

# AEG

## Demand-Side Resource Potential Study 2021-2024

(DRAFT WORK PLAN)

Prepared for: PacifiCorp

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Date: January 28, 2022

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# 1 INTRODUCTION AND SUMMARY

In January 2021, PacifiCorp engaged Applied Energy Group, Inc. (AEG), to perform a Demand-Side Resource Potential Study to support PacifiCorp's 2023 Integrated Resource Plan and energy efficiency and demand response program and portfolio planning. The assessment will utilize the best-available, applicable data and regionally- and nationally accepted methods to assess the Technical Potential and Achievable Technical Potential in each of the six states served by PacifiCorp, excluding an assessment of energy efficiency demand-side resources in Oregon, which is assessed by the Energy Trust of Oregon (Energy Trust). This study will build on the four previous potential studies AEG completed for PacifiCorp in 2021, 2019, 2017, and 2015 and will benefit from a foundation of research, materials, and models that were fine-tuned and enhanced during the prior studies.

The first step in any potential study is the development of a clear and concise work plan, documenting key scoping decisions, responsibilities, and milestones and ensuring a common understanding of study tasks, methodologies, and outputs between AEG and PacifiCorp. Additionally, the work plan serves as a tool for describing the study to internal and external PacifiCorp stakeholders.

In this document, we describe an in-depth scope of work, including data collection, analysis, stakeholder support, and reporting as well as a timeline of project tasks and milestones.

## 2 SCOPE OF WORK

### Planned Approach

AEG has honed its approach to estimating demand-side resource potential over many years supporting electric and natural gas utility planning and through four previous assessments for PacifiCorp. While detailed approaches continue to evolve, the general methodology will be similar to the previous study. As such, rather than describing our methodology and anticipated data sources in detail (this can be found in the previous study's final report), we focus the discussion in this section on key considerations and new areas for this project.

### Task 1: Develop Potential Study Work Plan

The project will begin with a kick-off meeting, including key members of the AEG and PacifiCorp project teams. Given the current state of the COVID-19 pandemic and the recent advances in both organizations' video conferencing capabilities, we anticipate holding the meeting virtually. The objectives of this meeting will be to introduce team members, review study objectives, scope, data availability and timeline, and discuss the stakeholder engagement strategy.

Within ten (10) days of the kick-off meeting, AEG will deliver a revised work plan, beginning with the scope of work and timeline presented in this proposal and modifying as appropriate based on decisions made during the kickoff meeting. The work plan will serve as a reference document for both teams throughout the project to ensure a shared understanding of study objectives, scope, and expectations. The revised workplan will also be provided to PacifiCorp's Washington DSM advisory group for review, along with other stakeholders as necessary. AEG will review the revised workplan with PacifiCorp, address any further feedback from PacifiCorp or relevant stakeholders, and make any additional adjustments necessary to finalize the document.

## Task 2: Conduct Research to Develop Study Inputs

The process for developing study inputs is described in the following subtasks. In conducting this research, AEG will thoroughly document sources and validate the appropriateness of data to PacifiCorp's service territory before incorporating information into the analysis. Factors that may inform whether data are suitable for incorporation include vintage, geography, weather, statistical significance, and general source reputability. Establishing a data source hierarchy (described in Task 2.1 below) will be a critical first step in ensuring that data sources align with PacifiCorp staff and stakeholder expectations; however, AEG anticipates a continuous dialogue with the PacifiCorp project team throughout the analysis phase of the project to ensure both teams are comfortable with source data being utilized to complete the project.

### Task 2.1 Develop Data Source Hierarchy for Each Resource and State

Given the scope of this project and the many resources and jurisdictions covered, it is critical that all members of the AEG and PacifiCorp project teams have a shared understanding of the data sources to be used and the priority each source should be given in each jurisdiction. For example, using DEER for Class 2 DSM measure assumptions may be critical in California but not desired in other states.

To ensure this shared understanding exists before research begins, AEG will work with PacifiCorp to develop a data source hierarchy for each resource and state. In addition to being an invaluable resource for the project teams, the Class 2 DSM measure source hierarchy in the previous study was a useful tool during stakeholder presentations. AEG will start with the Class 2 DSM measure source hierarchy from the previous study (shown in Table 1) to (1) develop an updated Class 2 DSM source hierarchy and (2) utilize it as a template for other resource classes.

Table 1 Example Class 2 DSM Measure Source Hierarchy

Source Hierarchy	Utah and Wyoming	Idaho and Washington	California
Primary		RTF, 2021 Power Plan	DEER and non-DEER Workpapers
Secondary	RMP Measure Characterization; Xcel Colorado TRM; RTF with Adjustments <sup>†</sup> , National Sources, <sup>††</sup> DSM Plan, Other Regularly Updated TRs <sup>†††</sup>	National Sources, <sup>††</sup> Idaho Power TRM, Other Regularly Updated TRMs <sup>†††</sup>	CMUA TRM; RTF with Adjustments <sup>†</sup>
Other			National Sources, <sup>††</sup> Other Regularly Updated TRMs <sup>†††</sup>

<sup>†</sup> Adjustments include weather and baselines (replace market with code/standard)

<sup>††</sup> Includes national sources such as the Annual Energy Outlook, ENERGY STAR<sup>®</sup> Savings Calculators, etc.

<sup>†††</sup> Includes Technical Reference Manuals from Illinois, Wisconsin, Pennsylvania, New York, Minnesota, Maine, and others as necessary

### Task 2.2 Data Request to PacifiCorp

Where available, PacifiCorp-specific data will be the preferred data source. From previous studies, we have a strong understanding of data that will be available from PacifiCorp and an existing template and process for receiving this information. As part of the workplan and source hierarchy development, AEG will review data needs with PacifiCorp to identify new sources that may be available since the previous study. AEG will establish a secure file transfer portal to receive data from PacifiCorp.

### Task 2.3 Resource-Class Specific Considerations

AEG will begin collecting secondary data once the work plan, source hierarchy, and data request are finalized. Although we have collected these data for Class 1, 2, and 3 DSM resources in previous studies, we do not want to assume that sources used previously are still the most appropriate, and we intend to review and update, where applicable, all studies inputs and assumptions. This research will all be new for Class 4 DSM resources, which have not been included in previous AEG studies for PacifiCorp. The process for gathering data for each resource class and incorporating this information into the estimation of potential is described in [Task 3](#). AEG notes the following key considerations for each resource class.

#### Class 2 DSM Research Considerations

- **Administrative Cost and Incentive Assumptions:** In the previous study, AEG reviewed recent PacifiCorp program data to develop state-specific assumptions for administrative and incentive costs. As part of this study, AEG will update this analysis to include more recent program data and work with PacifiCorp to determine the appropriate historical period to use as a proxy for future program costs. The results of this analysis will be used to develop leveled costs for use in IRP supply curve bundling.
- **Emerging Technologies.** AEG performed a comprehensive review of emerging technologies in the previous study, including a qualitative screening of each technology for inclusion in the potential study. The screening process considered the timeframe for becoming commercially viable and the availability of reliable cost and savings information. For this study, AEG will review emerging technology sources, including the Northwest Energy Efficiency Alliance (NEEA), the Bonneville Power Administration (BPA) emerging technologies program, and the American Council for an Energy-Efficient Economy (ACEEE), to establish a list of measures for consideration. AEG will then perform a qualitative screening and document the outcomes in the measure list and final report. For emerging technologies that pass the qualitative screen, AEG will review data sources that could be used to update prior measure characterizations and develop estimates for savings, cost, and lifetime attributes.
- **Baseline Energy Consumption and Savings for Simulated Measures.** For residential weather-sensitive measures, AEG will leverage the Simple Energy and Enthalpy Model (SEEM)-based consumption and savings from the RTF where possible and applicable to PacifiCorp's service territory. For measures, states, and sectors where RTF savings estimates for weather-sensitive measures are not applicable or available, AEG proposes to develop baseline energy consumption and savings using our Building Energy Simulation Tool (BEST), an in-house front-end for the DOE-2.2 building simulation engine.
- **California Measure Cost and Savings.** AEG will review the latest versions of DEER and non-DEER work papers to ensure the alignment of assumptions with California Public Utilities Commission (CPUC) guidance. AEG will also review the current California Potential and Goals Study to identify any differences in assumptions or methodologies that may lead to differences in measure savings and costs. In instances where the Potential and Goals Study assumptions differ from inputs AEG would otherwise plan to use, AEG will review these issues with PacifiCorp to determine how they should be addressed.
- **Non-Energy Impacts.** The Class 2 DSM measure analysis will include attributable and quantifiable non-energy impacts (NEIs), including values from PacifiCorp's program evaluations, the Regional Technical

#### Key Elements of BEST

- Use Northwest regional prototypes and modify the key building and equipment assumptions to reflect PacifiCorp's service area, incorporating state-specific building codes, survey data, and weather stations. Then calibrate the prototypes to ensure annual energy use is consistent with each state's market profile.
- Capacity to reflect more recent climate trends and incorporate normalized weather data for more recent years.
- Output hourly end-use level load shapes for use in supply curve development. AEG will review potential tradeoffs between using these new shapes, PacifiCorp's existing shapes, and newly available shapes from NEEA's End-Use Load Research project and the National Renewable Energy Laboratory to determine the most appropriate source.

Forum, the Abt Associates ductless heat pump wood smoke analysis, and other sources as appropriate. For Washington measures, the analysis will incorporate NEIs developed by DNV in support of PacifiCorp's 2022-2023 Biennial Conservation Plan.

#### **Class 1 and 3 DSM Research Considerations:**

- Incorporation of New PacifiCorp Data. Since the previous study, PacifiCorp has launched a new offering for battery energy storage in Utah, developed new time-of-use pilots, and issued a request for proposals (RFP) for demand response resources. AEG will work with PacifiCorp to determine whether recent experience from these new offerings and RFP results can and should be included in this assessment.
- Non-Energy Impacts. In the previous study, based on stakeholder input mid-project, AEG performed a high-level literature review of the applicability of non-energy impacts to Class 1 DSM resources and included a writeup of this research as an appendix to the study report. For this study, AEG will include non-energy inputs directly into its program-specific research for Class 1 and 3 DSM resources to help PacifiCorp determine whether there are non-energy impacts that can be quantified and included in resource planning.

#### **Class 4 DSM Research Considerations**

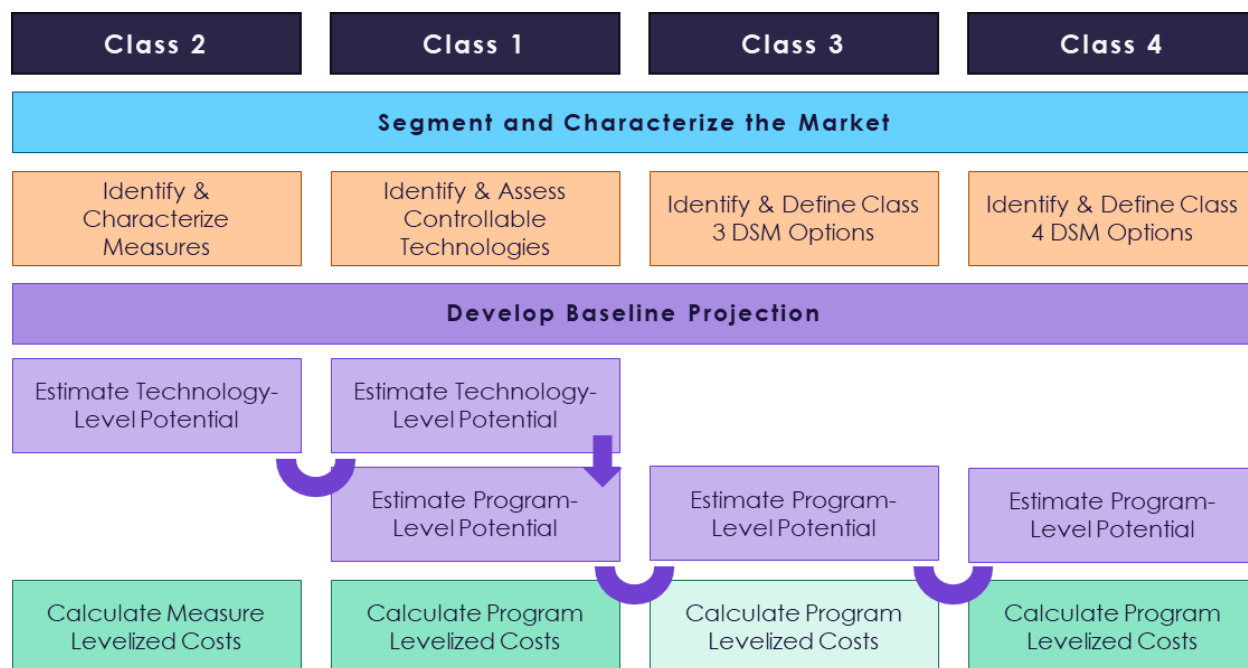
- Availability of Quantified Impacts. AEG will perform a thorough review of available information on the impacts of Class 4 DSM initiatives; however, because these non-targeted programs spread energy efficiency or capacity awareness to a widespread, general audience program administrators and evaluators often cannot measure program impacts through a robust analysis approach. PacifiCorp's 2007 Potential Study found that many utilities and program administrators do not report the savings or costs associated with non-targeted programs, and even when reported, program impacts varied substantially between administrators and program design. If this is still the case, finding reliable secondary sources for non-targeted program data may be difficult, and AEG will work with PacifiCorp to determine whether it is sufficient to document this finding or whether another method to estimate impacts should be employed.

### **Task 3: Perform Analysis of Demand-Side Resource Potential**

The key steps and considerations for estimating potential for each DSM resource class are illustrated in Figure 1 and detailed below. The order of tasks reflects both the relative level of effort to assess potential for each resource class and the order the analysis will be performed to account for resource interactions. Additionally, because Class 1 DSM resources can be used for grid services, but Class 3 DSM resources cannot, we have separated these resource classes to reflect the enhanced methodology for Class 1 DSM resources employed in the previous study. Cross-cutting activities regarding data validation and documentation, identified within Task 3 in the RFP, are addressed in [Task 2](#) and [Task 5](#), respectively.

The study methodology is designed to explicitly account for interactive effects within and across DSM resource classes (shown as the half-circles in Figure 1). The subtasks in this section represent the loading order of resource classes, with Class 2 DSM coming first, followed by Class 1, 3, and 4 DSM. That is, Class 2 DSM will be assessed absent other DSM interventions, but the potential for other resource classes will be adjusted based on the impacts of Class 2 DSM.

Figure 1 Potential Analysis Overview by DSM Resource Class



Once potential and cost for each resource class are determined, AEG will work with PacifiCorp to put results into the appropriate format for IRP supply curve modeling. Levelized costs will reflect jurisdiction-specific guidance on cost-effectiveness tests and treatment of non-energy impacts. The details of IRP supply curve creation are discussed in [Task 5.2](#).

### Task 3.1 Class 2 DSM Analysis

AEG's general approach to assessing Class 2 DSM resource potential will be the same as in previous studies. This approach is consistent with Council methodology and forms the basis of the Class 1, 3, and 4 DSM potential assessment for consistency, efficiency, and to account for interactions between resource classes. The general analysis steps for the Class 2 DSM analysis are described below:

1. Review and Refine Market Segmentation. Although customer segmentation has been largely unchanged across PacifiCorp's previous studies, we want to ensure this segmentation scheme is still appropriate and continues to meet PacifiCorp's objectives for this analysis. At a minimum, AEG will revisit the potential of segmenting customers by income level (as described in optional [Task 7](#)).
2. Characterize the Market. The purpose of this step is to fully classify customers, annual electricity use, and peak demand by state, sector, and market segment in the study base year (likely 2021). AEG refers to these values as the control totals to which we will calibrate our modeling. While straightforward in concept, this step is vitally important to develop a shared understanding among all team members about the PacifiCorp customer base and provide a solid foundation for subsequent steps.
3. Develop Market Profiles. AEG will update the end-use market profiles from the previous study describing how customers currently use electricity for each state, sector, and market segment. The market profiles document the number of customers, saturations of end uses and technologies, and unitized energy consumption in each segment and provide the foundation for conducting the analysis for all resource classes. Complete market profiles for the residential, commercial, and industrial sectors were provided as Appendices A1, A2, and A3 in the previous study report.

4. **Identify and Characterize Measures.** AEG will develop a list of proposed measures to include in the study for PacifiCorp's review, beginning with the previous study's list and updating for changes in market baselines, codes and standards, the inclusion of priority sources, and emerging technologies. Once this list is developed, AEG will fully characterize each measure using the source hierarchy developed in Task 2. As discussed above, AEG will review and update, as appropriate, every measure assumption from the previous study to ensure that measure data are up-to-date and align with the agreed-upon source hierarchy. Draft measure characterizations will be provided to PacifiCorp for review and feedback and may also be provided to stakeholders for comment, as directed by PacifiCorp.
 

From AEG's ongoing work with PacifiCorp and other regional utilities, AEG is extremely familiar with state-specific measure sourcing expectations, including the Regional Technical Forum, California DEER and electronic Technical Reference Manual (TRM), the Northwest Energy Efficiency Alliance, and other utility- and state-specific TRMs with approaches that are deemed applicable to PacifiCorp's service territories.
5. **Develop Baseline Projection.** The next step is to develop a reference projection of energy and peak demand through 2042, absent the effects of future utility DSM programs or regional market transformation programs. AEG will work closely with PacifiCorp's load forecasting department to understand the drivers of changes in PacifiCorp's official load forecast and attempt to capture each of these in the baseline projection. These factors may include forecasted changes in customer counts, economic conditions, equipment saturations, or efficiency standards. AEG will develop an initial baseline projection using PacifiCorp's 2021 load forecast, then update the analysis when the 2022 load forecast is available.
6. **Estimate Technology-Level Potential and Resource Costs.** As in previous studies, AEG will estimate two levels of Class 2 DSM potential, representing what is technically feasible and what could be achieved regardless of cost considerations. The study will not attempt to estimate economic potential, as economic screening will continue to occur within PacifiCorp's IRP. These levels of potential are calculated by applying Class 2 DSM measure interventions within the load forecast and comparing the resulting forecast to the baseline projection; the difference between the two forecasts represents the potential.

To develop achievable technical potential, AEG will begin by modifying the technical potential by the achievability and ramp rate assumptions from the Council's 2021 Power Plan. While we recognize that these assumptions may be less appropriate and accepted in Rocky Mountain Power states, beginning with these assumptions will allow us to start with common assumptions across all states and then make targeted updates to reflect considerations in specific markets.

Note that AEG's methodology for estimating Class 2 DSM potential inherently accounts for interactive effects or "opportunity stacking" between competing measures. To accomplish this, we first compute the total savings of each measure on a standalone basis, then assign a stacking priority based on levelized cost such that "integrated" or "stacked" savings will be calculated as a percent reduction to the running total of baseline energy remaining in each end use after the previous measures have been applied. This ensures that the available baseline energy shrinks in proportion to the number of Class DSM measures applied to avoid double-counting or estimating total potential that exceeds the baseline consumption.

### **Task 3.2 Class 1 DSM Analysis**

Prior to the 2021 potential study, although energy efficiency and demand response analyses relied on many common data sources, the assessments were distinct, reflecting a technology-based view of energy efficiency and a program-based view of demand response. However, the two types of resources are

becoming more closely linked as grid-enabled, energy-efficient technologies enter the market. In the 2021 CPA, AEG increased alignment between the two analyses by using a common baseline forecast and allowing the forecasted adoption of energy-efficient technologies to create new opportunities for demand response. Given the positive response to this change from stakeholders and the increased insight and IRP modeling functionality this approach provided for PacifiCorp, AEG proposes to employ this updated methodology again. The general approach for estimating Class 1 DSM potential is described below:

1. Refine Grid Service Definitions and Segmentation. AEG will work with PacifiCorp to identify the characteristics that Class 1 DSM options need to provide different grid services. The characteristics from the previous study will serve as the starting point.

The Class 1 DSM customer segmentation will be aligned with the Class 2 DSM customer segmentation, allowing the same data to be utilized for both analyses.

In the previous study, rather than merely assessing Class 1 DSM's ability to reduce peak demand, AEG investigated the potential for the following grid services:

- Capacity & Energy
- Regulation
- Flexibility & Regulation
- Non-Spinning Reserves
- Spinning Reserves
- Frequency Response

2. Characterize the Market. Because the Class 1 DSM analysis is concerned with demand impacts in specific hours of the year, rather than annual energy impacts, the results of the energy efficiency baseline characterization will be spread over hourly end use or technology load shapes to identify the forecasted load in each hour of the study period.

For this study, AEG proposes to develop an Oregon-specific market characterization, utilizing PacifiCorp's billing data, residential survey results, data from the Energy Trust of Oregon, and other sources as appropriate. In previous assessments, as agreed between PacifiCorp and AEG, Class 1 DSM analysis was performed by scaling the Washington market characterization to approximate Oregon because the CPA did not include characterization of Class 2 DSM resources in Oregon. While this previous method was sufficient historically given the increased importance of Class 1 DSM resources to PacifiCorp and external stakeholders, AEG believes this Oregon-specific market characterization will add significant value to this study.

3. Identify and Assess Controllable Technologies. AEG will work with PacifiCorp to identify technologies that could be controlled for demand response, either through (1) grid-interactive features or (2) separate equipment allowing PacifiCorp or third-party control during events. The previous study considered a comprehensive list of such technologies and will serve as the starting point for the assessment. AEG will review this list with PacifiCorp to determine whether any of the technologies are no longer applicable or if additional technologies should be added.

Once the list of controllable technologies is finalized, AEG will map the technologies to applicable grid services and develop costs, impacts, and participation rates based on PacifiCorp program experience and secondary data sources. While most technologies will map directly to end uses and technologies considered in the baseline forecast, battery energy storage, first assessed in the previous study, is a notable exception. Because the applicability of batteries is not dependent on the presence of end-use equipment, AEG proposes to estimate the potential for batteries in the same manner as the previous study, deriving the count of likely participants from the forecast of solar photovoltaic adoption from PacifiCorp's most recent private generation study and working with PacifiCorp to develop reasonable assumptions for battery size and program participation, consistent with other IRP studies.

4. Estimate Technology-Level Potential. The potential for each controllable technology will be calculated by multiplying the baseline summer and winter demand by controllability, sheddability, and assumed program participation factors. This process, combined with the grid services eligibility analysis, allows



for a detailed assessment of demand response options for a broad set of technologies, seasons, and use cases. In the previous CPA, AEG provided alternate Class 1 DSM IRP inputs on an hourly basis for testing purposes. AEG will work with PacifiCorp to determine whether this level of granularity is valuable for this study.

5. Estimate Program-Level Potential. In contrast to Class 2 DSM resources, where customers may choose to install energy-efficient technologies in the absence of utility programs, demand response resources do not exist outside of utility offerings. Therefore, while the core analysis will be performed at a detailed technology level, AEG will aggregate technology impacts into program bundles. AEG anticipates using the same program bundles as in the previous study but will review this list with PacifiCorp to determine whether any modifications should be made.

When aggregating technology-level potential to programs, where necessary, AEG will account for competition between program options to estimate both standalone and interactive potential to avoid double counting of impacts. As in previous studies, AEG will work with PacifiCorp to identify a suitable program hierarchy to account for these interactive effects. AEG will also work with PacifiCorp to identify appropriate ramp-up periods to full participation for both existing and new programs.

6. Develop Program Cost Assumptions and Levelized Costs. For each of the demand response program options, AEG will develop representative assumptions to estimate the costs required to capture the identified potential, including program development and administration, customer marketing and recruitment, incentive payments, enabling technology, and ongoing operations and maintenance (O&M), where applicable. These cost estimates will be informed by PacifiCorp's demand response program experience, the Council's 2021 Power Plan assumptions, and other applicable sources.

### Task 3.3 Class 3 DSM Analysis

The Class 3 DSM analysis will investigate the potential for voluntary rate options to reduce demand during peak periods. The general methodology for assessing the potential for these resources will be the same as previous studies, with a focus on updating assumptions and incorporating PacifiCorp's pilot experience and other newly available data sources. The major analysis steps are detailed below:

1. Review and Refine the Market Segmentation. As in the previous CPA, AEG will segment PacifiCorp's customers for the Class 3 DSM analysis by state, sector, customer class, and maximum demand (for commercial and industrial customers). This segmentation will allow AEG to understand the consumption and demand for like customers and to identify Class 3 DSM options that would be applicable to each customer class.
2. Identify and Define Class 3 DSM Options. AEG anticipates using the same list of Class 3 DSM options as in the previous study but will work with PacifiCorp to ensure this list still reflects viable options and PacifiCorp's strategic priorities. As part of this review, AEG will work with PacifiCorp to clearly define whether specific behavior-based options fall within Class 3 DSM or Class 4 DSM.

For each option assessed, AEG will develop estimates for customer eligibility, participation, and impacts based on the most applicable data sources. AEG will prioritize results of PacifiCorp pilot programs where available and then look to relevant secondary sources to fill gaps. In the previous study, PacifiCorp determined that costs of Class 3 DSM resources were not meaningful for resource planning, so the development of levelized cost

As in the previous study, AEG proposes to assess the following Class 3 DSM options:

- Residential Time-of-Use
- Residential Time-of-Use with EV
- Residential Critical Peak Pricing
- Residential Behavioral DR
- C&I Time-of-Use
- C&I Critical Peak Pricing
- C&I Real-Time Pricing
- Irrigation Time-of-Use
- Irrigation Critical Peak Pricing

determination was excluded from the scope. AEG will revisit the treatment of Class 3 DSM costs with PacifiCorp as part of the project kickoff meeting.

3. Estimate Program-Level Potential. After the market is characterized and rate options are defined, the process of calculating standalone potential is straightforward. The potential for demand-side rates is simply the peak demand of the class of eligible customers multiplied by the percent of customers assumed to participate multiplied by the per-customer percent demand reduction. The previous study assumed that all Class 3 DSM options would be offered on a voluntary, "opt-in" basis; AEG will review this assumption with PacifiCorp.

Once the standalone potential for each option is calculated, Class 3 DSM options will be combined with the Class 1 DSM program hierarchy to estimate interactive potential. This process is designed to account for both interactions between Class 3 DSM options and between Class 1 and 3 DSM resources that may target the same demand. As discussed in step 2 above, AEG will discuss the need for developing leveled costs of Class 3 DSM resources with PacifiCorp during the project kickoff.

### Impacts of Existing Class 3 DSM Rates

The impacts of existing Class 3 DSM rates have not been updated since the study completed in 2015. AEG understands that the structure of some of PacifiCorp's Class 3 DSM rates have changed since the time of that analysis and that rate options may continue to change in the future. AEG will work with PacifiCorp to understand whether impacts of existing demand-side rates are meaningful for future resource planning and suitable for further investigation and quantification. In instances where we find that existing rate impacts are pertinent to PacifiCorp's future planning, AEG proposes a limited update to capture new Class 3 DSM offerings, ensure that the previous estimates remain appropriate, and align impacts between relevant existing offerings and the identified potential.

In instances where quantification of existing Class 3 DSM rate impacts would be beneficial, AEG proposes to review and assess the suitability of using price elasticity for demand estimates in conjunction with customer participation data. Price elasticity of demand is defined as the ratio of the percentage change in demand to the percentage change in price. For example, for a price elasticity of -0.10, a 100% increase in price would result in a 10% decrease in demand. As part of this analysis, AEG will review recent estimates of price elasticities developed by PacifiCorp for its offerings. Typically, these estimates are developed as part of the creation of sales forecasting models. In case elasticity estimates are not available (or meaningful) for one or more offerings, we will review and compile secondary elasticity data from studies conducted for similar pilots/programs elsewhere in the country. AEG also considered a statistical analysis method to further investigate select options, but this approach is not recommended because of timing constraints and extensive customer and load data needs. The elasticity method described above is expected to be sufficient to quantify impacts of relevant Class 3 DSM rates.

### Task 3.4 Class 4 DSM Analysis

PacifiCorp last assessed the potential for Class 4 DSM resources in its first potential study, completed by Quantec, LLC in 2007. As such, AEG understands PacifiCorp's desire to re-assess these resources to determine what new opportunities and information may have emerged over the past 15 years. AEG's proposed approach to estimating potential for Class 4 DSM resources is described below and is similar to the approach AEG has successfully employed for Class 3 DSM resources in previous studies.

1. Market Segmentation. AEG anticipates using the Class 3 DSM market segmentation for consistency and to account for interactions across resource classes.

2. Characterize the Market. AEG anticipates using the Class 3 DSM market characterization for Class 4 DSM resources. If additional detail is necessary to fully characterize Class 4 DSM potential, AEG will leverage the Class 2 DSM market characterization data.
3. Identify and Define Class 4 DSM Options. AEG will work with PacifiCorp to develop a list of options suitable for inclusion in this analysis, starting with the list provided in the RFP. This is particularly important to ensure that behavioral options are only being considered in the potential for one resource class. For example, AEG will continue to consider home energy reports and behavioral demand response in Class 2 DSM and Class 3 DSM analyses, respectively.

After developing this list, AEG will perform secondary research to identify similar programs implemented in other jurisdictions and develop cost and savings estimates for each option. Sources may include annual utility reports and program impact evaluations and will be prioritized based on recency, geography, and applicability to PacifiCorp's customer base.

4. Estimate Potential and Resource Costs. Using the secondary research results, AEG will apply typical per-event or per-customer impacts to PacifiCorp's baseline forecast to develop estimates of potential. For example, if research indicates that a particular education campaign can reliably reduce residential peak demand by 1%, the potential for this program in each PacifiCorp service territory would be calculated as 1% of PacifiCorp's residential peak demand. Costs for each option will then be applied to the potential impacts to provide estimated levelized costs for comparison to other resource options.

#### **Task 4: Class 2 DSM (Energy-Focused) Resources Scenario and Sensitivity Analysis**

AEG's energy efficiency potential model and market characterization process are designed to understand and project energy consumption and intervention opportunities at a granular level. For example, inputs and results can be viewed for a specific state, sector, building type, construction vintage, end use, and technology. This structure not only provides deep insight into energy efficiency potential but also allows for customized scenario analysis around either global themes or specific model inputs. For example, AEG ran sensitivities around electrification policy, the inclusion of exempted customers, technology cost-effectiveness changes, and avoided costs in a recent study.

As part of this study, AEG will develop up to three distinct Class 2 DSM potential scenarios, which may reflect changes in load forecasts, weather, energy efficiency market adoption rates, measure or program costs, or other factors that may affect resource potential and cost. AEG will work with PacifiCorp to clearly define each of the desired scenarios and identify the appropriate format for scenario documentation and deliverables. For example, the project team will determine whether scenario results should be included in the study report or a standalone deliverable.

For each scenario, AEG will develop supply curves in the same format as for the reference case. Note that AEG will only be performing Class 2 DSM scenario analysis for California, Idaho, Utah, Washington, and Wyoming. However, if the Energy Trust of Oregon provides alternate potential for Oregon, AEG can incorporate these projections into scenario supply curves.

#### **Task 5: Segmentation & Data Presentation**

The subtasks below describe the major anticipated deliverables for this project.

##### **Task 5.1: Summary Potential Study Report**

As part of the previous study, and in response to stakeholder feedback, AEG worked closely with PacifiCorp staff to reimagine the format of the final report to streamline and clarify the information presented. This

included condensing the previous five-volume format into two volumes and moving data previously presented in Word to Excel.

Given the success of this effort, AEG proposes to produce a summary report in a similar format to the 2021 CPA. The report will include all information listed on pages 18-19 of the RFP, plus additional information to make the report as clear and effective as possible for PacifiCorp and its stakeholders. From our experience performing these studies, despite all efforts to streamline the report's content, given the breadth of the analysis, the report requires multiple rounds of review to get from draft to final. To accommodate this, AEG will provide a draft report to PacifiCorp well in advance of the final report due date and iterate with PacifiCorp to finalize the content before the report is made public.

### **Task 5.2: IRP Supply Curves and Load Forecast Adjustments**

AEG has provided resource-specific supply curves as an output of each of the previous CPAs. While the format for these supply curves has evolved, the objective has remained the same: to provide reliable information on resource location, cost, and savings in a format suitable for incorporation into PacifiCorp's IRP modeling framework. To allow PacifiCorp time to test the supply curve format, AEG will provide draft supply curves using the initial load forecast, followed by a final set incorporating an updated load forecast, reflecting final study results, and addressing any format revisions PacifiCorp deems necessary based on initial testing. Resource-specific supply curve considerations are addressed in the table below:

DSM Resource	Supply Curve Considerations
<b>Class 2</b>	<p>As the format of Class 2 DSM resource supply curves has been refined over many studies, AEG anticipates providing data in materially the same format as the previous study, though this assumption will be reviewed during the project kickoff meeting and leading up to delivery of initial supply curves.</p> <p>At a minimum, Class 2 DSM supply curves will capture:</p> <ul style="list-style-type: none"> <li>• Oregon potential provided by the Energy Trust of Oregon</li> <li>• Weighted average hourly impacts and levelized costs by resource bundle</li> <li>• State-specific levelized cost calculations aligning the preferred cost tests</li> <li>• Measure-level detail and load shapes for PacifiCorp to use to test alternate bundling methodologies</li> </ul>
<b>Class 1</b>	<p>Supply curves will reflect annual market potential and levelized costs (\$/kW-year) by product and state based on both standalone and interactive potential. Under both scenarios, supply curves will represent only incremental potential above existing programs. As part of the previous CPA, AEG also provided Class 1 DSM supply curves on an hourly basis to reflect the availability of resources throughout the year. As part of this study, AEG will review the hourly IRP input format with PacifiCorp to determine whether supply curves should also be provided in this format for the 2023 IRP.</p>
<b>Class 3</b>	<p>In the previous CPA, AEG and PacifiCorp determined that it was not necessary to develop cost estimates to implement Class 3 DSM resources, as these resources would not be modeled in the IRP and implementation costs would not reflect potential cost shifting among customers. If desired for the 2023 IRP, AEG will be able to package Class 3 DSM results for IRP modeling in a similar format to Class 1 DSM resources, again excluding the impacts of existing resources.</p>
<b>Class 4</b>	<p>Because Class 4 DSM resources have not been assessed in recent CPAs, AEG will work with PacifiCorp to determine whether these resources will be modeled in the 2023 IRP, and if so, what the appropriate supply curve format would be.</p>

### **Task 5.3: Class 2 DSM Database**

The Class 2 DSM measure database, developed and refined through previous studies, has proven to be an effective tool for providing measure-level inputs and results to PacifiCorp staff and stakeholders. This database was first presented to stakeholders in draft form for review in the previous study, then ultimately included as Appendix G in the final study report. As a key deliverable for this project, AEG will create a new version of the five-state Class 2 DSM measure database, starting with all of the same data fields from the existing database and adding additional fields as appropriate to document the analysis fully.

## Task 6: Stakeholder Support

AEG recognizes the critical importance of proactive and timely stakeholder engagement to the success of this project. For the 2021 CPA, AEG led four CPA workshops as part of the IRP public input process, participated in and presented at additional IRP workshops, provided work products for stakeholder review and comments, and assisted PacifiCorp in responding to stakeholder feedback and requests. Through our engagements with PacifiCorp and other regional utilities, we are extremely familiar with PacifiCorp's stakeholders and their respective issues. We have built our credibility with these organizations through our work quality, thoughtful consideration of their input, and transparency into study data sources, methodology, and results.

For this study, AEG anticipates stakeholder engagement will include:

- Leading up to five one- to two-hour trainings or workshops for stakeholders and commission staff as part of the 2023 IRP public input process. Example topics may include an overview of CPA methodology, review of measure and program lists, and summaries of draft and final results. AEG will work with PacifiCorp to determine whether in-person or remote participation is most appropriate based on public health conditions at the time.
- Providing draft work products for stakeholder review. Such work products may include the study work plan, measure lists, study results, the summary report, or other material as directed by PacifiCorp.
- Responding to stakeholder IRP feedback forms.
- Washington-specific engagement will include:
  - Meeting with the Washington DSM advisory group to gather feedback on scope, anticipated workplan, and key assumptions.
  - Providing up to 12-hours of web-based training to Washington Utilities and Transportation Commission (WUTC) staff on the analytical model. AEG recently worked with Avista, Cascade Natural Gas, and NW Natural Gas to file the LoadMAP models supporting their studies and to answer questions on modeling from WUTC staff.
  - Providing the final Washington conservation models to WUTC staff with appropriate non-disclosure provisions.

## Task 7: Low-Income Segmentation

In the previous CPA, AEG segmented Washington residential customers by income to provide additional insight into how potential was distributed across residential customers. Given budget and timeline constraints, that analysis was limited to estimating the number of residential customers and associated consumption above and below the income threshold and incorporating some differentiated equipment saturation information from PacifiCorp's residential customer survey. The analysis did not consider differences in the building shell or the applicability of energy efficiency measures across income segments.

Since completing the previous study, AEG has performed a more in-depth income-based analysis in potential studies for both Cascade Natural Gas and NW Natural Gas Washington service territories. AEG proposes to use this same methodology to perform income-based analysis in all states<sup>1</sup> for this project, utilizing data from the following sources to segment customers and identify available potential by income level:

- State-specific income group definitions. As directed by PacifiCorp, these may be based on federal poverty levels, program requirements, or other factors. While the previous study considered only standard and low

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<sup>1</sup> This task assumes this work would be performed for all states, excluding Oregon, consistent with the Class 2 DSM analysis.

income, AEG proposes to model up to three income groups in each state (e.g., low, moderate, and above moderate).

- The American Community Survey will provide median income by census block group, which AEG will map to PacifiCorp's customer data to estimate the number of customers in each income group.
- PacifiCorp's residential customer surveys will identify differences in equipment saturations across income groups.
- NEEA's Residential Building Stock Assessment will inform differences in building characteristics across income groups. AEG will review the appropriateness of this source to states outside of the NEEA region with PacifiCorp to determine whether alternate sources would be more appropriate to use in other states.
- State-specific Low Income Weatherization program evaluation results will help ensure the reasonableness of measure applicability and per-home savings.

While it would be possible to model residential potential as in previous studies and merely distribute the results by the number of customers in each group, the proposed method is much more robust, as it accounts for differences in building characteristics and energy consumption across income groups, creates full market profiles and measure characterization for all income segments, and provides results directly in study deliverables, including the Class 2 DSM measure database and IRP supply curves, without additional post-processing.

## Quality Assurance/Control Plan

We understand the importance of accurate, high-quality, and well-documented analysis through prior studies. We also understand that, while PacifiCorp staff review and acceptance of results are critical, the PacifiCorp's team's time is limited, and AEG needs to lead the quality assurance/quality control (QA/QC) process and drive it into all aspects of the project.

For this project, AEG will employ our standard due diligence and ensure that lessons learned from the previous study are incorporated into the QA/QC plan. These lessons learned include:

- The challenges that staff turnover on the AEG and PacifiCorp teams can cause and the importance of thoroughly documenting key decisions and study parameters for continuity;
- The importance of clearly defining and agreeing on data sources to be used and their relative hierarchy, particularly in jurisdictions with specific Commission guidance; and
- The importance of ensuring that new analytical methods (e.g., grid services view of demand response) create intuitive results that can stand up to PacifiCorp's internal and external stakeholder scrutiny.

AEG's key actions to ensure the highest quality deliverable for this project are described below:

<p><b>Project Management &amp; Communication</b></p> <p><i>Ensuring quality and coordination across analyses</i></p>	<ul style="list-style-type: none"> <li>• Develop RACI chart to define roles for each task</li> <li>• Clear, effective communication during regular check-in meetings to track progress, address issues, share project status, and establish action items</li> <li>• Hold regular internal check-in meetings to ensure timely completion of tasks, resolve issues, and establish action items</li> <li>• Develop and maintain a shared document between PacifiCorp and AEG to record key decisions and study parameters</li> <li>• Multiple levels of review of deliverables before submission to PacifiCorp</li> </ul>
<p><b>Data Accuracy</b></p> <p><i>Ensuring that inputs are accurate, appropriate, and well documented</i></p>	<ul style="list-style-type: none"> <li>➤ Establish resource- and state-specific source hierarchies</li> <li>➤ Validate and benchmark data, standardized input format for measure data</li> <li>➤ Proper documentation of inputs for better QC and retroactive investigation into possible issues</li> <li>➤ By-check-approve checklist to verify correctness and applicability of inputs</li> <li>➤ Verification of data source hierarchy with input from PacifiCorp</li> <li>➤ Confirmation of interim and final measure lists with PacifiCorp and stakeholders</li> <li>➤ Submittal of draft and final measure databases to PacifiCorp, including source plan identifying how source hierarchy is utilized for each state</li> </ul>
<p><b>Model Connections &amp; Calculations</b></p> <p><i>Ensuring that inputs are properly transferred into and implemented in the models</i></p>	<ul style="list-style-type: none"> <li>➤ Built-in diagnostics and error checks, standardization of data format and translation in templates</li> <li>➤ By-check-approve process to track updates and ensure data validation</li> <li>➤ Transparent calculations in MS Excel</li> <li>➤ Centralized calculation engine to eliminate opportunities for formula errors or inconsistency to propagate into other areas of the model</li> </ul>
<p><b>Results</b></p> <p><i>Ensuring that model results make sense</i></p>	<ul style="list-style-type: none"> <li>➤ Dedicated results files for multi-level output verification and standard presentation format</li> <li>➤ Examine model inputs and results at several levels: measure, end-use, sector, and overall</li> <li>➤ Compare results to prior studies and national and regional benchmarks to identify any unreasonable/out of range results</li> </ul>

## Project Schedule

The proposed project schedule is shown below, based on the key milestones presented in the RFP. AEG will work with PacifiCorp during the project kickoff meeting and work plan finalization to adjust and enhance this schedule as appropriate. While we will attempt to develop a "final" schedule for the project work plan, we understand the importance of remaining flexible as circumstances change through the previous assessments with PacifiCorp. These changes may include new requirements from the acknowledgement of PacifiCorp's 2021 IRP, new requests from stakeholders, updates to the 2023 IRP schedule, or other factors. Over the course of the project, AEG will work with PacifiCorp to maintain an updated schedule to ensure a continued shared understanding of deliverable timing. Additionally, AEG notes the following considerations relative to the schedule below:

- The schedule includes an update to the load forecast and underlying assumptions, as necessary, in the summer of 2022.

- We have not identified which draft deliverables PacifiCorp may want to send to stakeholders for review. These items will be incorporated into the final work plan schedule after consultation with PacifiCorp.
- The final work plan schedule will include the required timing of deliverables from the Energy Trust of Oregon.

Task	Timeframe
Task 1: Develop Final Work Plan	January 2022 – February 2022
Task 2: Research and Study Inputs	February 2022 – July 2022
Task 3: Analysis of DSM Potential	April 2022 – October 2022
Task 3b: Impacts of Existing Class 3 Offerings	March 2022 – June 2022
Task 4: Class 2 Scenario and Sensitivity Analysis	August 2022 – September 2022
Task 5: Segmentation and Data Presentation	June 2022 – January 2023
Task 6: Stakeholder Support	Meetings: February 25, March 31, May 5, August 25-26, October 13-14 (2022) Report: October 2022 – January 2023 Ongoing Support: February 2022 – September 2022
Task 7: Low-Income Segmentation	January 2022 – March 2022