels from the forest sector and a much needed lifecycle study is also now proposed to assess forest, agricultural and landfill bioenergy/biofuel benefits. We already have significant data to support the need for baseload and flexible renewables as part of a diverse portfolio for a reliable, resilient clean energy grid. While all of this data continues to be analyzed and assessed and as improvements continue to be made in the efficiency, environmental controls and in reducing emissions across the lifecycle of bioenergy/biofuels – monitoring is an essential tool to determine how successful we are at achieving and sustaining ongoing emissions reductions associated with these technologies.

Similarly, we need to continue to assess the full lifecycle impacts and benefits of geothermal, solar/wind combined with storage and with other resources and combinations/strategies that appropriately balance grid reliability and resiliency with lifecycle environmental and economic sustainability. We hope to get to a zero emission profile for generated electricity, but we need to take care not to shift emissions elsewhere or overlook other environmental outcomes or risks from how we source, produce or deal with the waste products of our energy resource mix. Sustainability, circularity, adaptability and cross-sector planning are all also part of monitoring and assessment requirements for an economically viable low carbon future.

**Urgency:** Now, before we lose existing resources and while we can continue to improve upon the efficiency and value to the grid and to achievement of our environmental goals of all of our renewable and grid resources, is the time to set policy that will ensure baseload and flexible renewable resources continue to be available. We need to look at grid values of all of these baseload and flexible resources and also their lifecycle environmental and economic benefits regionally and throughout the state. We can reverse some of the environmental harm already being experienced in vulnerable regions if we act fast to address the need for these resources to be sustained and continue to adapt, but if we fail to act now we widen the economic gap and worsen the environmental situation in already disadvantaged regions of the state.