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Docket Number:	19-SB-100
Project Title:	SB 100 Joint Agency Report: Charting a path to a 100% Clean Energy Future
TN #:	230590
Document Title:	University of California Multi-Campus Team on Energy Storage Comments - University of California - Research Needs for an Equitable and Robust Transition for Meeting SB100 Goals
Description:	N/A
Filer:	System
Organization:	University of California Multi-Campus Team on Energy Storage
Submitter Role:	Other Interested Person
Submission Date:	11/12/2019 8:41:12 AM
Docketed Date:	11/12/2019

Comment Received From: University of California Multi-Campus Team on Energy Storage
Submitted On: 11/12/2019
Docket Number: 19-SB-100

University of California - Research Needs for an Equitable and Robust Transition for Meeting SB100 Goals

See our comments in the attached document.

Additional submitted attachment is included below.

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University of California Multi-Campus Research Programs & Initiatives
Multi-Campus Team on Maximizing the Environmental Utility of Battery Energy Storage
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November 12, 2019

To the SB100 Joint Agency Report Scoping Team,

In order to meet the goals of SB100 in a robust, economical, and equitable manner, technological and policy solutions must be selected to achieve a carbon-neutral infrastructure while avoiding potential unintended consequences for environmental and socioeconomic outcomes. To better advise the selection of these solutions, we need to improve our understanding of the potential indirect benefits and impacts associated with their implementation. Specifically, there are two key areas requiring further research towards this end:

First, plans to meet SB100 must assess potential greenhouse gas emissions outside of California throughout the life-cycles of low-carbon infrastructure to be built in California. Given the global nature of greenhouse gas impacts, we must ensure that greenhouse gas emissions in other regions generated in support of our low-carbon transition do not negate greenhouse gas emissions reductions achieved in California. Depending on the technologies implemented for developing a carbon-neutral infrastructure and their contribution to global supply chains, the net greenhouse gas emissions benefits for meeting SB100 in California can be partially offset by greenhouse gas emissions contributions from out-of-state components of the technology life cycle.

This aspect can be addressed by incorporating life cycle assessment (LCA) of low-carbon and supporting technologies under consideration for complying with SB100. These analyses can be leveraged for quantifying the extent to which different SB100-compliant pathways contribute greenhouse gas emissions outside of California and serve as an additional metric for evaluating different pathways. LCA studies have been performed on various low-carbon electricity technologies and some supporting technologies such as batteries. Before LCA can be utilized to provide information relevant for SB100 planning, however, there are still significant needs to 1) standardize the data and scope of these analyses and 2) perform LCA studies of emerging and rapidly changing technologies that may be included as part of SB100-compliant technology pathways. The University of California system contains significant expertise in the development of LCA methods and their application for producing policy-relevant information, and can therefore contribute towards meeting these needs.

Second, plans to meet SB100 must also assess the impacts and benefits of different pathways for non-greenhouse-gas environmental and health outcomes to sufficiently address equity issues. The distribution of the costs for meeting SB100 and the affordability of these solutions for disadvantaged populations are important components of ensuring that the goals of SB100 are met in an equitable way. For example, while distributed household-scale battery systems or battery electric vehicles provide greenhouse gas emissions reductions in addition to energy security and resilience benefits, the price-barrier of such technologies may prevent low-income households from enjoying these benefits.

Additionally, however, it is also critical that plans to meet SB100 assess the environmental and human health benefits or impacts associated with SB100-compliant pathways. Unlike greenhouse gas emissions, which can be assumed to be global in nature, other impacts such as effects on air quality, water quality, toxic substances exposure, and likewise are strongly regional in nature and disproportionately affect economically disadvantaged populations. For example, battery technologies may contribute towards enabling a carbon-neutral energy infrastructure. Recycling of these technologies may be needed to sustain the material needs of the energy infrastructure, but the siting of recycling facilities in economically disadvantaged areas may increase toxic substances exposure, as well as air and water quality, for the local population[1]. In essence, there exist trade-offs among different life cycle stages and impact categories, as well as spatial and temporal boundaries. These are best addressed through systematic analysis methods such as alternatives assessment, which provides a foundation for both specificity and robustness in comparing alternatives relative to the overall system functionality and policy objectives.

A framework for assessing the potential for these types of impacts is needed to ensure that SB100 is implemented in an equitable manner. California has an impressive record of leadership in implementing forward-thinking policies to protect human health and environmental quality. Yet, community-level research has demonstrated gaps in the level of engagement of vulnerable populations in a way that supports equitable distribution of benefits from state-wide policies without partitioning risks of unintended adverse side-effects to those who are least able to bear the burden due to socio-economic disparities. Research is needed to investigate the role of social empowerment in addressing the risk distribution problems that are already associated with climate change impacts and to develop evidence-based policies that will avoid similar problems in the implementation of SB100.

Further, we believe that an LCA of the California energy system with high spatial- and socio-economic resolutions combined with various transitional pathway scenarios will be critically important. Currently, there is neither the data infrastructure nor the analytical platform to allow an integrated understanding of the environmental and socio-economic implications of low-carbon transition pathways in California. Such a data infrastructure and analytical platform can elucidate not only environmental but also socio-economic trade-offs of technological choices and siting decisions. The results can help develop policy instruments needed to protect low-income households while achieving carbon-neutral infrastructure.

Developing a further understanding of these topics and addressing these needs can be accomplished by leveraging the existing research expertise of the University of California system on toxicity and human exposure assessment, LCA, alternatives assessment and decision-making, and energy system modeling. We look forward to engaging in the SB100 scoping process and aim to work with other stakeholders to identify and pursue key research priorities to support California's SB100 goals.

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[1] Ogunseitan, O.A. 2016. Power Failure: The Battered Legacy of Leaded Batteries. *Environmental Science & Technology*. DOI: 10.1021/acs.est.6b03174.

Sincerely,

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