1. Attendance
   1. Edison: Paul, Jenifer, Joseph, Mandip
   2. Others: Ana Mileva, Anu Pandey, Ben Gutierrez, Beth Vaughan, Bill Monsen, Bob Faga, Carrie Bentley (ARem), Dave Vidaver, David Howarth, David Miller, David Smith, Eric Duran, Deborah, Gregg Morris, Jim Baak (vote-solar), Jim Caldwell, Jim Ross, Jin Noh, Kathy Treleven, Katie Plaza, Kevin Woodruff, Lynn Marshall, Matt Barmack, Mea Halperin, Michael Cohen, Mike Jaske, Patrick Cunningham (ORA), Pooja Kishore, Pushkar Wagle, Radu Ciupagea, Russ Garwacki, Salla Amezquita, Shelly-Ann Maye, Tom Jarman, Wenxiong Huang, William Rostov, Xiaobo Wang, Yuliya Shmidt
   3. ED: Forest Kaser
   4. Resolve/E3: Nick Schlag,
2. 10 minutes: Introduction to the Modeling Advisory Group
   1. (Forest- Slide#2) Overview of IRP Implmentation
      1. ED is working on developing an IRP Proposal
         1. Approach to develop portfolio
         2. Guidance to LSE to develop IRP
         3. How CPUC evaluates compliance (approve or certify)
         4. Procurement Authorization and Process Alignment
      2. December 2016- Draft Proposal and Proposed Decision April 2017
   2. (Forest- Slide#3) Overview of Staff Activity
      1. 10/5 Draft Charter and comments 10/14/16- will respond to some of the questions
   3. (Forest- Slide#4) Approach to Developing System Plan
      1. Mirror language in Concept Paper (Figure 1)
         1. Assumptions
            1. Draft proposal on sources of information- will be sent out soon (probably November 2016)
         2. Scenario Development- what types of future situations/conditions to look at, source to resource acquisition.
            1. Proposal circulated Friday (10/21/16)
            2. Webinar 10/27/16 at 10:30Am-12NOON
         3. Modeling- how tools function and how they should work. Focus of MAG
            1. Every other Thursday
   4. (Forest Slide#5) S/T Focus of Mag is Development of Reference System Plan
      1. Reference System Plan is the first step, and since support for Option C, so most likely start with this as the first step
      2. Some of the other questions will be addressed in January 2017
   5. (Patrick Young Slide#6)- IRP Process 2017 Interim Analytical Framework
      1. Initial effort of Mag- on how to develop Reference System Plan
   6. (Patrick Young- Slide #8-)- Using RESOLVE to Develop Reference System Plan
      1. Since 2017 IRP is compressed, start with RESOLVE to move forward
   7. (Forest- Slide#9)- MAG Questions
      1. There will be a new revised charter to the list, to address responses to the comments
         1. Issues/ Themes in Response- NRDS, TURN, IEP, CALWEA (focus on transparency)
            1. Overall Questions

Record development and transparency. Need for fact finding and decision made before opportunity before formal comment

Develop best proposal before reaching proceeding. There will be opportunities to comment on record. Try to produce good product before it goes into record

Charter- restricting scope to be efficient to produce modeling efforts.

Will have staff that will take notes, to have record of issues

Ask entities to reach out to ED staff about issues

Ok to send comment after MAG webinars to bring up issues (informally to ED Staff)

Summer 2017- will revisit all of the modeling work. RESOLVE is for short term, to complete 2017 IRP, not committing for long term use.

* + - 1. Q/A on Introductory slides
         1. Kevin Woodruff Consultant for RESOLVE- when will you give parties another opportunities to go through the RESOLVE model to get into the weeds.

Forest- 3 webinars will focus on RESOLVE and each will get into more details. So the next charter will provide more detail.

* + - * 1. Carrie Bently ARem- 2 different work plans (scenarios and modeling) will operate independently. Can you follow one and not the other and not be lost, or do you need to follow both?

Forest- eventually, they will need to converge to get the IRP off the ground. But they both have separate issues that can be addressed separately. More detailed model specific questions will be addressed in MAG, other in Scenarios Development

* + - * 1. Paul Klapka- SCE. Where will assumptions be developed? Is RESOLVE commercially available?

RESOLVE- not available yet. But talking with E3, will provide update on public availability.

Assumptions- proposed sources for modeling will be sent out tomorrow 10/21/16. Nov/Dec- will release values for each assumption.(via service list)

Will be opportunity for informal comments

* + - * 1. Mandip- will there be an in person opportunity to use and understand RESOLVE, since it is not commercially available, so modelers can understand how it works, first hand

1. 60 minutes: E3’s RESOLVE model overview- Nick Schlag (11:27-
   1. Notes/ Overview
      1. With only an hour- won’t be getting into technical details.
      2. Call is focused on methods and how RESOLVE works
   2. Flexibility Planning Paradigm
      1. Defining The New Planning Problem
         1. Grid integration issues and flexibility challenges as a result of RPS issues (renewable integration). How much flexibility to operate system reliably and economically, yearly. What is the optimal mix of resources to invest and provide flexibility
      2. Renewable Integration Challenges
         1. How new system will operate and to have flexibility to handle variability of load
         2. High renewable penetration systems need some curtailment on an hourly basis
         3. What other demand side programs should be considered to provide ratepayers an optimal amount of resources to meet RPS and GHG goals
      3. Optimal Solution Balances Non Renewable Solutions with Overbuild
         1. See PDF slides for notes
   3. RESOLVE Overview
      1. Capacity Expansion model, developed to examine grid integration challenges and need for high penetration RPS generation. Select combo of RPS resource (wind solar, biomass, geothermal, etc.) to meet RPS goals and GHG constraints. Also what are the cost of wide range of renewable integration solutions?
         1. Which renewable integration solutions would be least cost
         2. Portfolio- combined new RPS resource and integration solution to meet constraints (RPS, GHG, etc.)
      2. RESOLVE Co-optimized Investment
         1. New costs of transmission, system operating costs, etc.
         2. Costs is over long time horizon (10-20 year cycle). Looks at Short term (1-5 years) and what is optimal set of resources in each of those 5 year cycle. Timing of renewable integration solutions.
         3. Constraints considered- Hourly load, RPS, PRM, GHG, etc.
      3. Flexible Model design facilitates Scenario Analysis
         1. RESOLVE is flexible to develop scenarios/ sensitivity analysis. How portfolio adjust if a variable was modified.
            1. Uncertainties- RPS costs, ES costs, PV, export limits, EE goals, EV deployment- all are easy to adjust in the model
      4. Question on “A-C”
         1. Cathy T. (LSA Consultant) - Page 9 “geometric increase” cost. What does it mean?
            1. Cost of curtailment as $/MWh metric. 33% small curtailment, 40%, large curtailment, 50% curtailment is rapid. Marginal cost of adding MWh.
         2. Jim Balke- First Solar- how treat DG (input for distributed storage, how are those treated in RESOLVE now and plans for future)
            1. EV- exogenous load input in RESOLVE (quantity and need to charge info.
            2. DG- distributed solar as candidate resources. No data input on location value of DG could get based on their location. If there is data available, can be integrated in RESOLVE.
            3. Arnie Olson at RESOLVE/E#- working with LLLab to analyze flexible load. Model load as flexible (within operating hour and availability of resources)
            4. Jim B- if we provide rough estimate, would it be in scope of 2017 IRP.

Forest- it would be art of the assumptions assessment tool

* + - 1. Greg Morris GPI- Is RES)OLVE Linear program Model and does it run on excel
         1. Yes liner. But engine is written in python.
         2. Data input will be via excel
         3. Greg M.- slide 6 optimum solution assumed single RPS portfolio- different curves if other mixes of RPS (LCBF process overhaul to widen spectrum of RPS used in portfolios)
         4. RPS Portfolio is a result of RESOLVE optimization- will select optimal combination of RPS resourced
      2. ?- runtime for resolve model and can parties get access to RESOLVE
         1. Forest- working with E3 to make/ provide access to RESOLVE itself for feedback. No timeframe for access.
         2. Nick- run time, depends on complexity of inputs. For Sb350, 1-2, 3-4 hours.
      3. Dave Smith Transwest Express- Slide 9, RPS first then integration solution. Is that done in 1 step? Does RPS optimization looks at needs?
         1. Not sequential portfolio. Integrations solutions at same time as RPS, all optimized in a single step.
      4. Carrie Bently ARem- 1/5 year solution and investment, blocking constraints by time
      5. ??- are locational transmission constraints in model? If running linear program or multi-part?
         1. RPS portfolio have some location of potential of RPS available and transmission needs in region to developer resources to load.
         2. Zonal model (CAISO as single zone). Linked to neighboring regions (LADWP)
         3. Just a linear program
      6. Mike Jaski- Energy Commission Staff. How does RESOLVE deal with existing assets and retirement over time (assumption or exogenous constraints for hat decision).
         1. Existing resources are sunk investment
         2. Don’t model to keep or retire those assets (no unit level decision is market revenues would cover costs). But some retirement modeled as scenarios. Not exogenous
      7. CLECA- Renewable solutions on slide #6, shown storage, but what other solutions in model night now?
         1. Will be discussed in eh presentation
      8. Amex?-
      9. Bob- CINEX? - # of investment periods. Will model have ability to change parameters associated with investment (costs, etc.)
    1. Renewable Resources Linked to Transmission Zones
       1. Simplification for RESOLVE- each zone shows potential of developing resources
  1. Operation Modeling in Resolve
     1. Overview Operational Model
        1. Similar operating characteristic
     2. Interaction with Other Regions
        1. Allows for interaction and operation with neighboring zones (PNW, DSW, etc.)
     3. Sampling # of Days
        1. Smart sampling- 37 days, when weighted, long/run distribution wind/solar performance, etc. Choose days rather than running multiple years, etc.
        2. Not 8760 hours, but choice days that cover many aspects of resource usage
     4. Modeling Flexibility Reserves (Slide 22)
        1. System with nigh RPS, constrained to provide for reserves. Resources can provide reserves (incremental values to system) will get picked up. Allowed RPS to meet downward flexibility reserves. Can be curtailed on 5 minute basis
  2. Key RESOLVE Features
  3. Case Study CAISO SB350- DID NOT DISCUSS NOT ENOUGH TIME

1. 20 minutes: Q&A
   1. Jim Baalke- How to optimize for transmission. How do LCR get optimized? Are you looked at DER as options for transmission resources, or just solve for transmission?
      1. DER- central station zones.
      2. Distributed solar can be selected in the zone- no transmission upgrade costs.
   2. Matt Barnake-start costs in the model? Thought goal of IRP to do tradeoffs with zero carbon resources- EE will be part of the model or not?
      1. Think they are in for commitment decision (fraction of unit, incur start costs)
      2. EE- still try to determine how to measure EE. Working on how EE will be captured- not determined yet.
      3. Forest CPUC- challenges with data availability for EE.
   3. CESA (slide 20)- sub hourly constraints captured in model and how they help with investment decisions
      1. Flexibility Reserve Requirement- hourly.
   4. Antonio PGE- is emissions a constraint?
      1. In past, did not have emission modeling in constraint.
      2. Will be in the model for IRP (cap on GHG emissions)