Appendix B

Discussion Activity Format and Results

Los Angeles Department of Water & Power

NREL NATIONAL RENEWABLE ENERGY LABORATORY

Los Angeles Department of Water and Power
100% Renewable Energy Study

Advisory Group Meeting #3
Thursday, November 16, 2017, 8:45 a.m. to 2:00 p.m.

Appendix B: Discussion Activity Format and Results

Discussion 1: Energy Resource Questions

Below is a tabulation of results from Discussion 1. Advisory group members were randomly organized into four groups, each discussing the same topics. The goal of this exercise was to facilitate input from Advisory Group members on the advantages and disadvantages of incorporating each of five energy resources into LA 100% renewable energy study: 1) Large Hydro, 2) Bioenergy, 3) Nuclear, 4) Renewable Energy Credits (RECs), and 5) a Zero Carbon Emissions objective.

Group 1

Large Hydro	
Positives	**Negatives**
Already built (existing plants)	Controversial new development is expensive, has emissions
Cheap (existing plants)	Potential decommissioning of existing plants has risks, timing considerations
Flexible	Snowpack-dependent (affected by droughts)
Lots of storage	Currently not defined as renewable in RPS
Enables reuse of toxic water	Affects/impacts indigenous communities
Efficient (existing plants)	No local economic development benefit
Zero-carbon	
No particulate emissions	
No combustion	
No impact on EJ communities	
Helps with the duck curve	
General Comments	
None	

Bio-Energy	
Positives	**Negatives**
Carbon neutral	Biomass combustion emits carbon
Supports SLCP (short-lived climate pollutant) by CAR (California Air Resource Board)	Creates waste
Flexible resource	Ancillary environmental impacts
Can be used onsite	Building new facilities could impact EJ and indigenous communities
	Dis-incentivizes some sustainable farming/waste reduction practices
	Infrastructure concerns – what would be the cost?
General Comments	
None	

Nuclear	
Positives	**Negatives**
Existing: zero carbon; investment has already been made; currently a significant part of DWP portfolio (what would be the cost for not continuing to include it in the mix?); zero particulate emissions	Existing: nowhere to store waste product; high risks and environmental impacts; national security risk; close to fault lines
New: there is the potential for promising new technology that is smaller and safer (do we want to exclude this possibility?)	New: legality questions in CA; long permitting/lead times; high cost; technology is not mature
General Comments	
None	

Renewable Energy Credits (RECs)	
Positives	**Negatives**
Possibly the most cost-effective way to reduce global/regional carbon emissions	"Pay to pollute"
Creates new revenue stream for more renewables to come online generally	Does not necessarily put EJ local communities first, in terms of pollution
Gives DWP more options for meeting a carbon-neutral goal	Accounting of GHG/RPS requirements can be challenging
Possibility of even exceeding 100% renewables	Not a good model for LA in terms of local leadership
	Studies show the model doesn't work as it's supposed to in terms of pollution/carbon
General Comments	
None	

Zero Carbon Emissions Objective	
Positives	**Negatives**
Encourages a portfolio of diverse zero-carbon resources	Does not address other air pollutants
Most direct way of addressing climate change, as the goal	Could incentivize other less sustainable/renewable technologies
Could be less costly	Concerns about pace
Broad portfolio (doesn't just focus on renewables alone)	Need to address the storage issue
Objective is clear and simple	
Makes a statement about DWP's ultimate goal in establishing emissions as the clear priority	
General Comments	
None	

Group 2

Large Hydro

Positives	Negatives
Large amount, cheap power	Seasonality
Infrastructure exists	Connects to local goal of water use
Castaic: we are bringing the water in anyway	Has an impact on wildlife – doesn't align with sustainability goals
Can help in making sure we have enough money to build more renewables, but should consider ultimately commissioning	Not measuring cost of ecosystem health
Shortcut	Shortcut
24/7 power supply	Aging infrastructure – cost of maintaining – too much cost to maintain – or newer technology could provide better power
Provides an opportunity to add new technology without building a new system	Challenges with drought cycles • Less reliable • Water may take priority over electricity
Zero emissions – no carbon	Interference with indigenous communities – Pah-Ute tribe
Existing jobs	

General Comments
None

Bio-Energy

Positives	Negatives
Carbon neutral while producing energy	All of the technology used for bio energy falls under the same state regulation despite wide variation
Reduces existing waste in landfills	Combustion and associate pollution
Utilization of certain forms can reduce combustion	May not be at-scale or cost effective
Uses existing systems – compliments existing systems such as wastewater processing	Investment in dis-incentivizing waste reduction
Utilizes waste streams that cannot go elsewhere	Leakage – Methane – GHG intense
	Complex system

General Comments
What pollutants are we talking about?

Nuclear

Positives	Negatives
Band-Aid in the interim • Existing generation • Such a small amount currently	Current approach in U.S. is outdated
Carbon Free	Regulatory regime is not practical for new nuclear
Large energy source – has longevity	Nuclear waste
	Liability of an accident
	Uninsurable
	Regulatory system not sufficient to deal with waste
	National security concern

General Comments
None

Renewable Energy Credits (RECs)	
Positives	**Negatives**
Funding mechanism for future projects	Dis-incentivizes innovation
Financing source if LADWP can reach its 100% goal and can sell credits	Doesn't remove local polluting energy sources
Practical way (in the future) to get from 80-100% - Could cover baseload needs	"The solution to pollution is dilution" • If everyone uses them, they are not effective
	If we are investing in renewable energy elsewhere, we don't experience the benefit of jobs, economics, etc.
	Shortcut
	Take credit for being at 100% without actually achieving tangible goals – intellectual wiggle room
	Masks the fossil fuel generation in LA
	Contributes to racist policy
	Can easily be taken away
General Comments	
None	

Zero Carbon Emissions Objective	
Positives	**Negatives**
Low-cost – existing generation	Diminished efforts such as social justice
Carbon free	Does not adequately capture other effects
Addresses climate change	Not a good health objective
Good climate objective	Has not been effective in making massive transformation
Industry leadership and jobs	Takes focus off of using less energy
	Does not make a reduction
General Comments	
May not be renewable	

Group 3

Large Hydro	
Positives	**Negatives**
Provides storage which is helpful with renewables	Methane emissions
Critical for Power quality	Decomposing matter anaerobic digester
100% renewables isn't achievable without it	Variable with drought
Dispatchable	Ecosystem, biologic and landscape concerns
Extensive resources outside of LA that we could access (ex: British Columbia)	Long time to expand hydro facilities
We have it already	Extensive and expensive to access outside resources
Efficient storage	Not efficient
River basins provide multi-year storage	Migrating fish impacts
Low operating cost	Expansion will be politically and legally challenging
	High capital cost
General Comments	
Some comments are related to adding new capacity and some are about existing resources and including them in study	
There are trade offs	
Can we modify existing facilities to work better with renewables?	

Bio-Energy	
Positives	**Negatives**
Takes advantage of existing waste stream that will always be with us	Not zero emissions
Many are commercially viable, well demonstrated and globally deployed	Emissions
Carbon zero or carbon negative	Not a reliable source of energy
Taking advantage of currently installed infrastructure and end uses would require less investment	Increase in CO2 emissions
"Back to the Future" - will selectively harvest and burn wood again. We have over one million dead trees	Carbon accounting can be very challenging
Reduces methane	Must consider trade-offs between the negatives and positives and it's hard to figure out (what is the exact processing method? The exact ecosystem…)
We have very good carbon accounting models in California	Does not fit into our long-term plan for zero emissions
California is a great model - used to account for carbon	Puts in place infrastructure that displaces other options
Captures energy from waste (although this is complex)	Some waste streams are a small slice of the pie (apples and banana peels)
Dispatchable	
Base load	
Peak following	
General Comments	
Some might be really good transitional solutions that we don’t want to keep for too long	
Study should focus on different factors based on: • Environmental justice concerns • Availability of waste stream and how waste stream is changing over time • Overall impact of greenhouse gas emission	

Nuclear	
Positives	**Negatives**
Zero emissions	Expensive to build
Base load	Uncertain U.S. future
Helps system inertia	Need more research to make it cost efficient
Marginal production costs. Costs are low.	Significant health impacts upon exposure during accidents
We have it	Waste
We can access additional resources from out of state	We don’t have a viable solution for nuclear waste
	Significant environmental impacts that last for centuries
	Legally and politically problematic
General Comments	
None	

Renewable Energy Credits (RECs)	
Positives	**Negatives**
Cost effective solution	Proper accounting of credits can be a problem
Promotes renewable energy production	Prone to fraud
Can be a more effective way of reducing greenhouse gas emissions (Especially the last 10%-20%)	Communities in LA are not getting the same public health benefits
Can be helpful in a transition to higher goals	Subject to market forces (manipulation)
RECs is a global solution to a global problem	Exporting (negative) impacts of renewable energy generation to other places
A lot of renewable investments come in big, single projects and RECs allow for a smooth transition while retaining goals	Can be a bad investment (bad use of rate payer dollars)
As renewables come down in price, there can be a bridge with RECs	Expensive
Can still achieve goals by providing RECs	You are exporting all of the benefits too (like job generation)
Broadens price competition between renewable technologies	Missing opportunities to provide economic and technical leadership by showing how truly 100% renewable we can be
Can be technology neutral - not picking winners or losers	Does not coincide with Mayor's "Lead By Example"
Way to finance renewable energy transitions in places that cannot afford it	Politically it's opposed by Environmental Justice communities
General Comments	
How far away can we count them? Can we go internationally?	

Zero Carbon Emissions Objective	
Positives	**Negatives**
Reducing carbon emissions focuses on the main objective globally	A potential to blunt local objectives (like job creation)
We need to make tradeoffs with other emissions	Potential to fail to address other negative environmental impacts
Easier to define "zero carbon" than it is "renewables"	We deprive ourselves of multiple benefits of reaching zero carbon and societal benefits
Accounting for carbon is more difficult accounting and accounting for renewables is more difficult philosophically	
Run the risk of getting a scenario that grows carbon emissions in the short term	
Costs less (*but must consider society costs)	
Adds to diversity of available resources	
Climate problem is more pressing on whether our energy resources are going to run out	
General Comments	
Questions of life cycle analysis	
Should we stay faithful to Council Motion?	
Definition of "renewable" is political. The definition of emissions is scientific	

Group 4

Large Hydro	
Positives	**Negatives**
Cheap	Doesn't count as a Renewable Portfolio Standard
Reliable	Differentiated output over time
Flexible	Rainfall matters
Zero emissions	Environmental regulations affecting cost
Renewable	Quality of infrastructure varies
Local control (Castaic)	Build-out
	Upstream emissions
	Maintenance
General Comments	
Consider distinction between pumped hydro storage and generation	

Bio-Energy	
Positives	**Negatives**
Lower greenhouse gas option	Limited availability
Alternative to releasing methane into the atmosphere	Limited potential
"Renewable"	Fairly expensive
Forest management • Wildfire prevention	Emissions – NOx, particulates
Dispatchable	State limits availability of some types
Increasing availability	Controversial
	Changing regulations
	Refinement needed to get fuel into gas line
General Comments	
None	

Nuclear	
Positives	**Negatives**
Good baseload	Not renewable
Reliable	Expensive (newly-built)
Existing	Nuclear waste
Low cost	High environmental and public health risk
Paying jobs – 2000 at San Onofre Generating Station	Security risk
Real cost is high	Political challenges
Palo Verde is mostly paid for	Not flexible
Small footprint per output	Liability risk
Zero carbon	
General Comments	
None	

Renewable Energy Credits (RECs)	
Positives	**Negatives**
Cheap	Doesn't shift the makeup of grid – accounting system
Balance the margins on the shortfalls	Unclear whether purchasing RECs creates new renewable energy
Helps build projects somewhere else	Should be less available infrastructure
Jobs	Gives less credibility to program
Opens potential to renewable energy	Difficult to understand
	State standard should be considered floor
General Comments	
None	

Zero Carbon Emissions Objective	
Positives	**Negatives**
Avoid climate change	Harder to calculate
Cleaner atmosphere	More expensive – requires conversion from one technology / usage to another
Less expensive to pursue – dams, nuclear	Politically difficult
Requires less maintenance	
Stepping stone to 100% renewable future	
Good!	
General Comments	
None	

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Discussion 2: Considerations for the Study

Below is a tabulation of results from Discussion 2. Advisory group members were again randomly organized into four groups, each discussing the same topics. The goal of this exercise was to brainstorm on the following question: “What types of questions, issues, topics, and ideas should be considered as part of the study?” Facilitators asked Advisory Groups members to identify as many ideas as possible in a set amount of time, and input was recorded on a flipchart. Facilitators then asked Advisory Group members to identify relative priorities by placing one sticky dot on each of seven topics that they believed were most important. A pre-selected member of each breakout group then reported back to the larger Advisory Group on the top seven priorities identified. Because multiple ideas may have had a similar number of dots, the highlighted rows indicate ideas discussed during reporting out.

Group 1

Comment	# Dots
Consider electrifying appliances, not just transportation; what would be the impact of this to ratepayers in terms of costs and job creation/pipeline?	7
Need a clear timeline and targets for the study, both for the broader end goal and interim goals	6
Question: is rate design part of the study?	5
Measure reliability in terms of climate resiliency of the grid; the context for the study is a post-climate-change world, so extreme weather and disaster mitigation should be considered	4
Emphasis on energy efficiency (to reduce overall use)	4
Focus on energy that won't harm or kill us (consider health impacts)	3
Marry DWP goal with the LA mayor's plan for sustainability in terms of battery storage	3
Look at impacts of proposed changes at the ratepayer level (in terms of costs) compared to traditional/current practices	3
Study should be technology-neutral and focus on the broader goal	3
Study should be primarily concerned with environmental/climate impacts	3
Consider slow/medium/fast scenarios and tradeoffs for each	3
Consider lifecycle analysis for different technologies, including manufacturing and disposal	3
Question: what if we decentralize and provide power more locally (i.e., microgrids)?	2
Consider localized impacts in terms of urban pollution, EJ communities	1
Study should consider the idea of a "just transition;" a positive outcome should incorporate local workers into the new energy economy with new jobs, and consider the roles of CEOs on down in moving to this new economy and away from traditional fossil fuels	1
Consider the local impacts of new transmission/distribution lines (both overhead and underground)	1
Question: how do local investments in RECs help us get to 100% (analyze the impacts of DWP's current REC policy)?	1
Consider consumer education (energy efficiency) as part of the solution	1
Question: how can we safely decommission dirty energy?	
Consider how DWP can use this study and future actions to diversify jobs (in terms of DWP's equity metrics initiative and goals)	
Consider water footprint	
Analyze local economic impacts (vs. exporting energy)	
Consider equity when considering how and when we get to 100% – include diverse voices when collecting input	
Consider other programs DWP has (e.g., community solar, microgrids, feed-in tariffs) and how these will be impacted by or could contribute to the study	

Group 2

Comment	# Dots
Lifecycle analysis – GHG emissions • Fair footing on health • Externalities – health, environmental, etc. • Cost of climate changes that come about as a result of inaction	11
Lessons learned from other countries and/or projects	6
Equity, environmental justice, social equity, local hire, workforce development • Environmental racism – generation and emissions in communities of color – addressing this • Impacts from existing generation • How does new development address this? • CalEnviroscreen – Environmental justice benefits from air quality improvements first – where can air pollution benefit first? • Where does mobile-source electrification go first?	5
Leverage assets • Transportation elements • Revitalization – “Brownfields to Brightfields” • Tidal turbines on Castaic • Urban spaces / rooftops • Potential environmnetal benefits (other auxilary benefits) • Urban cooling / greening	5
Timing of when to achieve 100% • 2023 Olympics • Timing of other system replacements	5
Smart cities technology /smart grid – microgrid	4
Cost/benefits – comprehensive and up-front – consider potential sources for financing the transition	4
Leaving door open for tech innovations and emerging technology, consider how these are integrated – foster innovation	3
Biodiversity issues	3
Aggressive efficiency / reduction	3
Transmission and distribution flows and needs	1
Holding rates to inflation – what is the impact on rates? Should resulting policy be put to a vote?	1
Lifecycle of electric vehicles • True cost before rebates • How are we subsidizing the cost of rooftop solar, etc.	1
Reliability	1
How does LA planning relate to CA planning?	1
Environmental improvement	
Mission Creep – Are ratepayers responsible for certain aspects?	
Efficiency of different generation scales – utility vs. distributed	
Assign responsibility to sectors	
Land use	

Group 3

Comment	# Dots
How do we think about costs that are not easily quantifiable? • Talk about impacts to public health • How do we incorporate costs that are externalized? • Job creation, local economy, public health, political changes, co-benefits • Impacts of mining • Example: waste of solar panels that only have a 15 year life	5
Reliability	4
Resilience and building a future-looking system	3
There are other air pollutants. Consider public health benefits at a low cost.	3
Industrial, social, economic justice & environmental justice policy to help inform choices	3
Address rate payer value	3
What if we had 120% green power? • We can help others with their objectives • 80% base + 20% for others + an additional 20%	2
Process should focus on fast short-term greenhouse gas emissions reductions and then get to 100% renewable	2
Leave an opportunity for technological advances that may shift thinking	2
Shouldn't let price drive the choice	2
Create markets to solve problems as cost effectively as possible	2
Transmission availability and options	2
Typical local impacts of policy choices	2
Educate people on the bigger picture (People are willing to make trade-offs when they understand the broader context	2
DWP plan within other plans (such as integration with the CCA and CAISO)	2
Consider costs • Disadvantaged communities' costs vs. other communities	1
What are the likelihoods of getting to 100%?	1
Consider the long term - 75%-100%	1
Give context for how one might approach getting to 100%	1
Factor in behavioral changes	1
Think regionally and globally • This is a global issue - don't think just locally	
How do we get some technologies where they need to be?	
Not prematurely settling on one technology	
Study represents a longer-term goal	
• Required load storage and shifting	
• Cost considerations	
Consider cost and societal changes and how fast technologies are changing	
Study should inform what we are doing <u>now</u>	
Intersection of study and OTC is important	
New technologies have higher hurdles than current sources	
For what it is we are doing	
Status quo isn't sustainable	
What can new technologies do that merit displacing what we are doing now?	
There is a difference between "price" (dollars) vs. cost	
Framework for environmental justice and other benefits vs. energy priorities	
Create "rules of the game"	
Price is a factor of cost	
Model needs to cover local discussions	
Reflect diversity to hedge risk and add value	

Group 4

Comment	# Dots
What is the economic impact? • Local jobs, underrepresented groups • Creating broader social impact • Is LADWP the best to answer this question? • What are the economics – rate impacts	11
Distribution system resilience (grid modernization) • Smart grid and demand-side management	8
Near term decisions about long term assets (stranded assets)	7
Reliability	6
Timeline • What is the commitment to implementation?	4
Other commitments and goals and how they'll integrate	4
DWP's balancing authority	4
Resource agnostic with objectives • How study looks at energy & ancillary resources	3
Local emissions inside LA and outside LA	3
Evolving technology – will technology at the end of life impact?	2
Setting up criteria for determining priorities upfront (2)	2
Will DWP re-up commitment to displacement beyond 2020?	1
Future energy uses/ types – demand forecast	1
What must this achieve?	1
Global emissions	1
100% renewable energy every hour or over time?	1
Adaptability to change	1
Carbon intensity	1
Propulsion power – fleet electrification	
Storage	
Where to put it – location	
Align timeline with 2030	
Cost	
Pace of transition and cost – alignment	
How will the new system fit with existing? Will the reliability be better or worse?	
Hold to same or higher standards	
Look at resources allocated to different goals	
Is the current assumed to be the baseline?	
Is someone forecasting what's coming from the State? – current and future	
Regional context	
Cascading effects of system failure	
Build with data foundation	
Electrification of appliances in home	
To what extend DWP has storage systems for gas • How will dependancy impact?	
Forecast future population growth	
Current state of existing infrastructure – how much integration is in our distribution system	
How is this communicated to the public?	