BEFORE THE

ILLINOIS COMMERCE COMMISSION

OPEN MEETING

M&V 2.0: Innovation and Emerging Technologies for the Evaluation, Measurement, and Verification of Energy Efficiency Programs.

Monday, February 27, 2017

Chicago, Illinois

Met, pursuant to notice, at 9:00 a.m., at 160 North La Salle Street, Chicago, Illinois.

PRESENT:

BRIEN J. SHEAHAN, Chairman

SHERINA E. MAYE EDWARDS, Commissioner

MIGUEL DEL VALLE, Commissioner

JOHN R. ROSALES, Commissioner

SADZI OLIVA, Acting Commissioner

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CARYL L. HARDY, CSR

CHAIRMAN SHEAHAN: Good morning, everyone. We'll get started here.

Welcome to the Illinois Commerce Commission's Policy Session on Evaluation, Measurement, and Verification of Energy Efficiency Programs.

This session is convened pursuant to the Illinois Open Meetings Act and our guests and panelists should be aware that a court reporter is present. A transcript of this session will be posted to the Commission's website.

With me today are Commissioners Del Valle -- he's around here somewhere; I saw him; he'll be with us in a minute -- Edwards, Rosales, and Acting Commissioner Oliva. We have a quorum.

I'd like to take a moment to thank today's panelists for their time and effort and participation.

I'd also like to thank all of you for taking time out of your schedules to be here today.

I'd like to also offer a special thanks to Meagan and Wei Chen for organizing the panel this

morning.

Illinois has been and will continue to be a thought leader in the application of advanced technologies in the utilities, particularly in the deployment of smart meters.

With the wealth of data provided by these meters, one obvious question comes to mind: How do we extract value from the data?

Utilities have Energy Efficiency Program goals that they must meet. We also have a new law, the Future Energy Jobs Act, which calls on utilities to meet more aggressive goals for energy efficiency, changes how utilities can capitalize and recover costs on energy efficiency savings, and calls for the use of AMI data for energy efficiency.

The formal process by which we assess the performance of energy efficiency activities is called the Evaluation, Measurement, and Verification. This process lets us calculate the effective energy efficiency measures and helps us ensure successful program implementation for the future.

EM&V is an important function for the

Commission. It allows us to know that ratepayer dollars are being spent on Energy Efficiency Programs, are being used prudently, and that energy savings targets can be met which is why we're here today.

For those of you not familiar with EM&V, the dominant method used today in Illinois is called deemed savings which is essentially an estimate. A few years ago, people started wondering if we could more accurately measure the savings achieved by energy efficiency measures by leveraging data collected by AMI, weather information and other sources of information, and feed it all into a model. Instead of waiting until the end of the year to bundle up the data, we could continuously monitor the implementation and change course if something is not producing the results we expect.

This also invites the question of what value can be extracted from knowing how energy efficiency measures impact actual use. And that's what we're here to explore today.

We'll first dive into how EM&V is currently

conducted in Illinois. We'll then learn how deemed savings estimates are created and used and how new technologies may change the way the traditional EM&V has been conducted.

Later, we'll learn about specifics of some new technologies that are currently out there and specifically some of the benefits and drawbacks of those emerging trends. We'll also discuss policy and regulatory frameworks for implementing the new technologies.

My hope is that the session will help keep us, as regulators, and all other stakeholders up to date and informed on innovation in the realm of EM&V.

To start today's panel I'd like to introduce Meagan Pagels. Meagan is one of my legal and policy advisors. She'll be leading our first panel of the morning which will consist of an overview of the current state of EM&V in Illinois and across the country. One panelist who will be here shortly is just running late.

So Meagan...

MS. PAGELS: Thank you, Mr. Chairman.

As the Chairman said, my name is Meagan Pagels, and I will be the moderator for panel one which will be an overview of the current state of EM&V in Illinois and across the industry.

The questions will explore the benefits and drawbacks of the current approach which uses deemed savings to measure the savings produced by Energy Efficiency Programs.

The format of the panel will consist of brief presentations by each of our panelists, followed by a series of questions. If time remains at the end, we will take questions from the audience.

Before I begin, I would like to introduce our panelists.

First we will be hearing from Julia Friedman who is the Senior Policy Manager at Midwest Energy Efficiency Alliance.

We will then hear from Michael Brandt who is a Manager of Energy Efficiency Planning and Measurement at Commonwealth Edison.

Following Michael we will hear from David

Brightwell who is an economic analyst in the Policy Program in the Policy Division here at the ICC.

We will then hear from Karen Lusson, Assistant Bureau Chief of the Public Utilities Bureau at the Illinois Attorney General's Office.

We will then hear from Annette Beitel who will join us shortly. She's an Independent Facilitator of the Illinois Stakeholders Advisory Group.

And last but not least, we will hear from Kristin Munsch who's the Deputy Director of the Citizens Utility Board.

Please join me in welcoming our panelists.

(Chorus of applause.)

MS. PAGELS: Julia, you can please begin when you're ready.

MS. FRIEDMAN: Great. Thanks so much, Meagan. Thanks so much for having me here.

I did not get my slides together fast enough, so the Commissioners will find a handout. And if Staff will like some extra copies, Meagan has some additional copies. I realize that EM&V is

very technical, and some illustrations can be helpful.

So just a quick overview of MEEA, we are a nonprofit membership organization based in Chicago, but we cover 13 states in the Midwest. And our members include utilities; investor-owned utilities, munis, and co-ops; research institutions; state and local governments; as well as energy efficiency-related businesses.

So I am going to do some conceptualizing, some term defining, and then showcase kind of where things are at around the country and in MEEA's territory.

So when determining -- so this is -- we're now on this slide. When determining energy savings, you're coming up with the counterfactual. You're estimating what energy use would have been had an energy efficiency project not been installed and then measuring that against energy usage after the installation of a project. And this is done through the process of Evaluation, Measurement, and Verification.

And so here the question you kind of want to ask yourself when thinking through methodologies and approaches is you're trying to balance the certainty of the estimate of the savings that you want against the effort and the cost needed to obtain that level of certainty.

So EM&V, three words, kind of breaks down into two different categories. Lawrence Berkeley National Laboratory has defined evaluation as the performance of studies and activities aimed at determining the effects of an Energy Efficiency Program or portfolio, so kind of the higher level.

Then they define measurement and verification as data collection, monitoring, and analysis associated with the calculation of savings -- gross energy savings and demand savings from individual sites or projects.

So taken together, you have Evaluation, Measurement, and Verification.

And so now just to kind of show that EM&V is part of a continuous process -- we're on the circular side -- and -- so you do your initial

program planning and then you implement your programs and then you evaluate your programs, and all that information that comes out of the evaluation process is then used to feed back into the next cycle of program planning.

EM&V is used for ongoing program implementation and improvement, supporting the planning of future portfolio cycles, load forecasts, energy resource plans, and in some instances cost recovery, as well as incentive payment processes.

So I wanted to take some time to define four terms that you are likely to hear throughout the day, the first of which is impact evaluations.

There are four types of evaluations. There's impact, process, market evaluations, as well as cost effectiveness evaluations.

Impact evaluations is what I imagine you're going to hear most about today, and they are -- an impact evaluation is used to determine the change that has occurred, reduced energy usage, for example, due to an Energy Efficiency Program.

Then deemed savings, which you heard a little bit about already from the Chairman -- deemed savings, also known as stipulated savings values, are estimates. They're estimates of energy or demand savings for a single unit of an installed energy efficiency measure. Values are developed using historical and verified data and is applied when it's determined to be applicable to the situation that's being evaluated.

So typically deemed savings are used for prescriptive or standard measures, so these are things like energy-efficient appliances like washing machines, computer equipment and refrigerators, lighting retrofit projects. Anything that has well-understood operating hours would be an appropriate fit for deemed savings value.

Deemed savings values are then documented in what's called a Technical Reference Manual using agreed-upon engineering algorithms. So Technical Reference Manuals usually include a documentation of the assumptions like the baselines that are used to prepare values, the actual calculation of the

values, and guidance on when it's appropriate to apply those values and algorithms.

A separate approach from using deemed savings is comparison group EM&V methods. And I imagine the second panel will talk more about that, but that's where you're conducting statistical analyses of large volumes of metered energy usage data.

Comparison group EM&V methods determine program savings based on the differences in electricity consumption patterns between a comparison group and the program participation.

And so both of these approaches, whether you're using deemed savings or comparison group EM&V methods, can be -- can take advantage of what we can call EM&V 2.0, also known as M&V 2.0 or automated M&V, basically taking advantage of advances in big data.

So just to give you a quick idea of how this is starting to show up in regulatory documents, New York's Department of Public Service, in their EM&V guidance that was issued in November

2016, said a defining criterion for automated M&V software is that it continuously analyzes data as it becomes available.

The last term or terms that I'd like to define for you are net and gross savings.

So gross savings are the change in consumption that's attributed to the Energy Efficiency Programs for actions taken by customers regardless of why they participated in the program.

And then net savings are a subset of the gross savings that are directly attributable to the Energy Efficiency Program.

And so now I'll switch to kind of looking at who uses a TRM around the country and flesh out a little bit about what that looks like.

So under the slide titled National Perspective, you can see that there are statewide TRMs that exist across the country. Missouri and Iowa have a very new TRM. Missouri actually still needs to adopt rules around the usage of their Technical Reference Manual. And I think Missouri is, like, an interesting state to look at just in

that they decided to go down the path of developing a TRM, but as a component of that process, they'll be looking at how M&V 2.0 can kind of complement the TRM approach.

And so while each state has their own TRM, it's important to remember that the EM&V frameworks in which those TRMs fit are all different. So in Texas, for example, the contract with the evaluator is actually held by the Commission and it's just one evaluator for all the utilities which, as you'll hear from others, is different than how we do it in Illinois.

Sometimes utilities will also have their own utility-specific TRMs. Xcel in Colorado and Tennessee Valley Authority are two examples.

And the last thing I just wanted to point out is that Maine has a TRM. They have TRMs for their residential programs, for their commercial programs, and then also for their multi-family programs which can be useful to folks who are planning programs for the multi-family sector.

Then we can look at a couple regional

efforts around TRMs. So regional TRMs exist in both the Northwest, as well as the Mid-Atlantic. In the Mid-Atlanta, it's the sister organization to MEEA, the Northeast Energy Efficiency Partnership who runs their collaborative and their TRM that applies to Maryland, Delaware, and D.C. And then the Regional Technical Forum in the Northwest has a regional TRM that applies to Idaho, Montana, Oregon, and Washington.

And then lastly, just quickly, looking at the states within MEEA's region, there's a real mix of who uses net or gross savings for regulatory purposes. And so we have five states that report both, three states that report -- or that use only net savings, and two, Ohio and Minnesota, that use gross savings.

So it's definitely different within our region around the country, and I think while there are many different approaches, it's important to remember that for every state that has a statewide framework, there's been a process to determine that that works for that state, so I won't comment on

one framework being better than the other necessarily.

So thanks very much for your time and I'm happy to answer questions.

MS. PAGELS: Thank you, Julia.

Chairman and Commissioners, do you have any questions?

(No audible response.)

MS. PAGELS: Great. We will move on to Michael Brandt.

MR. BRANDT: I'd like to first thank you all for inviting me to come and talk. I'm Mike Brandt. For the past ten years, I've served as Manager of Energy Efficiency Planning and Measurement at Com Ed. In this role, the M&V function, which is near and dear to my heart, has been under me, so I've been responsible for it since its inception.

Today I'd like to briefly talk on five subjects; one, the purpose of M&V; two, how EM&V has evolved over the past nine years at Com Ed, how it currently works, the value of the SAG;

and finally, I'll just touch briefly on M&V 2.0.

The purpose of M&V -- this might be a little different than how Julia laid it out. I think of it more in terms of two functions: Process evaluation and impact evaluation.

The process evaluation evaluates how well a program operates possibly resulting in recommendations around program design at the end of the year.

But today we're discussing mainly impact evaluation which, at its highest level, is determining the energy savings associated with the various Energy Efficiency Programs.

And I'd just like to make two general comments about measured energy savings. Pretty much agreeing with what Julia said, the key to energy savings is measuring what wasn't used. There will always be an estimate, and our goal is to calculate the best, more accurate estimate possible.

Second, impact evaluations are not necessarily a straightforward calculation. There's

no absolute methodology to determine kilowatt hour savings from an individual measure or program. There are many factors and variables that can influence this result.

So how has EM&V evolved from Com Ed's perspective? We've been running our portfolio since 2008. We are currently in our ninth year of implementation. I can tell you the first year after we received our very first report from the evaluator, the results were less than expected. Our initial reaction was this is not working and unacceptable. I believe the program manager who received that report said we need to fire these guys right away.

(Chorus of laughter.)

MR. BRANDT: That wasn't quite possible. So we worked through that.

From our results in the first year, we're -- while we ultimately made our annual savings goal, our projected savings were much lower than we expected. Much of this had to do with the many moving parts or data points associated with

the evaluations, many factors which originally were not determined until the end of a program year. As a utility, we found this risk unacceptable, and fortunately so did many of the stakeholders.

Every year we have worked with the stakeholders, ICC staff, and the independent evaluators to identify risks in the evaluation process and developed various processes to best mitigate this risk.

Today I believe we've developed a highly successful process that yield results that give all parties a high degree of comfort that we have a robust estimate of savings.

So how does the EM&V currently work in Illinois? EM&V is required by law to be conducted by an independent evaluator, and the budget from EM&V is set at a percentage of 3.5 percent of the overall budget. We shared that contract with ICC Staff. Staff has the ability to cancel the contract if they believe the evaluator's independence has been compromised.

As a policy within Com Ed, the ICC Staff

is invited to all meetings with evaluators and included in all correspondence with the evaluator.

At the start of each year, the independent evaluator develops an evaluation plan for each program. Both Com Ed and ICC Staff usually comment on the various evaluation plans. Each program has a plan specific to it. A Residential Behavioral Program is treated much differently than an Industrial Process Program.

Com Ed, along with Staff, communicate with the evaluator throughout the year as each evaluation plan is implemented. At the end of the year, the independent evaluator produces an individual program evaluation report, plus an overall summary report. These reports are distributed simultaneously to all parties: Staff, stakeholders, and Com Ed.

While Staff and Com Ed usually have comments, it's been very rare for a stakeholder to offer comments on individual reports.

The value of the Stakeholders Advisory Group or SAG: Our stakeholder group has worked

very effectively over the last nine years. I believe one of the greatest successes for the SAG is the development of some specific tools to mitigate risk across the portfolio and standardize calculations of energy savings. In particular, three come to mind.

The net to gross framework: While we don't need to go into the mechanics of what a net-gross ratio is or how it's used, suffice it to say that through our SAG, we developed a statewide framework for determining these values and locking them down for an entire year allowing the utilities much more certainty on how they manage their portfolio towards their annual goals.

Second would be the Technical Reference Manual which Julia already mentioned. This document, which is now in its six iteration, provides the foundation of all standard efficiency -- energy efficiency measures assuring consistency again across the state.

And our newest policy is our -- our newest thing is our Energy Efficiency Policy Manual that

was just approved last year. Again, this document has standardized many processes across the state for all utilities.

In my mind, the stakeholder group has worked very effectively across the years, taken on many complex issues in working towards resolutions that satisfy the vast majority of the parties.

Lastly I just want to touch on M&V 2.0. So what is it? In theory, it will give access to much more data points than are currently available. As Com Ed completes its AMI implementation in the near future, residential customers will go from one data point per month to multiple data points per hour. The amount of data will dramatically increase, offering many new M&V opportunities.

For certain programs, this may lead to new and exciting M&V opportunities. We're very interested in exploring these opportunities for many reasons, including developing a better understanding of our customers, how they use our product, and the impact this data can have on our energy efficiently portfolio from the planning

function to the final evaluation function.

Specifically in terms of valuation, we expect this much more robust data to lead a new possibility in terms of measuring program impacts.

We're anxiously watching the M&V community as they explore these new techniques, vet them within the M&V community, and establish their validity. We are expecting that the Com Ed portfolio and independent evaluator will play an active role in this process.

With that said, I'll wrap up my comments. Again, thank you for allowing me to speak today.

MS. PAGELS: Thank you, Michael.

Chairman and Commissioners, do you have any questions?

COMMISSIONER ROSALES: I do, Meagan. For actually Julia as well.

I am trying to get my head around the Technical Reference Manuals. If the energy prices -- I mean, wouldn't the manuals be by utility rather than by regional or states because if the prices are different, wouldn't that skew the

numbers, especially in a state like Illinois that has a number of electric utilities?

MR. BRANDT: Right. It doesn't take into account the price. It's done at a measure level right now, so you're really just looking at what the base measure would be. Say, for an LED light bulb, we would looking at the base, how much energy usage is by the -- like the incandescents, that base measure, and then how much energy is used by the LED. And the delta, the difference there, that's the energy savings.

The pricing comes into impact when we do a cost effective analysis at the back end, but that doesn't have anything to do with the kilowatt hour savings.

MS. FRIEDMAN: And I will add that the algorithms that are used will take into account things like weather differences from state to state, and so it -- it can be tailored. It is tailored.

COMMISSIONER ROSALES: Okay. Thank you.

MS. PAGELS: Thanks, Commissioner.

Any other questions?

(No audible response.)

MS. PAGELS: Next we have David Brightwell.

MR. BRIGHTWELL: I'd like to thank everybody for allowing me to be here today.

Before we get started, what every Commission employee has to do, I have to tell you that the views and opinions that I'm giving today are mine. They don't reflect the Commission -- any Commissioner or any other employee with the Commission.

As a little bit of additional safety, I'll say they're subject to change, so don't hold me to them at a later date when we're looking at some of these things.

I'm going to briefly talk about EM&V. The previous two speakers, Mike and Julia, have covered some of these topics already.

Just in general, I'll say that it's probably safe to say that I have a little bit stronger statistical background than anybody else on this panel.

Energy efficiency is very difficult to

measure takeaway, whether it be new methods or the previously-used methods. And as others have said, there's a few aspects to it.

The one that I consider the most important is the impact evaluation from the perspective of the Staff and making sure that the customers that are paying for these programs are actually getting some value for their money. But the -- there could be a couple reasons for this. There's the impact evaluations are important, but process evaluation, which Mike mentioned earlier, is also important.

It's not always clear that something isn't getting the impact that it should because it's a bad program and it could be that there's bad delivery of it, and that's where the process evaluation comes in -- into play.

So you need to make sure that is it a problem with the measures not saving as much as they should or is it a process that -- or is it a problem that some vendor isn't doing all the work that they are saying that they're doing? The process evaluation can be thought of as the quality

assurance/quality control aspect of that.

And then the third issue is -- well, it falls into that is the verification that measures are actually installed. I can think of one case where Com Ed got dinged for some savings because they found that an industrial customer received a rebate for a lighting system and then uninstalled the lights. What they did with them is unsure.

I've read kind of a humorous story that in Connecticut that a couple guys got the idea to buy a bunch of energy-efficient lights through the rebates that the Connecticut program has and then sell them elsewhere where there wasn't programs and used the rebates as a markup.

The problem was that they parked a big U-Haul van across the street from the police station, freaked everybody out thinking it was a bomb, and ended up getting their -- getting their product seized. And a few of them were in the country illegally and reported as a result of it.

Had that not happened, they probably -- the Connecticut program probably wouldn't have

known that the lights weren't actually being used within Connecticut.

So the problems that you can have with EM&V with the measurement of savings are that, as I've mentioned before, it's not always clear how much energy measures saves measure -- I mean a particular product. Using a furnace or an air-conditioner, for example, there's a lot of factors that can go into how much a furnace saves. One is what kind of building is it placed in. Is it a small two-bedroom apartment that's 800 square feet? Is it a 4,000-square-foot house; how old the building is; what type of insulation is within the building?

You have questions then are there behavioral differences. If you get a new furnace that saves a lot of money, are you less concerned with setting the thermostat to 72 instead of 68? So you get a little bit of creep in the temperature settings.

All of these types of things are things that you have to answer in order to figure out how

much a measure will save at just the individual level for a particular measure.

And then after that, you have to determine was it the utility program rebate that caused the person to install this program or would they have done it anyway. If the person would have installed the program -- installed the furnace without the measure, they're typically -- they're what's known as typically a free rider. As Mike and Julia were talking about, that's where net to gross comes in.

Additionally, you need to know things of were they so happy with this program that they installed other EE measures that the utility doesn't get credit for; for example, they liked their furnace so they went out and got an air-conditioner, but they didn't use a rebate for the air-conditioner. That would basically be considered spillover.

Then a third one that's not talked about very often is, did this cannibalized savings from some other program. Did the person on the fence of getting a furnace or an air-conditioner, because of

the -- because they received a rebate for one, they chose that one instead of the other one so that some savings would have occurred. It's just the program led them to a different choice than they would have made. We need to find out what the net effect of this is.

So really, the only way to perfectly measure this is not possible. You need to create an alternative world that's identical in every aspect except that one world has a utility-based Energy Efficiency Program and the other world doesn't.

And then to measure the effect of the program, you'd take the difference in the energy savings -- in the energy use between the worlds and say that that's the difference.

What's done in some settings but isn't always feasible within the Energy Efficiency Programs is randomized control trials. A randomized control trial basically says that you select a group randomly to receive a program and a group randomly to not receive the program and you

look at the difference between the groups, and whatever the difference is, is the effect of the program on average. It can't tell you for each individual person, but it can tell you for the average of the two groups.

This is really not feasible for the portfolio as a whole or even for a lot of programs. Can you imagine the complaints that a utility would get if they decided to randomly assign half their customers to be eligible for furnace rebates and not the other half? The vendors would have to -- it would be a pain. They probably wouldn't want to deal with the program because they wouldn't know who they could market the program to and who they couldn't.

Customers would be calling up and complaining because they found out about this program and that they're not eligible for it and were probably assuming that they are paying for it, although if it was set up correctly, only the group that was in the treatment would be paying for it anyway.

Another alternative which, again, isn't always effective but is where a lot of the new EM&V 2.0 comes in is Quasi Experimental Design.

The Quasi Experimental Design is similar to a randomized control trial, is a little less rigid. Basically you find customers that aren't participating in it. You try to find customers that aren't participating in it that look very similar to those customers as far as on characteristics that you can observe. This could be house size if you have the data. It could be income level. It could be their zip code.

Quite often, the data is limited and what you end up with is what their use was -- energy use was prior to some of the customers that weren't getting the treatment. And in matching controls upon that group and then assuming that they're similar in every other way, there -- that could be valid -- there's a lot of technical reasons that are covered in economics literature on why there may be issues with that as well.

COMMISSIONER ROSALES: I'm sorry. Is that

what you recommend?

MR. BRIGHTWELL: When it's feasible, I think it's probably the best alternative.

COMMISSIONER ROSALES: Even if the variables are not the same? Because when you're taking -- you're somewhat taking for granted that those that are participating -- are participating -- the ones that are not participating are almost the same, and that's -- that's an assumption that really --

MR. BRIGHTWELL: It can be a very strong assumption. I grant you that. It's just that compared to some of the alternatives, it seems to be better than those alternatives at times. And it's not that the variables are different. It's that based upon what you observe about the people that they are very similar -- more similar than any other customer.

The problem that you have is are things that you don't observe. Are the unobservables important for the decision? And it's just coincidence that they're looking the same, although

they're different on other unobservables that do matter.

If you don't observe square footage, you can say that two customers are similar where one has a 2500-square-foot house and the other has a 1600-square-foot house. That's one of the potential drawbacks of the quasi experimental methods.

And again, it's far from perfect, but in some sense, that's what you're getting with the new EM&V 2.0, the more advanced methods. It's what you get with Quasi Experimental Design overall that you're making the assumption that on average that the two groups are the same; that for every time that somebody in the treatment has a 2500-square-foot house and the person that matches them has a 1500-square-foot house that there's somebody else that has a 1500-square-foot house that's in the treatment group and -- and somebody else with a 2500-square-foot house that's in the matching group and then, on average, the differences cancel out. And like I said, it can be a very -- it's a strong

assumption and it can be problematic.

If we go to what's actually used -- and again, where the quasi experimental methods may be better is that, quite often, you're using engineering estimates of energy use to figure out how much the furnace saves or the air-conditioner saves. And for these you have to make assumptions as well: What does the house look like; what's the temperature in the area where the house is; where the measures are being installed; what's the square footage of the house; what's the family size. All of these things could matter for the energy use.

Quite often, what you have is the -- in a house with characteristics of A, B, and C, the baseline unit uses X, the efficient unit uses Y, and the savings then is Y minus X. So it's -- it has strong assumptions as well. It's just different assumptions.

Other things that are used to determine the net to gross ratios is that you often survey customers, do phone calls, on-site interviews when they're buying the products, whatever it may be, to

determine whether they bought this program without -- whether -- whether they bought this when it was a program or not.

Some of the problems that you can see with surveys are recently I think every poll that was out there had Hillary Clinton beating Donald Trump, so there are issues with surveys as well.

And then to figure out the spillover, to the extent that this is possible, this is, again, very difficult. You know, you're trying to figure out the effect of the program on people that didn't directly participate in the program. You're asking vendors that are within a program the effect that they think the program had on their sales: They thought they'd sell 20 efficient furnaces or air-conditioners and they end up selling 80.

You know, there's difficulties with this, too, because the vendors could have falsely assumed that the program is responsible for all 60 of those differences where the economy could have picked up.

Or the program -- he could have thought that he would sell 40 and he sells 80, but the

vendor is not anticipating the economy drop so that it should be -- so that there should be additional sales.

So again, the theme of all that is this is a really hard subject because you're trying to figure out what would happen if there was an alternative world which you can't do.

Some of the advantages that you have from the traditional methods are that recently they were about all that was feasible. With the advent of big data, AMI meters, and getting more data, it's making more stuff feasible and making more stuff practical.

The disadvantages are that you're doing this on a piecemeal approach. You're looking at a program for air ceilings. You're looking at a program for furnaces. You're looking at a program for air-conditioners. You're looking at a lighting program. You're not looking at the holistic approach of if the portfolio didn't exist, what would the savings have been versus not -- since the portfolio exists, what is it.

It's also time intensive. As Michael was saying, the first ones that came back long after the program was over, with the program as at the end of May, June 1st, and a lot of times it was -- is March of next year fair to say?

MR. BRANDT: Yeah, first couple years.

MR. BRIGHTWELL: So nine months afterwards is when you're getting evaluations. Obviously you can't make any course corrections nine months after the year is over.

And then as I mentioned earlier, with reliability of survey responses, it's unknown and perhaps unknowable. There's assumptions made when they go out to determine how many people to survey. It's fairly technical, but to explain what -- it's hard to even verify whether the assumptions for the survey methods are correct.

So this gets into a little bit of why the state developed a Technical Reference Manual, and some of the advantages of a Technical Reference Manual is that it will allow for consistency across the utilities.

When the Technical Reference Manual is -- was proposed, I believe it was proposed by some parties that noticed that there were wide discrepancies in how much measures were considered saved depending on which utility was filing the plans and that these parties were wanting to standardize the process and get everybody on board.

The additional thing is that it provides the certainty that Mike was talking about that you know ahead of time what your goals are for what -- at least for what the measures are, not necessarily for net to gross. The Net to Gross Manual is another portion of this that provides even more certainty.

The process of developing a Technical Reference Manual takes issues that may be contentious and have a lot of area of disagreement and allows parties to work those out and resolve as many issues as possible before bringing it to the Commission for formal litigation.

Then some of the disadvantages then is that another way to say that there's consistency

across the process is to say that you standardize the wrong answers in a uniform manner.

Additional problems are -- I'm sure everybody can think of the days that they were in college -- and I've also taught a few classes -- that if the professor made a mistake grading your paper, you were almost certain to take it to him if it was in your favor to get more points, but I don't know if anybody and it would be a very rare case that says you gave me too many points; you need to take some away.

With the Technical Reference Manual, there's asymmetric information. People that have the most information are the program implementers, and quite often, you know, they're in the position of saying we found an error in the Technical Reference Manual; it's not providing us as much savings as we think there should be. The -- you know, it's possible that it happens the other way that things are correct and so that errors gave you too much credit, but I'm not sure that that's ever happened. It's quite possible that there aren't --

I don't know if it's quite possible. It may be possible that there have been no errors that have been beneficial to the utilities.

It also takes a lot of time to reach agreement and compromises and to hash out all the values that are within there.

And then you also seem to be playing catch-up between the time that these values would have -- were -- when these values were derived in real time, but there's an organic evolution to energy efficiency that over time more people seem to be becoming more aware of energy efficiency anyway.

And to the extent that that's not the result of the utility programs, the data would be giving too much credit to the utilities because you're using data from a year ago to measure what's going on now.

So some of the advantages of the newer approaches, they are more data-intensive or they can provide verification in near real time.

A while back I had a conversation with

Jake Oster from Energy Savvy. This is one of the things that he brought out is that they found people that were getting rebates for furnaces that actually had gas furnaces installed, electric furnaces, so that they noticed that there was a lot of use that was unexplained by the models.

And it turned out that the reason why was because people were replacing gas furnaces with electric, so it was actually increasing electric use with a new utility and that by getting this data to the people quickly, they could determine they either weren't eligible for the rebates and not give it to them or that -- to clarify with the vendors that were installing these that they needed to stop doing that, make sure that they were doing electric-for-electric-type installations and not changing the energy source.

The data used in these are closer to the quasi ex- -- well, they are the quasi experimental methods that I explained earlier so that it gets you a little closer to the randomized control trial, and what you end up would be the engineering

estimates and that they can provide the analysis a lot quicker than the evaluations that we have currently.

And then some of the drawbacks are that these models are proprietary, so you're left with the vendor giving you information and you don't really have a way to look at the methods or at least it's at the discretion of the vendor whether you get these methods.

I have the terms of train, test, and validate there. These are all statistical terms that are basically used to determine the quality of the model, and that information isn't necessarily public or provided to be able to reproduce the results independently so that it can make it difficult to judge whether the proposed solutions provide an improvement.

It's easy to think of even if it does provide an improvement that it's -- it may not necessarily be a good thing. Well, it's an improvement, but it's not necessarily the best that you can do.

It's easy to think of big data and all this -- all these things as just wow, but how many people have got recommendations from Netflix that you leave you scratching your head? That's a -- that's an example of the big data.

Obviously their recommendation system is similar to this. You find customers that have made purchases in the past that look like the purchases you've made and then you see what they've bought and liked and then say, well, you might like this, too. This is to your point, Commissioner Rosales, there's a lot of unobservables there that may affect the decisions that you make with your Netflix purchases or with your energy use that are unobservable and can cause problems in this area.

And then a final one is from discussions we've had with utilities before is that once they set their budgets in the plan and get the budgets set and things in place that even if you get data, it's unclear how much you can -- how much you can change the ship and stream as a result of the new information that you're getting.

So there could potentially be the problem of you're getting all this data and it looks great, but the utilities can do little with it because they don't have the processes midstream to divert a whole lot of money from one program to another program as a result of the information.

That concludes the slides that I have. If anybody has any questions...

MS. PAGELS: Thank you, David.

Chairman and Commissioners, any questions?

COMMISSIONER EDWARDS: I have a quick question. Thank you, Meagan. Thanks, David, for being here. I appreciate it.

Back earlier in your presentation when you were referencing problems with EM&V, you referenced spillover, and so I thought that was interesting that you referenced that as being a problem because I would think that if a particular program encouraged other programs to be installed, that would be a positive thing.

MR. BRIGHTWELL: Let me clarify. Spillover is not a problem. Measuring spillover is a problem.

COMMISSIONER EDWARDS: Okay.

MR. BRIGHTWELL: It's next to impossible to measure the indirect effects that a program has. So I apologize if I didn't make that clear.

COMMISSIONER EDWARDS: Okay. And then my second question is also you talked about particular programs that could possibly, I think you said, cannibalize savings that could have occurred without that program. How often does that happen?

MR. BRIGHTWELL: I don't know that there is any way to answer that. I'm not sure that it's addressed very often.

COMMISSIONER EDWARDS: How would that be detected?

MR. BRIGHTWELL: Again, it's like one of those things like spillover, it's an indirect effect. It would be next to impossible to measure it --

COMMISSIONER EDWARDS: Oh.

MR. BRIGHTWELL: -- say, for creating an entirely new world with clones, you know, which is impossible on a 3 and a half percent budget.

COMMISSIONER EDWARDS: Thank you.

MS. PAGELS: Any other questions?

(No audible response.)

MS. PAGELS: Thank you very much, David.

MR. BRIGHTWELL: Thank you.

MS. PAGELS: And next up we have Karen Lusson.

MS. LUSSON: Thank you, Meagan.

Chairman and Commissioners, we appreciate being invited here to participate in the Evaluation and Measurement and Verification session.

As Meagan mentioned, my name is Karen Lusson. I'm Assistant Bureau Chief in the Public Utilities Bureau. We are a regular participant in the SAG, a very active participant in the SAG, SAG being the Stakeholder Advisory Group, which I know Annette will speak a lot about as the facilitator.

Just as a point of background, I would agree with Mike, one of those rare moments where the AG's Office and Com Ed agrees, that the Stakeholder Advisory Group process has been a great success in bringing parties together to collaborate

about program plans, what should or shouldn't be included in Energy Efficiency Programs, where to target those dollars. And the members over the years have gotten to know each other. I think there's mutual respect and politeness within the SAG, and so while it sometimes has been a bumpy ride, I think all in all the results have been good.

We also -- the AG's office also filed a petition for the Commission to approve the Energy Efficiency Policy Manual which was ordered to be conducted through the SAG. And all of the utilities, evaluators, stakeholders, Commission Staff participated in that process again. That was a long process, but I think in the end, most parties believe that it was a beneficial process because it established a manual that -- it's updated each year to ensure that there are consistent policies being implemented by each utility and, at least up through the end of this year, the Department of Commerce and Economic Opportunity in the delivery of programs.

We spent a major portion of the last 12 months in the SAG working on reaching consensus in the filings of the three-year plans that the Commission just approved in this last month. That was a long process. We spent many hours doing it. And unfortunately those agreements are essentially going to be null and void as of June 1st because of the new law.

But that process, we are hoping, will serve as a framework in the coming weeks and months as the utilities work to put together their next plans for their filing which will take place in June for the next four years beginning January 1st, 2018.

I also want to acknowledge to my left Annette Beitel who's been the facilitator in the SAG and has led it, I think, with great expertise and patience and has helped keep all of the parties organized over the years, along with Celia Johnson her assistant.

So getting to what we're here to talk about today...

So I should mention, too, that the Attorney General's office utilizes the expert assistance of an energy efficiency expert Phil Mosenthal who's based in Vermont. He works for Optimal Energy Group. Phil Mosenthal has been active nationally and internationally in the development and evaluation of Energy Efficiency Programs.

So why is EM&V important? Why are we here? Why are we talking about it? I guess the point -- initial point I want to make is we can't lose the forest through the trees, and that is we spend a lot of money in Illinois on energy efficiency. These are numbers taken from a recent SAG meeting where the utilities made presentations about what they anticipate spending in the coming four-year plan. So these would be annual numbers: Com Ed 353 million, Ameren approximately 100 million, Nicor about 40 million, and Peoples Gas and North Shore combined 31 million.

The EE spending is about 3 percent. Mike mentioned 3 and a half percent, so I may need to go

back and double-check that new statute to see if it says 3 and a half percent. But it's been around 3 percent for -- historically.

So you can see the dollars that are at stake here. They're significant, and from our perspective as ratepayer advocates, we want to make sure that the dollars are spent effectively and that the dollars and programs are designed in a way that the customers who can benefit the most from efficiency are, in fact, receiving those benefits.

Again, not losing the forest through the trees -- and some of the other speakers have talked about what the general purpose of EM&V is, and that is to estimate the energy savings that are actually occurring as a result of the measure or program being evaluated. So it is, again, talking about the delta between what happens -- what would have happened but for the energy efficiency measure.

It also, through various methodologies such as the net-gross methodology, looks at the cost effectiveness of the programs; in other words -- and David and Mike touched on this -- one,

determine is there free ridership which is are -- are the programs necessary to actually achieve that energy savings, are people out in the marketplace buying LED bulbs anyway. Those kinds of examinations and surveys are a part of the net-gross analysis.

And also, we want to -- another point of EM&V is to find errors in assumptions, maybe look at program implementation practices and, where needed, make corrections going forward. So that's also a very important part of EM&V.

And then under the new law, we're now -- the company will be earning a return on the dollars it spends on energy efficiency. So from our viewpoint, now more than ever, it's going to be important to look at the valuation measurement and verification of energy savings because, as we know, if the -- under the new statute, if the utility exceeds the authorized savings goal, then it can earn an increased return on equity on the spending based on percentage -- per percentage in excess of the savings amount, 8 percent return on equity --

I'm sorry -- eight-basis-point return on equity bump. So it's, again, important that we make sure the savings estimates that are filed annually are correct.

Again, I think I've highlighted on some of the successes that have occurred in Illinois. Certainly the net to gross ratio, the net to gross framework, kind of an awkward name, but again, I think the speakers have -- before me have highlighted what this is all about.

Again, it attempts to pinpoint whether savings would have occurred without the measure and whether additional unanticipated savings, the spillover measure that you referenced, occurred as a result of the measure.

Now, this was an area of contention earlier in the delivery of Energy Efficiency Programs, but a framework was created. Consensus was reached. It's now codified in the -- so to speak, in the Illinois Energy Efficiency Policy Manual. So we have a policy that the program administrators understand and, as Mike mentioned, it reduces their

risk, but there also is a -- within that policy is a provision that says if the program administrators choose to adopt assumptions that vary from the -- I'm sorry -- the net to gross ratio, then there -- there could be consequences.

The creation of the Technical Resource Manual was first approved in docket 13-0077. It provides, as the other panelists have mentioned, a permanent and a transparent and consistent basis and it is updated annually. It's, again, overseen by an independent third-party, VEIC, an entity based in Vermont, and they facilitate those discussions.

The other success, again, is the policy manual. And if you look at that policy manual, it lays out in detail the process by which parties, Commission Staff, stakeholders are able to comment on evaluation plans submitted. The SAG facilitator posts those plans on the website. Parties are given an opportunity to comment. The evaluators review the feedback and provide final EM&V plans to the program administrators.

And of course, if there is still a lack of consensus, parties are free to bring up any issue of contention in, for example, the Manual Reconciliation Docket where any sort of methodology can be challenged. So there's always litigation, but the -- these manuals are designed to minimize litigation, try to find areas of consensus, and hopefully move forward.

So getting to the issue at hand, Measurement and Verification 2.0, the benefits and limitations, AMI/new technologies obviously create opportunities to verify gross energy savings numbers that help ensure the accuracy of TRM assumptions, but -- and be for sure that these are more granular data for understanding when savings occurred. So it gives program evaluators and administrators and any stakeholders interested in learning about what's happening an idea of what potentially is happening on a more granular basis with a measure.

It provides -- you can learn about when savings occurred at a particular time of day and presumably a more precise measure of particular

equipment's energy use.

But there are limitations, and just simply because we have more data doesn't necessarily mean that we will have better evaluations. This kind of data needs to be used effectively. I look forward to hearing from the second panelists to where they see this data can bring value.

But at the end of the day, it does have to bring value. And the utilities are in possession of this data, so I think where there are areas that it makes sense to dig into the data that it will be helpful if the utilities encourage the evaluators, because they're the ones who have the contracts with the evaluators, to make use of granular data in evaluations. Again, it has to be a cost effective use.

And also, the limitations are even when we have this new granular data, it's still not necessarily an analysis. The evaluator still needs to go back and say was this change in energy use that's driven by market changes, codes, and standards, free ridership, et cetera, so all of

those questions remain important.

Finally, getting to where we see EM&V processes can be improved, I think it's important to have regular bidding of evaluation contracts. We don't have a magic number, but certainly once -- now that plans are four years along, certainly we would like to see, at a minimum, a rebidding of evaluation contracts once every plan period.

One issue that has arisen as of late is the participation of financially-interested parties in TRM consensus-making meetings. And I should say that while we have keen interest in participating in the TRM, because of limited resources, we are not always able to. And that includes other stakeholders as well.

So the Commission Staff, in particular Jennifer Morris and David, I think have played critical roles in holding the utilities' feet to the fire and making sure that documentation is there, making sure proper baselines are used.

So you don't want to -- so another issue that has come up is on the issue of furnaces, do we

use an 80 percent baseline -- efficiency baseline assumption for the -- looking at the energy savings associated with a furnace measure or, in fact, do we use 90 percent as a baseline which studies have shown it's my understanding that in Northern -- at least in the state of Illinois and in particular in Northern Illinois, I believe, that 90 percent is probably a more appropriate baseline.

And, in fact, we agree there needs to be more stakeholder engagement in the TRM process. Again, it's a matter of resources. The SAG -- the work that's been done within the SAG over the last year and a half has required a great number of hours and financial resources. Consumer stakeholders, not surprisingly, have limited dollars, so to the extent the participants can talk about streamlining processes, doing more kinds of joint evaluations, the better -- all the better because then maybe the dollars can be used more effectively.

Also, again, we want to make sure that the participants who are engaged in reaching consensus on the inputs to be included in the Technical

Resource Manual do not have a financial interest.

And then finally, the program design should drive the TRM process, not the other way around. And at times, there can be a sense that vendors looking to get a product included in the TRM could sometimes be driving the items selected for study and inclusion in the TRM.

So those are all kinds of issues that are in the background as this process continues.

Again, to the extent possible, the more we can do joint, multi-utility evaluations of measures where it makes sense, the better. If we have -- if two utilities are doing the exact same program, there should not be a siloed evaluation with multiple and inconsistent methodologies. I think we've made a lot of headway on that.

And again, utilities can and should insist, where appropriate, on joint evaluations to ensure the most effective use of EM&V spending.

Our expert Phil mentioned that in Massachusetts under the Mass Saves program, which is the statewide moniker given for all the Energy

Efficiency Programs there, all of the utilities there deliver the same set of programs under that statewide moniker.

In terms of evaluations, there are single evaluations for these programs to the extent that those programs are the same, so here, again, in Illinois I think there should be a constant examination of where we can do those kinds of joint evaluations to make sure the dollars are spent wisely.

And again, in the new -- operating under the new statute where here, for the first time, we have utilities being able to earn profits on efficiency spending, it's going to be critical that we use EM&V dollars effectively and that, to the greatest extent possible, stakeholders get involved to make sure that the programs are not only being delivered to people who need it the most but also that the savings authorized and filed with the Commission are, in fact, the savings that have actually occurred.

That's it. Thank you.

MS. PAGELS: Thank you, Karen.

Chairman and Commissioners, any questions?

(No audible response.)

MS. PAGELS: Great.

Next we have Annette Beitel.

MS. BEITEL: Thank you. Thank you, Chairman. Thank you, Commissioners, for having me here today.

My name is Annette Beitel. I'm the independent facilitator for the Illinois Energy Efficiency Stakeholder Advisory Group which I have been for the past ten years. For the past three years I've also been the independent facilitator for the California Technical Forum, and some of my remarks here today relate to my experience in California.

That's a body similar to the SAG, but it focuses on technical issues. It's similar in that it has the support of the for-investment utilities, two large publicly-owned utilities, environmental groups, and the two regulatory commissions overseeing energy in California which is the CPUC

and the CEC, California Energy Commission.

So Illinois has a very strong evaluation framework already, strong evaluation practice, for several reasons which I'll describe.

However, as with many things, it's good to refresh and update, and in Illinois we have a new technology, so AMI. We have a power of computing, and we also have a new statute. And as Karen mentioned, two elements of the new statute that are very important for evaluation practice is; number one, the introduction of share- -- considerable shareholder incentives; and number two, the switch from annual to cumulative savings targets. And that means understanding how long a measure lasts now is important whereas before, the framework was just really looking at how much did it save the first year. So that's a big shift and something that Illinois has not really spent too much time thinking about in the past.

Before I start with my remarks, I'd like to rehabilitate the art and practices of EM&V a little bit. So Dr. Brightwell did an excellent job

reviewing all the things that can go wrong with EM&V. However, EM&V does rely on a law of averages, so if you have a measure, let's say, a furnace, in Dr. Brightwell's example, gets installed in a 1500-square-foot home versus a 2500-square-foot home, obviously that is going to produce different savings, but for many of these measures, we rely on the law of averages. And what is developed for the TRM is looking at average value recognizing that there's going to be a distribution of savings, but -- so that can help.

In addition, for the question of net to gross and whether or not the program actually caused the customer to install the measure, we all recognize there are big error bands in that calculation. It's really, a lot of times, directional, so if you have a net to gross value of 1 versus .2, then that means the program is doing very well versus the program is the .2.

So yes, they're not perfect, but they give us a pretty strong sense of how much measures are saving and also whether or not the program induced

the savings.

We had a situation pretty early in the gas portfolios where, for a very large program, it was a custom program, one of the gas utilities got a net to gross ratio of .9, meaning that 90 percent of the customers installed the measure because of the program. The other utility got a -- for the same program using similar methods, got a net to gross ratio of about .65.

And there was initially a big gnashing of teeth and flurry, you know, why did this program not do as well as the other program. We looked at the error bands around the two values, and it turned out that statistically they were really the same value.

And the reason I'm mentioning that particular example is just yes, these methods aren't perfect, but they give us a sense directionally of whether they're working well and should be continued or they're not working well and should be discontinued.

If a measure is not something that's

replicable -- the savings are not replicable across different circumstances, then that measure can't be deemed and put into the Technical Reference Manual. It's got to be treated on a custom basis, meaning site-specific measurements. Those are usually for large commercial and industrial projects where spending the money to do a site-specific evaluation is cost effective.

So that's just a few preliminary comments.

So first of all, again, to repeat, evaluation in Illinois, both the framework and also practice, is strong compared to many other states. And there are several reasons for that.

Number one: We have very strong evaluators. I think part of the reason is because the contracts are bid fairly regularly, and during the evaluation process, the utilities allow stakeholders to be part of reviewing the bids and selecting strong evaluators. And they have -- all of them have national practices, so they learn about what's going on in other states, what's working, what's not. They're also informed by the work done by

NREL, Uniform Methods Project. So those evaluation methodologies are regularly being updated. They stay on top of those and they use those to inform the evaluations in Illinois.

Staff has also done an excellent job ensuring high-quality evaluations. So Jennifer Morris, Dr. Brightwell, others down in Springfield, they've shown leadership in insisting that methodologies be consistent across the state even if it's not the same program being -- being evaluated by the same evaluator.

So we had an early set of evaluations on the electric side where the numbers for the lighting programs that were being run very similarly looked, you know, relatively different. And it turns out that the result or the differences likely was attributed to the approach that was taken, and it was difficult -- so even though the numbers were different, it wasn't clear that they were -- the programs would be using different results. And it's important for us to be able to do, quote-unquote, an apples to apples comparison

to see, you know, is Nicor doing a better job than, let's say, Peoples Gas/North Shore Gas. We'd like to have consistent methods applied so that we can do some comparisons across the programs and learn from how the different utilities were implementing like programs.

So Staff was really incremental in insisting on setting up a working group to help standardize methodologies and being informed by this national effort funded by DOE, the Uniform Methods Project. So they've been leaders in that respect.

They've also been strong leaders in ensuring that the evaluations are done properly after closing the program year. So that was -- they really drove, getting into the policy manual, fairly tight time frames for getting the evaluation studies out in draft and final. And the reason that's important and it's not done in many other jurisdictions is that those studies not only say how much did the utility save, they also provide a wealth of information on how can a program be

improved in the future.

And then the final point I'll note about Staff is that there are very -- a lot of the stakeholders have focused their efforts on looking at programs and measures and improving those and less effort on really individual evaluation studies. And Staff has really paid attention to the quality and the results of those studies, and so they've really been tremendous in helping ensure a strong evaluation framework.

The utilities have also contributed to that. So early in evaluation history in Illinois, there were some pretty negative evaluations that came out, and the chatter amongst the utilities was, okay, we're going to fire the evaluators. And Val Jensen, who is really the senior leader in the state, said absolutely not; they're doing their job; you guys have to improve.

So that's been very much a utility message that the evaluations will be open and transparent; that if the results are bad, the evaluators don't get fired and the programs have to improve.

Finally, stakeholders have been involved in certain areas of evaluation but less so compared to their involvement in program and portfolio design and implementation. And again, because of the change to the law, this is an area where I think it's going to be important for stakeholders to find resources to be more involved in the TRM and the evaluation.

So again, the three of the -- three of the elements of what's working well in Illinois is timely studies. I've worked in other jurisdictions where evaluation studies come out a year and a half after the programs are done, and that's because -- there's a whole range of reasons, but in Illinois they're out within four months or usually five months to six. And that allows programs for the next cycle to be informed, and that's hugely powerful.

Open and transparent: So what I'll say about that is, again, stakeholders are allowed to be involved in the selection of the evaluators.

In addition, there's a rule that, by and

large -- we've seen a few violations over the years. The reports are released to the utilities as the -- at the same time they're released to the stakeholders. So the utilities, in other words, can't get them and sanitize them before they get widely distributed, and so I think that helps in ensuring high-quality evaluations. And then, again, there's now consistency methods informed by the Uniform Methods Project that's really helped improve quality.

So there are always ways to improve things. So one area -- so over the past several years, the evaluators have really focused on understanding things like net to gross ratios, are the programs being structured so that the incentives being paid are really causing the customer to install a measure versus it was the advertisement that Home Depot did or Abt did, so -- and that's an important question to ask because once those net to gross ratios get established and they're robust, typically they don't change huge amounts over time unless there's a huge change to the market. So

they've spent a lot of time and resources establishing robust net to gross ratios for the core programs.

Evaluation has not spent as much time understanding how much the measures actually save in the field. So a lot of the measure savings are established through engineering equations, through engineering simulation models, and less so through measurement because measurement is expensive. And oftentimes, the measured results are different from the engineering equations because things happen in the field that you can't predict.

So in one of my California meetings last week, we were looking at a pump for multi-family homes called a high-performance circulator pump. It has a lot of potential for California. And the engineers insisted that it saved, you know, basically 60 kilowatt hours and that their base load usage was 12 kilowatt hours and then the group insisted on field research, and it turned out an actual use of the efficient measure was two and a half times what the engineer forecasted.

So that's an example I mention because it happened last week and there was a lot of strong feelings on both sides, but it's illustrative of a need to really do the field research.

There are other reasons that measures don't perform in the field the way you expect. One of those is because people behave differently. And so if people are interacting with the measures, like, for example, smart thermostat, that they can override values or a power strip that shuts down their TV to save energy sooner than they were expecting and they just rip it out and override the controls.

So it's important to actually measure savings, and that's an important area to spend more money on going forward.

Market assessments: So understanding, as Karen mentioned, what's the baseline, so we don't want to assume that the savings result from, let's say, code baseline, it's really the market, if really what's being sold in the market is a lot higher. Karen mentioned the example of furnaces

where we believe that the savings should not be measured from code but actually from a higher market baseline.

LEDs, which are rapidly plummeting in price, are another example of where the market is really transforming very rapidly, and we need not to necessarily assume code is baseline but actually do some research to say what's actually being sold in the market and that's what we should be -- claiming our savings based on market baseline versus the code. So Karen mentioned that as a key point.

Finally, the question how long measures last is a question that has not really been studied in Illinois because of the fact that the statute has been annual savings and not lifetime savings. The evaluators in our last meeting recognized that that was an important area to start investigating, and so they will be building that into their future evaluation plans going forward.

So a few words about TRMs. So Karen made a point of saying that with the advent of

shareholder incentives, the utilities will earn substantial shareholder incentives for savings. It will be important to make sure that the savings that are adopted in a Technical Reference Manual for the deemed measures are as accurate as possible.

And up until now in Illinois, a lot of the TRM discussions have been dominated by utilities vendors and implementers with few lone voices, including Jennifer Morris of Staff. And up until now where there has not been choices, I would say it wildly exceeded their goals.

So the issue of savings has been important, but there have been no consequences really to over or underestimating savings. Now the stakes are high, so it's going to be very important to ensure that there's adequate participation from non-financially interested parties in the development of the TRM.

And David -- Dr. Brightwell talked about how TRMs tend to overestimate and underestimate, and I would say that really is a function of the process by which the values are reviewed and adopted. So that's not the case in some other

jurisdictions that have a more independent process for getting these values reviewed and adopted. It's a function of the process, not the manual itself or the structure of the manual.

At some point we should consider Illinois converting to an electronic TRM. Right now it's a big, thick document that can't even basically fit into a simple pdf and send it around. Really the wave of the future is more an electronic TRM. That's something that should be done here for a variety of reasons.

Okay. So a couple of final thoughts. Number one: I'll just repeat that it's really -- we have ambitious goals in Illinois. We also have, under some limited circumstances, the ability to adjust goals.

My strong view as a ratepayer in Illinois is that we want accurate savings estimates, accurate assessment of savings achievement. And if it turns out that the budgets aren't big enough to get the goals that are established by law, let's adjust the goals. Let's not cook the books. It's really

important to not overpay for savings that aren't really there.

Now, my second point is engineering equations and building simulation models can be inaccurate. It's really important to focus resources, particularly when we're claiming shareholder incentives on measuring what happens in the field.

Market assessment studies: We need to divert some money to those and lifetime savings. There needs to be more independent oversight of the TRM savings development process than there has been up until now because of the change in the legislation.

So thank you.

MS. PAGELS: Thank you, Annette.

Chairman and Commissioners, do you have any questions?

CHAIRMAN SHEAHAN: So, Annette, you and Karen both mentioned kind of the importance of having independent participation in the process which I agree with, but how do you determine who

those people are? I mean, everybody involved in this has an economic or political sort of stake in the game or opinion, a bias, so how -- what standards do you use to determine who can participate?

MS. BEITEL: Do you want to go first?

MS. LUSSON: Sure. I'll take a stab at it.

I would argue that the ratepayers don't have a bias. I mean, we're -- the ratepayers, who technically the Attorney General's Office represents, we're paying for the programs obviously, but in terms of setting savings goals and setting up the algorithm inputs that determine whether or not a measure is actually achieving those savings, I think the stake ratepayers have is tell us the facts. Tell us what's really happening so, again, that we're not paying for measures that, in fact, may be an incentive level that isn't needed to get that customer to buy something, say, like a smart thermostat or something like that.

The people who do have a financial stake should not be making those decisions. The

vendors -- while I think it's important that the utilities be there to talk about implementation and the program design and what the measure brings and their understanding of what's happening in the market, I think that the -- it's really important for the independent evaluator, VEIC, who has been designated in the policy manual, to be the final decision-maker and to make sure that -- again, that the vendors that are -- have been invited to the TRM process not -- are not voting in that process.

I would argue that I don't think technically the vendor should be in the room during the TRM process. Maybe there are times when questions need to be answered or mistakes are pointed out and assumptions, so perhaps there's a limited role for vendors, but when it comes to determining what those consensus value inputs are for the algorithms and the deemed savings, vendors should not be voting on it.

MS. BEITEL: So my response is I agree. Everybody has a bias, 100 percent. And there are some processes around the country where I think

some of the biases have been minimized, so I think it would be worth looking at the Massachusetts process, the Northwest Regional Technical Forum, and then also the California Technical Forum.

So I believe that it's really important for the utilities, the implementers, the vendors to be part of the discussion because oftentimes, they're the ones in the field. They know how their equipment works.

But when it comes time to actually voting or coming to a consensus, it's important to identify the parties that are less likely to be biased. And I would say that those really would be, in my view, Staff, AG, some of the -- you know, CUB, NRBC.

I think the evaluation contractors in Illinois have demonstrated that they act independently, so I think they're an important voice as well, as well as Efficiency Vermont.

So I do think it's really important to get the input from those working with the customers but -- when consensus is being built to the

independent parties to help identify consensus. And if consensus really is not reached, then there needs to be a decision by the Commission who can be informed by both sides and make a decision. Those are going to be far and few between. That's my view.

But I agree everybody has a bias for sure.

CHAIRMAN SHEAHAN: At the end of the day, it isn't the vendors or participants in SAG that have the vote; it's the Commission that has the vote, right?

MS. BEITEL: Right.

CHAIRMAN SHEAHAN: You agree --

MS. BEITEL: Yes.

COMMISSIONER DEL VALLE: Can I just follow up on that?

CHAIRMAN SHEAHAN: Yes, please.

COMMISSIONER DEL VALLE: You just listed the folks who are involved, but here you say that there's a need for more participation from independent stakeholders.

MS. BEITEL: That's a good point. So

they're not actually participating in the TRM discussions. They've been -- the entities that I listed have participated in the large group SAG, in the policy --

COMMISSIONER DEL VALLE: But not the TRM.

MS. BEITEL: They've largely not, except for Staff --

COMMISSIONER DEL VALLE: So you're saying they should be involved in the TRM?

MS. BEITEL: They need -- we need to figure out a way to engage them to participate in those discussions.

COMMISSIONER DEL VALLE: But are there any others that you can think of that weren't listed that -- the usual, the AG, CUB --

MS. BEITEL: I covered the bases, yeah. I think we need to find a way for them to be involved in those discussions, along with evaluations. A strong regulator was, so...

And again, I think there are models for how to do that. But I think that would be -- you know MEEA. I'm looking at -- MEEA would be another

one, especially because they just did a lot of research on various TRMs around the Midwest, so finding a way to get them to be able to participate effectively.

MS. LUSSON: And to your point, Commissioner, we're absolutely interested in participating now more than ever, and we have -- to a very limited extent in the past, we were actively involved in establishing the net to gross framework, our expert witness, Phil Mosenthal, but as you can imagine -- and I know this is something that Commission can relate to in terms of financial resources and the need for more. Expert witnesses are expensive, and so we --

COMMISSIONER DEL VALLE: Well -- and excuse me. That's one of my concerns is I keep hearing that there aren't enough resources. I don't see that changing, so how do you get to the level of participation that will really protect us from, you know, having these values overly optimistic and...

MS. LUSSON: Right.

COMMISSIONER DEL VALLE: Because everyone is going to -- is making money now. The utilities are making money.

MS. LUSSON: Right, absolutely. And so I think that -- so in the coming weeks, we are going to be -- the latest TRM has just been -- is going to be filed with the Commission shortly. And in the coming weeks, we are working at SAG on the development of the next four-year plan, the program design, what programs, how to divide those dollars. We, in particular, are interested in getting more resources to low-income programs because we really feel strongly that that's where the dollars need to be focused, and we will continue to push that.

But we also recognize now in this new framework that we have to figure out a way to budget our expert witness dollars so that we can take a more active role in the TRM process.

I think, you know, we've sort of focused on the problems. I think, for the most part, the processes work but can always be better, and certainly making sure the vendors aren't voting in

establishing numbers is a prerequisite to a successful TRM.

And yeah, just keep making sure that the parties remain engaged is critical now more than ever with profits, you know, on the line here.

COMMISSIONER EDWARDS: Annette, in response to the Chairman's question, you talked about different regional and national processes kind of that are taking place.

What type of -- from a best practices point of view, what are some of those states doing -- I guess you could probably most relate to California since you're working with them as well -- that we could implement here, particularly as it relates to this resource issue and getting, you know, more participants in the room more active in -- the necessary participants in the room? And then also, how will the legislation that obviously now allows a lot more money to be allocated to energy efficiency, how will that assist with that process?

MS. BEITEL: So number one, some states

have intervener compensation, so there's a pool. That's a -- I'm using a fairly technical term of art to mean the following that basically that stakeholders that participate in making a meaningful contribution get some compensation for that, so that's one way. I think that's the Massachusetts model. They allow a small percentage of the funds to go to technical experts that support the stakeholders, you know, as distinct from the utilities.

Another way is to set up a process whereby it's very clear who's allowed to -- right now there's not a lot of clarity around who's allowed to participate in the TRM discussions. Kind of anybody goes who's allowed to be part of the consensus-building process; to have some rules around that and then also a code of ethics that people have to sign saying that if they're going to participate, they're participating based on their best professional judgment. There's some models there.

I've spent a lot of time in the Northwest

looking at their model, as well as California, and both those processes have stakeholder groups where they've been established through some additional funding but also a code of ethics saying that they need to act based on their best professional judgment, not based on an organization's interest, and then that there's limited utility participation.

So in the group that I'm running consisting of 30 technical experts, only three of them are from the utilities. That might be a little bit extreme. That's the -- California has also very high shareholder incentives, and there was a period of time where the utilities were involved, like they are now, in establishing the savings, and over time that proved to be a flaw in the model in the context of the actual incentives. So I'm drawing from that analogy here.

COMMISSIONER EDWARDS: Thank you.

MS. PAGELS: Thank you, Annette and Karen.

Next up we have Kristin Munsch. We are running a little bit behind on time, but we'll just move it back a little bit. We're looking forward

to hearing from Kristin.

MS. MUNSCH: No pressure to make it lively then, huh, or a little bit interesting, the final comments?

So thank you for inviting us and thank you for picking up this topic.

As Karen mentioned -- you know, I was sitting here listening to the discussion. I think I was actually a clerk in the AG's office at the very first meeting of the SAG. It was started as an informal body coming out of the work that Val Jensen had done, I think, working with Com Ed forming their plans.

And listening to the discussion, I think you see, first off, kind of the tension between the SAG evolving. Originally it was an informal advisory group. The concern was the utilities were going to have programs that may have been without -- as meaningful perhaps as folks wanted it to, and over the years I think you've seen a lot of good process that's been made.

I think what you're seeing a struggle with

is, as has been pointed out by almost everyone on this panel, which is the difference between what we think people do with efficiency and sort of what we want to know they actually do in their homes in the real world.

I think that one of the things that has interested CUB in this for a long time has been the installation of the AIM meters, right. The data we're talking about that's so valuable, I think, is actually the usage data, right. I mean, that's -- to be specific, what we're looking at is the ability now to have millions of data points for Com Ed and Ameren customers and, by extension, Nicor and Peoples Gas customers, as to how some of this usage is being done. One of our concerns has always been that with that infrastructure invested, we wanted to see how it could be integrated with what the programs are doing.

The second concern has been the law has changed things. It's changed how we look at things. It's gone from the sort of annual calculation now to a cumulative calculation. That

means we really do need to understand how people actually use things in the field.

I think that also means that we do have a concern over how those baselines and goals are set. Oftentimes in the energy efficiency plan dockets, intervenors are the ones pushing the utilities saying we think you can actually do more under the cost cap than less. And now I think we have that concern.

We also have a concern over whether or not they might actually perhaps have an incentive now to lower that for trying to get some of those incentives.

One of the other obviously real concerns is it is a big incentive for them out there, and so these savings have to be real and we have to know how they're interacting in the field.

One of the early decisions, I think, that the SAG and the evaluators talked about was the budget, while robust, is not necessarily enough. California spends more, I think, on energy efficiency in terms of dollars because their

portfolio is larger. We always struggled with, and I think the gas companies in particular really struggled with, well, with only 3 percent, can you do sort of an impact or a process evaluation. It seemed like for a long time, you couldn't do both.

And one of the things, I think, that has us very interested in this topic at EM&V 2.0 is the opportunity to try to close that loop a little bit and to try to -- instead of treating them as purely separate to try to look at, well, how can we use this data to get a little bit more of that program evaluation in real time in a way that we weren't able to do so before.

I think one of the other important parts for this has been understanding -- I guess I wrote down sort of when Dr. Brightwell was talking, you're trying to shift through the noise. I mean, that's absolutely true, right. We're trying to take into account market conditions. We're trying to take into account are these people on pricing programs. We're trying to take into account their building stock.

And I think the -- what we're interested in seeing at the end of EM&V 2.0 is how do we use the data that's being generated to help cut through that noise because I think if you compare this with -- Com Ed, for example, has an anonymous data usage tariff where you can get anonymized data down to zip plus four level at this point. Well, you can use that not only at targeting EM&V programs, but you can use that now with geographic and other income data perhaps to actually see whether or not or how customers are reacting.

It's never going to replace the work that's been done on some of these other issues because there's always going to be a role for trying to figure out attribution. There's always going to be a role for trying to figure out whether or not the issue is with the contractor or the issue is with an incentive.

But I do think it can enhance and perhaps provide a secondary look at, well, we have engineering algorithms -- and I think the point is a great one -- with what actually seems to be

happening. There's always going to be a role for something like a Technical Reference Manual which I think has been a great issue. And I actually think the net to gross framework was actually fantastic because it eliminated, I think, fully one major issue in the dockets off the table.

I see this use of data as refining those processes. It's not necessarily immediately going to replace them, but I definitely think it can enhance that.

I think one of the last things I kind of want to mention is that it's interesting to think about how we are now moving towards a more integrated role. The EE programs are going to be -- the statute calls for not only more specific spending on low-income programs but talks about the integration of gas and electric programs.

I think one of the challenges for the utilities -- and we're hoping the data can help us sort of look at these things -- is that oftentimes they were sort of segregated. The AIM team wasn't necessarily the same guys who were working on the

EE programs for Com Ed and AIM. And I know that a couple of the SAGs we go to, there'd be -- you know, someone would mention something and they'd be, like, you know, I didn't really know that that was going on.

It's not a fault of necessarily anyone there. I mean, I think Mike and the Ameren team do an excellent job trying to stay on top of things. They're just very large businesses with very large, you know, staffs to work through.

And I think that if we start to get data and begin to parse that usage data, we can begin to look at, well, how are these things working and bridge that gap between are there things in messaging that AIM has had an impact on in EE and vice versa.

I also think -- I guess that one of the big challenges going forward has been, in fact, getting stakeholders involved. I can only speak for CUB, but I know that it is a struggle with resources to send folks. And I think -- I'll speak for myself as a lawyer. To Dr. Brightwell's point,

looking at algorithms for me is difficult to parse, you know, and I think that's a real challenge.

I think that the discussions that SAG is having over how do we move through these issues in a timely fashion is a good one, and I think that it's been a good experience for folks to get together and have an opportunity to talk about this.

As was noted, everyone kind of is going to have an opinion. You heard it already in terms of what are we doing and how can it be done better which is why I think it's good of the Commission that it brings people together to have this opportunity to talk about these issues.

What we're all interested in, I think in the bottom line as folks who all live in Illinois, as Annette pointed out, is the delivery of cost-effective Energy Efficiency Programs. We believe that energy efficiency has tremendous savings not only for those individuals directly in the program but for others who are receiving the benefits of that.

The key to making that work is

understanding how usage is changing, why it's changing to the best of our abilities, and how the utility programs are interacting with customers, with market forces, with building codes, with a variety of things that are out there in order to make sure that what the utilities are doing is what we want them to do in delivering real savings to the customer.

The Future Energy Jobs Act obviously puts a sharper lens on those things. One of the advantages, I think, to comparing usage data in real time will be the timelines are going to be tighter. The evaluators already have tight timelines. They're going to be even tighter because now we're going to annual year or calendar year.

And so having that usage data available to whatever sets of folks we think it's appropriate for them to see that is going to be very important because the utilities, Com Ed and Ameren, are going to be relying on that every year. They're going to have to have an adjustment to that ROE.

And so how we can integrate that data to make that process more seamless, more certain -- and certain not from the utility point of view but certain from the perspective of the stakeholders, and, by extension, the customers in Illinois can be confident for what they're paying for I think is very, very important. I think the second panel obviously starts to get to maybe exactly how those programs can be done.

But a lot of what has been said here I would certainly agree with. I just wanted to, I guess, close by saying why we thought it was important to us to have this discussion and why we think it's a very timely one to have. The AIM rollout is going to be fairly soon. There are ways now to get that usage data. We are discussing ongoing how to get that done. I'll stop there.

And I think one of the things that we hope to engage with the SAG on is sort of wedding those data processes with what SAG has been doing. That would be an ongoing effort.

MS. PAGELS: Thank you, Kristin.

Chairman and Commissioners, do you have any questions?

(No audible response.)

MS. PAGELS: On behalf of the Commission, I would like to thank all the presenters for educating us on the current state of EM&V. We appreciate your perspective and expertise on traditional EM&V, as well as your thoughts on the use of emerging technologies in this area.

I know we're a bit short on time. I want to get out a couple questions, though, from our Q&A portion of the panel.

I'll pose a question to the entire panel, and anyone can feel free to jump in and respond.

So we know that no new technology is perfect and we've heard M&V 2.0 vendors say that their tools are not a cure-all and that M&V 2.0 may not be capable of performing all the tasks involved in evaluation.

So can you all tell us a little bit about what tasks M&V 2.0 can't do and what concerns that we're hearing from ratepayers, evaluators, utilities,

and regulators?

MR. BRANDT: I'll go first.

I'm not sure at this point we know exactly what M&V can do or cannot do. I mean, we still need to see the data and really dig into the data to see what's there. That's what we're really counting on the M&V on, the community out there who's looking at it all over the country to start vetting new ideas and new methodologies.

I think there's going to be some cases where the data is wonderful, and I think there's going to be other programs where it just doesn't make any sense and the current model would work perfect.

MS. PAGELS: Anybody else?

MS. LUSSON: Yeah. I would just add that I think data is great and there's going to be a lot of it obviously with AIM data because it delivers information on 15-minute increments so it tells you when energy was used, but it is not the be-all and end-all for attribution: Was this new measure responsible for that change in energy usage.

So we're still going to need analyses. We're still probably going to need surveys, you know, talking to the -- you know, the CNI customer talking to that customer, see what other changes they made that may have been responsible for energy -- you know, energy reduction.

And so it's -- it can be helpful, but I think I agree that it's not necessarily relevant to every -- any energy efficiency measure in a portfolio.

MS. MUNSCH: I guess, yeah, because one of the things I would add to that is I think if you're talking about usage data as being part of EM&V 2.0, I think that's going to help sort of cut through the noise and things.

One of the interesting things that I think utilities have explored that might start to help is the sort of disaggregation of these, right. I mean, that I don't think we've really talked about as part of the EM&V 2.0. I'll leave that to the second panel because I'm not really sure how all of them interact with that, but knowing the sort of

load profiles or device profiles of certain things, there's definitely an opportunity to enhance. It won't replace it. It can't sort of replace the attribution question in all cases, but I think enhance, on sort of a randomized basis, the ability to know, well, if I have this sort of measure in my house, I know I took this rebate...

My understanding is folks are testing different programs to see in real time whether or not the changes in my usage profile actually match up with, say, I actually installed this device in my home, I took this rebate, I went home, and now I think they can tell.

And that's where, I think at least on an informational basis and hopefully going forward, you can start to parse that out and control for some of those variables.

I just wanted to mention we didn't spend a lot of time -- I didn't -- also on usage data, but there's a whole other aspect to this data analysis that I think is becoming possible right now.

MS. FRIEDMAN: I would just add I think

that as the new legislation calls for robust R&D programs and we see more market transformation programs, all the points that were made about market assessment will become even more important and hopefully can leverage the data from M&V but the evaluation portion of it still remains.

MS. PAGELS: Thank you.

And my next question is -- it's a bit of a loaded question and some would say a critique at deemed savings, but I believe it's an important policy question for the Commission to look at legislation and the language around using AIM data for evaluation.

Should utilities be rewarded for energy efficiency measures regardless of the actual savings achieved? So in other words, if an energy efficiency measure does not actually produce savings equal to the deemed savings, why should a utility be able to apply it towards their energy efficiency targets?

MR. BRANDT: My answer is yes, we should get that.

(Chorus of laughter.)

MS. FRIEDMAN: So I think it's just important to remember even with -- and maybe the second panel will disagree, but these are always going to be estimates. To Dr. Brightwell's point, you know, we're trying to measure against an alternate universe that doesn't exist, and so I'm not sure it's a completely fair critique just of deemed savings.

MS. PAGELS: Anybody else?

(No audible response.)

MS. PAGELS: Okay. Great.

Well, I appreciate all of you for being here. We really appreciate your perspectives.

We are running short on time, so I will go ahead and say that we're going to take a break right now and meet back here in five minutes.

Can we give our panel a round of applause?

(Chorus of applause.)

(A recess was taken.)

CHAIRMAN SHEAHAN: I think we have everybody on the panel. Welcome back.

Our second panel, we're going to hear from industry leaders and researchers to discuss differences between traditional M&V and EM&V and emerging technologies frequently referred to as M&V 2.0.

The questions will explore the benefits and drawbacks of 2.0 and associated policy and regulatory concerns and challenges.

To lead our discussions, I'd like to introduce my other legal and policy advisor Wei Chen Lin. Not just my other, my second.

Please join me in welcoming Wei Chen.

MR. LIN: Thank you, Mr. Chairman. My name is Wei Chen Lin. I'll be leading the second panel which will discuss the differences between M&V and M&V 2.0.

The format of the panel will be the same as the first panel which you're already familiar with.

Before we begin, I'd like to introduce the panelists.

We have Bridgid Lutz, Regulatory and

Quality Assurance Analyst for Energy Efficiency from Nicor Gas;

Brian Bowen, Regulatory Affairs Manager at FirstFuel;

Eliot Crowe, Project Manager at Lawrence Berkeley National Laboratory;

Tim Guiterman, Director of Measurement and Optimization for Energy Savvy;

Andy Frank, Founder and President of Sealed;

And finally, Dr. Sami Khawaja, Chief Economist at Cadmus.

Please join me in welcoming our panelists.

(Chorus of applause.)

MR. LIN: So first, Bridgid, would you mind explaining to us M&V 2.0, what the 2.0 is referring to?

MS. LUTZ: Sure. Hi. First of all, thank you, Chairman and Commissioners, for inviting us here today. As Wei Chen said, my name is Bridgid Lutz. I work on regulatory with Nicor Gas. Among other things, I am responsible for managing our EM&V process.

Wei Chen, I had slides?

(Brief pause.)

MS. LUTZ: Thank you.

So what I'm going to talk about today is Nicor Gas and how we are moving towards M&V 2.0.

To start out with, what we first had to do was recognize the need for it. So where we were when we started was it was kind of the Wild West, so the first thing we saw was the need for a process that allows for a faster response to recommendations given by the evaluator -- by the independent evaluator. And you heard some of that during the first panel on the delay in the lag between when the utilities would receive the evaluation reports and when we were able to implement any responses to those recommendations.

Next, we also determined the need for a system to store and manage all the data relating to energySMART, energySMART being Nicor Gas' efficiency program. And I'll get to that a little bit more in detail in just a minute.

So to address these needs, Nicor Gas

developed an in-house data management system that we refer to as energyENGINE. And again, I'll be talking about this a little bit more in detail in just a moment.

So here we have some of the important differences between M&V 1.0 and M&V 2.0.

In M&V 1.0 what we typically saw was the end of a program year at which point we would gather data from our various implementation contractors. At one point we had as many as 14 implementation contractors running our programs, so this was a pretty monumental task.

We then would have to package this up and send it to the independent evaluators for their analysis.

The evaluation then would have been typically completed about six months or even more -- often more months after the end of the program year. That meant that the opportunity to implement any process improvements in a timely manner was completely missed. So if we gave our evaluator our data after the end of, say, program

year four, we are then halfway or even more through program year five before we even get any recommendations from them for process improvements which means that we've lost the opportunity of program year four and program year five and it is program year six before we can implement any meaningful changes to our programs in response to these evaluations. That was a big problem.

The last point here is survey results. As part of the M&V process, the independent evaluators roll out surveys where they are calling both customers and trade allies to ask about their experiences with our Energy Efficiency Programs.

And what's required here, when you're waiting to give the evaluator the participant data until after the end of the program year, is a recall on the part of the customers or the trade allies from several months or more than a year into the past and to ask them questions about how meaningful their participation in the program was: Would they have participated in this program without the program -- would they have implemented these

measures without the program, questions about the process, what was their application process like, how was their response from the utility or the program implementer.

So to be asking these questions to our customers and trade allies a year or more after the fact really led to some issues with the quality of the survey results.

So moving on to M&V 2.0, we now have data submitted to the independent evaluator monthly throughout the program year, so this gives them the opportunity to review, check our math, make sure we're doing things right as the year is ongoing.

Interim findings are then supplied by the evaluator which means that process improvements can be implemented immediately. We can change while we're still in the same program year instead of two years later.

And finally on the customer surveys, since these are now -- since the evaluators now have the participant data, they are able to perform these surveys in a more real time fashion and the

customers are talking about measures that they just implemented within the last couple of months which leads to higher quality results.

So energyENGINE, I mentioned earlier, is our in-house data management system. The pieces of energyENGINE are twofold. First we have data management, and then we have reporting.

So for data management, one of the things that Nicor Gas recognized was the need to be the owner and manager of all its data regarding the energySMART programs.

As I mentioned in the past, we had as many as 14 implementing contractors. We didn't always own all the data, so the evaluators were depending on us to gather data from the various contractors over going to the implementation contractors themselves. So we didn't necessarily have all of this in house. If there were engineering models that were used, we didn't necessarily have those files in house.

That has all changed since we have built up energyENGINE. All of our data, including

complex engineering leveling, is held in house so that we are able to pass on to the evaluator any piece of information that they may need to look at our programs.

This is a Cloud-based dynamic system, so everything stored on the Cloud. It is easily built up. It can easily be scaled. It enables efficient management of data from multiple implementation contractors. So regardless of the number of implementation contractors we have, we are able to feed it into our system quickly and easily. It is very versatile. We can easily adjust to absorb to any other new changing data sets. If we have new measures that are implemented, these can be added into our data sets very easily and seamlessly.

Now, as for report generation, this is a second piece of energyENGINE which is very important. One key factor is that M&V data is provided in a standard format, so regardless of which program our evaluators are looking at, the data looks the same.

So if, for some reason, we have an

evaluator that isn't typically working on our home rebates program, they needed to pull in additional help from a co-worker or something along those lines, the data looks the same, and it's not going to take them a long time to pick up and figure out what it is exactly that they're looking at.

Data also can be produced at any degree of frequency. As I mentioned -- as I mentioned, we currently pass this along to our evaluator monthly. This can be changed. We can do it quarterly, annually, daily, weekly, at whatever interval we decide, along with our program evaluator, is the most optimal time frame for them to be receiving the data.

Standard reports can be generated on demand. One example of this is our appendix A to our quarterly report. So all of our numbers, our usage, our spending is produced at the push of a button.

Also, ad hoc reports are very easily generated with any custom inputs. If you came to me and said you wanted to know how many faucet

aerators we installed in our multi-family program in PY2, I could pull that up in a matter of seconds, if not minutes; so very easy, versatile system that pulls on all of our data sets across all our programs with all our implementation contractors.

One last thing that I did want to mention is that there are some key differences to M&V 2.0 where the gas companies are concerned. Big changes have been happening because of the legislation that was recently passed, the Clean Energy Jobs Bill, that have different impacts on the electric companies than they do on the gas companies.

For one thing, the gas companies still have annual savings goals, so we're not seeing the shift to the cumulative savings goals that the electrics are.

And a second piece is that the gas companies do not have the ability, through the new legislation, to recover any of our investments.

So when we're thinking in terms of EM&V 2 and how it's impacted across the board, we do need

to keep in mind that the gas companies still are looking at this through a slightly different lens than the electric companies are.

That's all I have.

MR. LIN: Chairman and Commissioners, any questions?

(No audible response.)

MR. LIN: I had one question about the Cloud part of the program.

MS. LUTZ: Sure.

MR. LIN: Was the Cloud essential to the success of the program? Could it have been duplicated using traditional servers?

MS. LUTZ: It could have been. We made the conscious decision to make it Cloud-based because it does give us a level of versatility that we don't have by housing our servers in house. It also allows us to kind of pick up and go in a different way.

MR. LIN: Thank you.

Brian...

MR. BOWEN: Great. Thank you to the

Chairman and Commissioners for hosting today's session.

My name is Brian Bowen, Regulatory Affairs Manager for FirstFuel Software, and I'll be talking about a few things today.

The first of the points I wanted to make is that M&V 2.0, although we're talking about it at a future state, I think it's very much here and it's a part of the way that we're doing business today not only as a company at FirstFuel, but many utilities are beginning to pilot and scale up these approaches. It's not a beta offering. It's something that's here today, and I'm glad we're having this discussion.

The second portion of my presentation will present the case study from a program that we supported in California with our client, Pacific Gas and Electric. I hope it's illustrative of the work we're doing for commercial buildings which is really where we focus as a company.

And then the third point is that if you look at the language of the new Future Energy Jobs

Act, M&V is only one of the components of the bill language around where advanced meter infrastructure data can be utilized. It can also be utilized in planning implementation, so in the last portion of my presentation, I'll take a step back and talk a little bit about the work we and our utility clients are doing on that front.

So before I begin, just a bit about FirstFuel. We're a big data analytics company for the energy industry. We serve investor utilities, municipal utilities, also government agencies and program implementers. And what we do is analyze meter data, building data, customer data in support of utilities' Energy Efficiency Programs, as well as customer engagement programs.

So what we do is in the Cloud. It's software-based. Software is a service. And it really enables us to serve a wide array of needs very cost effectively for electric and gas utilities.

So to talk a little bit about what's being done in EM&V today -- and as I said, M&V 2.0 is

really here. I'll talk a little bit about how we approach it, and that's really through the lens of measuring savings at the meter.

So what you're seeing on the screen here is an illustration of a single building, and the blue line represents the actual consumption within that building measured at the meter, and the green line represents the prediction from the building model that FirstFuel generated for that building.

The black line in about the center of that graph shows where there was an implementation of an energy efficiency measure, and so what we're seeing here is a big dip in the actual consumption, that blue line, after that measure was implemented.

And what continues on is the green line which is where we think the building -- what we think the building would have used in terms of energy consumption over time were it not for that energy efficiency measure.

So this is kind of the basic illustration of our methodology when it comes to measuring savings at the meter. It requires us to have a

really good building model up front -- we do this at the individual building level -- and then to have an excellent assumption of what consumption would have been otherwise based on weather and other normalization techniques.

The second part of the slide mentions some of the advantages here. So Bridgid mentioned, you know, it's important for Evaluation and Measurement and Verification to influence the way that programs are run in the future, and I think having this better real time alignment between understanding the actual savings and how the programs are being run enables that.

It also -- by measuring savings at the meter, we're less focused on which widgets exactly were installed in that facility and we're able to look at the building as a holistic system. That means we can measure operational savings for a commercial building: You know, is the building shutting down overnight as it should, as well as the physical upgrades that are made to that building.

And especially as electric utilities are looking for measures to last over time -- that's how their goals are being measured -- it's very important for us to be able to see the consistency and persistence of savings, especially when they're operational.

Of course, there are cost efficiencies from automation: Fewer site visits, less human input overall. I mentioned the real time aspect and the impact on programs as we plan for the future.

So that's our basic approach to meter-based savings.

We've also worked with Southern California Edison to do this work at the grid level. Many folks in the room may remember when the San Onofre plant went offline, there was a big procurement for a variety of distributed energy resources, energy efficiency demand response. We did a lot of measurement and verification of what actually was delivered to replace a power plant.

So you can really think of this modeling

work enabling efficiency to be used as a grid level resource, so that's something that benefits all ratepayers when you can defer or delay or avoid an investment in the grid.

So moving on, I'll give a case study of Pacific Gas and Electric, a program we did for them over the past few years -- this is still ongoing work -- where we looked at commercial buildings as holistic systems. So rather than measuring specific widgets, as I said, you know, do we change the lighting, the heating/cooling, we did a comprehensive approach to the building energy efficiency.

And the goal of the program was to deliver more than 15 percent meter-based savings as compared to a normalized baseline.

And the good news is that this enables this flexible approach where behavioral savings, operational and retrofit savings all can be measured.

It also had a pay-for performance element which gave the implementer and the building owner

and operator an incentive to actually ensure that the savings persisted because they were paid not just when the measures were implemented but also as the savings were measured over time.

And this is something that's assisted by doing meter data analytics at a large scale. Glad to report that rather than just delivering 15 percent savings, on average, buildings that participated in this program are generating upwards of 20 percent savings. And that's because we're able to look at the building as a holistic system rather than just as a series of engineering problems to be solved.

And then the final point of my presentation today, moving on again, is that AMI data can really address multiple energy efficiency goals. So if you look at the statute here, this sub-clause related to AMI data, it mentions that electric utilities shall incorporate advanced metering infrastructure data into the planning, implementation, and evaluation of energy efficiency measures and programs.

Today we're focusing on the end of that cycle which is to measure the savings using that data, but I'd argue that it's just one part of that cycle. And actually each of these three processes, the planning, the implementation, and the M&V, all interact with one another.

I certainly know that many utilities are looking to AMI data to help them plan a better portfolio of measures that they know they can address. They're looking to that data to engage their customers, get them to participate in programs that they might not have otherwise known about. And then finally, you know, the measurement is really the goal of today's discussion.

But I think if we ignore the first two steps in the equation, we're really missing out on a lot of the benefits for consumers from this AMI investment that we've seen here across the state of Illinois.

So I'll leave my comments there and I'm happy to answer any questions.

MR. LIN: Chairman and Commissioners, any

follow-up questions?

(No audible response.)

MR. LIN: Next we have Eliot Crowe from LBNL.

MR. CROWE: Thank you. Thanks for inviting me here today.

Lawrence Berkeley National Lab, LBNL, is a government lab based in Berkeley, California. I myself work in the Building Technology and Urban Systems Division. The team that I work on is dealing a lot with energy management and information systems, EMIS, which use smart meter data to do all kinds of cool stuff, and a big piece of that is M&V 2.0.

So we have a host of research projects, many of them funded by the U.S. Department of Energy, and we are working -- have been working for several years on this topic area.

Now, a lot of our funding comes through the commercial group within the U.S. Department of Energy, so a lot of my background is in the commercial field, but we do touch on some residential also.

By now you're all experts on what M&V 2.0 is, I imagine. I don't know that I can add much more to what's already been said, but I will say one thing which is that M&V 2.0 is essentially a method or a set of methods for establishing energy savings estimates.

So it's not necessarily a piece of software. M&V 2.0 techniques can be implemented manually using smart people with regular kind of software like statistical energy software.

What we see on stage here is some examples of software tools like FirstFuel or Energy Savvy offering EM&V 2.0 in a more packaged -- more packaged form. But I just want to make that distinction, it's essentially a method rather than a tool.

To summarize some of the past, current, and ongoing work at LBNL, we've been working in this field since 2014. An initial phase of the work was in identifying that while there are many tools that have capabilities to assess savings, there wasn't any way to actually compare them

objectively.

And so some of the early work was around working through how might you compare and test certain tools against each other, tools and methods, so we have established those protocols going into 2015. We are able to apply that test procedure to a number of specific software tools and manual methods that were implemented.

So we've published that research which came out to suggest that there were a number of tools that did a great job of estimating with high certainty.

And the way that that worked was we obtained data for many hundreds -- I think it was over 500 buildings, and we had at least two years of data. We used half of that data to, quote, train tools or methods to develop an energy model.

We then used the energy model and applied it to the second half of the data to see whether it was actually predicting accurately what that second half of the data was. It's maybe hard to conceptually show by describing it, but essentially

it compares the uncertainty of an energy model using data from real buildings.

So we applied that. And moving on from that, we then got hold of some data for cases where projects actually happened, and we used that to actually test some tools and demonstrate how tools could show those savings and estimate those savings and also comparing the prediction of the energy model to the actual reported savings for those projects. And that research is also published right now.

That brings us on to the current phase of the work which is taking that -- another step to some live pilots. We have one that is in process -- just getting started up in the Northwest, another one in the Northeast. We're going to be looking at conducting M&V 2.0 on projects that are actually ongoing. What we've done before was taking historical data, we're now going to take that live.

Other elements of the current work are to take the test procedure that we previously developed and hand it off to industry so that we

actually have hopefully an independent testing body that can produce an independent verification of certain tools or methods that can serve the public good.

We also are looking to connect with stakeholders nationwide, regulators, evaluators, et cetera, to try to understand what might be some thresholds we might share. So once you've established a test procedure, you can compare tools, but how do you actually determine what is an adequate result of that test?

So we're looking to get to that phase of the work where we can actually understand, well, what are people going to look at as the actual cost-fail thresholds for these kinds of tools and methods.

In amongst all of that, we hope to come out with a number of practitioner resources that takes this kind of work out of the field of researchers and more into the hands of Energy Efficiency Program implementers and the utilities themselves.

Benefits and drawbacks: I think we've covered a lot of this, but I'll go through my list since I made it anyway.

(Chorus of laughter.)

MR. CROWE: So in terms of benefits, there can be benefits to reduce the effort and reduce the time to get to project results -- we've heard that today -- actually get a more dynamic understanding of what's happening on projects.

We are looking at the true impact of the buildings. Now, we cannot truly estimate what didn't happen, but we can -- if we take what's happening at the meter, we can say it's the true impact of what's occurring at the building, what is the energy use at the building.

In that sense, it aligns with the building owner priorities which is they want to reduce their bills. It aligns with policy, resource, and grid management, as Brian made a good point there, that you can actually tie what you're reporting to the actual grid or generation.

It does account for interaction between

measures. Again, the example Brian gave about the program which was implementing many measures on individual sites, you're actually capturing all the interactive effects which are very difficult to capture by other means.

You can help to verify measures that were installed correctly. You may not have a perfect ability to see exactly all the different measures and what each one did to the energy use, but you can see gross problems that may be happening if measures aren't installed correctly.

Similarly, you can catch cases where measured performance degrades. Perhaps several months after controls upgrades, somebody reverses that controls upgrade, you can catch that with M&V 2.0.

You can also quantify the uncertainty. We've talked a lot today about how all you're doing is comparing one estimate to another with M&V and EM&V, but at least with M&V 2.0, you can actually quantify the uncertainty in an energy model which I think helps us understand the risks involved much

better.

I think there's a whole field of discussion around what the long-term benefits are. I won't get too lost on that, but I think there's some real visionary thinking that can come from seeing what M&V can create for programs in many measures.

In terms of the drawbacks, the methods have not yet been proven at scale. The research we have done has not been showing, you know, the benefits and ironing out all the kinks at scale.

There is also a need to wait six to 12 months to determine annualized savings. So with an engineering estimate, you can predict today what the whole year savings are. With M&V 2.0 you won't have to wait for that year potentially to make that claim which changes the nature of your programs.

If you install a mix of measures, then some of those might be long-lived, some may be shorter lived, and how you actually discern that mix, when you're only looking at the meter level, is not that easy.

Dealing with non-routine events: I give an example here. So if you're working in a commercial building and then three months after install measures, 20 percent of the occupants move out, they have a tenant move out, now that's going to severely impact the energy consumption, but that's not necessarily a result of the energy efficiency project, and you will likely need to account for that somehow. And right now there is no consistent way of doing that.

Not all sites will be suitable. You do need stable operation in -- during a baseline period where you build up an energy model of performance on the site.

And you also need to have -- it's not a hard-and-fast rule but I'd say below 5 percent savings. If you're expecting below 5 percent savings for a project, it may be tricky to see that above the noise in the energy.

There are a couple of things I should probably also add that I forgot to put on the slides here in terms of drawbacks.

There's currently nothing established about how you might deal with a case where you're trying to apply a code baseline for certain measured you've installed. There's no way to tease that out of the meter level, so that's something that, as I say, I haven't seen that addressed anywhere to date.

The second one is that as, I think, we've discussed here, we're only measuring gross savings with M&V 2.0, not net. I think there could be a future point where net savings could be measured, but right now we're not there.

Okay. The final slide here. So in terms of remaining gaps after our current phase of research is done at LBNL, we would love to see scaled pilots. What we're doing right now is two to three dozen projects in the pilots. I think we'd love to see much larger-scale pilots to look at both the results and also how practitioners in the field can actually apply the methodologies.

I think there's also -- a lot of research has happened, but I think we need to continue

looking at what's the impact of giving a consumer that ongoing feedback on what they're getting from their energy consumption behaviors and how that can accelerate the actual energy savings.

Moving towards consistent regulatory requirements, that's something that we are hoping to support through the current phase of research as we push out our results.

Standardized data management protocols: I think there's a hypothesis that the more data that becomes available through M&V 2.0, it really can help to accelerate financing in the energy efficiency space as there becomes more data for risk management. I think that to achieve that, we need to have agreement on how we're going to actually manage the data and report data.

I think there's also a lot of discussion still to be had around defining the intersection and the relationship between M&V 2.0 and EM&V.

Thank you.

MR. LIN: Chairman and Commissioners, any follow-up questions?

(No audible response.)

MR. LIN: Next we have Tim Guiterman from Energy Savvy.

MR. GUITERMAN: Great. Thanks. I appreciate being here. Thank you to the Chairman and the Commissioners for having us. This is very exciting.

First I'll just say my name is Tim Guiterman. I'm the Director of Measurement and Optimization Solutions at Energy Savvy. We're a software service company currently serving approximately 40 utilities and program administrators around the country generally with the goal of increasing customer satisfaction while reducing cost to serve for those utilities.

We do that by leveraging Cloud computing, data analytics, better customer engagement, work flow processing, and really a full holistic understanding of what's happening at the customer meter: How customers use energy, how they use that utility's product as Michael Brandt said before, how they interact with that product, and, when it

comes to energy efficiency, really understanding those impacts in a more near real time way.

So I want to talk about what it is -- we've gone through that. I'll kind of speak from our perspective how it works and I think why it matters.

I think what's exciting about being in this room today particularly is we believe at Energy Savvy -- and we hear this often -- is there's kind of a moment where folks say that makes sense, like, yeah, that makes sense; we should do that; that makes sense. But just -- I guess making sense doesn't necessarily translate to where and how it can add value to an existing paradigm or existing processes.

Now, myself -- I should say I'm an evaluator. I was, in fact, formerly with Navigant who's well-represented in this room, as well as I have connections with Illinois which is great. And so from my perspective, I see a huge opportunity for the evaluation community to refine, advance, and improve existing processes.

And this is an industry that relies on, I think, continuous improvement and taking advantage of the best methods and protocols and practices out there and taking advantage of the, you know, increasing availability of granular data and analytic methods and other tools and technologies.

So I think it's just exciting that this room is here and the evaluation industry is talking about how to keep moving forward.

So with that, what is M&V 2.0? And this actually came up in the first panel which I was really glad to hear, but I think this definition that's on this slide is very helpful. And it comes not from us but from the New York Department of Public Service and it's in their most recent evaluation guidelines. It says that the defining criterion for automated M&V software is that it continuously analyzes data as it becomes available. And that is, in its essence, one of the main things that we want to talk about when we use this term 2.0.

As data is coming into these systems and

becoming available through customers' usage data and/or project data, as Nicor Gas was talking about, that is being analyzed. And the results from those analyses are then available to the stakeholders who need it the most, typically the program administrators and the evaluators and the implementers.

There are a lot of names on there that have been thrown around today. When I say M&V 2.0, it can be a substitute for any one of these. The state of New York chose to use Advanced M&V in this case.

I want to also acknowledge to the Chairman and Commissioners that, you know, you're not the first one to have this panel, and that's a good thing. There's a lot of activity going on around the states in this country, and I highlight some examples. I won't go into great depth here.

New York, California, we hear about those often in energy efficiency. They tend to be on the leading edge occasionally, and in this case, they do continue to do that. But New York has really

dug in and is encouraging the use of this Advanced M&V in the world of impact evaluation which is the main topic of what we're talking about today.

California is really pushing to embed these data collection strategies in performance -- or in deployment, so in the programs really embed M&V from the conception of program design and collect that data in order to use it. And there's more going on in California about actually measuring impacts at the meter which is at the heart of what we're talking about today.

But states like Missouri updating their TRM and accounting, doing some reporting on how 2.0 can fit in; New Mexico, in fact, asking the evaluation community to consider including M&V 2.0 into their bids. And it -- kind of hot off the press, a state like Maryland is wanting to refine existing processes by tracking the actual energy savings, something we heard Annette talk a lot about on the last panel which is, well, we don't know what's actually happening at the meter right now, so let's begin tracking that and we can use

that data to incorporate into our design of our plans and our portfolios.

I do want to capture a few elements as I think it's very important to see language that has already been included in a state's guidance. And this is from the state of New York as I mentioned previously.

They're encouraging the program administrators and the evaluators to use these techniques, do it to aggregate and analyze data and where it's appropriate.

They're also acknowledging something I'll talk briefly about today which is the benefits accrue not just to the field of evaluation and that process but to implementing programs and making those more cost effective and making them better which is really one of the goals of why we're all here. And so they encourage budget-sharing because those benefits have proven both channels.

And finally, I think a really important thing that came out of the New York guidelines is the concept of being -- because this has been asked

about in the first panel -- being able to extend evaluation cycles.

So there's nothing about replacing evaluation or any of that language. Rather, it says where you can assess that the analysis is accurate and it's working, then we can continuously monitor what's happening along those programs throughout the year. And this might -- allows to extend that formal evaluation cycles where we have to bring in other -- you know, other impacts or process studies or net to gross. And we can do that on a more longer-term basis, and that might lead to some cost savings directly to the administrators.

So how does M&V 2.0 work? I think this has been talked about enough, but from our perspective at EnergySavvy, we really work in the residential and the small-medium business sector, so we call that mass market. And we're looking at the usage data of customers.

And, in fact, where our clients -- we'll take -- if we're doing a residential program, we'll

take all of the residential customer usage data; so, say, a million or two million customers, all of that data, whether it's monthly or AMI or even bimonthly data, and build these models, like Brian talked about initially, about what happened in the last year and how is that usage correlated to weather and model that out going forward after the energy efficiency impacts are installed and compare what the model said would happen to what actually happens.

I thought this would happen. So I have some animations in here, and some cool stuff might get lost. That's okay. We're just going to work through that.

What we do with this data, though, is we look at each customer and then we build a -- we use comparison groups of non-participants -- this was talked about also in the first panel -- where we compare the changes in usage that happened at the meter of the participants to the customers that were not part of the program. And that relies on best practices of the field of evaluation to ensure

that the savings are both attributable to the programs so we know they're not just because of external effects happening, economy, rates, other issues. And from our perspective, it allows the software to calculate savings in near real time with confidence and reliability.

And where M&V 2.0 really shines is it does this automatically, so all the data comes in and the analysis is generated automatically and continuously and is put onto dashboards for the clients, the evaluators, the utility program administrators to see the impacts of their program in real time and assess what's happened.

And let's just see if this goes away. So at least we have some of this animation. So if you could see the whole chart here, it would be brilliant, but what I'll explain to you here is one of the powers of M&V 2.0 that's been touched upon but -- and I've heard different elements of it today but is, I think, very powerful to understand is that you can assess these impacts along the way through the program year and you can confidently

and reliably do that, in this case, in many cases about halfway through the year, have a solid, reliable understanding of how the energy savings are occurring, what kind of energy savings you're going to get, and we get confident estimates that are the same as when we actually get the data -- go out and get the data, like, a year after the program ends.

So in simple terms what I'm saying is if we're looking at a program year that starts in January and ends in December, in June with the data we have available to us, the software can calculate the energy savings impacts in a confident and reliable way to the same extent it can with another 18 months of data adding in and rolling in.

And that's a very -- that allows you to understand what is happening on the ground, make course corrections where necessary, feed into next year's program design, and feed into the really important processes that happen in parts of the evaluation which is process.

So we want to research and study what's

happening and inform what to look at, where to go on the sample, where to use our on-site resources, et cetera. And I'd be more than happy, after this presentation, to get people a better visual here.

So I think an important topic is people want to understand. We have this technology. It can do things differently. It can enhance and support processes, but how do we get it in? How do we embed it into kind of a formal evaluation process that we have now?

So what I'd like to talk about is examples that we have across the country with different clients right now.

So in one case, we are part of an evaluation team. EnergySavvy's software is running a building analysis in a continuous fashion for a residential program. The traditional evaluator did a kind of -- I call it a crawl-walk-run approach where they validated that the software was accurate and reliable, and therefore, they rely on the continuous building analysis of the software to understand the impacts of the program and provide

the building analysis of the record.

And a traditional evaluation firm can then go and do what's needed for the supplemental work, so additional on-site research as needed or any nets to gross of customer surveys to get that kind of feedback. And that way, the entire evaluation effort is enhanced with this early insight and feedback.

And we are also actively partnering with the evaluation community on various portfolio bids in various states around the country where the service of the 2.0 software is integrated into the delivery of the traditional evaluation firm.

And I say that because I think we often hear this tug -- this play here; that is, we have an existing paradigm and we have new technologies; one must trump the other; one must replace. But that's not that case.

What it really is, is integrating in a fashion where it makes sense at first. So if you were already going to do a building analysis on a behavioral program for understanding smart

thermostats as Annette was talking about or various other programs that exist in your portfolio, integrating 2.0 initially into those services already makes sense from the perspective of the evaluation firms that we're working with and to the utility administrator clients.

And then as you have that data and you're understanding that data and you're looking at all the customer's energy use and savings, you can expand from there and apply it to various new programs, new technologies, and new initiatives.

So a couple quick case studies, and then I'll leave it there.

People often ask how does it work; is it accurate; has it been validated against other technologies. From EnergySavvy's perspective, we've actually gone through this kind of checklist process of being validated against traditional evaluation building analysis or the traditional evaluation practices, and we've been able to check that box each time.

Oftentimes, that work is done on behalf of

the utility, so I don't have four or five different case studies to talk about, but I do have one where the question was being asked can M&V 2.0 match the existing results so the utility has the results from an existing evaluation. Can it match those? Can it give the utility those results in a quicker, a sooner time frame?

And what we were able to prove was that we were able to reproduce the evaluation results with the 2.0 software, provide a reliable estimate of the savings performance in just about seven months.

And all of this was with bimonthly data, so this is data that was collected every other month. And that's kind of the low bar. We're talking about AMI and the great things you can do with granular data. This is just across the board with bimonthly data.

And we were able to match those with a tight margin of error, and that gave trust to the utility that they could go forward and invest in the technology and use it across their programs where it makes sense and where applicable.

And also, we ask the question not only for evaluation but what can be learned from faster feedback; what can we do with this information to make programs more cost effective and improve better outcomes and improve customer satisfaction?

One of our clients, Arizona Public Service, takes the continuous measurement of their -- three of their residential programs, and they use that to better manage their contractor network and greater understand their contractor performance. And the most notable learning is they've used that to improve their entire on-site inspection process.

They've taken this data, identified the contractors who are of interest, the ones that are performing -- maybe, from a red flag perspective, aren't performing up to snuff, and they have focused their inspections on those contractors and removed inspections from contractors that they can verify are doing well. And the data supports that.

And they've taken their on-site inspections from 40 percent of all the projects -- and this has gone on in hot Arizona -- and gone to

20 percent inspections. And they have a goal this year to even further reduce that in half.

And that's been able to allow them to shift or save, you know, 25 percent of their inspection budget and use that to directly improve the program through better training and better offerings.

And so with that, I'll leave it there. I'm happy to take questions now or after.

MR. LIN: Thank you.

Chairman and Commissioners, any follow-up questions?

(No audible response.)

MR. LIN: On one of your slides, you mentioned an error rate of 6 percent. Can you tell us a little bit more about how that's calculated and how that compares to a traditional M&V?

MR. GUITERMAN: Sure. It's probably a bigger question than that, but in this case this was -- this was actually a very -- this is probably one of the most simple tests you can do.

They had -- the utility had an existing evaluation. A building analysis was based on

customer meter data, and it had a realization rate. So, say, it found out the program saved 90 percent of the savings, and the realization, you know, on that had an uncertainty bound plus or minus a few percent.

The utility wanted to test the bar if technology can match those results: Would we tell them it saved -- you know, the program saved 60 percent or 50 percent or 120 percent. And we were able to match within their 90 percent finding of 6 percent. So it was -- so the margin of error was -- in that case was just that.

I can give a much more longer and complicated answer about how we calculate uncertainty around program estimates, but I don't know if you want to do that.

MR. LIN: We don't have time for that, but I would love to hear about that during the Q&A session.

MR. GUITERMAN: Sure. We can talk more about that, sure.

MR. LIN: Thank you very much.

Next we have Andy Frank from Sealed.

MR. FRANK: Thank you, Chairman and Commissioners, for having me today.

So I'm Andy Frank here from Sealed. I'm here to at least hopefully give the market approach to M&V 2.0, basically what these -- all of the kind of methods and the techniques that have been talked about, how that can be applied in a non-utility context; so lessons that can be learned from that and also how those approaches can potentially at least be applied back into the utility space.

So when I say market, we are a private company. As I'll explain, we literally invest in energy savings in residential homes in New York right now, and so we are not an M&V consultant. We're not a program implementer. We're working directly with contractors and homeowners on the ground.

But M&V 2.0, as we've defined it today, is very important to us because it's basically our business.

So we have created a program that we call

HomeAdvance where we allow homeowners to pay for some or all of their home efficiency improvements with the energy savings achieved from their project. And I'll kind of explain to you how that works, but the bottom line is we better be darn sure what the energy savings are because we're literally putting our money on the line that we're going to get paid on with those energy savings.

So the way it works with the customer -- kind of the pitch to the customer is, you know, you want to do any number of measures, insulate your attic, install a new smart thermostat, you know, duct sealing to reduce leakage, et cetera, basically we're going to improve your home. We're going to upgrade your home, make you more comfortable, give you more control, better health benefits, all of the kind of non-energy benefits that we all know and love about energy efficiency and you're going to be able to pay for that out of your energy savings.

So every time -- after the project is complete, every time a new bill comes in, we look

at what you actually used versus the baseline that we define -- and I'll go into how we think about that and how we do that -- and basically we charge the customer based on how much energy that they've actually saved. There's a lot more obviously behind the scenes in details, but that's kind of the eye level.

So the way that we determine, you know, that baseline is how we talk about it with customers. And they're, I can tell you, very tough people. They don't want -- residential customers, we couldn't -- I don't think we'd ever convince them deemed savings would be an effective way to charge them.

So what we do do is take their past usage, we take their home characteristics and their local weather to basically determine their baseline. I'll get to the mathematics of that in a second, but basically what we're telling them is based on how you used to use energy, this is what we would have expected you to use -- same kind of baseline idea that we've been talking a lot about today --

and then here's how much you actually used and here's why we're going to be charging you the difference. So again, a contract between us and the customer, but it uses M&V principles.

Why do we do this? Just from a customer perspective, we found in our own surveys and independent surveys that most people, when given a choice, prefer to pay with their energy savings versus paying with a lower payment of cash. People really like the idea that there's accountability. As -- you know, I'm sure as the Commissioners do and as many people in this room do, accountability is very important, and that's very important to customers as well.

So again, I think a lot of times when we talk about things in these policy contexts, it's kind of disconnected from how normal people who are actually the end users of Energy Efficiency Programs actually think, and I think it's actually very aligned. If you talk to an average homeowner about what's fair and what's not fair, I think a lot of the things that we've been talking about in this

room will resonate. Maybe different terminology but same principles.

So obviously getting the baseline approach is extremely important to us. It's not an academic exercise. It literally determines whether we make money or not.

So what we've done is apply -- kind of similar to what Eliot was talking about on the commercial side but to the residential sector in terms of predicting analytics, so it's kind of a branch of machine learning. And what we do is we take data from homes that -- both before and after that they've used energy and we basically create a test setting, training set to create an algorithm for what the baseline should be.

We have to make that pretty simple for the customer determining base load and weather variable -- weather variable usage, so usage per day and usage per every day. And that's kind of in their contract. That's how we actually do it.

What we're able to do internally is actually validate that our baseline analytics are

correct. So with -- kind of also in Long Island, using, again, bimonthly or monthly data, we've been able to create an algorithm that is able to show that the test sets and the training sets are within less than 1 percent error between them. So we can rely on that internally in order to be able to make a good bet on what the energy savings are going to be.

More importantly or just as importantly, if not more, we've been able to use the same analytics to get other private sector actors to put their own money on the line as well.

So working in New York, we've been, you know, able to share our analytics with the New York Green Bank and actually last week we announced an insurance policy with Hartford Steam Boiler which is a part of a lucrative, big insurance company, and so because we're taking, you know, kind of this predictive analytics approach -- it's almost called an actuarial approach -- a lot of the same themes that we've been talking about today in EM&V 2.0, we have been able to get both a line of credit to be

able to fund projects based on the energy savings and also an insurance policy that's able to cover most of the energy savings.

So if we go out there and we're wrong, on a portfolio level, of how much money is actually saved, a big balance sheet insurance company will actually come in and pay that difference. So we can actually create confidence in the financial markets around energy savings as a resource.

So, you know, kind of putting my market hat on, you know, we think that with M&V 2.0, at least there is the potential, going back into the kind of utility side of things, that the private market can actually remove risk from both the ratepayers and utilities while increasing accuracy, innovation, and simplicity.

So right now by default -- and obviously this is changing a little bit in Illinois and the same conversations are happening across the country. Right now, the risk of how much energy is actually saved lies either with the ratepayer or the utility. The companies that are doing the

implementation generally that are getting paid for service aren't taking any risk.

We think that with M&V 2.0, you can flip this on the head and actually let private companies take the risk for the energy savings and take the risk away from both ratepayers and utilities.

The other big benefit of this is that as we've talked a lot about, there's a tension between accuracy and certainty. With M&V 2.0 and private actors taking risk, you can have the accuracy that comes with M&V 2.0 while -- while allowing the private market to take all the risk for the certainty, so you don't have to put that on the ratepayers or the utilities.

What it also does -- and I think this was brought up with kind of the operational measures that Eliot and others were talking about -- you allow the private market to innovate a lot more to try different measures, to try different techniques because all you care about at the end of the day is the energy savings. And to, I think, Tim's point, we have a level of simplicity because it's really

transparent, you know, what's being saved compared to a baseline.

Some factors that I think are important from the market's perspective for M&V 2.0; number one, anonymized data sets are really important. I mean, that's how we've built a lot of our models. I think the recent ruling and what Com Ed is doing is really, really important to moving the market on that front because you need those data to be able to properly calibrate based on models.

My recommendation would be to try to pair, if you can, that usage data with home and project characteristics so on an anonymized basis. That allows for another level of certainty.

The market can leverage these data sets both for savings-based financing, which is what Sealed is doing -- this is also happening in the commercial space -- as well for -- and we've talked about a little bit today -- pay-for-performance programs. So both of these are basically private capital invested in energy efficiency with accountability for results.

So I think that -- you know, one thing that we've really focused on is making sure that we can create M&V methodologies that, you know, don't just pass kind of traditional, you know, evaluation tests but can actually pass the test of other private actors that are putting their money on the line, so insurance company, bank. That's important.

The one thing it can't do, as we talked about, is absorb net to gross risk. That's kind of a separate issue that needs to be applied. In some issue or form, everything I'm talking about is on a gross savings basis. But ultimately what the market wants is for energy efficiency to evaluate resources -- another thing that's come up today -- so that compensation for the energy savings is based on -- based on an actual value that we can look at, not based on policy targets and budgets which can change from year to year.

So that's kind of the market view from on M&V 2.0 from our perspective. Thank you.

MR. LIN: Thank you.

CHAIRMAN SHEAHAN: Andy, can I ask, how do

you guys get paid? Is it on bill?

MR. FRANK: No. We actually bill -- right now at least, we bill customers separately. So we set up an auto debit agreement with the customers, and they have the choice to either do consolidated billing, so we'll actually combine their utility bills into one single bill or separately so they get their bills and we send them a separate Sealed bill. But regardless, we have access to their energy usage data, so we're monitoring what we're doing.

CHAIRMAN SHEAHAN: Thank you.

COMMISSIONER EDWARDS: Thanks, Andy. This is fascinating to me as just I think a month ago, we -- I was originally exposed to the concept of pay as you save. We had a meeting here. I don't know if you recall.

MR. FRANK: Yes.

COMMISSIONER EDWARDS: I just think it is -- I'm a hundred percent on board. I think it's a fascinating program.

Can you talk a little about some of the

pushback? I think right now, if I remember correctly, there are just six states that are participating in the pay-as-you-save program from the utility perspective. Do you know of any pushback from the utilities -- maybe what -- I shouldn't say pushback but any challenges that you're having with getting kind of the utilities on board with it and why?

MR. FRANK: Yeah. So to be clear, our program doesn't rely on utilities. We've done -- this is a private contract between us and a customer. In New York we actually have partnered with a few different utilities. We're working right now with National Grid and Com Edison, but to date, those have been based on marketing partnerships, so they're really excited about what we're doing and they're telling their customers about it.

But in terms of getting usage data and billing the customers, all of that is on a private basis. So we haven't had to, you know, get a utility kind of involved, approval basically.

COMMISSIONER EDWARDS: So what's the benefit to, I guess, excluding the utility from the process? Is there?

MR. FRANK: Well, the benefit is flexibility. So we can -- we've been able to iterate very quickly. So we've evolved our program based on what we've heard from customers, from our contractor partners, and we can basically change things around pretty quickly.

So all -- you know, all the market really wants is a price signal. A price signal comes from lowering customers' energy bills, potentially from the extra benefits of energy savings than, you know, kind of energy efficiency programs represent.

And so we view utilities as potentially really high-value partners, but we don't want them to be the choke point, if at all possible.

COMMISSIONER EDWARDS: Thank you. Great presentation.

MR. LIN: Any other questions?

(No audible response.)

MR. LIN: Thank you.

Next we have Sami Khawaja from Cadmus.

MR. KHAWAJA: Thank you. The disadvantage of being last, of course, is, of course, the audience has lost some enthusiasm.

COMMISSIONER ROSALES: Not at all.

MR. KHAWAJA: Not at all?

MR. ROSALES: Not at all.

MR. KHAWAJA: Also, it turns out that everything I'm going to say has already been said, but I'm going to say it slightly better. We'll see.

(Chorus of laughter.)

MR. KHAWAJA: My name is Sami Khawaja. My title at Cadmus is Chief Economist. I'm not really entirely sure what that means, but what I have done for the last three-plus decades is EM&V. I've been involved in all kinds of programs and I have seen the good, the bad, and the ugly. So I'm going to try to talk today about the good of EM&V 2.0. There really is not much bad, maybe a little bit of ungood, and there's no ugly at all.

I was recently on a panel in California

for the Public Utilities Commission and the panel was given a simple task, to answer two questions: Can California double its DSM impacts in the next decade, and the next question was what can EM&V professionals do to assist.

So the panel I was on, I was the sole EM&V contractor. And, of course, everybody said absolutely, yes, we can talk about DSM impacts in the next decade, no problem at all.

And then when I spoke, I suggested to them that maybe from their perspective that the best thing I can do as an EM&V contractor is get the hell out of the way. That would make their jobs a whole lot easier.

So that, of course, hurt my feelings because it's not really entirely true. We can indeed be -- we can help. We can help the regulators move the process more efficiently because at the end of the day, we all have the same objective which is how do we get the highest amount of savings with the least amount of money using ratepayers' dollars.

So one of the things that -- you know, one of the items that was talked about is that historically EM&V really has not helped much. And so, you know, I thought a lot about that, and it turned out that is kind of true really. Historically we haven't really been all that helpful.

So within the old paradigm, if you will -- secondly, you should say paradigm at least once in every public speech.

So in the old days when I started in this business, we came in after the fact, we went backwards, and we told you how you did. And by the time we actually told you, it was too late, right? The program no longer exists. The technology has changed. The target market has changed. By the time we actually told you, it was really not all that useful to you.

So why did that happen? Some of the big issues, the problems that we have maybe caused was, you know, creating an undue data collection burden on the implementers because -- well, because we

didn't really have some of the technologies that are available to us today. A lot of what we did was very intrusive, and many of the data collection instruments that are available to us today are a lot less interesting. We'll talk more about this in a minute.

And also, we found out through the years that nobody really likes surprises, and we had a lot of surprises. By the time we were done with our work and we came back and we delivered our results, people were surprised, you know, why did it happen the way it did. Well, because we weren't there from the beginning. We didn't collect the data in real time. We didn't provide the data to you in real time.

So some of these were technological barriers. Some were institutional barriers. The way -- the nature of the regulatory process and the nature of the EM&V contract between the -- arm's length between, you know, the implementer and the utility in some cases did cause some problems. Surprises happened because we couldn't really do

the work in real time and prevent surprises.

There was also some -- just a bad attitude on the EM&V community side, and that is the -- we never really wanted to have standard methods. I think a lot of us really thought that we should -- you know, there's beauty in the EM&V process, and we wanted to maintain that beauty by not forcing specific methods on us for that. That really has been a problem for us historically. The type of results that you get very much are a function of the method that you used. You get entirely different numbers if you do a beta analysis than if you do engineering models. You also get completely different results if you hire company X versus company Y.

And, of course, none of that should happen. We should have standardization. And we're working closer to that with the IPMVP and with the National Action Panel for Energy Efficiency/Economy and with the --

MR. GUITERMAN: UMP.

MR. KHAWAJA: Thank you. We are the

private contractors. I should know that. Uniform Methods Project.

These are all processes in place that are trying to standardize and make sure that if you install a light bulb in New York or you install it in California that if the difference -- there's a difference in the savings between the two light bulls, it's entirely because of the fact that New York isn't California, not because you used engineering in one case and a building analysis in a different case and not because you hired company X as your EM&V contractor and company Y in California. So those differences should not exist.

To me, if you're looking historically, those are the things that have kind of put a bad taste in people's mouths about EM&V in general.

So now the stakes are higher and we really need to become part of the process. So is M&V 2.0 the answer? The answer is, well, yes and no.

All right. So what can we -- how can we, the EM&V people, help? Well, I mean, it's been said several times already that we need to take

advantage of new technologies, better use of new data. We need to provide quick feedback. We need to be more transparent. We need to be more consistent. And we need to provide in-depth analyses.

So where does M&V 2.0 fit in all this? It overlaps a lot of these components, but I think the main conclusion that I do come up with and I'm going to present to you at the end is that M&V 2.0 is one tool. It is not the solution for all of these problems. You will continue to need the traditional exposed, old way of doing things, and M&V 2.0 can help us get there.

So back to the paradigm business, as I said earlier that -- you know, in the old days, the evaluation was done after the fact. That's what we called exposed. It was more an audit like than an actual rate evaluation.

In the new world, the EM&V process should be part of the delivery. It should be there from the very beginning to the implementers to ensure they have the right data at the right time. So in

order for us to be able to stand upright, we need to be able to do a lot of things.

And technology by itself is not going to necessarily solve the problem. Having a lot of data by itself is not going to solve the problem. We need the technological paradigm shift. We need the institutional paradigm shift. In other words, we need to be -- we need to walk away from the need to keep the EM&V separate from the implementation contractors. We need to all work together.

So institutional paradigm shift, regulatory paradigm shift, technological paradigm shift, all of these implements are needed.

So what can 2.0 do? I think it's already been talked about quite a bit. I mean, help get hard-to-get savings, better targeting, new opportunities to engage their customers, understand how they use energy, load disaggregation. Opportunities exist that would improve not just targeting and better allocation of resources, it will allow us to do better M&V.

Instead of looking at a total bill, if we

could somehow take that total bill with that new technology and have better data available to us, if we could just aggregate that bill with its components, that's fantastic and will make the EM&V a whole lot better.

A lot of the stuff I'm talking about here and everybody else really, it's just not really -- it's not really that new. I mean, this is stuff we've been talking about for a few decades. I found some slides from workshops I did in the late '80s. I don't know if it was -- I don't think we had PowerPoint in the late '80s. It was a slide -- we turned it like this. It was animated. It was really cool. But basically, you know, back in the '80s we were still talking about the need for early feedback. We needed to have done that.

The problem was that, like I said, historically the technology was just not quite there. You know, we tried. I mean, we did use to look at prism analyses. I don't know how many of you even know what I'm talking about. We used to use Lotus 1-2-3. I don't know how many of you even

know what I'm talking about. We used to run these models in Lotus at home one house at a time, and we tried to segregate the load to see if we could figure out how much of that total energy was actually heating, cooling, and base load.

It's a lot of useless information that's still in my head that I wish I could just shed and use that brain for something more useful like remembering people's names or anniversaries, things like that.

(Chorus of laughter.)

COMMISSIONER ROSALES: I want you to know I appreciate that because I go through this every day with my policy advisors because they always say that they weren't born yet.

MR. KHAWAJA: Yes. I actually -- in a workshop recently, I used the word cassette because I was talking about -- well, it's not important, but I looked around the room and people did not know what I was talking about, cassette. This is not really going that far back. I mean, technology is moving so quickly --

CHAIRMAN SHEAHAN: How about beta?

COMMISSIONER ROSALES: No. Our state cars still use cassettes.

(Chorus of laughter.)

MR. KHAWAJA: Anyway, 2.0 and associated technologies can really speed up program design and redesign allowing us to better target programs allowing us to quicker -- more quickly shift funding around to more impact for programs.

Is it going to lower costs? I don't know. Tim, what do you think?

MR. GUITERMAN: I think the potential is definitely there to lower costs.

MR. KHAWAJA: Excellent. There you have it.

Is it going to be less intrusive to the implementer and the customer? Absolutely. A lot of these technologies will allow us to learn a lot more about how customers use energy without being intrusive or invading so much in their home as we used to do -- in the commercial buildings as we used to do in the past.

So what do we need? We need to know the deemed savings. We need to have some number to begin with. I mean, in the presentations over on the commercial, they talked about the ability to forecast what energy use would have been which is the biggest challenge in evaluation. This is it. The biggest challenge in evaluation is what would have happened absent the program, period. That is it. That is what I have devoted my entire life to measuring: What would have happened absent the program.

And both Tim and Eliot and Brian talked about the fact that you could look at forecasts where you think -- the energy use of a specific building at a specific hour or a specific day and compare it to the actual. And that's great. If you're able to do that, that's fantastic.

If you're not able to do that because you're starting out with a process that has a deemed savings number that may be something like 500 kilowatt hours for installing an efficient air-conditioner, that number that is the basis of

our current planning process is not really all that useful in M&V 2.0.

I'm not saying that should stop us. I'm just saying right now, we don't have the right processes in place to be able to efficiently use 2.0 because I don't know what to do with a -- a prediction of what happened in hour one, month one if I don't have a number to compare it to.

And yes, we can forecast what the energy use would have been, but right now a lot of the data that we have are based on deemed savings numbers that tend to be annual and they're not necessarily divided into individual months or individual hours of the year.

It would be great to do interval data. Tim talked about being able to do the analysis with monthly data. That's fantastic. And we have done that in the past. Like I said before, we have actually looked at load disaggregation using monthly data many, many times in the past. If you have interval or granular data, that makes the process even better.

Interval metering: Stuff that you actually install on people's meter or embedded devices within pieces of equipment, there are many manufacturers now who are embedding these devices in the equipment and you can collect the data of how the device is being used or you can even control that device remotely.

Load disaggregation is another one of those really fantastic things that are going on right now where you can look at the total energy use of a house or a building. And I know FirstFuel has done a significant amount of work in that area -- and that's been really fantastic work -- trying to take that one reading either -- whether it's per minute or per hour or whatever it is and trying to figure out what are the components of that energy use without actually having to go out and put devices on individual pieces of equipment.

There's a new piece of equipment out now called Sense that you can put on your home and it can take a thousand readings a second. And that's -- are you guys familiar with that? Have

you ever heard of that? It's a fantastic piece of equipment. You can -- using the machinery, you can try to understand exactly how the energy is being used in the house. And the more frequently you collect the data, the more you are able to disaggregate the load.

So load segregation is an extremely important component both in terms of targeting a program design and also in terms of M&V.

So I think I already pretty much said all of this. A lot less intrusive...

Oh, persistence of savings. I think, you know -- Tim maybe mentioned a little bit about persistence of savings. It's one of those issues that really we have -- we knew it was out there. We just, in the past, haven't really done much about it. We estimate the savings from doing X to a specific home and we assume those savings pretty much persist for the useful life of the measure.

But with 2.0, it will be a lot less expensive for us to continue to track and find out what happens to those savings as time moves on.

Again, this is not really bad, bad per se but it's ungood is that it's not the answer. It is an answer that applies to certain types of programs. The size of the program does matter. The homogeneity of the participants does matter. The prescriptiveness of the program does matter and ability to convert initial TRM values because we still live and die by these TRM values. And that's where we are right now. That's the world we live in. And those TRM values do not differentiate impacts by time. They do not differentiate impacts by season.

So being able to get results of a program that installs furnaces, getting those results -- those real time results in the summer really is not all that meaningful to me because I don't know what to do with it.

And also -- and I think this is an important component. M&V 2.0 is extremely useful in providing real time feedback if you can make course corrections, but if you are unable to make a course correction because of the nature of the

program, the program itself does not allow you to make these quick changes, then it's a little bit less useful. It's still good to do because then you're not surprised at the end, but I think really, really, in my opinion, the best application of M&V 2.0 is providing the feedback and then using that feedback to make changes to the programs to either alter the measure mix or the design or something.

Okay. We already talked about interval data and eliminating surprises and so on.

I just want to add that a lot of the evaluation challenges that exist which primarily all revolve around estimating what would have happened absent the program are not solved by M&V 2.0. Issues like baseline, you know, what happens as the codes and standards change, M&V 2.0 cannot answer that question for you. What would have happened absent the program, EM&V 2.0 cannot answer that for you.

M&V 2.0 also is not necessarily going to shorten the total length of time that you need to

conduct a full evaluation. Just because you can collect the data more frequently and provide some results more frequently, you still need to wait for a full year to get the impact of the program.

The full impact of the program is not necessarily going to be the aggregation of the impacts that you see in individual hours or weeks or days. You cannot just add those up to get the annual value.

Once you have the full annual or full seasonal data in the post period and the pre period, you may end up with a number that is not a simple aggregation of the M&V 2.0 specific values as you move on.

I am currently the chair of the Uncertainty and Statistics Committee for the IPMVP group. It's a very exciting group, just a blast.

So one of the things that we're dealing with right now in the IPMVP world is there's this thing called Option C which is basically what Brian and Eliot were talking about and, to some extent, Tim was talking about.

When you build a model based on a pre period and you try to forecast what the post period values are going to be, you can compare those to the actuals.

And one of the biggest challenges we're having is -- in writing this new guidance for estimating uncertainty is that you really cannot and should not try to estimate uncertainty as the data become available. You really ought to wait for the full period before we estimate uncertainty.

As we look at uncertainty for the first month or the first hour, you're going to get such huge ranges that it's completely meaningless plus or minus 400 percent, completely meaningless, because you just don't have enough data. And as time progresses, you really do need to wait until the end. While you can get these values as you go along and they are useful, you should wait until the end to get the real result, the final value, and a better estimate of uncertainty and risk.

We're working with Nicor Gas where we collect data from clients on a monthly basis to

see, like, what free ridership levels are, what the satisfaction scores are, and so on every month rather than wait until the end and closer to when people are making those decisions so it's clear in their heads what they would have done absent the program.

All right. But then when we get the results and they change erratically month to month and my client wants to immediately make changes to the programs -- and that really scares the heck out of me. You cannot make those changes based on one monthly observation. You should wait. It's good to look at this monthly data and the hourly data and see where you are, see if you're on the right trajectory, but being an old person -- being an old EM&V person, I really -- personally I like to wait until I've got enough data so I know for sure that what I'm seeing is real.

Bottom line, we need both. We need M&V 2.0 as another tool in the bag. And it's fantastic. It's good to have. We need to endorse it. A lot of my EM&V friends have not endorsed it

that much because they're a bit worried that this is like an evaluator in a box; try to shrink wrap evaluators and replace us, get us out of the picture which I don't think is the intent.

So it's just another bag in the -- in our tool bag and we -- another tool that we need to use, but we need to continue to use the traditional, long-term EM&V models.

Thank you.

MR. LIN: Thank you very much. We're already running about 15 minutes late, so very quickly, can we talk about any regulatory challenges that exist and how we can overcome those challenges?

CHAIRMAN SHEAHAN: This is your big chance.

MR. FRANK: I'll jump into that one.

So from Sealed's perspective or from, I'd say, generally the market perspective, the big challenge right now is we don't really know what the value of energy efficiency is from a market perspective, so it's hard for us to know which markets to go in, which areas to target, what to look at.

And there's also a lot of friction in the process to actually get to that value. There's not a clear price signal of, you know, it's worth five cents per KWH produced in Evanston, if someone can prove to us in M&V 2.0 that if that gets reduced, you get paid five cents. That sounds very simple on paper. Right now it's a very complicated thing.

So any regulatory rules to basically enable a private market to come to reduce those barriers, that friction between what it's worth and the private market taking risks to deliver that benefit I think is huge.

And then the second thing, which I had mentioned in my presentation, is going as far as possible to release anonymized energy data sets with as much information about each home or each building as possible. Obviously there's privacy concerns to be careful, but the more that can be released, the better you're going to leverage the investments that have been made in smart meters and data and the more the private market is going to be able to understand and properly invest in the risk.

So there are two big ones in my mind.

MR. GUITERMAN: I would chime in. I mean, there's a few regulatory challenges. You want to protect ratepayer dollars or stewardship of those dollars. And you want to ensure that customers are experiencing the savings that they're being promised. I think those are big picture things.

But I think the real primary challenge is allowing utilities to test the waters, so to speak, and dip their toes into these technologies and measure savings with the understanding that we've heard echoed in multiple panelists, including Dr. Brightwell, is that the answers -- the results might differ from what you expected, and the utilities need to be provided some sort of grace period where they can track these savings and work on calibrating what they have in their TRMs and their estimates with the -- with what's happening in the actual savings on the ground. In that period of time, there should be kind of a no harm -- you know, an exploration.

And then they will -- I can assure you

from my experience, they will learn all sorts of other value propositions from this continuous monitoring of the data that improve programs and improve outcomes, meet all the goals you're trying to protect. But they -- you can't change the rules in the middle of the game and expect them to line up.

MR. BOWEN: Yeah. I'd echo that, too. I think the reason that TRMs are so successful and agreed upon by all the stakeholders is that they take a lot of the risk out of the equation. And what we're asking by exploring this new EM&V 2.0 world is to take a leap beyond what's currently done.

And so absolutely there has to be testing. There has to be piloting. Those results should be socialized with stakeholders, certainly with regulators. And I think there needs to be that assurance that it's okay to do those tests and it's actually going to lead to a better conversation, a better understanding of what the savings may be.

And if that means that programs change, so

be it. At least we're all better informed and we're making use of this great resource which is the data that's available now here in Illinois.

So I think absolutely testing, socialization among stakeholders, and, you know, regulatory oversight, where appropriate, those are the biggest things. That's it.

MR. LIN: Please join me in thanking the panelists.

(Chorus of applause.)

CHAIRMAN SHEAHAN: Let me just, on behalf of the Commission, thank all the panelists from the first session and second and for all of you for attending.

Thanks again. Great session.

(The meeting was adjourned.)