Questions from EUC Commissioners White and Reed
on DNV Market Potential Study Values Used in Modeling
October 25, 2024

1. What were the assumptions and methodology used in reaching the economic potential and technical potential and market potential numbers for energy efficiency, demand response and local solar?
2. What programs were assumed to exist and start dates for any new programs?
3. What types for community outreach was assumed for various programs at what funding levels? Was door-to-door outreach included?
4. Was a battery tariff assumed? If so, starting when and at what rate(s)?
5. Was a battery incentive assumed? If so, starting when and how much?
6. For all demand response programs, was it assumed customers would be paid for participating in each event? If so, starting when and how much?
7. Which appliances were assumed to be able to participate in demand response? What were the start dates for any new additions?
8. Were the SECO HOMES and HEAR programs assumed to exist?
9. What staffing increases were assumed?
10. What budgets were assumed for each program?
11. What electric rate increases were assumed?
12. What types of partnerships and external contracts were assumed?
13. What other data points were factored into determining growth projections?
14. In terms of the economic potential levels for Demand Response (269 MWs), and Energy Efficiency (360 MWs), did DNV calculate those totals based on summer peak only? Did DNV also look at winter programs and if so what levels of demand reduction were found to meet the Economic Market Potential?
15. IN terms of EE, DR and Local Solar, what technical potential did DNV identify by 2035 beyond the economic market potential?
16. Did the Local Solar economic potential level take into account the $31 million received in federal funds for the Solar for All program? If so, what level of MWs was assumed to be achieved through this program by 2035?
17. Did the Local Solar economic potential level take into account the new standard offer program expected to be adopted by City Council today? If so, how many MWs were assumed to be generated by this program by 2035?
18. The EUC has asked for several portfolios to be developed that involve higher levels of EE, DR and local solar. As an example, one of those portfolios assumes that 540 MWs of EE could be achieved by 2035, or about 180 MWs higher than the DNV market potential, 300 MWs of DR, so about 21 MWs of additional DR, and 700 MWs of local solar, that is about 269 MWs higher than the DNV market potential identified. What is DNVs opinion if any about achieving these higher levels of EE, DR and local solar within the 10-year time frame?

1. Q. What were the assumptions and methodology used in reaching the economic potential and technical potential and market potential numbers for energy efficiency, demand response and local solar?

R. The DNV team provides deep capabilities in the full range of technology, market, economic, and regulatory analytics for DSM and DERs, along with extensive experience in shaping and supporting technology and policy-oriented stakeholder processes. With decades of experience providing these services, DNV has developed analytical methodologies and computer-based tools that estimate savings potential and customer adoption. In addition to DNV's support of Austin Energy's previous studies as referenced in the Resource & Generation Plan in 2012, 2015 and 2021, other recent projects completed by the DNV team include:

- A programmatic potential study for the Tennessee Valley Authority (TVA) region including energy efficiency and demand response. The study will be used to support planning initiatives (both integrated resource plans and impact assessments) and program design efforts.
- Using the data from the Phase One 2021-2023 Industrial Stock Study (also performed by DNV), DNV estimated technical, economic, and achievable potential over a 3-year, 8-year, 15-year, and 20-year period from 2023-2042 for decarbonization of the industrial sector in New York.
- DNV is currently assessing the potential for electric energy (kWh) savings in the residential and commercial sectors from company-sponsored demand side management (DSM) programs over a 10-year horizon from 2024 to 2034 in Dominion Energy's Virginia and North Carolina service territories. This is the fourth Market Potential Study that DNV has conducted for Dominion Energy in the past decade.
- DNV prepared a Long-Term Private Generation (PG) Resource Assessment for PacifiCorp covering the service territories in Utah, Oregon, Idaho, Wyoming, California, and Washington to support PacifiCorp's 2023 Integrated Resource Plan (IRP). This study evaluated the expected adoption of behind-the-meter distributed energy resources (BTM DERs), including photovoltaic solar (PV only), photovoltaic solar coupled with battery storage (PV + Battery), wind, small hydro, reciprocating engines, and microturbines for a 20-year forecast horizon (2023-2042).

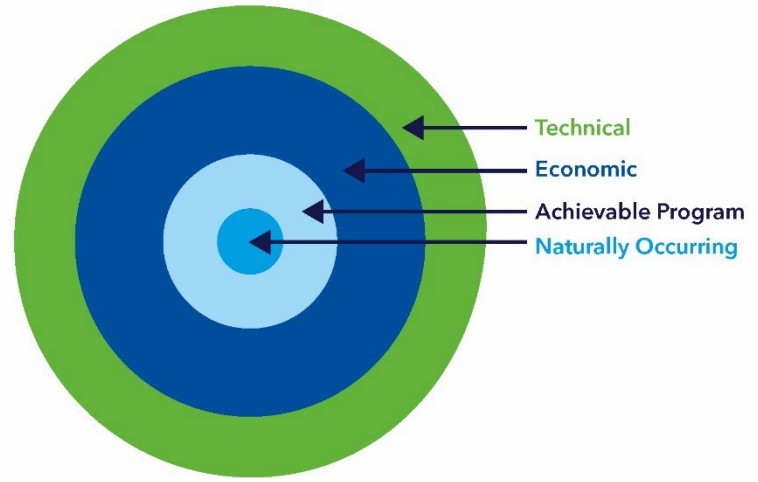
For this study DNV leveraged our fully vetted model, DSM Assyst™. DSM Assyst™ is an industry-recognized, spreadsheet-based model, that uses a bottom-up approach. The tool builds up potential estimates from underlying assumptions about measure costs, savings, and applicability grounded in data provided by Austin Energy or from industry secondary sources.

At its core, this study represents a modeling exercise that is intended to support the development of future goals that can help drive program achievements based on our estimates of potential. These estimates can be used by Austin Energy to develop realistic implementation plans and achievable targets for MW reductions.

Within this study DNV defines several *types* of *potential*, namely technical, economic, achievable program, and naturally occurring. These types of potential are conceptualized in Figure 1 and described below:

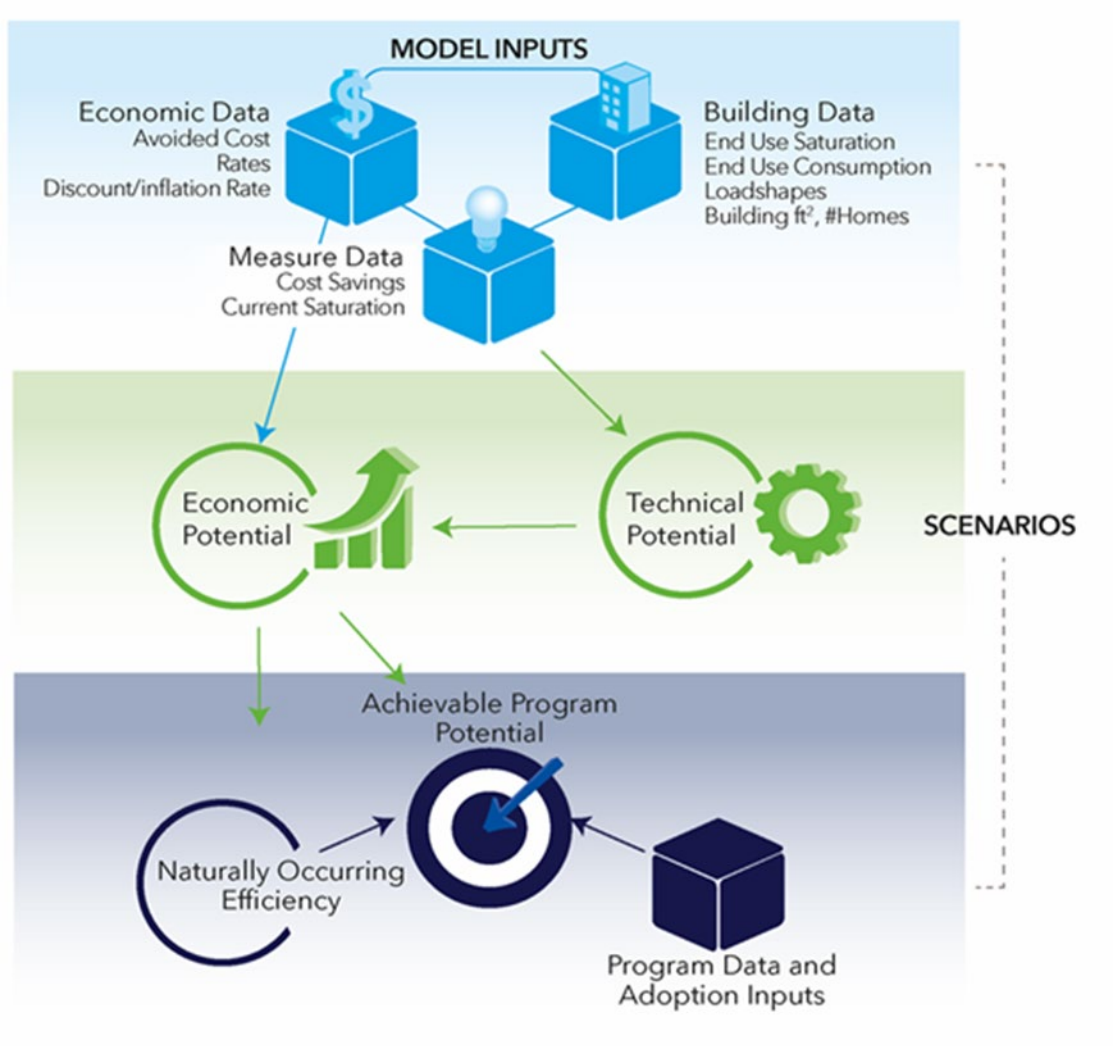
- Technical potential is defined in this study as the complete penetration of all measures analyzed in applications where they were deemed technically feasible from an engineering perspective.
- Economic potential refers to the technical potential of those energy conservation measures that are cost-effective when compared to supply-side alternatives.
- Achievable program potential refers to the amount of savings that would occur in response to various measure incentive levels. Savings associated with program potential are savings that are projected beyond those that would occur naturally in the absence of any market intervention.
- Naturally occurring potential refers to the amount of savings estimated to occur as a result of normal market forces; that is, in the absence of any utility or governmental intervention.
- **Market Potential,** which was also provided in this study, includes both achievable potential and naturally occurring potential. Note that for demand response, naturally occurring potential is zero.

Figure 1. Conceptual relationship among potential definitions



The crux of DNV's analysis involved carrying out several basic analytical steps to produce estimates of the potentials introduced above. The basic analytical steps for this study are shown in relation to one another in Figure 2. The bulk of the analytical process is carried out in the DSM ASSYST model.

Figure 2. Conceptual overview of study process



The key steps implemented in this study are:

1. Develop Initial Input Data

    a) Measure data:
        a. Energy Efficiency: Develop a list of energy efficiency measure opportunities to include in scope based on the measure list developed for the 2020 study with adjustments to reflect current program designs and codes and standards.
        b. Solar and Storage: A list of solar and storage options that aligns with Austin Energy's current programs was developed in consultation with the Austin Energy Team.
        c. Demand Response: A list of program options and controllable technologies was developed in consultation with the Austin Energy Team.

    b) Gather and develop technical data (costs and savings) on measures and opportunities. Data on measures were gathered from a variety of sources including:
        a. ENERGY STAR Calculators

b. U.S. Energy Information Administration (EIA) Commercial Buildings Energy Consumption Survey (CBECS)
c. EIA Residential Energy Consumption Survey (RECS)
d. Texas Technical Reference Manual (TRM)
e. Austin Energy program tracking data and program reports
f. Professional judgment of DNV engineers with experience in Austin Energy's service territory
g. Northwest Power and Conservation Council 2021 Power Plan technical resources for demand Response in the state of Utah
h. DNV's internal DER cost database, developed from data sources including NREL Annual Technology Baseline (ATB), LBL's Tracking the Sun Database, and actual project cost reviews

c) Gather, analyze, and develop information on building characteristics, including total square footage or total number of households, average available rooftop space and technically viable customers by customer segment, energy consumption and intensity by end use, market shares of key electric consuming equipment, and market shares of energy efficiency technologies and practices.
    a. U.S. Energy Information Administration (EIA) Commercial Buildings Energy Consumption Survey (CBECS)
    b. EIA Residential Energy Consumption Survey (RECS)
    c. Billing data to identify consumption residential and commercial customers
    d. System load data
    e. Other secondary studies for specific end-uses
d) Collect data on economic parameters: avoided costs, electricity rates, discount rates, and inflation rate as provided by Austin Energy.

2. Estimate Technical Potential

    a) Match and integrate data on energy saving measures and opportunities to data on existing building characteristics to produce estimates of technical potential.

3. Estimate Economic Potential

    a) Match and integrate measure and building data with economic assumptions to produce indicators of costs from different viewpoints (e.g., societal and consumer).
    b) Estimate total economic potential.

4. Estimate Achievable Program and Naturally Occurring Potentials

    a) Screen initial measures for inclusion in the program analysis. This screening may take into account factors such as cost-effectiveness, potential market size, non-energy benefits, market barriers, and potentially adverse effects associated with a measure. For this study, measures were screened using the total-resource-cost test.
    b) Gather and develop estimates of program costs (e.g., for incentives, administration, and marketing) and historic program savings.
    c) Develop estimates of customer adoption of energy efficiency measures as a function of the economic attractiveness of the measures, barriers to their adoption, and the effects of program intervention. This process utilized Austin's past program performance metrics to calibrate the model's adoption curves.

d) Estimate achievable program and naturally occurring potentials and associated program costs.

2. Q. What programs were assumed to exist and start dates for any new programs?

R. The Energy Efficiency analysis reflects the inclusion of all existing programs except the school kits program which was not included in the 2020 analysis. The school-based education program, as determined in consultation with Austin Energy, was expected to have very small savings potential and was thus not added to the EE analysis.

The Solar analysis includes all existing programs plus the addition of the following new programs: Solar Standard Offer, and Solar for All. Potential for new programs was estimated beginning in 2025.

The demand response analysis includes all existing programs plus the addition of new programs targeting the following end-uses and segments: Water Heaters and Battery Storage. Potential for new programs was estimated beginning in 2025.

3. Q. What types for community outreach was assumed for various programs at what funding levels? Was door-to-door outreach included?

R. Funding levels, or program costs, were determined based on historical spending. The potential modeling occurs at a high level and does not incorporate granular assumptions around specific types of outreach.

4. Q. Was a battery tariff assumed? If so, starting when and at what rate(s)?

R. No, a battery tariff was not modeled as part of the analysis.

5. Q. Was a battery incentive assumed? If so, starting when and how much?

R. Yes, a battery incentive was assumed within the solar and storage and demand response analyses.

The solar and storage incentives were both rebate and performance-based incentives (PBI) applied to relevant residential and non-residential customer segments beginning at the time of install. These were based on existing Austin Energy solar incentives and expected future changes. Additionally, the “Solar for All” incentives were applied in the adoption modeling for low-income customers.

The demand response incentive for battery storage was $50/kW annually for participation in DR events beginning at the time of enrollment.

6. Q. For all demand response programs, was it assumed customers would be paid for participating in each event? If so, starting when and how much?

R. No, for all demand response programs participant incentives were assumed to be paid annually with an event frequency of 15-20 events per year. The annual incentives were based on Austin Energy's current incentives where possible and on incentives being offered by similar programs in the industry where not available. Incentives would commence in 2025 upon enrollment and are as follows:

a. Smart Thermostats $85/year
b. Batteries $50/kW/year
c. EV Charging $50/year
d. Water Heaters $20/year
e. Behavioral DR $0/year
f. Pool Pumps $300 one time incentive on variable speed pool pump
g. The C&I DR programs are incentivized based on the average response across all events at a range of $50 to $80/kW aligning with the current commercial demand response program.

7. Q: Which appliances were assumed to be able to participate in demand response? What were the start dates for any new additions?

R. The demand response analysis includes programs targeting the following end-uses and segments:

a. Water heaters
b. Batteries
c. EV Chargers
d. Pool pumps
e. Smart Thermostats in the residential and small / medium C&I sector

Potential for new programs was estimated beginning in 2025 ramping up to full participation over several years.

8. Q: We're the SECO HOMES and HEAR programs assumed to exist?

R. For energy efficiency and solar we looked at different scenarios that cover different percentages of the incremental cost – baseline (meaning current incentive levels), 75% and 100%. The more of the incremental cost is covered, the higher the uptake. Meaning, if 100% of a measure like attic insulation was covered through incentives, uptake would be maximized. Those values were available for information purposes, and the utility may choose to use them depending on how those programs manifest in your territory.

The 75% and 100% scenarios are intended to represent what savings could likely be achieved if the cost to the customer is reduced through additional incentive dollars. While the 75% and 100% do not explicitly assume funding is coming from HOMES and HEAR, Austin Energy could evaluate the budget and savings impact of these scenarios to assume some of the incentive dollars will be provided by SECO.

9. Q: What staffing increases were assumed?

R. The DNV analysis does not make explicit assumptions about staffing increases, however each program does make assumptions around administrative costs, from a high level, that are needed to support the programs.

10. Q: What budgets were assumed for each program?

R. Program costs, including incentives, administration, and marketing are developed based on historic program information and/or secondary data and include an inflation rate of 2.5%.

11. Q: What electric rate increases were assumed?

R. For solar and battery storage adoption the following electric rate assumptions were included:

- Current rate class tariff data used based on city of Austin utility rates and fees schedule (both energy and demand)
- Electric rate forecast by customer segment from EIA Annual Energy Outlook (AEO) 2024 for Texas applied to current rates
- Value of Solar (VoS) rates and forecast provided by AE for all scenarios

For Energy Efficiency DNV did not update the electric rates from the 2020 study in order to meet the study's July 31 deadline. The 2020 retail rates were developed by applying the 2.5% inflation rate provided by Austin Energy to the 2018 EIA average energy rate.

Changes in rates are usually not significant enough difference to move the needle. These are not super elastic, and rates would need to be significantly different to change the results. DNV does these types of analyses all over the country and between places with high rates (California) vs. low rates (Oklahoma), the results are very consistent.

For the demand response analysis, the current rate class tariff structure was assumed for all customers. Electric rate increases are not explicitly modeled; however, overall achievable participation rates account for general industry trends including increasing electricity rates and a desire to seek out additional bill savings.

12. Q: What types of partnerships and external contracts were assumed?

R. Partnerships and external contracts are not addressed in the scope of the potential study but could be considered in an implementation plan.

13. Q: What other data points were factored into determining growth projections?

R. Customer adoption, or participation, is an important element when determining growth projections. To forecast adoption DNV's study relies on our broad industry expertise, Austin Energy's implementation experience, and the development of adoption curves as follows.

- Adoption is estimated based on the annual percentage of available customers (those eligible for the technology in a given year) and customer behavior. We refer to this as availability.
- Availability is based on the building stock (developed using counts of Austin Energy customers and building growth rates based on Austin construction permits), existing measure saturations, and effective useful life of the existing technology.
- Customer behavior is reflected in a base diffusion curve which is designed to estimate how many available customers will adopt a technology at a given benefit-cost rate, which is influenced by incentive amounts. DNV has been developing these curves for over two

decades based on measure and program performance data and calibrated them to reflect Austin Energy's past program performance metrics.

14. Q: In terms of the economic potential levels for Demand Response (269 MWs), and Energy Efficiency (360 MWs), did DNV calculate those totals based on summer peak only? Did DNV also look at winter programs and if so what levels of demand reduction were found to meet the Economic Market Potential?

R. Yes, the MW are in terms of summer peak. Unfortunately, winter peak estimates were outside of our scope.

15. Q: In terms of EE, DR and Local Solar, what technical potential did DNV identify by 2035 beyond the economic market potential?

R. Technical potential is intended to quantify the upper limit of technical feasibility and assumes that 100% of all customers that can adopt a technology do adopt a technology regardless of cost effectiveness or other barriers.

- For Energy Efficiency DNV identified a total technical potential of 3,949 MW or an incremental 3,589 MW over market potential.
- For local solar + storage DNV identified a total technical potential of 1,597 MW or an incremental 1,166 MW over market potential.
- For Demand response DNV identified a total technical potential of 1,889 MW or an incremental 896 MW over market potential.

16. Q: Did the Local Solar economic potential level take into account the $31 million received in federal funds for the Solar for All program? If so, what level of MWs was assumed to be achieved through this program by 2035?

R. Yes, the adoption modeling included "Solar for All" incentives that were applied to low-income customers that could receive paired solar plus battery systems as part of 15-year Power Purchase Agreements (PPA). These economic achievable results are included in the scenario adoption results and were broken out separately. Modeling results indicate ~18 MW of solar PV and ~14.9 MW of battery storage adopted through the "Solar for All" program by 2035.

17. Q: Did the Local Solar economic potential level take into account the new standard offer program expected to be adopted by City Council today? If so, how many MWs were assumed to be generated by this program by 2035?

R. Community solar was modeled separately compared to individual customer-sited or "local" adoption. Two different community solar scenarios were modeled: one current incentive scenario and one scenario that included updated "Standard Offer" assumptions. The current incentive scenario resulted in ~7.5 MW of economic achievable potential by 2035, and the 'Standard Offer" scenario resulted in ~34.9 MW of potential by 2035.

18. Q: The EUC has asked for several portfolios to be developed that involve higher levels of EE, DR and local solar. As an example, one of those portfolios assumes that 540 MWs of EE could be achieved by 2035, or about 180 MWs higher than the DNV market potential, 300 MWs of DR, so about 21 MWs of additional DR, and 700 MWs of local solar, that is about

269 MWs higher than the DNV market potential identified. What is DNVs opinion if any about achieving these higher levels of EE, DR and local solar within the 10-year time frame?

R. In general, market potential is seen as an estimate of what could be achieved under ideal conditions, subject to our assumptions around incentives, and program costs, while conforming to industry best practices. As such, in order to achieve higher levels of potential, additional funds and resources would need to be committed, as well as substantial effort expended to break down barriers to adoption and participation. Additional thoughts for each area are presented below:

- For energy efficiency, increasing savings by 50% would be challenging under the time horizon, requiring increased program spending, program staff, and implementation staff. It would also assume the availability of the equipment and workforce to facilitate installations which we know to be a barrier industry-wide.
- For local solar, a 62% increase in the savings that results in capturing 43% of the total technical potential would likely be extremely challenging. Here, the biggest barrier is cost of the systems and would require a significant investment in incentives in order to make the decision to purchase equipment cost effective for consumers. In addition, there are also supply chain concerns and interconnection barriers that would limit the amount of solar that could be realistically installed over a 10-year time horizon.
- For Demand Response an increase of approximately 11% would be most challenging in terms of participation. The participation rates that were used in the analysis are at the upper end of what is currently considered achievable within the industry. Significant increases in incentives that could render the programs not cost effective may be required to push past those upper limits.

Some additional research on barriers to adoption completed by DNV can be found here: https://www.energy.nh.gov/sites/g/files/ehbemt551/files/inline-documents/sonh/24-market-barriers-nh-energy-efficiency.pdf