

ADVANCED ANALYTICS FOR EVALUATING MARKET TRANSFORMATION

Brett Close, PhD, EMI Consulting

Tim Michel, PG&E

2019 International Energy Program Evaluation Conference, Denver, CO

August 20, 2019



AGENDA

- 1. Introduction**
2. RPP Program Overview
3. Methods
4. Results
5. Conclusion



MARKET TRANSFORMATION IS A DIFFERENT FRAMEWORK





MARKET TRANSFORMATION REQUIRES A DIFFERENT EVALUATION FRAMEWORK

- Focus on market changes, rather than individual changes
- Don't know where the equipment is
- The design is to make the comparison group invalid

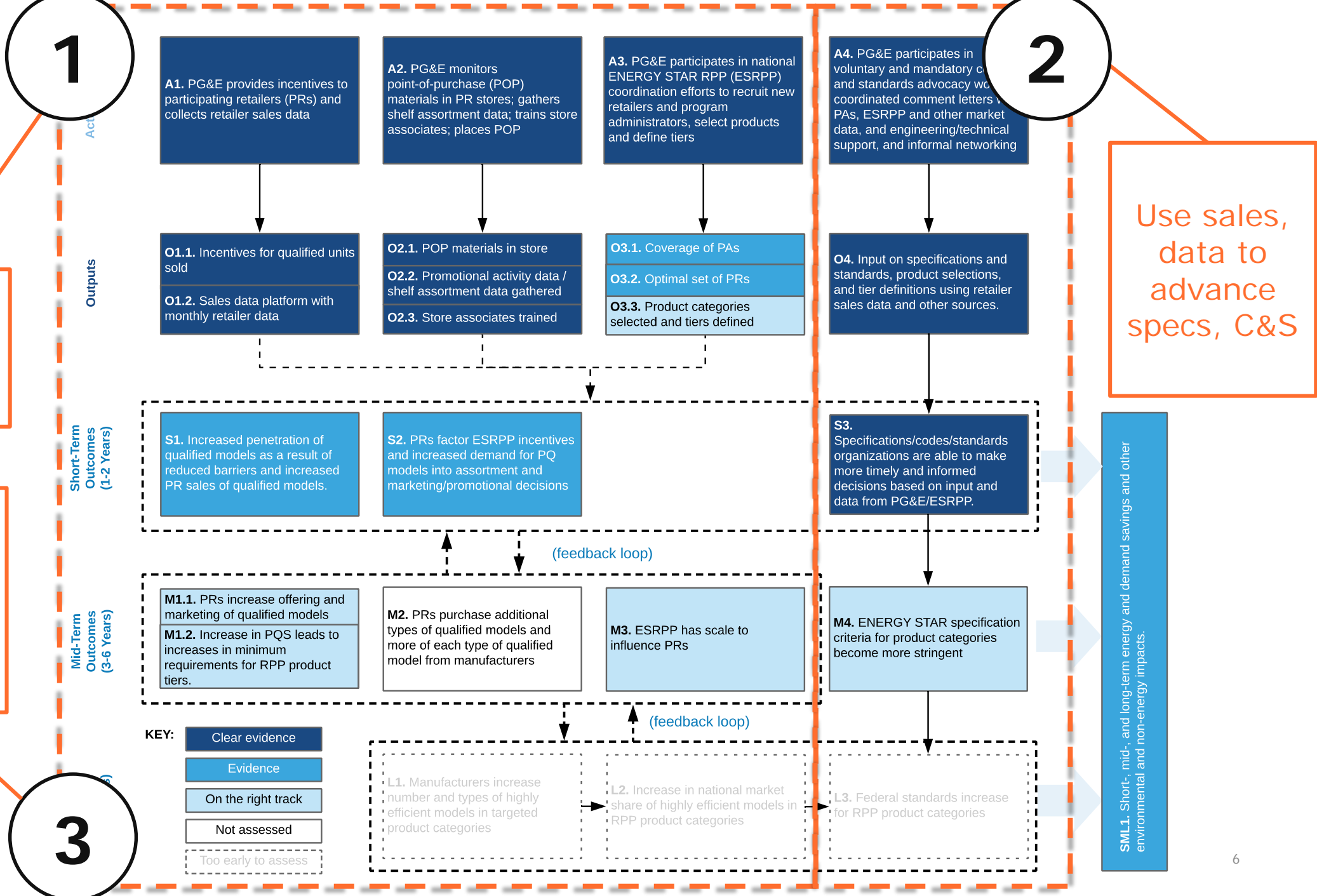
Need some way to see an alternate future

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REVISED LOGIC MODEL



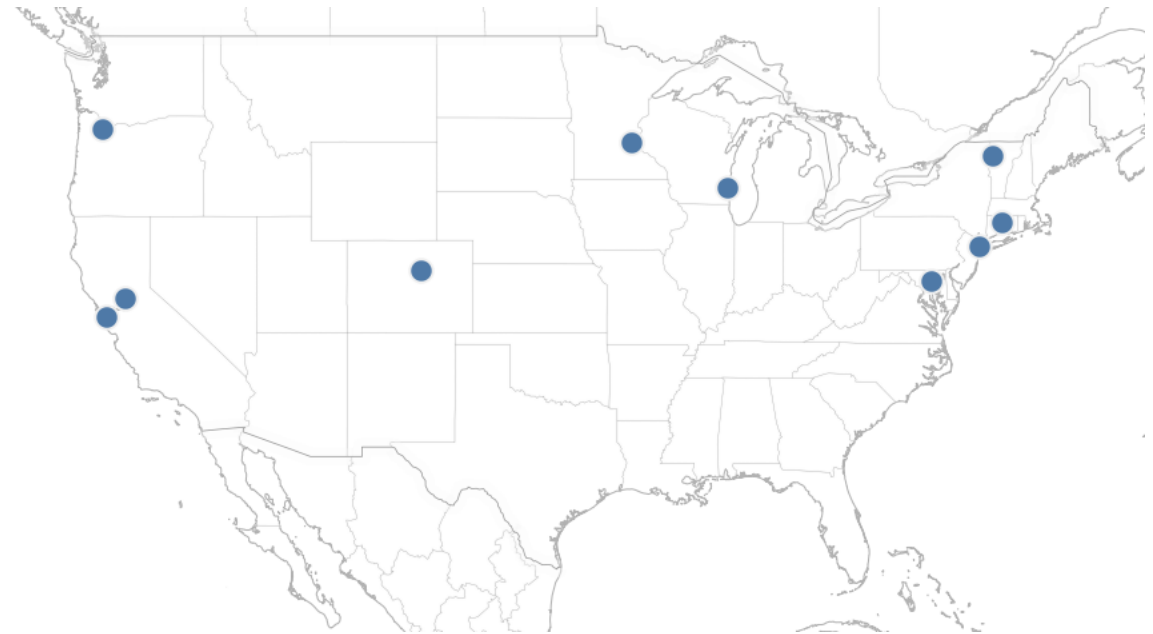
NATIONAL RPP CONTEXT

Since March 2016 RPP is a national effort under the auspices of ENERGY STAR

The most recent estimates from ENERGY STAR indicate the program **covers** roughly **18%** of the total U.S. residential population.

In 2018, RPP had **9 Program Sponsors**.

PY2018 Participating Retailers

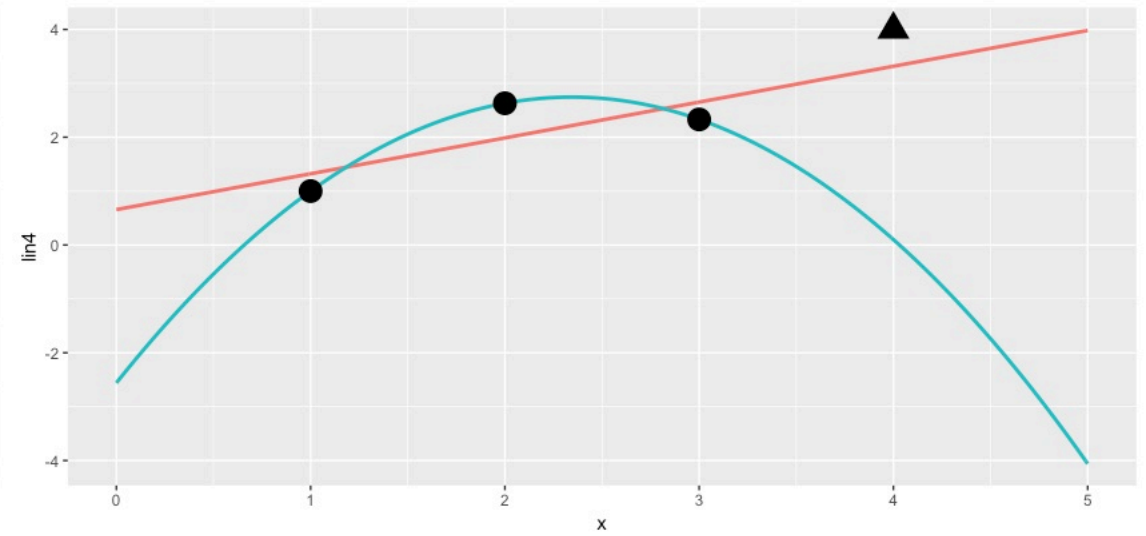
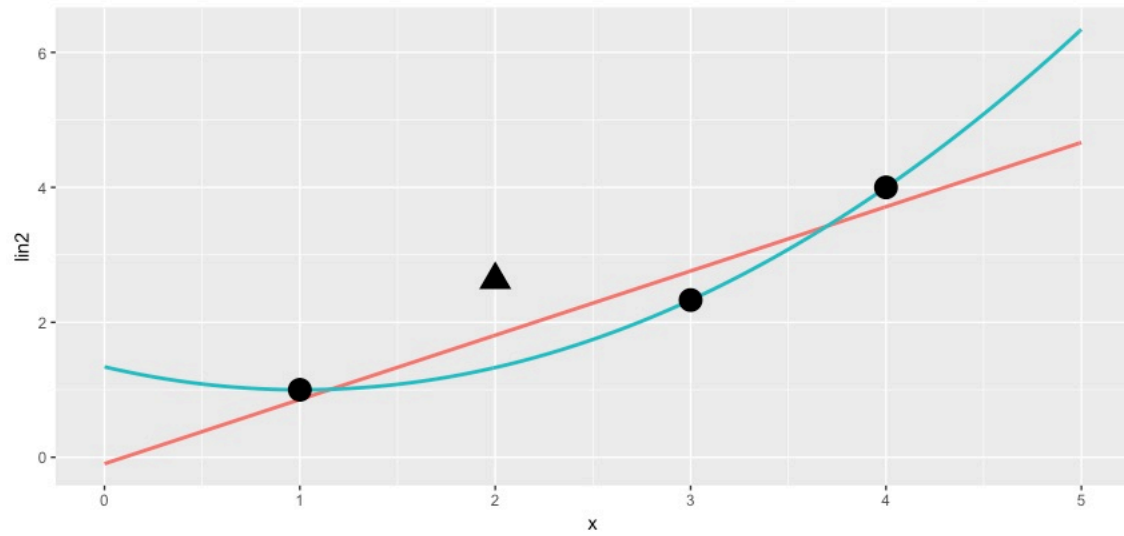
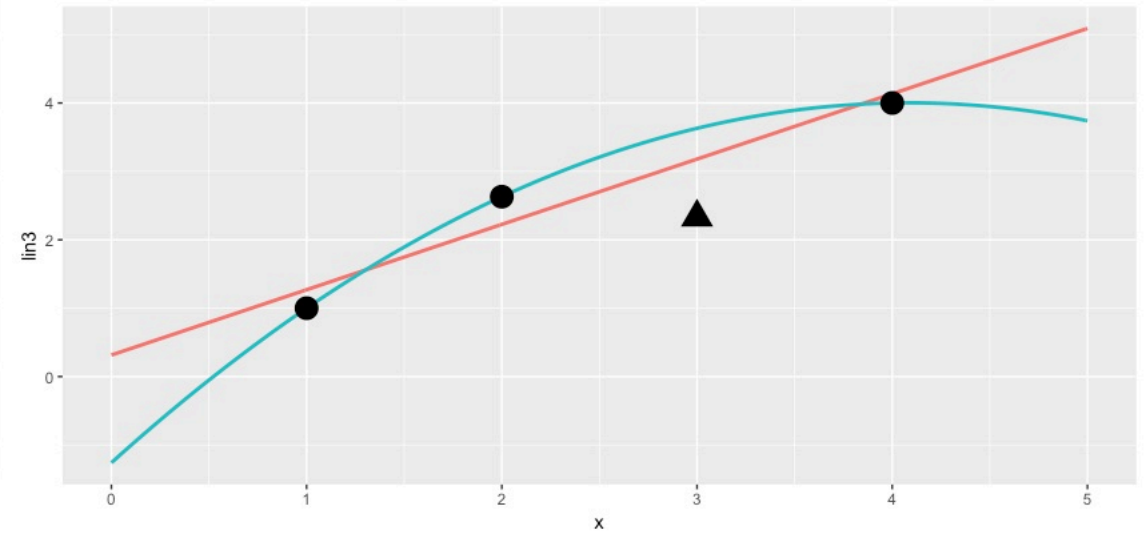
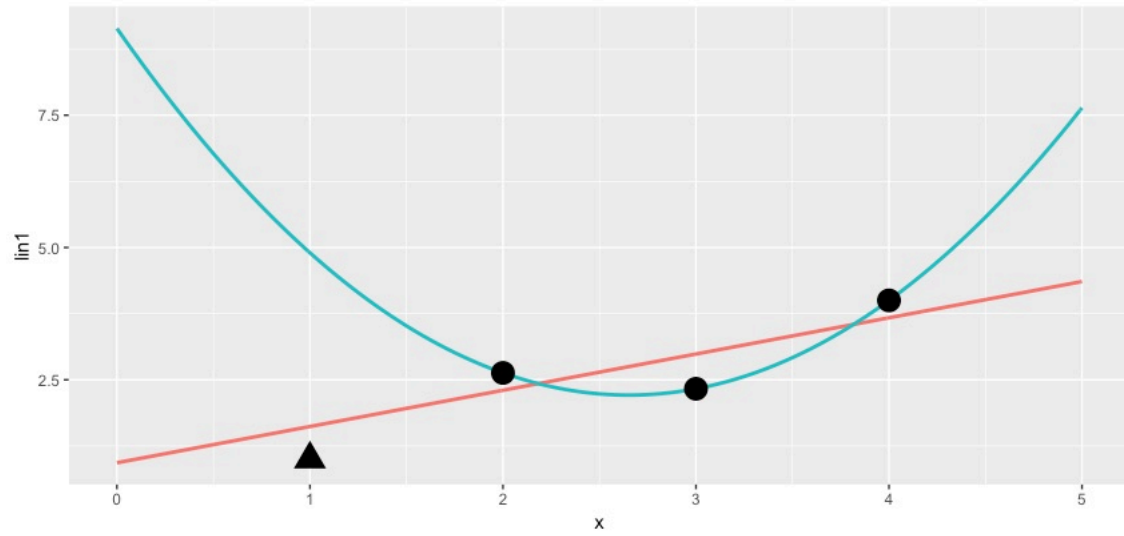


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SIMPLE EXAMPLE: LEAVE-ONE-OUT MODEL FIT



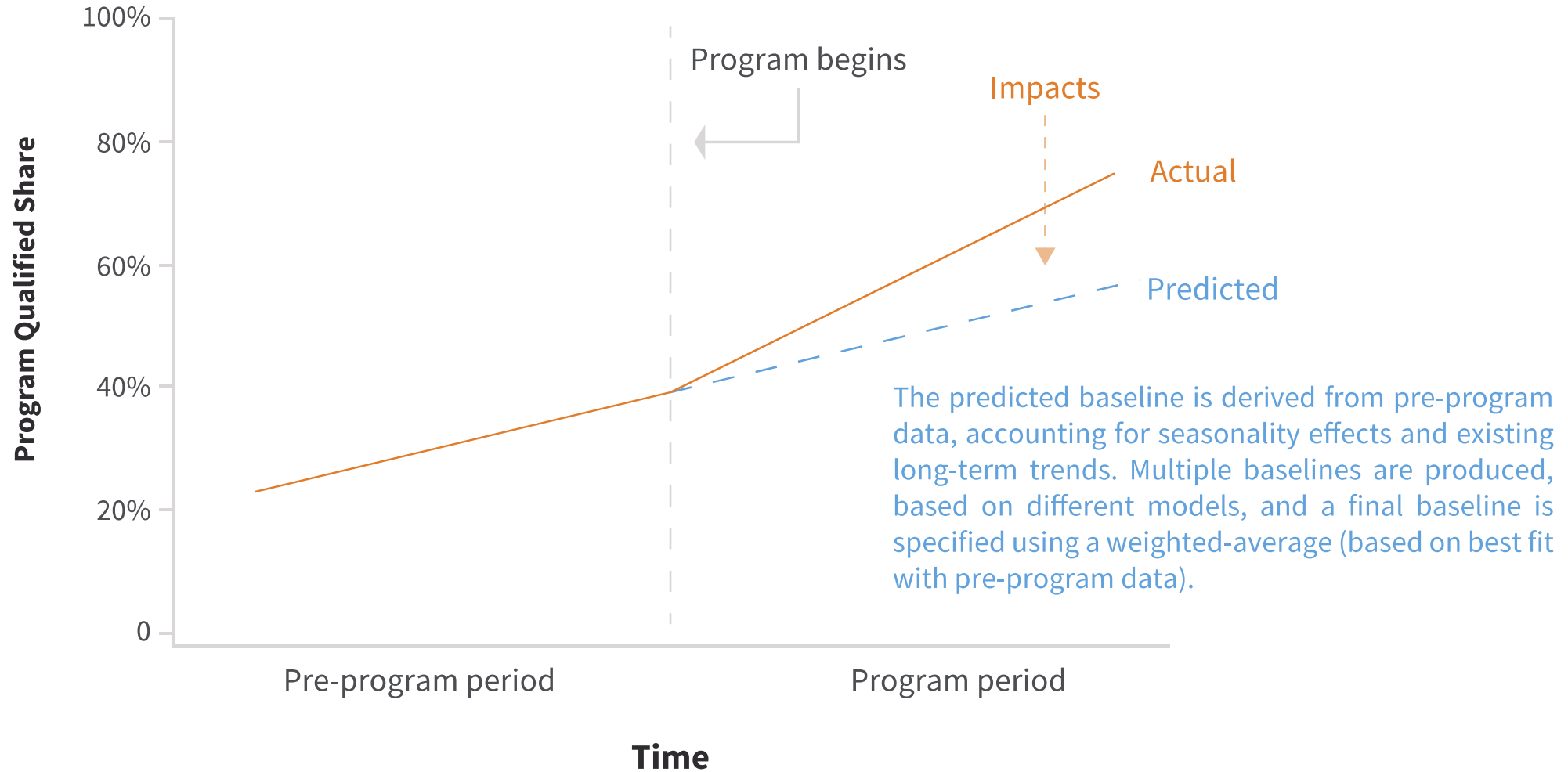


JACKKNIFE MODEL AVERAGING

- All models are simplifications
- Multiple models may have features that fit the underlying market behavior
- By combining multiple models we can create a better synthetic model

- Jackknife model averaging uses numerical optimization to combine the models to achieve the best leave-one-out fit.

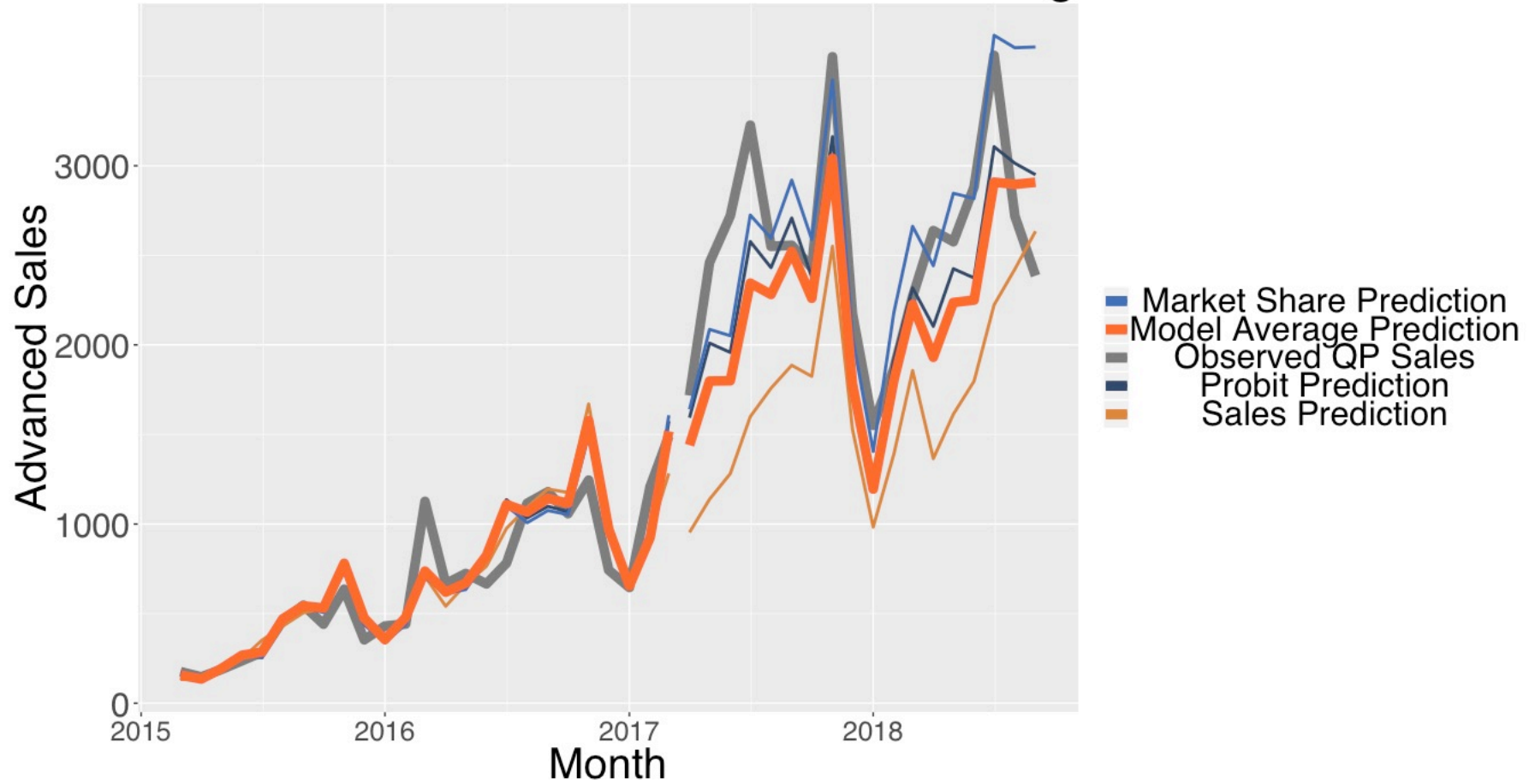
PRE/POST MODEL-AVERAGING FORECAST BASELINE



Additional methods supplement the sales analysis to create a holistic picture.

MODEL AVERAGING OF SALES DATA

Modeled and Observed Advanced Refrigerator Sales



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SALES DATA MODELING RESULTS

Over two-year period

Product	Tier	Increase	SE	Lower Bound (95% CI)	Upper Bound (95% CI)	PQ Sales in the Post Period	% Change
Dryers	Basic	10,557	2,482.8	6,347	14,766	135,388	7.8%
	Advanced	159	20.0	125	193	279	57.1%
Freezers	Basic	2,522	352.5	9,849	1,924	3,120	14.8%
Refrigerators	Advanced	6,933	1,055.7	5,102	8,764	45,948	15.1%
Soundbars	Basic	(986)	60.8	(1,089)	(883)	421	-234.2%
	Advanced	10,477	115.6	10,281	10,673	15,057	69.6%

PG&E stopped incenting basic tier soundbars in April 2017.

COMPARISON OF SALES DATA + SHELF ASSORTMENT DATA

A comparison shows general alignment, though soundbars shows opposite trend, and room AC trend is not significant.

Product Category	Program-Qualified Sales Increase?	Program-Qualified Shelf Assortment Increase?
Air Cleaners	No	No
Dryers	Yes**	Slight increase**
Freezers	Yes (basic tier only)**	Slight increase**
Refrigerators	Yes (advanced tier only)**	Slight increase**
Room ACs	Indeterminate	Slight increase**
Soundbars	Yes (advanced tier only)**	No
Washers	No	Slight increase**

*** denotes statistical significance.*

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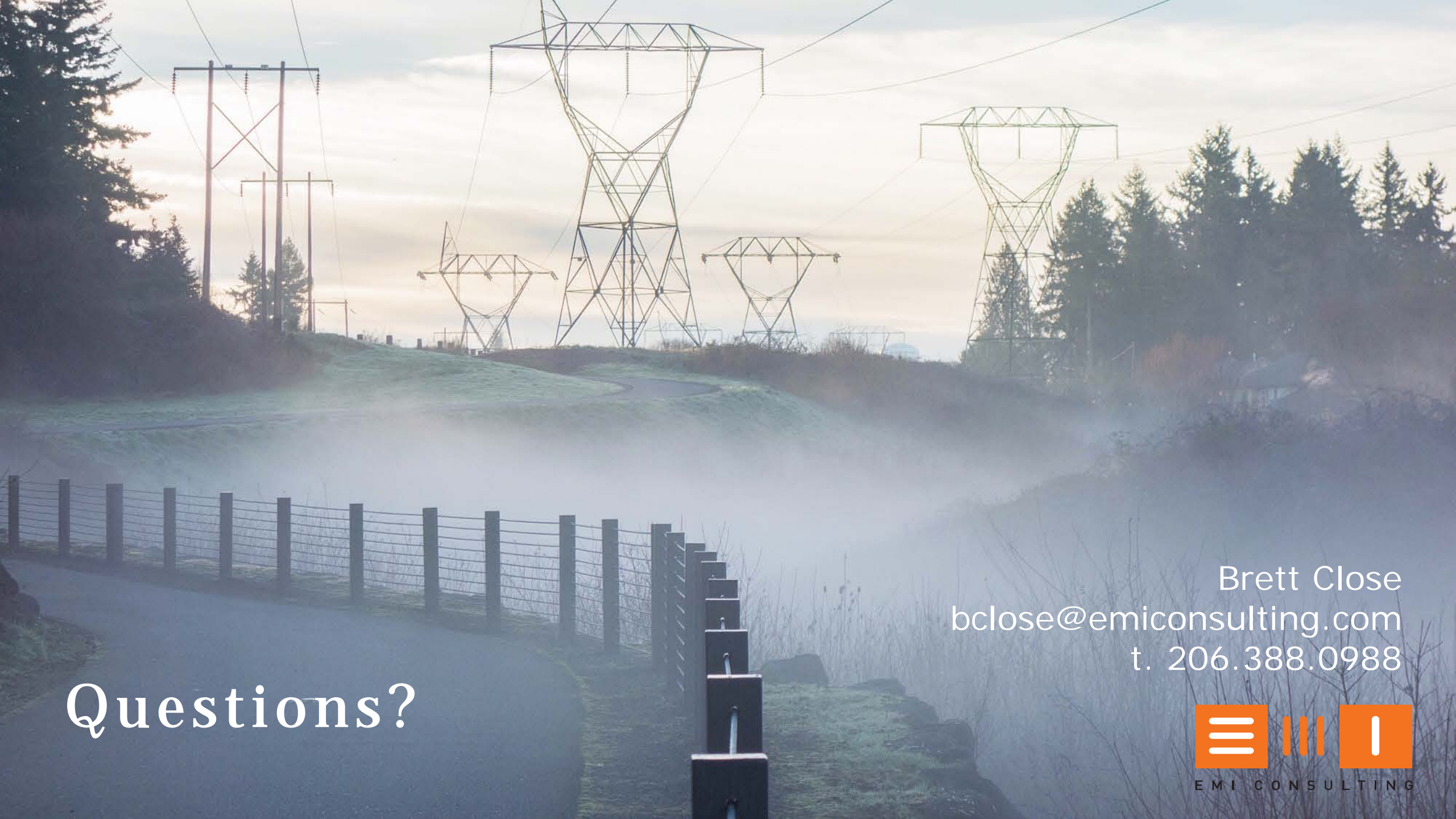
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CONCLUSIONS

- Market transformation efforts like RPP require a different evaluation framework
- Model averaging provides a method to combine competing models of program impact in a data-driven, statistically-founded manner
- With PG&E's RPP program, this approach lined up well with other sources of information





Questions?

Brett Close
bclose@emiconsulting.com
t. 206.388.0988



EMI CONSULTING