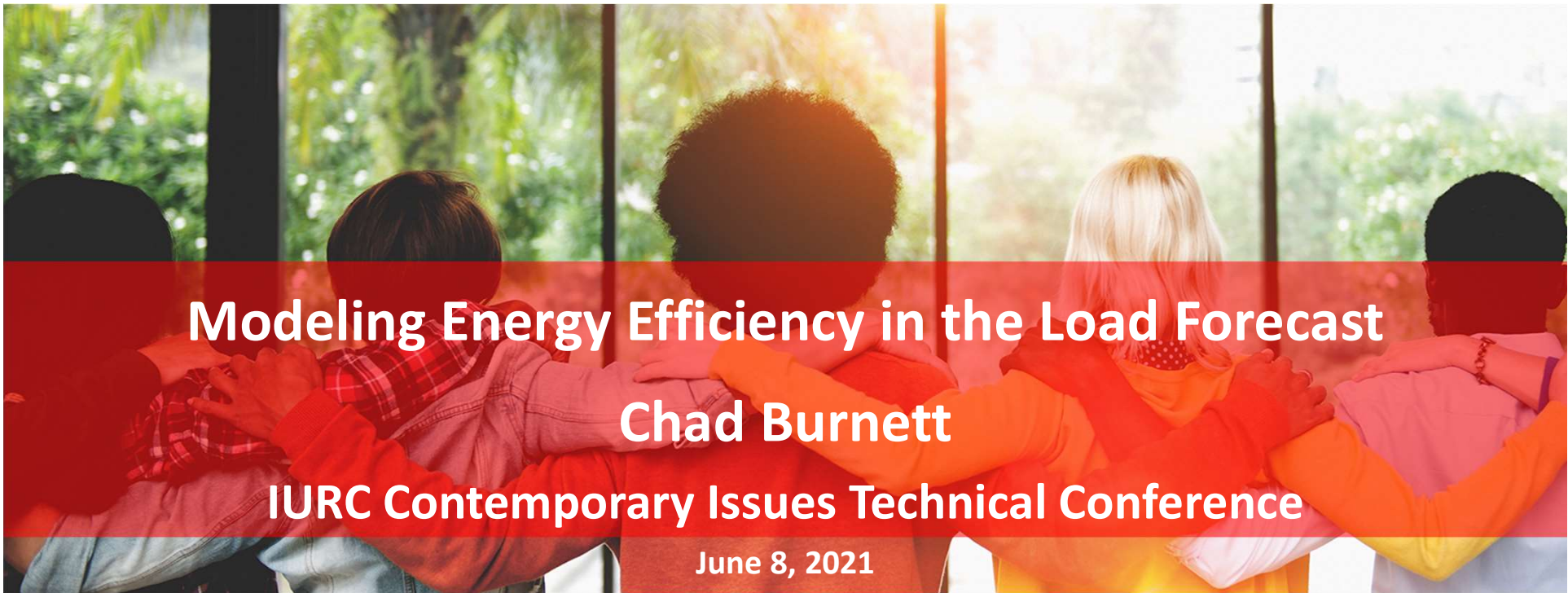




BOUNDLESS ENERGY™



Modeling Energy Efficiency in the Load Forecast

Chad Burnett

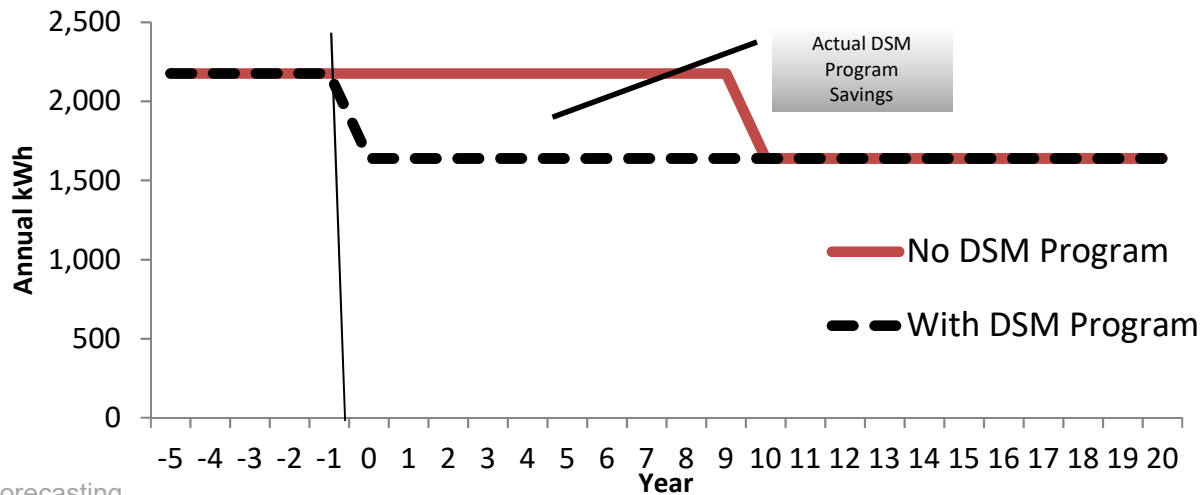
IURC Contemporary Issues Technical Conference

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Accounting for DSM in Load Forecast

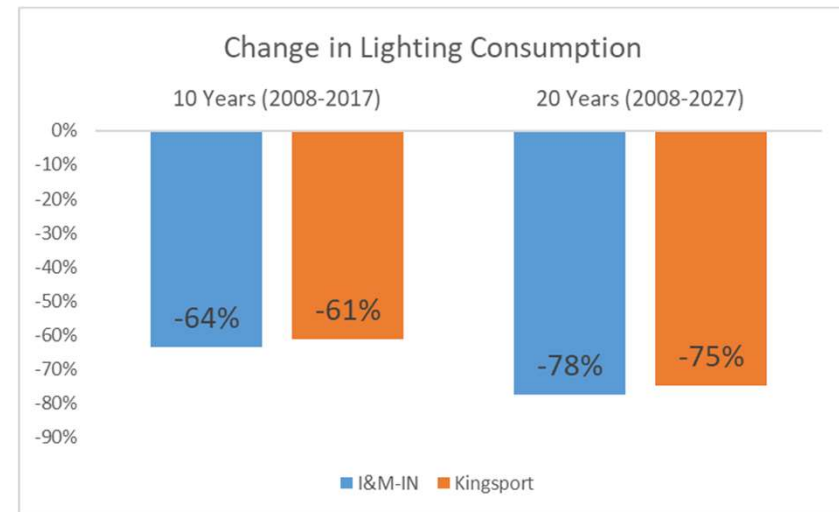
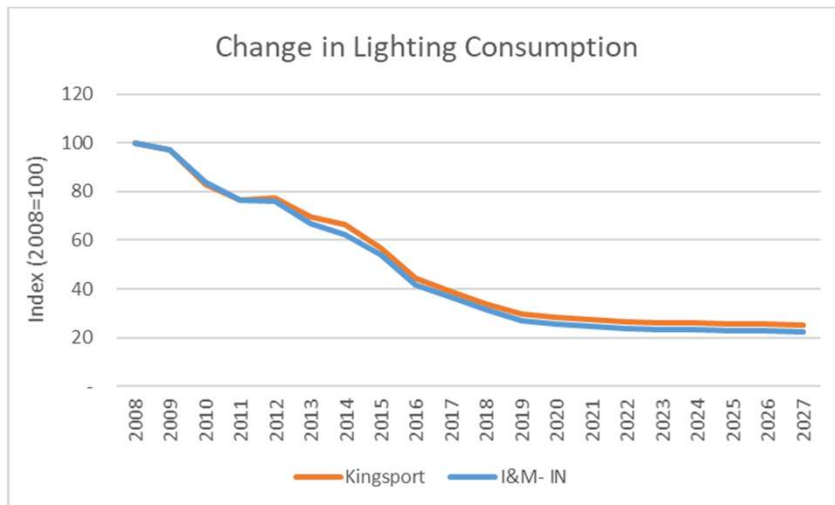
The purpose or effect of the Company's DSM/EE programs is to accelerate the adoption of energy efficient technology to enable our customers to be more efficient consumers of energy.

Cooling EE/DSM Program Example



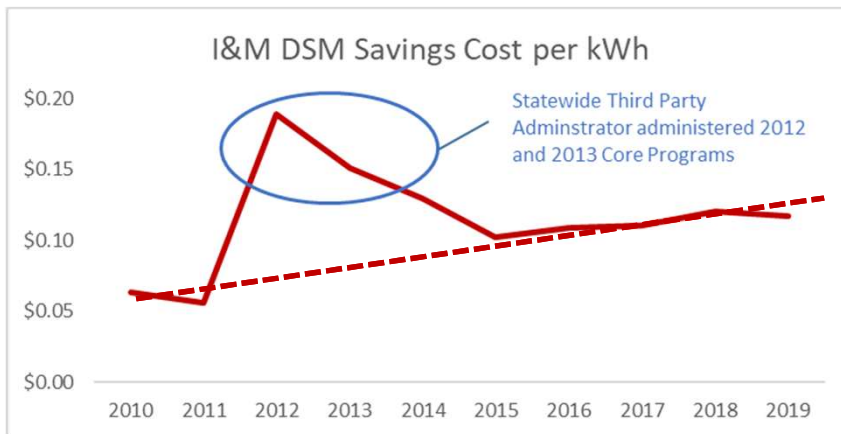
Residential Lighting Example

- I&M's DSM programs in IN accelerated the adoption of energy efficient lighting faster than Kingsport, where there were no utility sponsored energy efficiency programs.

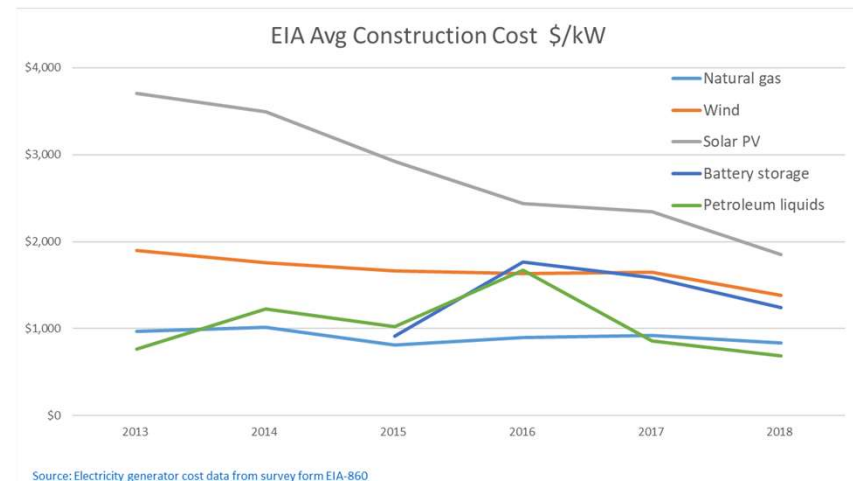


Economics of Low Hanging Fruit

- The Law of Diminishing Returns
- Price of Substitutes



4 | Economic Forecasting



Measure What Matters With Meters

- The way DSM program savings are measured is different than the way loads are metered and modeled in the load forecast.
- Full deployment of AMI technology could dramatically improve the measurement accuracy of DSM program savings and allow for consistent measurement across jurisdictions.



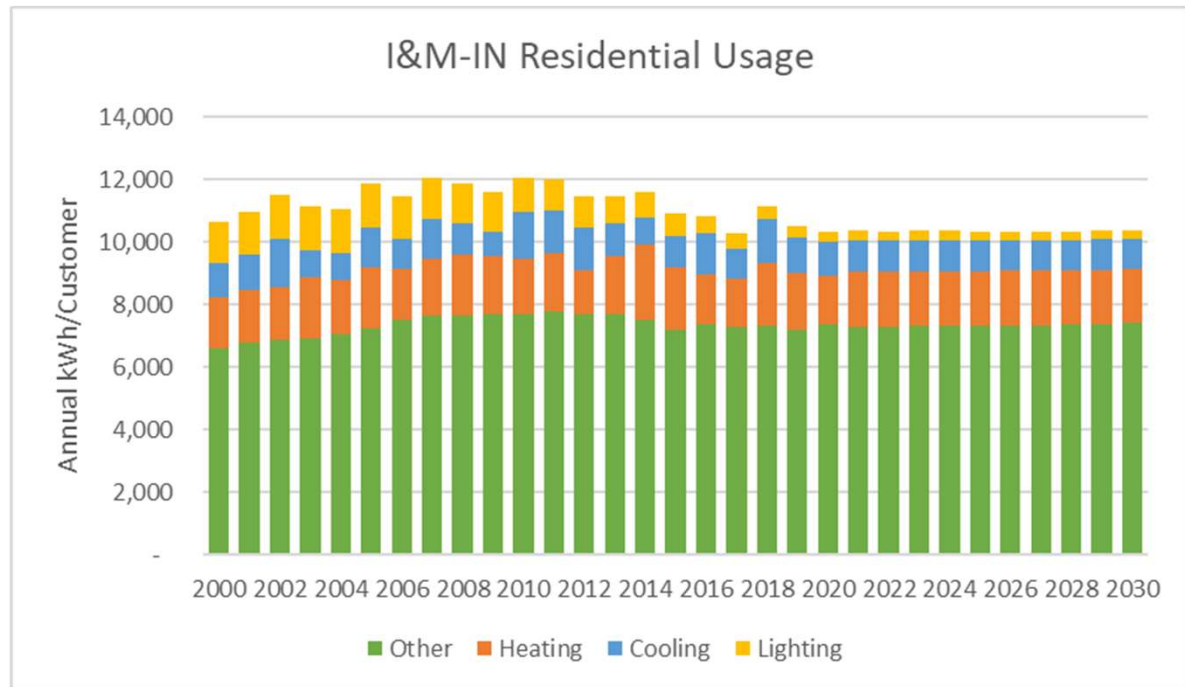
Multiple Ways to Model DSM in the Load Forecast

- The Brattle Group¹ has identified 6 different approaches used across the industry to model DSM impacts in energy sales forecasts.
 1. DSM Already Embedded in Sales Data - No post-regression adjustment needed
 2. **Historical DSM Embedded in Sales Data - Adjust for incremental DSM in forecast**
 3. Reconstruct Historical sales as if no DSM and do post-regression adjustment
 4. Include DSM activities as a right-hand side variable in econometric models
 5. **Hybrid Model (SAE) that embeds end-use features in econometric models**
 6. Combination of approaches identified above
- I&M's approach is most like #6- Combination of Approaches #5 and #2- **Itron's SAE combined with a Supplemental Efficiency Adjustment** (formerly called degradation)

¹ 'Estimating the Impact of DSM on Energy Sales Forecasts: A Survey of Utility Practices' by Z. Wang, A. Faruqui, and J. Hall. The Brattle Group. 2017
http://files.brattle.com/files/5648_estimating_the_impact_of_dsm_on_energy_sales_forecasts.pdf

SAE Load Forecast By End Use

- The SAE model provides the ability to dissect the load forecast by end-use type.



Survey of Peer Utilities (Work in Progress)

	Utility A	Utility B	Utility C	I&M
Itron SAE Models?	Yes	Yes, Itron develops forecast	No (traditional econometric model)	Yes
DSM Optimized?	Constant Target	Optimized	Constant Target	Optimized
DSM Model Approach	Regress DSM as independent variable	Regress DSM as independent variable	Model programs base on measure life. Assume no savings after measure life expires	Supplemental Efficiency Adjustment Matrix based on measure life
Adjusting DSM savings in Load Forecast?	DSM coefficient used to discount future DSM savings in forecast	DSM coefficient used to discount future DSM savings in forecast	Not using SAE so load forecast does not already account for energy efficiency. As a result, no adjustment needed for future DSM savings.	Supplemental Efficiency Adjustment used in conjunction with SAE model to prevent double counting EE

DSM as Independent Variable?

- Some utilities are including historical DSM savings as an independent variable in the model to determine the appropriate % to discount (or adjust down) future DSM savings to avoid double counting energy efficiency in the load forecast.
- I&M tried this approach, but the DSM variable was not statistically significant.
- Instead, I&M uses a Supplemental Efficiency Adjustment matrix to adjust the DSM savings amounts in the load forecast.

Variable	T-Stat	P-Value
ResidentialVars.XHeat	30.034	0.00%
ResidentialVars.XCool	29.456	0.00%
ResidentialVars.XOther	79.723	0.00%
BinaryVars.Jan	1.189	23.57%
BinaryVars.Feb	-6.501	0.00%
BinaryVars.Mar	-6.187	0.00%
BinaryVars.Apr	-7.443	0.00%
BinaryVars.May	-6.407	0.00%
BinaryVars.Jun	-3.537	0.05%
BinaryVars.Jul	2.188	2.96%
BinaryVars.Aug	4.229	0.00%
BinaryVars.Sep	3.422	0.07%
BinaryVars.Oct	-2.453	1.48%
BinaryVars.Nov	-4.705	0.00%
BinaryVars.JanD06on	6.240	0.00%
BinaryVars.FebD06on	6.077	0.00%
BinaryVars.may13on	-7.248	0.00%
BinaryVars.d1112	-4.953	0.00%
BinaryVars.d2020on	2.538	1.17%
dsmusage.dsmusage	-0.406	68.54%

Not statistically significant



Consistent Load Forecast For Multiple Uses

- I&M's methodology has proven to produce accurate and reliable results that are useful for planning and setting rates.
- I&M uses the same load forecast in its financial planning as it uses in rate cases, rider and fuel filings, and the Integrated Resource Plan.
- The only difference is that the IRP load forecast is the long-term DSM assumptions.
 - Financial forecast assumes long-term DSM assumptions consistent with the most recently completed IRP.
 - IRP load forecast includes Commission approved DSM programs in the near term, but solves for the optimal DSM levels in the long-term.