STEAB June 2016 Meeting
June 14-15, 2016
Lawrence Berkeley National Laboratory
Berkeley, CA

JUNE MEETING ATTENDEES

Designated Federal Officer (DFO):

- Michael Li, DFO, EERE, DOE
- Molly Roy, EERE, DOE

STEAB MEETING ATTENDANCE		
BOARD MEMBERS	Present	Absent
Jeff Ackermann, Director, Colorado Energy Office	X	
Susan Brown, Deputy Administrator, Wisconsin Division of Energy		X
Tom Carey, Director, Energy and Rehabilitation Programs, New York State Division of Housing and Community Renewal		X
Molly Cripps, Director, Office of Energy Programs Tennessee Department of Environment & Conservation	X	
Diane Duva, Office Director, Office of Energy Demand Bureau of Energy and Technology Policy Connecticut		X
Lauren Faber, Deputy Chief Sustainability Officer, Los Angeles, CA	X	
Marion Gold, Commissioner of Energy, Rhode Island Office of Energy Resources	X	
Robert Jackson, Director, Michigan Energy Office , Michigan Economic Development Corporation	X	
Elliott Jacobson, Vice President for Energy Services, Action Energy		X
Maurice Kaya, Hawaii Renewable Energy Development Venture	X	
Ashlie Lancaster, Director, South Carolina Energy Office		X
Louise Martinez, Director, New Mexico State Energy Office		X
Katrina Metzler, Section Supervisor, Weatherization Office of Community Assistance, Ohio Development Services Agency		X
Andrew McAllister, Commissioner, California Energy Commission	X	
Frank Murray, Consultant and Strategic Advisor, Former President and CEO, New York State Energy Research and Development Authority	X	
David Springe, Executive Director, NASUCA, Washington, DC		X
William "Dub" Taylor, Director, Texas State Energy Conservation Office	X	
Geoff Wilcox, Weatherization Program Administrator, State of Vermont		X
Malcolm Woolf, Sr. Vice President, Policy and Government Affairs, Advanced Energy Economy		X

Contractor Support:

- **Genny Baptiste**, Coordinator, SRA International Inc.

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Welcome and Introductory Remarks: STEAB Goals

- STEAB Chair, Frank Murray (FM), opened the meeting thanking all members for their participation. Mike Li (ML) and FM then reviewed the agenda for the day. ML stated that the new members and re-appointed members of STEAB have been signed off and approved by the Secretary. They proceeded with Task Force updates and goals for the meeting. Frank stated that he wanted the focus for the next few months to be on the separate Task Forces getting back on track with their monthly meetings. He believes a lot of the brain storming and recommendation ideas come from those meetings and they will be key in putting together the transition document.
- Mike Li welcomed the Board and thanked them for participating in the Berkeley meeting. He stated that he wanted the focus during the meeting while hearing the speakers to be on the working paper/transition document that was started during the last meeting. Mike Li wanted the board to listen to the speakers and start to develop ideas to incorporate into the transition document that would be a great vehicle for the next administration. He also asked the Board members to find out how each topic can fit into the various states represented by STEAB. Also to think about how the projects/programs being presented can be improved to benefit and be more relevant to the various states.
- They then proceeded to start with the first invited speaker on the agenda.

The Status of Solar and Net-Metering
Bryan Miller, SVP Sunrun and Melicia Charles, CPUC

- Mike Li (ML) introduced Bryan Miller (BM) and gave a little background about him. BM used to work at DOE in the General Counsel's office where he has spent about half of his career on the Federal side. He served in the first 2 years of the Obama administration then moved to Constellation Energy which later merged with Exelon where he worked on renewable energy across the country. He then moved to Sunrun where he is currently working managing political regulatory affairs.
- BM then started with an overview of rooftop solar, how it works, and the benefits. He explained that solar panels are made of photovoltaic cells that convert sunlight to direct current electricity (DC electricity). As long as rays are hitting your roof, rain or shine, your panels are converting solar radiation into DC electricity. But in order to get the kind of power needed to turn the lights on in your living room, you'll need an inverter. The inverter is a device that takes the DC electricity produced by your solar panels and turns it into alternating current electricity (AC electricity). It's typically installed on an exterior wall of your house, or in the garage. Your Sunrun meter monitors your system production and sends the information to Sunrun through a wireless signal. Since it tracks your energy production 24/7, it will automatically alert Sunrun if it detects problems or irregularities. Solar electricity from your inverter flows to the electrical panel, and then into to your home where it powers your lights and appliances. Or, if you generate more solar energy than you use, it flows into the utility grid and while you rake in the solar credits.
- BM then went on to discuss net-metering. He explained that the net meter measures the amount of electricity you draw from the grid, and how much excess solar electricity you push into it. So when you use less electricity than you make, you get credit from the utility company.
- To close out his discussion, Mr. Miller focused on savings. He explained that most people what to know the benefit to rooftop solar and most customers want to know what they save and how does Sunrun find that information. He stated that first, they looked at all of the customers they serve

across the country who went solar between October 15, 2014 and October 15, 2015 and calculated how much they would pay for the electricity our solar systems produce over a 20-year period. Next, they determined how much it would cost those customers to purchase that same amount of electricity from their local utility, assuming utility rates increase 3.16% per year. They compared the two numbers, and based on those assumptions; found that approximately two-thirds of their customers will save at least 20% by going solar with Sunrun.

- Bryan Miller then allowed Melicia Charles to come up and further discuss the status of Solar and Net-metering. Melicia is the supervisor for Emerging Procurement Strategies at the California Public Utilities Commission (CPUC). CPUC works at the technical advisory group for all things electric and gas related for the Commissioners. She started her presentation with an overview of NEM which is Net Energy Metering. She explained that NEM as a policy was established in 1996, and has been modified numerous times over the last 20 years. Any customer can install system renewable gen facility sized up to 1 MW as long as it is sized no larger than average annual load. NEM must be offered to customers until total installed capacity is equal to 5% of aggregate non-coincident customer demand. The goals of NEM are: Encourage private investment in renewable energy resources; Stimulate in-state economic growth; Reduce demand for electricity during peak consumption periods and stabilize California's grid; Diversify California's energy resource mix; Reduce interconnection and administrative costs for electricity suppliers; Encourage conservation and efficiency.
- She then went on to state that when NEM was established, solar was still really expensive compared to power from the utility, so the legislature established the solar incentive program the California Solar Initiative (CSI) in 2006. CSI was a 2 billion dollar program to install 1,940 MW of customer side solar by 2016 and to transform the market for customer-side solar. Basic structure was 10 incentive steps where the incentive levels decline as MW goals are reached. Customers would sign up for the NEM tariff and would receive the CSI incentive. As of 2015, all CSI incentives have been reserved – and we have seen a major transformation in solar market. That was the overview of NEM 1.0. They are now at NEM 2.0 and she proceeds to update the group on that.
- She explained that the legislature told them to do the NEM 2.0. AB 327, passed in 2013 did a lot of things – residential rate reform, distribution resources plans, revisit NEM; For the NEM portion – the 5% cap was getting closer and solar industry wanted to remove the cap, the negotiation was that if the cap gets removed, there needs to be an effort to make NEM more cost-effective. There was also the 2013 NEM evaluation study from E3 that showed a cost shift of $1 billion in 2020 from NEM to nonparticipating customers. NEM customers can zero out their bill, but they still use the wires when their systems aren't generating, and the IOU incurs costs on these customers' behalves for maintaining the wires. The IOUs are claiming that DG doesn't allow them to avoid system upgrades, so these costs remain, and they need to be recovered, which will result in increased rates that non-NEM customers would pay. At the same time, California has a strong GHG reduction policy and DG is a contributor to this, there is also the acknowledgement that DG can provide value to the grid, we just need to figure out how to capture it and quantify it.
- She explained that NEM 2.0 Continues basic NEM structure; Makes adjustments to align the costs of NEM 2.0 customers more closely with those of non-NEM customers; Allows systems over 1 MW to participate; Establishes warranty and equipment safety requirements; Guarantees NEM 2.0 customers can remain on Successor Tariff for 20 years from their date of interconnection; Commission will revisit NEM Successor Tariff in 2019. One of the differences from NEM 1.0 is the interconnection fee. Historically NEM customers have not paid a fee to interconnect to the grid.

Costs for IOU to review and ensure that a NEM system interconnects safely have been borne by all utility customers (including non-NEM). NEM 2.0 customers will pay these costs themselves. One time interconnection fee based on each utility's reported NEM interconnection costs. Allows utilities to recover costs of providing interconnection services from the customers who are benefiting. Fees for each utility being approved in Advice Letters ($75-$150)

- She ended the presentation by giving information for when NEM 2.0 takes effect. She explained that IOUs will each reach their NEM caps on different dates – but all expected before July 1, 2017; Can't predict dates with certainty; Based on MWs of systems installed; IOUs are publicly reporting their progress to their caps so customers/developers can make informed estimate; Any customer who interconnects before the NEM cap is reached is eligible to remain on NEM 1.0 for 20 years.

Storage: Technology and Policy

Audrey Lee, Advanced Microgrid Solutions
Nick Tumilowiczm EPRI

- Audrey Lee started her presentation stating that Advanced Microgrid Solutions is a behind the meter energy storage project developer, they project, finance, install, and operate behind the meter energy storage projects. They work very closely with the utility companies. She is here to talk about storage technology and policy. Audrey states that Storage is a technology; it is mostly about the policy and the market drivers and what problems are we using that technology to solve. She wants to focus the discussion on market transformation and the policy surrounding that.
- Audrey states that it is important in this market transformation to learn from our successes. The reason California was so successful in Energy Efficiency and Renewables is because there was a very strong effort to bring together policies to attack the problem from all different sides. She explained that the Public Utilities Commission, the Federal Government, Independent System Operators, and the Energy Commission are all different stakeholders coming together. With Energy Efficiency it started with decoupling; Utilities revenues not being dependent on how much energy they sold and then coupled with customer investment in their homes and businesses, Utility investments in energy Efficiency and also from the energy commission building and appliance standards. All those coming together really made energy efficiency take off and continue to see gains in California. Same thing with renewables; the Federal Government with the Investment Tax Credit and leveraging that, with a very strong Renewable Portfolio, Net Energy Metering and CA Solar Initiative.
- She explained the last piece of the loading is Demand Side Management or Demand Response. Demand Response, which provides incentives to shift energy usage away from times when there is high demand on the grid. Since 2007, the Commission has sought to work with the utilities to provide their customers with efficient and sensible ways of making energy management decisions easier for their customers. Decision (D.07-10-032) directs that utilities "Integrate customer demand-side programs, such as energy efficiency, self-generation, advanced metering, and demand response, in a coherent and efficient manner. She then went on to explain that the integration of demand side programs and technologies was expected to achieve maximum savings while avoiding duplicative efforts and reduce transaction costs and customer confusion. In short, IDSM is a strategy that seeks to provide comprehensive building energy management solutions via the integration of technologies, programs, and strategies to facilitate customer behavior changes that reduce load and grid inefficiencies.

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- Nick Tumilowiczm, EPRI, stated he appreciated the opportunity to continue the conversation around the value of the bi-directional, integrated grid. Imagine a world where a typical consumer can buy, sell, and manage their energy in real-time with their mobile device. A fully executed vision is still a ways down the road, but evidence of iterative gains toward this is underway. He explained that today he wanted to share a tangible example around the evolution of the bi-directional grid.
- Mr. Tumilowiczm discussed 3 topics during this presentation; Energy storage is a major key to an on-going transformation of the grid, Technology/policy drivers are making storage an opportunity right now and Utilities are well-suited to take the lead in storage implementation.
- He states that the role of energy storage starts with today's power system. The modern power grid was designed to operate as a just-in-time inventory system: power is generated at nearly the same time it is consumed. This has several consequences on the way the grid is designed.
  First, we have to continuously balance generation and load. We do not traditionally have control over load, so we maintain tight control over generation. We build controllable fossil fuel-powered generation plants and operate them at less than full capacity to provide us with the ability to quickly respond to second-to-second changes in the load. We build additional peaking generation that we can quickly bring online to respond to peak loads, even if they occur very rarely. This peak generation is turned off most of the time. We use complex prediction methods which estimate future load (years ahead, months ahead, weeks ahead, days ahead, and hours ahead) and then use equally complex control methods to control our generation units to ensure we have enough capacity to meet the need.
- Similar constraints dominate the design considerations in transmission and distribution. We have built transmission and distribution to serve peak consumption, which means that much of the infrastructure operates at less than 100% capacity most of the time. Furthermore, in most traditional systems, there is little control over the power flows in the grid. Finally, from a reliability standpoint, any interruptions in the system propagate downward from the point of interruption. To address this issue we have designed the power system with redundancy at every step, to reduce the chance of interruption. Note also that we do not have a mechanism for power to flow upstream. This system has worked very well for over a hundred years. But now things are changing.
- Then he moved to discuss the transformation of the power grid. He stated that we have now begun to develop a much more sophisticated power system, following the needs of the moment. First, increasing amounts of variable renewable generation has reduced our control on the generation side. We are using more sophisticated methods to predict how this impacts the grid, and we are developing new technologies to recover some of this control.
- We have also greatly enhanced ability to gather data on transmission and distribution networks, but we have limited ways in which we can effect change on those networks unless we deploy sophisticated smart grid assets (including storage). This is especially crucial because the grid is being asked to do things it was not previously designed to do, such as conduct power flow backward, from the load up to the system.
- He stated that new developments transpired at the federal and state level: Front-of-the-meter: 14 states and 2 regional markets, Behind-the-meter: 8 states Regulators are evaluating the participation of storage on the grid, FERC Rulings 755, 784, 792 open new doors for storage in electricity markets, PJM and other markets have created special market products such as Reg D, targeted for storage, California has mandated 1.325 GW of utility energy storage by 2020. Most investigators project continuing growth in storage installations over the next decade. Precise growth assessment is difficult given the small base of present projects. According to market research firm

IHS, the energy storage market is set to "explode" to an annual installation size of 6 gigawatts (GW) in 2017 and over 40 GW by 2022 — from an initial base of only 0.34 GW installed in 2012 and 2013.

- Storage is a rapidly developing opportunity, Incentives and markets already make storage compelling in some situations. Further cost reduction will result in increasing opportunity IPPs, solar developers, and others are moving quickly to capitalize on this (lease), Utilities are well-placed to leverage the opportunity; Utility-owned and operated storage can be rate-based assets (or services); Utilities can enable use of customer and third-party owned assets as part of the Integrated Grid; Distribution system operations can gain flexibility and value.
- He ended with the key take-aways from the presentation: Energy storage is part of an on-going transformation of the grid: By creating a system for inventory in a just-in-time supply chain, storage can radically transform the electric power enterprise, especially when linked to other technologies such as renewables. Several drivers are making storage an attractive opportunity right now: Newer and better storage technologies, falling costs, and enabling policy are coming together to create a highly favorable environment for learning about storage. Utilities are well-suited to take the lead in storage investment: While initial investments in energy storage have been focused on market applications, storage integrated into transmission and distribution systems and used for multiple applications provides the greatest benefit-cost potential

Lab Priorities and Interest: Chuck Goldman, Director, Energy Analysis and Environmental Impacts Division (EAEI), LBNL

- Mr. Goldman started the discussion with an overview of his presentation: LBNL Energy Analysis & Environmental Impacts Division; LBNL DSM Program Database & Cost of Saved Energy Project EE Program Reporting Tool, eProject Builder and Analysis of U.S. ESCO Industry, Low-income Program results, Energy Efficiency Financing, Electric Utility Regulation and Utility Business Models, Future Directions for DOE: Biennial State of U.S. Energy Efficiency Report??
- Mr. Goldman went on to explain his Division and its mission. EAEI's mission is to analyze U.S. and global energy consumption and its related impacts to inform policy, standards, and decision making for the benefit of society and environment. The group that he leads and does most of his research is Electricity Markets & Policy; they do a lot of work for the Office of Electricity and their wind and solar program in parts of EERE. The research results he plans to share come from the work of this group. In his division they also have 2 international groups. They have been working in China for almost 30 years. They work with Chinese policy makers and they have brought a lot of best practices to the U.S. A lot of work in that area is funded by the Department of State and by foundations also parts of DOE. There are a total of 6 groups within EAEI, they are China Energy, Energy Efficiency, International Energy Studies, Electricity Markets and Policy, Indoor Environment and Sustainable Energy Systems.
- Mr. Goldman then went on to talk about the first research project which is the Cost of Saved Energy Project. Objectives: Enable policymakers and program administrators to weigh different energy resource options, Enable assessment of program performance and approaches across different markets, delivery mechanisms and designs. Encourage more consistent reporting of EE program impacts and costs. We standardize all this data to aggregate and analyze it in a self-consistent way – so we can look at efficiency programs on an apples-to-apples basis and across multiple dimensions – We characterize programs according to a typology of more than 60 distinct program types that we

found across the country. We also have developed a common lexicon, a kind of data dictionary for efficiency. We are also developing a reporting tool to resolve some of the problems out there. . SEEAction Definitions also being used by the Consortium for Energy Efficiency (CEE) and the Northeast Energy Efficiency Partnerships (NEEP)

- He then shared an illustration of the LBNL program typology. He states that we developed this typology based upon a national survey of program types; this is the diversity that we found. We classify every single program according to this typology. We have 65 different detailed program categories that are consolidated into 30 simplified categories and further into 7 sectors. Each program type is defined by market sector and technology, design or delivery approach.
- Mr. Goldman explained the value of this program to DOE. The database provides the most comprehensive inventory of DSM programs funded by customers of investor-owned utilities Insights into technologies, markets and program approaches; Benchmarking tool that enables comparison of EE program performance over time (and factors that influence COSE); Improved estimation and reporting of total costs help satisfy regulatory needs and instill market confidence in the efficiency resource.
- He then introduced his colleague, Pete Larson, to discuss Analysis of U.S. ESCO Industry and eProject Builder. For ~20 years, LBNL has been evaluating ESCO industry and project-level trends: Periodic analysis of project-level trends; biannual industry-level survey of ESCO executives.
- Mr. Larson then explained eProject Builder. eProject Builder ("ePB") is a FREE web-based system for entering and tracking ESPC data for the life of the contract. ePB is maintained by Lawrence Berkeley National Lab (LBNL) for U.S. DOE. ePB enables ESCOs and their local/state/federal government customers to securely: (1) upload and track project-level information (2) generate project data for analysis and reporting (3) benchmark new projects against past project performance. The benefits of ePB are, Secure centralized online database with varying permission levels as customer deems appropriate; Standardized data collection across ESCOs and markets (federal, state, local, schools, etc.); Ready access to data for portfolio of projects for analysis and reporting ESPC success stories; Reduced ESPC transaction costs; Improved customer confidence through transparent calculations (via Excel-based “data template”) and 3rd-party standardization; Minimal time commitment for customers; ESCOs typically enter detailed project data.
- Mr. Larson moved on to talk about the ePB activity in the last 6 months: Federal agencies have been directed to use eProject Builder. In other sectors, ESCOs may at some point be required by their customers to use ePB (some states are beginning to require ePB or are providing legacy data—NV, NC, CO, NM, VA, GA, KY, MD). NAESCO Board of Directors unanimously approved use of ePB as part of national accreditation process. Currently contains 420 projects, representing total implementation costs of ~$4 billion and total cumulative guaranteed dollar savings of ~$9 billion; 100+ legacy projects to be entered by LBNL staff in coming months.
- Mr. Goldman took the floor again to discuss low income programs. Low-income programs funded by utility customers are widespread. LBNL DSM Database includes 146 unique programs in 34 states* Spending: $1.2B from 2009-2012; ~$350M in 2012 alone. For comparison, DOE LI WAP spent $207M in 2012; Program Data: 495 program years* for utilities of all fuels; Highly diverse in size, design and regulatory treatment. Range from small-scale direct-installation retrofits (~$100-$400) to refrigerator swap-outs to full weatherization, including HVAC replacements; Some programs are designed in part for resource acquisition (CA); Most programs are pursued for non-resource purposes and often use relaxed (or no) cost-effectiveness screening.

- Mr. Goldman showed a graph of customer-funded low in-come electric energy efficiency spending and savings by state. In half of the states, low-income programs account for about 2-3% of the reported savings for all programs funded by IOU customers. Low-income program spending as % of total program spending is 5% of less in 10 states and is >15% in 4 states. He also shared future research ideas which included: Characterize different LI program designs in greater detail, accompanied by cost performance ranges for each design type; Analyze potential influences on LI program performance: labor/materials costs, design features, urban demographics, policy supports; Estimate number of LI households reached by state and region; Estimate percentage reduction in typical household energy bills and bill savings as a percentage of income.
- Mr. Goldman switches gears to discuss financing. LBNL has 3 major focus areas as it relates to energy efficiency finance. Those areas are: Big Picture: Key Policy Questions in EE Financing; EE Finance-oriented programs: Design Features/Issues and Lessons Learned; Standardization and data.
- The final topic for Mr. Goldman was Future of utility regulation and business models. The Office of Electricity has funded the Future Electric Utility Regulation Project. This project is a new series of reports from Lawrence Berkeley National Laboratory that taps leading thinkers to grapple with complex regulatory issues for electricity. Unique point-counterpoint approach highlights different views on the future of electric utility regulation and business models and achieving a reliable, affordable and flexible power system.
- Mr. Goldman gave his contact information for those who wanted more information and thanked the Board for having him present.

California DR Potential Study: Mary Ann Piette, Director, Building Technology and Urban Systems Division, LBNL

- Mary Ann Piette was invited to present on Demand Response (DR) Potential Study. She started her discussion with giving a scope overview and study approach. There were 2 phases of the study. The purpose in phase 1 was to Evaluate Resource Adequacy capacity credit, day-ahead energy market participating DR & basic TOU (Time of use) rates. Phase 2 will also include flexible & fast DR products' values (i.e., ancillary services (AS), real-time & regulation products) & additional load-modifying DR. In this presentation she will explain phase 1.
- Ms. Piette explained that during the study they defined a range of possible DR scenarios (BAU (Business as usual), Medium, High). Medium DR forecasts by 2025 for cost competitive DR is 6 GW out of total 15 GW available potential (double current). Bottom up methodology utilized 300k AMI load profiles & basic demographics from 11 million customers: DR technology costs & shed capabilities modeled; Includes coincident weather & renewable generation; Leverages the benefit of granular data models. DR Breakthrough potential could mean batteries & IoT can change DR landscape if costs reduced. Achieving DR potential requires market transformation to unlock system value behind meter.
- Ms. Piette then explained how DR and distributed energy technology meet evolving needs of grid. She describe 3 ways that can happen; Integrating increasing amounts of renewables; Significant changes in capabilities of DR and DER; Need for transparent methods and tools to assess DR potential in changing electric grid.
- She then went on to show illustrations of data and study results. (Copies of tables and graphs are available upon request)

- In summary Ms. Piette explained that Medium DR forecasts by 2025 for cost competitive DR is 6 GW out of total 15 GW available potential (double current). The next phase will include flexible & fast DR products' values (i.e., ancillary services (AS), real-time & regulation products) & additional load-modifying DR.

Energy Policy Simulator: Robbie Orvis, Energy Innovation

- Robbie Orvis started his presentation explaining that Energy Innovation is a small think-tank based in San Francisco, CA. They focus on power sector policy, urban sustainability, and they do some policy modeling. He then proceeded to explain the Energy Policy Simulator (EPS). The idea of EPS started when they were approach by the Chinese Government with the questions, which policies can best drive down emissions and how much will it cost. He explained that there are 3 versions of EPS: China (used for INDC and 13th FYP); United States (public launch in October 2015); Mexico (working with Mario Molina Center); Talking with others (Poland, Indonesia, India, Norway, California). They designed this model so that it could easily be transferred to other countries and other states.
- Mr. Orvis then explained that the simulator allows the user to control more than 50 different policies (such as a carbon tax, fuel economy standards for vehicles, reducing methane leakage from industry, and accelerated R&D advancement of various technologies) that affect energy use and emissions in various sectors of the economy. He states that The Energy Policy Simulator operates at the national scale and includes every major sector of the economy: transportation, electricity supply, buildings, industry (including agriculture), and land use. It calculates at annual intervals between 2013 and 2030, and provides numerous outputs, including: Emissions of 12 different pollutants (CO2, NOx, SOx, PM2.5, and eight others), as well as CO2e; Direct cash flow (costs or savings) impacts on consumers, industry (as a whole), government, and several specific industries; Monetized social benefits due to avoided mortality from particulates and avoided climate damages; The composition and output of the electricity sector (e.g. capacity and generation from coal, natural gas, wind, solar, etc.); Energy use by fuel type from various energy-using technologies (specific types of vehicles, building components, etc.)
- Mr. Orvis then explained why EPS is unique. EPS is open source, it is completely free to use; it runs instantly and in real time; Incorporates cash flows and monetary effects of policies. The Energy Policy Simulator allows us to predict the combined effects of packages of policies.

Stacey Crowley, CA, Independent System Operator

- Stacey Crowley was invited to speak about Energy Imbalance Market (EIM) and the Independent System Operator (ISO). She explained that The California ISO is one of nine independent/regional transmission operators (ISOs/RTOs) in North America. EIM is an easily-scalable extension of the real-time market to broader region. She shared some facts about ISO: Nonprofit public benefit corporation; Part of Western Electricity Coordinating Council: 14 states; British Columbia, Alberta and parts of Mexico; 66,000 MW of power plant capacity; 50,270 MW record peak demand (July 24, 2006); 26,014 circuit-miles of transmission lines; Serves over 30 million consumers.
- Ms. Crowley then discussed EIM. She stated that EIM supports integration of renewables, enhances reliability through improved situational awareness, brings down costs thru access to a wider array of resources, balancing authorities maintain control and responsibility for the their system.

- Ms. Crowley stated that a regional ISO can transform the electricity sector to a low-carbon energy delivery system. ISO is a cost effective way to help comply with federal and state energy and environmental policies; enhances reliably of the larger system; larger geographic footprint aids renewable integration, aggregate renewable energy's variability, and reduce the need for flexibility reserves, saving money; governance structure must preserve state policy and procurement authority.
- Ms. Crowley ended by giving a timeline for regional integration activities. She explained that expanding the operational and market functions of the current CAISO footprint across more of the West, and establishing a governance framework that allows CAISO to act as a regional system operator, can provide many of the tools we need to transition to renewable energy and reliably and affordably meet the climate challenge. Study Work: May 24/25– the ISO will post preliminary results and host a workshop (Folsom, CA). Slides will be posted in advance (May 20) June – comments will be due two weeks after the workshop; Governance:
  May 6 – the California Energy Commission hosted a Regional Grid Operation and Governance Discussion, likely another workshop in June outside of CA. For more information and agenda visit the CEC website at: http://www.energy.ca.gov/calendar/index.php?eID=2663
  Transmission Access Charge Options - This initiative considers whether the existing revenue recovery mechanisms would be appropriate should a transmission owner with a load service territory join the ISO as a participating transmission owner. Regional Resource Adequacy -
  This initiative evaluates whether the existing resource adequacy tariff provisions are appropriate for use in a regional ISO balancing authority area that encompasses multiple states.
  Metering Rules Enhancements - This initiative will review existing metering requirements and propose possible revisions to accommodate the growth in renewables, energy storage and distributed energy resources; technology advancements, developer interest in new and complex metering configurations; expansion of regional markets through the energy imbalance market; and, the potential integration of other balancing authority areas into the ISO balancing authority area.
  Greenhouse Gas Compliance - This initiative will review potential changes to the existing EIM approach for tracking GHG compliance obligations needed to support an expanded ISO balancing authority area that encompasses states outside of California

Alecia Ward, LBNL, Small Business Voucher Update

- Alecia Ward started her discussing giving and update on the Small Business Voucher (SBV) program. She stated that there is $50k-300k in vouchers available to small businesses that request for assistance at www.sbv.org. The purpose of these vouchers will be to solve key clean energy problems important to the success of your business plan. For example: Prototyping, Materials characterization, high performance computations, modeling and simulations, intermediate scaling to generate samples for potential customers, validation of technology performance, and designing new ways to satisfy regulatory compliance.
- She then discussed which states had the most RFA's (Request for Applications). She stated that California remained the state with the highest number of requests (RFAs). Colorado, Penn, Mass, Washington, Florida and NY, NM and Michigan were the states with the highest request. New states since round 1 - Rhode Island, Kansas and Wyoming; would love to see submissions from: Nebraska, ND, Oklahoma, WV, SD; Round 1 submitters, none for Round 2: Alabama, South Carolina, Alaska, DC, and Indiana.

- Board member Jeff Ackerman asked how long the process would take. Ms. Ward stated that it is intended to be a 15 weeks process total and expect to announce by mid-July about the rewards.

Jessica Granderson, Deputy Director for Building Technology and Urban Systems R&D Portfolio, LBNL

- Jessica Granderson was invited to present and explain M&V 2.0 Tool Testing and Application. M&V 2.0 is generally understood as: use of interval meter data, analytics, computation at scale to streamline the M&V process through semi/automation; Delivered in proprietary tools, 'open' algorithms. She explained promising opportunities associated with meter-based M&V approaches. Enabling delivery of whole-building programs that combine strategies for deep savings; Enabling pay-for-performance programs; Provide results for context where gross savings important – e.g. absolute reduction goals, carbon impacts, etc.; Scalability and streamlining
- Ms. Granderson explained that their research has been to answer the numerous industry questions. Some of the questions have been: Are proprietary tools reliable? How can I verify their accuracy? Are they any better or worse than standard regressions? She explained that standard replicable test procedure and metrics used to show that many models predict within a few percent for many buildings. Another question that she hears frequently is, Even if a tool is generally robust, how do I know that it will work for my specific projects or program? She explains that you should use test procedures and automated tools to quickly assess with participant or candidate participant load shapes and ongoing LBNL demonstrations with utility partners using historic program data.
  Ms. Granderson then went on to discuss some of their future work. Some of the upcoming projects are: Transfer of M&V2.0 tool testing procedure to industry for formalized, ongoing use; Establish acceptance criteria and documentation requirements to prove that a robust tool was applied well, to generate a quality result; Explore methods for auto-identification of non-routine adjustments; Conduct larger demonstrations of M&V 2.0 in 'live' programs.
- Ms. Granderson ended her presentation and gave her email for those with questions. For more information please contact JGranderson@lbl.gov.

Danny Kennedy, California Clean Energy Fund/National Network for Manufacturing Innovation

- Danny Kennedy is the Managing Director of the California Clean Energy Fund, (CalCEF) which is an independent non-profit in the state. He started his discussion talking about a project called CalCharge that is a partnership with CalCEF and LBNL. CalCharge's initial vision was born from prominent researchers at Berkeley Lab seeking to more effectively collaborate with industry. MOU formed with CalCEF and Berkeley Lab to better understand the needs of the emerging energy storage sector in California. CalCharge is the result of 2+ years of research that included engaging with over 200 industry leaders and stakeholders. An innovative new P3 model was created to accelerate the movement of clean energy from innovation to infrastructure.
- Mr. Kennedy stated that California was the first market for electric vehicles (EVs). 47% of all EV's sold in the US are registered in CA. Energy storage is key; CA's total target is 1325 MW by 2020 (online in 2024). Decision allows for shifting up to 80% of the MW between Transmission- and Distribution-connected storage. There is no ability to shift into or out of Customer-connected storage targets. 2014 Distribution targets will be adjusted down to account for existing pilot projects (Vaca-Dixon (2 MW) and Yerba Buena (4 MW)). Customer-connected anticipated to come through existing Self-Generator Incentive Program (SGIP), with 3.6 MW already ID'ed. These targets do not

look massive, but given the current level of existing storage worldwide, these targets are quite aggressive. The current focus is on what services / attributes these devices can deliver. They are making progress, but they want to go faster and sooner and that is where SuperCharge comes in.

- Mr. Kennedy started the pitch on SuperCharge and gave a few benefits of why government and states on the federal level should join SuperCharge, he wants it to be a national push, not just in California: Out-innovate and outcompete other global players; Drive the direction of energy storage innovation; Access to a nationwide network of R&D centers; Fund innovative research with non-dilutive capital; Own the technical roadmap for the future of energy storage; Develop and recruit from a nationwide pool of talent.
- He explained that Energy Storage 2.0 is conventional Li-ion will plateau at $125/kWh at pack level. There are new materials and processes needed for further cost reductions. Complete electrification of auto and grid integration of storage requires $60/kWh and $0.10/kWh/cycle. He states that the U.S. will dominate manufacturing of Energy Storage 2.0 with SuperCharge.
- Mr. Kennedy explained the big opportunity with joining SuperCharge: Federal grant for $70 million over 5 years, Led by NIST under Department of Commerce, An industry-led, private-public partnership, requires at least 1:1 private sector match.
- He explained that SuperCharge in action is broad public-private partnership across supply chain players and world class R&D institutes. He states that funding is to support new ideas (materials, processes, designs. There will be a test center for state of the art feasibility and prototyping, preferred IP position for team members and, train Energy Storage 2.0 workforce.
- SuperCharge innovations would be at least $35 million of grant money available to institute members. Funding program dedicated to advancing innovative battery manufacturing and technologies. Guided by industry, end users, investment community, and government agencies. Addresses valley of death between R&D and industry
- Mr. Kennedy ended his presentation and gave information from the Board members who would be interested in sharing SuperCharge information with their states.

STEAB Final Remarks

- FM started the discussion stating a few main focuses for the remainder FY16; have the Task Forces meet monthly, to continue work on the transition document. Listen to DOE and not feel constrained while trying to make the case of gaining a stronger relationship with the department.
- Next STEAB in-person meeting will be in October in Washington, DC; Exact dates TBD.
- Final decision will be based on the STEAB budget after the Berkeley meeting.

Public Comment

- FM then turned to the part of the STEAB meeting where members of the public can comment either in person, via the teleconference line, or through written and provided statements. FM asked if there were members of the public who wanted to make comments. There were none present; he moved on to adjourn the meeting. The STEAB spent the rest of the afternoon doing lab tours at LBNL.

STEAB June 2016 Meeting
June 14-15, 2016
Lawrence Berkeley National Laboratory
Berkeley, CA