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1 EXECUTIVE SUMMARY

This review provides DNV GL’s response to the white paper, “Potential Demand Side Management MW Savings by 2025, 2027 and 2029 – An Assessment of Projections and Market Conditions Impacting Goal Achievement,” from here on referred to as the “white paper”. The response provided here is a result of preliminary benchmarking, analysis, and research conducted by DNV GL. This review contains estimates and makes assumptions based on the best available data at the time of publication.

The City of Austin and Austin Energy have long been recognized as demand side management industry leaders who utilize energy efficiency and demand response programs to achieve bold and impactful sustainability and conservation goals. Considering the threats of climate change, Austin Energy and relevant stakeholders are reviewing savings targets, program designs, measure mixes, program budgets, and staffing support to ensure the city continues its leadership position in reducing energy demand from now through 2029. That said, Austin Energy’s DSM portfolio, as do comparable leading portfolios across the country, faces substantive challenges in the coming years:

- after 30 years of energy efficiency programs, the average residential customer uses 850 kwh per year which is approximately 25% less than other ERCOT utilities, reducing the potential savings;
- mass market adoption and federal legislation of LEDs and several other energy efficient measures have substantially reduced potential savings faster than previously anticipated;
- green buildings baseline changes have led to reductions in claimable savings;
- ambitious energy codes have improved the efficiency of new construction and renovation, thus reducing the potential to further reduce usage via the program and lower savings potential among repeat program participants;
- and increasingly difficult-to-penetrate barriers among non-participants.

Yet this report and subsequent assessments emphasize and demonstrate that with optimal design, leveraging data and analytics for more effective and efficient targeting, and agile benchmarking and evaluation practices, supported with sufficient resources, tools, staffing and budgets, Austin Energy’s DSM programs can effectively navigate and overcome many of these challenges. Furthermore, DNV GL believes that Austin’s DSM programs will continue to grow as a synergistic and impactful interface with Austin Energy customers.

Specifically, this report analyzes assumptions, calculations, and findings identified in Austin Energy’s white paper, highlights areas throughout Austin Energy’s DSM portfolio that hold the greatest uncertainties, risks, challenges that could prevent Austin Energy from reaching their goals and identifies similar trends and utility responses in comparable regions around the country.

At its core, this report assesses whether Austin Energy can achieve 1,350 MW in demand savings by 2029. To validate the MW and budget calculations presented in the white paper, DNV GL analysed historical progress report data from 2007 through 2019. Using the historical data to look forward, we reviewed participation rates and savings per participant, identified past market effects and emerging technologies. We confirm the market conditions identified the white paper and put forth some initial recommendations. We then compare predicted savings calculations, from prior potential studies, against industry trends. A subsequent Phase 1 report (in 2020) will quantify a series of attainable demand reduction targets, while this current assessment qualitatively reviews the assumptions of Austin Energy’s previous forecast in the 2019 white paper and outlines anticipated changes that Austin Energy should expect in the updated forecast. With the data at hand, we expect that our upcoming Phase 1 forecast will
produce estimates within +/-20% of the projected savings and budget estimates provided in the white paper.

Overall, DNV GL supports the majority of savings projections provided in the white paper assuming no changes to current assumptions and baselines with the expectations of requested additional resources would be provided. We caution Austin Energy that reaching too high will increase Austin’s risks in not hitting their goals or demanding additional, unexpected higher budgets to do so which would increase the utility costs. Furthermore, while achieving a stretch target of 1,200 MW may be possible with innovative approaches and investments, exceeding 1,200 MW savings appears unlikely, expensive, and carries substantial risk.

2 RESPONSE TO WHITE PAPER

This review supports the white paper’s key overarching finding that several market, technology, and regulatory factors will impact energy savings and demand reduction achievements from 2020 to 2029. This report reviews the most prominent findings that the white paper highlighted. As identified in the white paper, we consider the energy savings and demand reduction impacts relating to:

- Gaps in current knowledge including market transformation, emerging technology and the scale of opportunity
- Changes in the current situation including codes and standards, renter population and competing priorities

In addition, we conducted an updated high-level review of the savings estimates and assumptions in recent potential studies. Throughout this response, DNV GL has provided initial guidance and direction for Austin Energy and stakeholders to consider. We believe the estimates provided in the white paper will be within +/- a 20% of the findings of our upcoming forecast model results. While we are confident, current gaps and changes from the current situation have resulted in our conclusion. These gaps are further outlined below.

2.1 Analysis of Austin Energy Forecasts to 2029

To reach the MW savings goals by 2029, we agree that current baselines and assumptions would remain unchanged and increased program budgets as well as additional staffing is needed. Increasing program savings almost always requires an increase to program budgets. Moreover, programs must proactively prevent shrinking savings potentials due to increasingly efficient industry standard practices. These increases in budget will be driven by several factors. First, Austin Energy staff will need to integrate new emerging energy efficiency, load shifting technologies and program designs to make up for lost savings elsewhere in the portfolio. Second, Austin Energy will need to invest in new technologies, vendors, training, and an increase in staff to ensure these new measures and programs are scalable and efficient. Third, an increase in participation will require increased marketing. Often, increasing participation requires making inroads with harder-to-reach customers, which may require greater or repeated contacts to induce participation, or may require more expensive implementations strategies, such as direct install programs for small businesses. As Austin Energy has focused on energy efficiency for over thirty years, the “low hanging fruit” which can be an opportunity of other utilities, is less of an option for the utility. Marketing expenses also tend to increase as measures mature, since it can be difficult to target the shrinking portion of the market that has not yet adopted the measure. In addition, low income programs cost considerably more with less savings. If the portfolio is changed with more of these programs, there would be less chance of making the goals while requiring more resources.
2.1.1 Analysis of savings

DNV GL reviewed the savings trends in the white paper and finds them in line with other utilities. We conducted two primary analyses that reviewed historical data from 2007 to the present and the projections included in the white paper through 2029. First, we analyzed historical and projected savings-per-participant. While participant data was not provided in the white paper, incorporating these data produced a better understanding of projected participation targets. We looked for areas of portfolio risk where projected savings targets depended on high and or increasing participation rates. Second, we calculated the average annual customer participation by program as well as the average per-customer savings by program and analysed the annual deviation by program. We identified areas of high risk where lower-than-expected participation rates coincided with lower-than-expected per-customer demand savings.

Figure 1 through Figure 5 below chart demand reduction savings in blue and participation counts in orange. To forecast annual participation counts, we divided the projected annual savings by the average annual savings per-customer for each program from 2007 to 2019. Note that the SPUR program does not have average customer counts. Austin Energy and DNV GL agreed that a 3 MW annual savings estimate is a more realistic cap than 4.99 as indicated in the white paper. We modified savings projects to reflect this change to the SPUR program and estimate the program will hit its saving cap in FY22 and beyond. This has an overall cumulative reduction in savings of 11.88 MW relative to the white paper estimate.

These charts can reveal a few areas of risk: volatility in annual historical savings and or participation, programs for which savings potentials are holding steady or winding down, and programs that have ambitious targets moving forward. In Figure 1, most programs are holding savings steady, while SPUR or similar mid-stream programs would need to maintain steady annual savings throughout FY2021 and FY2029 implying the efficiency program technologies would have to continually outpace that of industry best practice which could introduce uncertainty in the associated product and size of the rebates. We recommend Austin Energy staff prioritize keeping up with the emerging technologies that can be offered through this program as well as innovative opportunities to push new, residential demand response programs.

**Figure 1: Residential Program Historical and Forecasted Savings and Participation**
Figure 2 supports the position that Austin Energy is focused on sustaining participation in their multifamily program. This is in alignment with Austin Energy’s focus on low and middle-income customers. That said, Austin Energy and DNV GL agree that a cap of 6,000 customers per year is likely the maximum participation that this program can realistically achieve. We used historical average per customer kW savings to calculate a maximum annual savings target of 2.5 MW, and revised annual projected savings from FY20 through FY29 accordingly. Cumulatively, this adjustment resulted in a savings reduction of 39.51 MW. Even achieving these goals will require sufficient funding in marketing, program management, and ongoing research into emerging technologies and measure mixes. The white paper indicated expanding rebate budgets from around $1M annually to almost $3M in FY22 to $4M annually in FY25 through FY29. Given the reduction in savings targets, the overall rebate budget has been lowered by $1.8M annually, and cumulatively by about $18M.

The Reference section at the end of this paper provides summary tables of the above comparisons. Also, within the reference section is a graph of the average proportional spending in mature rebate portfolios.

Figure 3 and Figure 4 show that Austin Energy sees their commercial, small business, and demand response programs as remaining stable or in slight decline, while the AE Green Building program, shown in Figure 5, is expected to grow modestly but steadily in the coming years. These projections appear to account for the challenges as outlined in this report.

Figure 4 shows the historical and projected savings for Austin’s Demand Response programs. Savings from both programs are forecasted to remain steady or to slightly decline, although the scale of their demand savings remains relatively large. The load coop program shows the most volatile annual savings.
DNV GL is aware that Austin Energy is also piloting or exploring storage and EV charging load shifting programs. These programs will likely be high-value opportunities to reduce demand sometime in the future that other municipal utilities such as Sacramento Municipal Utility District (SMUD) are also considering. Note that to take advantage of these opportunities customers will need to install enabling technologies such as batteries and level 2 charging stations. Austin Energy could consider subsidising these technologies through incentives.

**Figure 4: Demand Response Program Historical and Forecasted Savings and Participation**

Lastly, Figure 5 provides projections for the Austin Energy Green Building program. Savings from this program show a reduction in 2019 due to the change in the baseline definition, but annual savings show a continued and steady increase in 2020-2029. This growth in savings is especially important to support through additional staff. Not only are the annual increase in savings associated with this program among the largest in Austin Energy’s portfolio, but the ability for the AE Green Building team to ensure that builders are complying with codes will require sufficient support.

**Figure 5: Green Buildings Program Historical and Forecasted Savings and Participation**

The second savings analysis that we completed quantified the degree to which participation and savings-per-participant varied annually from 2007-2019 as shown in Figure 6 through Figure 10. Program savings are dependent on two fundamental variables: the number of customers who participate and the amount of savings that participants achieve. The more volatile a given program’s participation rates and or per-customer savings are, the more difficult it will be for Austin Energy to count on predicted savings. Having identified participation and savings volatility in isolation, it is important to consider them together. It is possible that while a program may recruit fewer participants in a given year, they will make up for potential loss in program savings by spending more time with each participant and achieving deeper savings. Alternatively, it is important to investigate programs where low participation appears to coincide with low per-customer savings. Such a program would indicate that fewer people are participating, and those who are, are individually achieving less savings than projected. Programs with
these trends should be investigated more closely moving forward. Please note, this may also include programs that have been undertaken for social purposes such as low-income weatherization.

Consider the bottom left quadrant (quadrant 3) to be the worst quadrant in each chart. It indicates the coincidence of low participation with low per-customer savings. Conversely, the upper right quadrant (quadrant 1) indicates a coincidence of higher-than-average participation and higher-than-average per-customer savings. The top left and bottom right quadrants (quadrants 2 and 4 respectively) are relatively “safe” zones, where per-customer savings may help make up for low participation and vice versa. In most cases, lower participation appears to coincide with increases in per-customer savings, suggesting that in years when fewer customers participated, they achieved deeper savings. This finding suggests that Austin’s portfolio is inherently resilient, and that low participation or low per-customer savings might be offset by one another through program design and staff enhancements.

Figure 6 shows a healthy mix of variability in per-customer savings and annual participation rates. For the Home Performance program, the variability in participation swings from -60% to 60% of the average 1,851 participants, and as expected, per-customer savings remains roughly the same apart from one year where per-site savings were 27% lower than the average.

AEP again shows relatively few signs of risk in savings or participation. The most negative swing in per-participant savings is seen when per-participant savings were 0.44 kW/customer, or 37% below the average. This occurred in 2014, though in this same year, participation was 40% higher than the average participation from 2007-2019.

The Direct Install program follows a similar trend. Even in a few outlier years where program participation fell to 75% and 50% below the average, the per-customer savings increased to 18% and 14% above the per-participant average respectively.
Figure 6: Residential Program Variation in Historical Participation Compared to Variation in Per-Customer Demand Savings (2007-2019)

Figure 7 shows a healthy trend where lower participation rates coincide with higher per-customer savings. However, we note that there appear to be some heavy swings in annual participation. This may be due to natural market forces and not Austin Energy’s outreach, but it suggests that the growth in savings as forecasted in Figure 2 should be monitored, revisited, and given the appropriate resources to avoid missing targets.

Figure 7: Multifamily Program Variation in Historical Participation Compared to Variation in Per-Customer Demand Savings (2007-2019)

Figure 8 reveals both the commercial and small business programs have trends in the right direction, where swings in participation and per-unit savings tend to offset one another. Two key risks that we observe are a large variability for both programs in both participation and per-unit savings, as well as
some coincidence of lower-than-average per-unit savings and participation. The small business program is projected to increase its savings targets in 2020, although it is projected to remain stable moving into 2021 and beyond. This stability is likely a good assumption that will allow savings variability to balance out over the 10-year projection.

**Figure 8: Commercial and Small Business Program Variation in Historical Participation Compared to Variation in Per-Customer Demand Savings (2007-2019)**

Figure 9 provides insight into the demand response programs. The scale of the variability of the Load Co-Op program is very large, but this is likely due to the small size of the program. Both demand response programs do suffer from some degree of low-participation and low per-participant savings.

**Figure 9: Demand Response Program Variation in Historical Participation Compared to Variation in Per-Customer Demand Savings (2007-2019)**

Green Building has relatively low variability and mostly shows that with low per-site savings, participation tends to go up. While low participation shows a slight increase in per-site savings, it is not high enough to offset the loss in savings completely. The graph below includes residential, multifamily and commercial Green Building programs.
Overall, our savings analysis revealed a resilient portfolio, although we did observe some key risks. We observed a downward trend in recent annual participation rates for several programs including Home Performance, AEP, Multifamily, PPT, and Load-Co-Op. Targets for Home Performance and AEP indicate an expectation that these trends flatten and stabilize. Additionally, the targets for the Multifamily program increase. We advise Austin Energy put deliberate thought into how to mitigate further downward trends. Furthermore, DNV GL will be providing a more robust forecast in the upcoming Phase 1 report in 2020.

2.1.2 Analysis of budgets

Our analysis, as well as the white paper, show a direct correlation between project budget and MW savings. To continue to stay relevant, programs will need to make a variety of investments.

Higher levels of incentives may be offered to make the program more appealing to customers and can also increase word-of-mouth for a program. That said, increasing incentive levels is doubly costly, since the higher incentive must be offered to all participants, even those that would have been willing to participate at the lower incentive level.

Administrative costs naturally increase with program participation, but also with the number of programs and measures offered. Austin Energy offers a wide variety of programs to meet its aggressive savings targets, increasing staffing and other administrative costs.

Both to achieve higher participation levels and keep administrative costs in check, Austin Energy should continue exploring specific areas to optimize their savings potential and scale their solutions. Austin Energy should consider these investment opportunities:

- Emerging technology research to identify new measure to include in programs
- Tracking database improvements
- New digital tools
- Automating audits and incorporating benchmarking through apps
- Customer targeting tools
- Identifying and optimizing geospatial DSM cost effectiveness
- Additional staff to manifest and manage these changes

2.1.3 Analysis of additional staff

More Austin Energy staff will not only allow for the management and manifestation of the opportunities outlined above but also allows for current staff to focus on program management. All staff will need to be proficient in current trends and digitization. This may mean training existing staff and hiring additional staff. New staff will need to be brought in before a program makes significant changes or incorporates new technologies in order to compensate for a training and acclimation period. Finally,
bringing on new staff allows for current staff to offload some of their work and focus time and energy on program expansion and improvement. We do recommend that Austin Energy plan to integrate staff well in advance (6-months to a year) of substantial program investments or changes, such as the integration of new measures or tools.

We agree that the additional staff additions as recommended in the white paper are appropriate. A 2014 study titled, “Assessing National Employment Impacts of Investment in Residential and Commercial Sector Energy Efficiency: Review and Example Analysis1,” conducted by Pacific Northwest National Laboratory, showed a correlation between job creation and both energy bill saving and energy efficiency program investment. This study further supports the notion that additional staff are needed as programs expand and demand savings increase.

2.1.4 Calculation validation

To validate the MW and budget calculations presented in the white paper, DNV GL analysed historical progress report data from 2007 through 2019 taking into consideration past market effects and emerging technologies. We then brought in the predicted savings calculations from the white paper to compare against our trends. We also added historical participant data to better understand program trends and saturation. We expect that the estimates as provided in the white paper will be within +/- a 20% of the estimates our upcoming Phase 1 forecast findings. Our analysis showed similar trends while considering upcoming changes and predicted market transformations. The greatest discrepancy in our analysis was in the timing of additional staff. We feel staff should be added before a program undergoes drastic changes (such as automation or measure additions) to compensate for the time it takes to train a new member. We also believe bringing on new staff sooner is necessary to allow current staff the bandwidth to design and implement program enhancements. These factors were not included in the white paper.

DNV GL is currently performing a holistic forecasting of demand reduction that will explore different savings, incentive, administrative, and measure-mix scenarios and thus better equip Austin Energy to plan and react for the future. These various scenarios will be included in the Phase 1 study expected in 2020.

2.2 Support from Past Research

Austin Energy has forecasted achievable energy efficiency and demand response potential through multiple study iterations in recent years. In these studies, researchers estimated three basic types of energy efficiency and demand response potential including technical, economic, and achievable program potential. DNV GL will by updating our model and providing a more robust forecast in the upcoming Phase 1 report in 2020. The model update will identify and integrate new Austin-specific information on building stock, customer consumption, end use saturations, measure applicability, emerging technologies, updated baselines, and diffusion curves.

Forecasts, by their nature, are uncertain, and the uncertainty increases the further out the forecast. Baseline equipment efficiencies have continued to improve, new appliance standards have been enacted, building codes have changed, inflation has played out differently than forecasted, the customer count has expanded, LED prices have fallen, avoided costs and rates have changed, and new technologies have entered the market. Below are some key assumptions of the study, and how they look with 20-20 hindsight.

- LED costs have fallen drastically and were more quickly adopted based on cost and availability

• The Energy Independence and Security Act of 2007 (EISA) has presented and continues to present federal uncertainty around lighting standards
• New codes and standards for dishwashers, room air conditioners, refrigerators and freezers have since gone into effect
• With changes to the generation mix and to the cost of generation fuel stocks, avoided costs have changed dramatically over time
• Measures have changed as technologies and markets have changed

To respond to the white paper, DNV GL looked at the prior potential studies and while taking into consideration prior key assumptions as well as future key assumptions, compared the potential study’s findings to the white paper calculations. Overall, DNV GL found the white paper assumptions to match many of our own such as the changes brought on by LED lighting and “smart” technologies.

2.3 Gaps in Current Knowledge

Efficiency programs have always had to navigate the reality of changing markets and technologies. The efficiency measures that were promoted in the 1990s are very different than those of today, due to new technologies, business-as-usual efficiency improvement, and changes to codes and standards. On one hand, market changes can make it more difficult for DSM programs to claim savings as transformed markets raise baselines, while on the other hand, emerging technologies produce new opportunities for programs to evolve and capture the next generation of energy savings.

For example, as noted in the white paper, lighting is likely to be a key measure for which projected savings is not likely to materialize as expected. From T-8 fluorescent lamps and CFLs to the wide array of LED products available today, lighting has consistently been a key source of cost-effective program savings for decades throughout leading DSM portfolios across the country. Today, however, program administrators are facing a “lighting cliff,” as the market success of LEDs and the accompanying lighting standards are rapidly eroding the potential for lighting savings. Lighting savings in the commercial and residential markets are dwindling as more commercial customers adopt LEDs as replacements for fluorescent tubes and residential/small business customers replace screw-based incandescent or CFLs with LEDs. There may be potential for higher efficiency LEDs to replace older LEDs, but the savings might be only 10% rather than the 80% that could be claimed when an LED replaced an incandescent. Thus, large saving lighting measures may be replaced by a combination of measures which could mean additional administration costs for programs.

The white paper notes that evolving markets result in raising baselines, sun setting measures, and reduces the pool of eligible customers. In addition, the white paper notes a challenge in the rising amount of multifamily housing and the difficulty it brings to program administrators to incentivize both the tenant and the owner. Specifically, the white paper states: “[f]uture reductions in the years to 2025 and beyond take into account additional market conditions and unforeseen program modifications.” We agree with this conclusion, and below provide additional detail, benchmarking, and forward-looking set of mitigation strategies to consider.

DNV GL’s upcoming forecast will quantify the degree to which changing baselines and emerging technologies will impact long-term savings and demand reduction projections, but we note that programs across the country are identifying new strategies to find new savings, many of which we reference in this report, as emerging technologies within existing program structures alone are unlikely to meet the rising importance of increased energy and demand reductions.

2.3.1 Market transformation

Market transformation is said to have occurred when technologies that were once considered high efficiency become the new normal. While equipment standards are designed to speed up this process, it
will occur naturally over time for many products. Among the measures that have approached or achieved market transformation, LED lighting and thermostats offer good examples. Additionally, the expansion of online retail shopping has shifted the actual markets in which consumers view, evaluate, and purchase products.

LED lighting provides a clear example of market transformation. As the prices of LED’s decreased and consumers discovered both the energy savings and the performance advantages over CFLs, LED’s are now becoming the baseline. Overall this is a positive change resulting in less energy use, it presents challenges for program administrators who once relied on lighting savings for their programs. Thus, savings will need to come from elsewhere.

Energy efficiency programs once promoted programmable thermostats, but these devices are so commonplace that they now represent the baseline technology, with wi-fi, smart, or learning thermostats taking their place as efficiency measures. Wi-fi thermostats are now code for new residential construction and are included in Green Building savings. The International Energy Conservation Code (IECC) currently requires homes have at least one programmable thermostat per HVAC system and the 2018 IECC goes on to say, “The thermostat controlling the primary heating or cooling system of the dwelling unit shall be capable of providing a 5:2 (weekdays, weekends) programmable schedule, and at least 2 programmable schedules per day.” This IECC code change will help to distinguish between weekend and weekday occupancy schedules and accounts for auto-adjustments. Smart thermostats also continue to offer expanding demand response (DR) savings, and serve as an example of a transformed market that has continued to innovate and produce new savings. The expanding demand response savings potential is in line with industry movement and is something Austin Energy should consider further investigating to reach their savings goals.

While not what we typically think of when we speak of “market transformation,” retail markets and sales channels have changed dramatically in the internet age. Amazon and other online retailers have a large and growing market share for almost any product imaginable. These sales channels create challenges for upstream and mid-stream efficiency programs. The advancement of technology continues to accelerate across the industry. The internet coupled with the advanced processing power has dramatically changed how we buy products and learn about programs. Furthermore, wireless technologies have enabled amazing innovations in control technologies and demand response.

Internet behemoths like Google are directly affecting efficiency markets and programs in other ways. Google’s 2014 acquisition of Nest home automation products, including thermostats, and Oracle’s 2016 acquisition of Opower, prove there are very big fish in the previously small pond of energy efficiency products and programs. They, and other digital companies, represent potential disruptors to the products and markets that Austin Energy targets with its programs. In response, some jurisdictions are piloting product platforms to reduce transaction costs and attract customers to purchase multiple measures over time. Advanced building controls using Internet of Things (IoT) technology and new business models working to provide energy efficiency as a service are new designs for non-residential being piloted and deployed in the American Council for Energy-Efficient Economy (ACEEE) leading states of California and Massachusetts. Online retailers present some potentially significant changes in program design and outreach, but offer potential new opportunities such as improved customer targeting.

2.3.2 Emerging technologies and the scale of opportunity
Eventually, existing technologies mature to the point that they are no longer viable targets for programs, and new technologies will enter the market. DNV GL is currently evaluating pilot and emerging

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technology demonstrations, some of which are well suited to Austin’s customers and climate. A few of the relatively new measures being added to programs are:

- High-efficiency heat pumps designed for cold climates after investment by the Northeast and Northwest utilities show better performance for cooling as well. Moving from ducted air conditioning and heat pumps to ductless can be significant since many homes have cooling ducts located in extremely hot attics.
- Manufacturers continue to improve learning thermostat technology, including remote occupancy sensors and improved algorithms, which creates opportunities for energy efficiency savings.
- As Austin Energy knows, Wi-Fi thermostats enable demand response for residential and small commercial customers; however, the efficiency improvements due to the thermostats’ learning features will also lower the baselines against which the demand response is measured.
- LEDs will continue to be a source of savings as replacements for fluorescent tubes and other non-screw-based lighting, particularly in the commercial sector.
- Networked lighting represents both a demand response opportunity and a potential source of energy-efficiency savings.
- More automation technology and commercial building system adoption will enable additional demand response participation, though customers with more advanced systems are likely already enrolled or their participation decided, offsetting some of that potential.
- Innovative management of emerging DERs such as electric vehicles (EVs) and storage. Given Austin’s EV leadership there may significant MW impacts from managed charging in 2025, 2027 and 2029.

DNV GL expects offsetting the portfolio losses of lighting and codes and standards will require a deep dive into emerging technologies for both increases in end-use efficiencies but also in remote management of an increasing number of highly impactful devices. These measures will require more resources. Our upcoming Phase 1 and Phase 2 reports in 2020 will include further research on such emerging technologies and help identify savings opportunities for Austin Energy.

2.4 Changes in Current Situations

To forecast savings potential, changes to the current situation must be considered. Over the course of two days in October of 2019, DNV GL spoke with Austin Energy program staff to better understand the program offerings and to get a sense of program needs. The conversations were aligned with many of the points made in the white paper including program saturation, changes to code, and the rent/principal agent conundrum. Each of these presents challenges to program staff and begs the need to make changes to current programs to ensure their continued success.

2.4.1 Program saturation

The white paper notes that Austin Energy programs have found lower savings for returning participants. This could be due to three factors. The first is interaction between measures, such as HVAC measures and building shell measure. For instance, adding ceiling insulation will not save as much in a home with high-efficiency HVAC equipment as it will in a home with standard equipment. Similarly, installing high-efficiency HVAC will not save as much in a tight, well-insulated home as it would in a leaky home with inadequate insulation. The other explanation is simply that customers are likely to tackle the projects that offer the largest savings potential first, which would naturally lead to lower savings for returning participants. While another reason is due to the more aggressive building codes in the Austin area.

Although savings may be lower on average for returning participants, it is certainly not true for all participants. Participants might choose to do easier measures over harder ones (for example, an appliance change-out before insulating a wall), a lower first-cost measure over a more expensive one, or a measure that is easier to understand over one that is complex.
Despite these concerns, there are specific approaches Austin Energy can employ to identify and capture further savings for returning participants.

- Identify which programs and measures can be used as a gateway to attract new customers, who can then be targeted for a deeper dive
- Analysis of historical participation data to see what measures are associated with declining savings
- Continue use of customer data paired with tracking data to do advanced targeting
- Use a technology like smart thermostats to entice people to participate but use the installation as an opportunity for data collection/targeting, perhaps through an audit
- Periodically evaluate demand response programs to ensure that the current mix of equipment, house/unit sizes and demographics (which can affect occupancy) is reflected in the average impacts. With the phase-out of one-way thermostats and full adoption of 2-way communicating thermostats, larger samples and near census data can be brought to bear to support participant population impact estimates and evaluation

### 2.4.2 Codes and standards

Many of Austin Energy’s programs and measures interact with building codes and equipment standards. Codes and standards set the minimum efficiency allowable for buildings or equipment by law. Typically, program administrators use applicable codes and standards as the baseline for calculating program savings.

Austin Energy Green Building’s aggressive savings targets were set under previous generation building codes, as well as previous generation equipment standards for some types of equipment. Austin Energy has continued to use the original baselines to provide continuity for measurement of progress against the original targets set by the 2007 Climate Protection Plan. While this puts savings on the same playing field as the savings targets, these baselines attribute savings to the program that can rightly be claimed by state building codes or federal minimum efficiency standards.

The good news is that the savings are occurring, regardless of who gets the credit for achieving them. The problem for Austin Energy is one of accounting. If the savings occurring outside of the program are not credited toward the city’s goals, then stepping up the baseline to updated codes and standards makes it all the harder for Austin Energy to achieve the goals, which should be accounted for when establishing new goals. However, changes in the baseline provide significant challenges in reporting and forecasting savings and progress to that savings target. Utilizing baselines that are more static allow for reporting stability and are an industry best practice.

The white paper brought up concerns about HB 2439. The law restricts local governments from setting restrictions on building materials that are allowed under national building codes. While the law was not designed to limit local building codes, Austin Energy is concerned that it could nonetheless be used to challenge the City’s building and energy codes.

### 2.4.3 Renter population and competing priorities

As stated in the white paper, “the renter population impacts the reach of the rebate programs”, and results in split incentives between the property owner and the tenant. This is a significant challenge for program administrators across many jurisdictions, some of whom are starting to develop creative offerings for tenants and for building owners.

For tenants looking to invest in energy efficiency, a solution might be:

- Offering and marketing incentives for efficient technologies that can move with a tenant within the AE service territory such as small appliances, smart thermostats and/or smart power strips
For building owners who are looking to maintain their property value and reduce the risk of stranded assets in a potentially changing climate, solutions might include:

- Combining a resilience/energy efficiency audit with holistic recommendations so the owner can maintain and improve their property value and reduce their liability risks
- Targeting incentives at measures that provide both energy efficiency and resilience benefits
- Correctly assessing and monetizing non-energy benefits of health and comfort, which can make energy efficiency easier to sell. Programs across the country are starting to monetize these benefits

Traditional cost effectiveness constraints can pose challenges for such program redesigns. Cost effectiveness metrics could be adjusted to include non-energy impacts such as:

- Peak load reductions
- Transmission and/or distribution savings
- Reduced payments arrearages
- Reduced carrying costs,
- Lower debt written off/ lower collection costs
- Fewer customer calls
- Operations and Maintenance (O&M) cost savings
- Participant heath impacts
- Comfort
- Employee productivity
- Property values
- Benefits to low-income customers
- Public health and welfare effects
- Air quality impacts
- Water quantity and quality impacts
- Economic development and employment effects
- Employment impacts
- Societal risk and energy security
- Benefits unique to low-income energy efficiency programs

A re-alignment would most certainly require additional funding for education and coordination.

3 SUMMARY

In summary, our preliminary benchmarking and information gathering along with our revisit of the potential studies, has led us to believe that Austin Energy is on track to achieve 1,100 MW reduction by 2029 given appropriate budget and staff support. Furthermore, while achieving a target of 1,200 MW may be possible with innovative approaches and investments, exceeding 1,200 MW savings appears unlikely, expensive, and carries substantial risk. That said, DNV GL has identified a wealth of challenges that demand side management portfolios currently face, and increasing demand reduction targets may introduce risks of missing targets, exceeding budgets, and betting on emerging technologies that have yet to demonstrate real savings.

At this point in time, DNV GL believes that upcoming comprehensive forecasting will yield results within +/- a 20% margin of the white paper estimates. DNV GL will provide a more complete assessment with multiple incentive scenarios within our subsequent Phase 1 and Phase 2 reports. Even for Austin Energy to hit current goals by 2029, they will need to replace existing measures or couple them with new technologies. Austin must continue to transform digitally and expand innovative analytics to target, benchmark, and serve more customers more cost-effectively. To hit reach goals, Austin Energy should explore and expand on these investments even more aggressively, increasing participation where necessary. We also recommend exploring options such as non-energy impacts (such as societal benefits) to entice building owners and large customers towards existing programs. Finally, additional staff will
provide Austin Energy with the bandwidth needed to integrate new measure offerings into their existing programs, explore new technologies, and continue to offer customers enticing programs.
REFERENCES

Table 1 below displays the white paper projected savings and the DNV GL modified projected savings.

<table>
<thead>
<tr>
<th>Year</th>
<th>White Paper Savings Projections*</th>
<th>DNV GL Modified Savings Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY20</td>
<td>59.56</td>
<td>57.46</td>
</tr>
<tr>
<td>FY21</td>
<td>52.66</td>
<td>50.11</td>
</tr>
<tr>
<td>FY22</td>
<td>53.42</td>
<td>50.11</td>
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<td>FY23</td>
<td>54.59</td>
<td>50.50</td>
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<td>55.89</td>
<td>50.80</td>
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<tr>
<td>FY25</td>
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<td>FY27</td>
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<td>FY29</td>
<td>57.90</td>
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<tr>
<td>Total</td>
<td>564.89</td>
<td>513.50</td>
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</table>

*Note that this table has summed the program-level projected savings that Austin Energy listed in the White Paper (SPUR, AEP, Home Performance Benchmark, Direct Install and CAP, MF, Commercial Rebates, Small Business, PPT, Load Co-Op, and Green Buildings)

Table 2 below displays the white paper projected rebate budgets and the DNV GL modified projected rebate budgets.

<table>
<thead>
<tr>
<th>Year</th>
<th>White Paper Rebate Budget Projections</th>
<th>DNV GL Modified Rebate Budget Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY20</td>
<td>$18,710,384</td>
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*Note that this table has summed the program-level projected rebate budgets that Austin Energy listed in the White Paper (SPUR, AEP, Home Performance Benchmark, Direct Install and CAP, MF, Commercial Rebates, Small Business, PPT, Load Co-Op, and Green Buildings)
Figure 11 below displays the average spending for a mature portfolio. Please note the data used to make this figure derived from a combination of several (some confidential) large portfolios throughout the United States and includes a variety of program offerings.

**Figure 11: Combined Mature Portfolio Spending**

- Admin: 16%
- Marketing: 10%
- Incentives: 74%