MAG Webinar 2

Key note: CAISO SB 350 Regionalization study is referred to for shorthand as the SB 350 study.

Q&A on Background slides

-Kevin Woodruff, TURN

Q: Slides 3 and 4, curious about extra details of timeline. When is Proposed Decision coming out?

A: We didn’t put dates on the slides because until further notice Scoping Memo is source for dates, we will try to reach those dates. Aware of challenges and limits but we’ll be sticking to the scoping memo until it becomes impossible to attain it.

RESOLVE Model Case Study Intro

Starting on Slide 8 – recap of RESOLVE modeling framework

Goals of presenting case study: Last MAG we spoke about RESOLVE in an abstract way, the goal today is to provide you with something more concrete.

The study done for CAISO is inherently different from what will be done for IRP.

Focus today: design of RESOLVE model and how all pieces fit together

RESOLVE Overview

A lot of work has been done on integrating renewables and the challenges of higher penetrations of renewables. Curtailment presents an issue for meeting state policy goals.

3 options:

1. Overbuild renewables, results in significant amounts of curtailment
2. Optimal, sweet spot between Option 1 and 3. Look at relative costs of curtailments and investing in storage.
3. Resources to absorb surplus generation, e.g. using storage and other DERs

RESOLVE is a linear program. Optimizing cost over a 20 year period.

Regionalization Study Background

SB 350 required CAISO to study impacts of regionalization.

Slide 16 explains the analytical framework used in study and how RESOLVE was used.

RESOLVE was used to generate the portfolios under a variety of different scenarios.

Two major impacts were tested in RESOLVE:

1. Effect of regional operations
2. Effect of regional transmission tariff

Q&A

-Mandip Samra, SCE

Q: When will RESOLVE model be available so we can see when it works so we can play around with it?

A: Still working on timeline. As a heads-up, it will be released “as is” with no technical support. But there will be documentation to help facilitate examination of it.

-Paul Klapka, SCE

Q: Slide 13, talked about cost looked at in RESOLVE. Is it looked at hourly?

A: We have an hourly operational model within RESOLVE. That’s the most granular time interval the model considers.

Q: What are your decision variables?

1. Installed capacity of different resource types
2. Decision variables that fall under reduced from production cost models. Flows between regions.

There is also a module that looks at reserve requirements, load following. So there’s offline modeling that goes into parameters

-Mark Nelson, SCE

5,000 MW of out of state and 11,000 MW came from where? Does RESOLVE run after that to fill in the residual need?

A: 5,000 MW of out of state and 11,000 MW were inputs decided on by the study team. They are available in all three scenarios for the model to select.

-Ben, PG&E (45:41)

Q: You said you’re going to customize RESOLVE for IRP. What kinds of changes are going to be made?

A: A number of functionality updates. Mainly capability to implement a constraint on GHG, internal planning reserve margin metric within the model, and simplified ELCC calculation for renewables.

Q: Slide 13, do you do any unit commitment in this process?

A: You’re right, traditionally mixed integer programming has been used to capture unit commitment. We do have some requirements that plants operate above their pmin while they’re online. The model allows you to commit fractions of units at a given time.

-Phillip Muller, Ormat

Q: Slide 13, When RESOLVE is looking at the different resource scenarios is it going to be accounting for the resource behavior. E.g. 1 MW geothermal same amount of energy as 4 MW of solar. Is that built in?

A: Yes, absolutely, E.g. thinking about renewables the solar resource that is considered has a different hourly shape than the wind resource, the wind resources from the geothermal etc.

Q: Slide 18, the assumptions that you’re basically using exports to reduce the amount of curtailment on renewable resources. How is that renewable component of that export accounted for? Any implications on CA RPS requirements and RPS behaviors?

A: Any generation exported was assumed to have been stripped of the renewable attribute. California still takes credit for the production of those renewables for RPS compliance.

- Kevin Kitz, US Geothermal

A: Traditionally the most expensive plant to run is curtailed first. Last slides mentioned that any curtailed plant cost would be still attributed to cost of operating the system. Does the model reflect that?

Q: If the resource has a 0 variable costs then those resources are all treated the same by the model. The model treats all the renewables the same. RPS has a binding production quota. The overbuild component is built into the cost.

It seems like if solar goes down in price it becomes cheaper and cheaper to curtail it. Geothermal is always going to be more expensive to curtail a geothermal MWh than it is to curtail a new solar MWh.

A: Arnie-There’s a difference between existing plants and building new plants.

-Dave Smith, TransWest Express

Q: You didn’t really test advanced Demand response, energy storage. For the purposes of this it seems like you did renewable overbuild.

A: Of the ones on the list in slide 13. The renewable portfolio is a natural part of the optimization. We do have energy storage available for the model to select.

- Sarita Sarvate, CLECA

Q: Slide 16, Can you give me a flavor of what kinds of things would go from RESOLVE into the production cost model.

A: There were a lot of different considerations on transmission topology and marginal loss factors. Unit commitments were a big part of that. A whole bunch of additional details needed to address the study questions.

The production simulations balance the entire Western Coordinating region.

-Pushkar Wagle, BAMX

Q: Could you elaborate on how those decisions are done or if there’s a loop?

A: RESOLVE is a linear program. Its a bunch of decision variables and a bunch of constraints. Our constrains reflect things like an RPS target, meeting hourly load, and you can imagine your variables and your constrains end up in 1 big matrix at once. A very large system of equations and a linear solver will solve them in a single step.

Q: You have single optimization model that is taking the cost and some interactions between those solutions. Is there a way to visualize if other than applying one solution at a time and seeing what comes out?

A: Theres many ways you can look at your outputs of diagnostics. You have to look at your inputs and your diagnostics. A shadow price: if constraint has shadow prices greater than zero – it is doing something to the optimization.

* Bob Fagan, Synapse

Q: You’re modifying RESOLVE so you can do GHG constraints in CAISO. Will you be able to impose GHG constraints on WECC or parts of WECC?

A: RESOLVE optimizes renewable build out and that constraint is tailored to that specific zone.

Q: Soft constraints vs hard constraints in the model?

A: Yes there are, we have a little bit of latitude there.

Q: Any lessons learned about using the two different modeling platforms in the CAISO study process given that in this process (IRP) it’s not clear when or how production cost simulations will be used in addition to RESOLVE. How did that work out for you?

A: We worked with Brattle to see how output metrics were lining up between the two models. We were able to get to a satisfactory point with renewable curtailment lining up. Seeing comfortable results with the two models. We feel comfortable we’re getting reasonable outputs from RESOLVE. We’re open to the possibility of a more detailed diagnostic process.

- Kevin Woodruff, TURN

Q: Re: GHG constraint, will RESOLVE also produce emission results for the entire WECC?

A: Yes, output we can produce. But we don’t model Canada so it won’t be a clear picture of the entire WECC.

- Dariush Shirmohammadi, CalWEA

Q: Do you look at California ratepayer benefits. Do you account for in the case of any wind or solar RPS generators in the state instead of getting curtailed getting exported from the state that there is a payment that the ratepayers pay in California for that generation and that fact that in the process of exporting we pay to have that power picked up by e.g.UTAH? e.g. Ratepayers pay for 50-60 bucks for MW of solar generation and another 10 bucks and give it to UTAH for… Do you account for these types of financial transactions?

A: No. Model takes a societal perspective as if the entire system was owned by all of the system. There are no market transactions reflected in the model.

* Jan Reid

Q: Are you suggesting some of these assumptions (ones used for ISO study) will be used in this process (IRP)?

A: In the next sections we will discuss which ones are specific to the ISO study and which ones we’ll want to revisit as we look at the IRP.

Key Inputs and Assumptions that went into the regionalization study

Q&A

-Kevin Woodruff, TURN

Q: Assumptions used in SB 350 compared to those that will be used in the IRP. Not assuming they will be the same. Just want to clarify.

A: Yes, there are a number of functions that may or may not be appropriate for IRP.

Third slide lays out work-paths.

-Carrie Bentley, AreM

Q: Clarifying terminology used in Scenario Development to terminology used here: Can I relate the base assumptions to “uncertainty factors”? And scenarios to “candidate acquisition plans”?

A: We are working on lining up the terminology in scenario development to terminology in this presentation. What Nick described on slide 43 is the hub and spoke model that was presented in the scenario development deck. Typically we think of them as uncertainties. We’re going to defer this question a bit because we’re envisioning this conversation (convering MAG and ScenDev) happening in the next webinar. In general, what you said is true but it becomes tricky in some cases where we’re talking about something that might be under the influence of the CPUC and what isn’t.

Q: Data from RPS v 6.1?

A: Data from RPS v 6.1 will be updated. We have RPS v 6.3 that will be appropriate for use in IRP.

Q: Unit commitment? Can you restrict it from not turning on and off every hour?

A: We have built some logic into resolve to try to capture that but its’ a difficult thing to try to model in a linear program. It’s represented in a simplified way.

- Aaron, PG&E (1:53)

Q: Earlier you mentioned data sources used will be made available and want an indication of when sources will be expected.

A: Before the end of the year we’ll have an assumptions document. There’s a lot of different threads we’re getting into one document. Don’t have a more specific date for release yet.

Q: Related to what aspect of the RPS calculator will transition into RESOLVE. How you’re modeling RPS req., for the system vs for LSEs? Whether it includes bank usage? Transmission constraints: Do you see RESOLVE replacing the transmission planning function related to energy only and fully deliverable resources that was developed in the RPS calculator?

A: We would be building on contract information and resource cost and potential information developed for the RPS calculator. There’s a lot of data we’ll be leveraging from the RPS calculator. RESOLVE won’t have LSE specific details that the RPS calculator was eventually built out to include. RESOLVE is a system level optimization. The planning reserve margin logic is one of the areas of functionality that we’re doing development on to answer question of best way of capturing energy only and fully deliverable resources dynamics and their different impacts on the system

And yes, RESOLVE has built in banking and redemption.

Paul Klapka, SCE

Q: Process question: At what point will process become formal.

A: December Staff Proposal and onward

-Dariush Shirmohammadi, CalWEA

Q: 2,000- 8,000 export limit? Where did that come from? It’s arbitrary. Did you think about reeling rate? Have you tried to perform study with simply that hurdle rate and see whether you get reasonable results out of it?

A: It’s a difficult issue because there isn’t even really a WECC path rating west to east. There’s no simultaneous import limit CEC and ISO have been using for years. Even under regionalization study where those numbers were chosen there are not a lot of detailed studies on this.

Dariush comment: there’s no reason for any export limit. Out of state utilities have their own resources and ability to absorb our resources. Don’t see need for the artificial constraints. Don’t correspond to reality.

Arne response: Very complex question. How much of surplus generation could be absorbed by other 37 balancing authorities? It would require a lot more granularity than what we have in the RESOLVE model. Based on reality there is need for some limit.

* Kevin Woodruff, TURN

Q: Does RESOLVE have the ability to test other WECC regions ability to absorb from CA?

A: We’re using resource constraint as a proxy for that. Export limit is easiest and most transparent way to express idea of a limit. This isn’t a challenge unique to RESOLVE. LTPP cycles have played around with export limits. WECC wide production cost models you can do this. RESOLVE is must less detailed.