WECC

LRTF Report – Proposed Reconciliation of L&R Data

Loads and Resources Task Force

March 4, 2021

Table of Contents

Introduction

The Loads and Resources Task Force (LRTF) was established by the Data Subcommittee (DS) in partnership with the Anchor Data Set (ADS) Task Force (ADSTF). The purpose of the LRTF was to develop and recommend processes to identify and reconcile inconsistencies between the load and resource (L&R) information submitted to WECC by WECC data submitters in response to NERC's Loads and Resources (LAR) process, and the L&R information included in the power flow (PF) data submitted to WECC by WECC Data Submitters in response to WECC PF data requests.

Considering these inconsistencies, the LRTF began an assessment of processes that WECC follows to develop PF base cases for the reliability assessment and production cost model (PCM) data for production cost assessments. The LRTF has found key differences in these processes and procedures and developed recommendations for the Reliability Assessment Committee (RAC) to consider to settle these differences and, if applied, to further harmonize PF and PCM data definitions and databases with the ADS process.

The LRTF Charter is included in Appendix 1 and its members are listed in Appendix 2.

Six Key Issues

The LRTF reviewed, among other documents, the ADS Lessons Learned[1] and ADS Work Flow[2] developed by the ADSTF, the WECC 2020 Loads and Resources Collection Manual[3], the data submitted in the WECC Power Flow Base Case Compilation Process, the WECC Project Coordination, Path Rating and Progress Report Processes[4], WECC Data Preparation Manual[5], as well as the requirements of both the ADS to develop the tenth year PCM case and the data used to develop the corresponding (10th year) heavy summer PF case. As a result of this review the LRTF identified six key issues that contribute to the inconsistencies between the L&R data collected in the NERC LAR process and the L&R information that is included in the PF data that is used to annually develop base cases for WECC PF data bank. These key issues are:

---

[1] See *ADS Lessons Learned*

[2] See *PCM ADS Work Flow Enhancement Initiative – SDWG/PDWG Proposal* Yr(x) Ver 1.8 (9/26/2019): DeShazo - *PCM ADS Work Flow Enhancement Initiative January 2020*

[3] See *2020 Loads and Resources Data Collection Manual*

[4] See *Project Coordination, Path Rating and Progress Report Processes* at https://www.wecc.org/Reliability/Project_Coordination_Path_Rating_and_Progress_Report_Processes_20170316.pdf

[5] *2020 WECC Data Preparation Manual*

Issue 1: How should WECC resolve differences between the Loads and Resources assumed in PCM analyses and the PF analyses? How would bridges be built between the PCM and PF cases?;

Issue 2: Elements included in the Loads in the PCM case and the elements included in the corresponding PF case may be different but should be consistent. How should consistency be determined?;

Issue 3: Modeling of generator station service load. Resolution of this issue has been transferred to Production Cost Data Subcommittee (PCDS) (formerly PCM Data Work Group (PDWG)) and System Review Subcommittee (SRS) (formerly System Data Work Group (SDWG)) and will not be addressed in this report;

Issue 4: Ensure that unit commitment and de-commitment for generators within the same plant between peak and other periods are correctly captured. PCDS (formerly PDWG) uses a methodology to commit generators in the same plant based on total plant generation. This result should be vetted through PCDS, StS and SRS for use in the round-trip process;

Issue 5: How should future resources additions and retirements be modeled in the PCM and PF cases? How would resources be efficiently mapped between the PCM and the PF in a consistent manner?; and

Issue 6: Different interpretations of the resources that can be defined as Fictitious Elements between PCM users and PF users. This issue has been resolved through clarification of definitions of "Planned Resources" and "Fictitious Elements."

The bulk of the work performed by the LRTF focused on these six issues. However, understanding these issues and resolving them are two different problems. The integration of production cost modeling alongside the traditional PF/stability reliability assessments is relatively new across the interconnection and as such, attempting to "blend" the two modeling approaches will inherently be difficult. For over 50 years, PF and stability data development and collection have yielded long-standing processes and procedures that have served to preserve the reliability of the WECC, and many WECC members needed reassurance that system reliability will continue to be preserved with the introduction and use of the ADS. As a result, there has been reluctance to modify or change the existing processes as needed to fully implement the ADS process. However, as uncertainty increases in future resource portfolios and load characteristics, the need for a better understanding of multi-hour electric resource portfolio performance and economics has become more important in utility decision making and establishment of policy. The ADSTF recognized these modeling differences as a process gap that has prevented the full implementation of the ADS. The ADSTF has urged the RAC to address those issues that are contributing to the reluctance to adopt the process modifications and changes that are needed to fully implement the ADS.

The LRTF has weighed the merits of these assessment models and concluded, like the ADSTF, that current planning practices must be changed to fully embrace the reliability and economic aspects of planning within the interconnection. This conclusion requires the assumptions and methodologies to be complimentary when developing PF and PCM model data for the ADS to be of the greatest benefit to WECC members. The LRTF acknowledges that, through the ADSTF's work, the PCDS and SRS have been working together to implement the ADS Process Work Flow[6], but it also recognized that this collaboration was based on "bootstrapping" old processes together to force an outcome that was adaptable to the needs of the ADS. Following the ADSTF's conclusions, the LRTF also recognized that there was a lack of clarity of the information that is collected through the existing L&R process, including how that information, modified if needed, could address the six issues presented earlier.

To further refine the issues noted earlier, the LRTF sent out a Load Survey[7] to NERC LAR submitters and transmission Data Submitters. These surveys were intended to find more information about the elements that are included in each Balancing Authority Area's L&R Load Forecast and the comparable elements included in the WECC PF base cases. The responses to the survey were used to guide the development of a Supplemental Data Request and refinement of other processes.

Finally, the LRTF reviewed and leveraged the work and information that has been produced by the ADSTF, the PCDS and SRS who have also been engaged in developing resolutions to similar issues. This report documents the work and resulting conclusions and recommendations of the LRTF. The LRTF believes that, if the recommendations are implemented by RAC, the benefits envisioned for the ADS process can be realized.

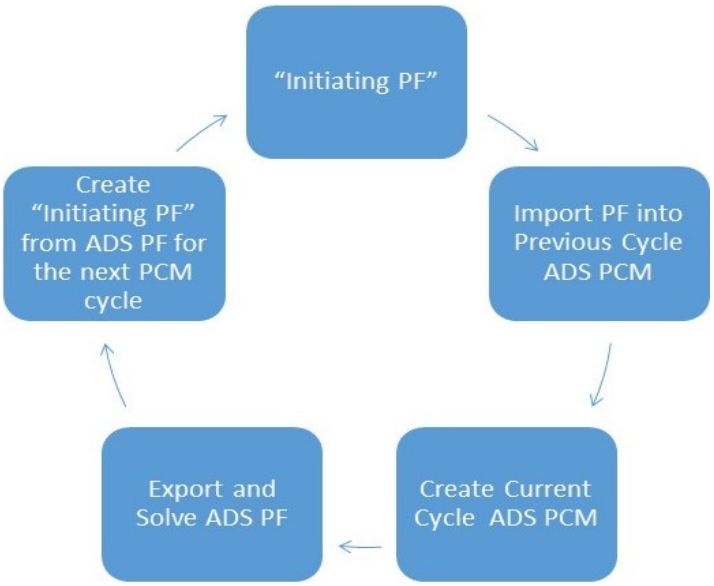
Discussion

The PCM dataset is developed by the PCDS (formerly PDWG) encompasses vast amounts and types of data. Economic grid simulation studies use security constrained PCM of the interconnected power system to determine least cost dispatch for a specified system condition, typically covering each hour of a year. Unlike a PF model, which simulates a single steady state system at a particular moment in time, the PCM model considers the interconnected system operation for every hour of a year. While the PF does provide key resource, transmission, and load information for the PCM dataset, there is a significant amount of other data that must be collected and managed for the PCM dataset to be complete.

[6] PCM ADS Workflow Enhancement Initiative

[7] See Load Survey and Responses: LRTF Load Survey and Attachment 1 - Proposal for the new Load Format for L&R and Load Survey Results Compilation LAR Entity Name Removed and Lined Up dated January 7 2020

Figure 1: ADS Process Workflow



The ADS PCM is developed through a combination of tasks collaboratively performed by the SRS, PCDS, and WECC staff. These tasks, generally represented in Figure 1, fulfill the ADS process requirements following an established process which is discussed in detail in the ADS Process Guide.[8] In general, the implementation of the ADS process uses the round-trip method described in the ADS Process Guide and is initiated by importing updated ADS power flow data (reference PF) into an existing ADS PCM to create a current cycle ADS PCM. A new current cycle PF is then exported from the ADS PCM to create the current cycle ADS PF. When the next ADS cycle begins, SRS uses the ADS PF to create the new initiating PF to start development of the new ADS PCM.

Although seemingly simple in structure, the L&R information developed through a separate WECC process plays a significant role in the ADS process. Without considering the L&R information developed annually, the ADS process would simply not work. The ADS is intended to reflect applicable state, provincial, and federal statutory public policy requirements, like Renewable Portfolio Standards (RPS), Regional Haze Programs, and Mercury and Air Toxic Standards (MATS), and any greenhouse gas (GHG) emission constraints or prices. Entities that "own" or are responsible for data submitted to WECC (as the Regional Entity) are responsible for providing data associated with these public policy requirements. WECC relies on these entities to ensure that the data they submit is consistent with their local, state, provincial, and federal jurisdictional authorities. Considering the content of L&R information and the current WECC practices for building base cases, the L&R information should be included in the ADS development process to ensure it is consistent with the ADS concept as approved by the WECC Board.

Following ADSTF recommendations, the LRTF also concluded that the ADS should include the L&R submitted by each Balancing Authority (BA) to WECC in the NERC LAR Process. For consistency, the L&R in the corresponding PF should be based on the loads and resources forecast in the same forecasting cycle and the same geographical load profiles and characteristics. For transmission planning analyses separate from the ADS, PF cases can use different load levels and resource

[8] https://www.wecc.org/Reliability/ADS%20Process%20Guide%20Version.pdf

dispatches to satisfy compliance requirements with NERC TPL Standards. Such PF cases may use the corresponding ADS as a starting point.

The challenge in developing the ADS has been to link loads and resources in the Load Serving Entities' NERC LAR filings to the PF case, and to the corresponding PCM case to ensure there is no double counting or under counting of resources. To encourage a process that accounts for and identifies accurate mapping between the PF and PCM dataset, the process must be efficient and easily repeatable.

Considering these challenges, the LRTF focused its effort on developing the following:

1. Additional information on Load compositions[9] (to address Issue 2)
2. Behind-the-meter (BTM) distribution resources and other quantities that can affect the load profile (to address Issue 2)
3. Resource mapping between the PF and the PCM (to address Issue 5)
4. Accounting for small resources between the PF and the PCM (to address issue 5)
5. Clarifying definitions (to address Issue 6)
6. Software enhancements to support the mapping processes (to address Issue 4 and others)

Recommendations

Based on its review of work done by the ADSTF, the PCDS, and SRS, the LRTF used knowledge gained from this work to consider the six key issues presented earlier in this document to identify and develop specific actions that will move full development of the ADS process forward. The following information presents recommendations, developed by the LRTF, to specifically address the six key issues. Each of the recommendations are discussed in detail and provide the context behind the LRTF's consideration of the issue, the LRTF's conclusions, and a recommendation for which the LRTF seeks RAC consideration and approval.

Recommendation 1 (Issue 2)

Define supplemental NERC Codes for Load and Supplemental Data Requests to include Load compositions (see Appendix 3 for input format).

The results of the Load Survey show that the load forecasts from different BAs, while being responsive to the L&R data request requirements, may vary in how certain load and transmission elements are represented in the overall L&R responses. Generally, WECC and its members have been aware of these differences but with the application of the ADS, they induce errors into the data. The LRTF concluded

[9] Load composition refers to the distribution quantities, such as incremental energy efficiency and resources that are embedded in the L&R submitters' forecast loads and the distribution quantities that are explicitly modeled in the PF Data Submitters' bus load model.

that these errors are avoidable and should be corrected by applying the recommended supplemental data requests.

In general, load forecasts in the L&R submittal are used to determine future resource supply requirements and the general practice has been to include transmission losses in the load forecasts, which results in the forecast Load being increased to reflect the estimated transmission losses for the load forecast being submitted. However, since the PCM includes the topology of the system, it calculates an estimate of the transmission losses that is more accurate than what has traditionally been modeled through the load forecast itself. Considering this issue, the LRTF concluded that it should be assumed that the PCM will calculate the transmission losses. Clearly, this requires a reversal of a traditional practice within the L&R process. This is not a change that the LRTF considers to be onerous. However, the results of the Load Survey appear to indicate that some BAs submitted their Load forecasts including transmission losses while others did not. Note that the L&R Manual currently requires that load forecasts include transmission losses in the load data submitted to WECC. The LRTF instead recommends that the L&R Request be modified to include a request for a separate forecast of the embedded transmission losses, where such losses are expressed in MW at the time of the BA's monthly peak loads and in MWh for each month of the forecast. However, the Load Survey also highlighted that some BAs submit Load forecasts excluding transmission losses. To avoid undue impacts on the internal procedures of the L&R submitters, the LRTF recommends that Load Forecasts without transmission losses also be accepted. All data entries should use the Supplemental Codes provided so it is clear whether transmission losses are embedded in the load forecast. The Data Development and Validation Manual (DDVM) should be updated to reflect this change.

In addition, different BAs may define the threshold voltage above which facilities are considered "transmission," but the LRTF learned that there may also be differences in the definition of "transmission" in the L&R submittals and what is modeled in the PF and the PCM. To the extent that the L&R Load forecast includes transmission losses, these differences can also lead to differences in the loads assumed in the studies even for the same BA. To further understand the assumptions in load forecast and guide future improvements, the LRTF recommends that WECC incorporate a question in the Supplement Data request on the threshold voltage at and above which the BA would consider the losses "transmission losses."

Finally, the Load composition assumed in the L&R submittal may not be consistent with the Load composition used in the PF for the BA. Where the additional information is not available, models and practices must be developed to account for the missing information in order for the data to be consistent with the ADS requirements. To facilitate development and inclusion of this missing data the LRTF developed Supplemental Codes for Load Compositions and a spreadsheet to help with Supplemental Load Composition Data Requests.

Recommendation 1.a (Issue 2)

Issue a supplemental L&R data request (including annual hourly profiles) to NERC LAR submitters for:

1. Gross Load with transmission losses and a separate forecast of the associated transmission losses in MW and MWh.

Table 1: Proposed Supplemental Codes and the Applicable Submitters

Code	Description	Remarks	L&R Submitter	PF Data Submitter
1001	Gross load with transmission loss (Peak)	Gross load = BA load reduced only for Energy Efficiency (EE) Savings and includes losses in the distribution system. • If Gross Load with Transmission Loss is entered, also enter the associated Transmission Loss (Code 1005), • Transmission loss is the total loss on lines and transformers in WECC PF model within the same footprint as the load forecast	X	
1002	Gross load without transmission loss (Peak)	• If Gross Load without Transmission Loss is entered, then it is not necessary to enter the associated Transmission Loss.		X
1003	Net load with transmission loss (Peak)	Net load = Gross load - Incremental committed EE - AAEE – DG_BTM – DR – EV - Storage - Pumping load (if included in L&R). • If Net Load with Transmission Loss is entered, also enter the associated Transmission Loss (Code 1005)		
1004	Net load without transmission loss (Peak)	• If Net Load without Transmission Loss is entered, then it is not necessary to enter the associated Transmission Loss.		
1005	Transmission losses (Peak)		X	
1006	Gross load with transmission loss (Energy)	Gross load = BA load reduced only for Energy Efficiency (EE) Savings and includes losses in the distribution system.	X	

1007	Gross load without transmission loss (Energy)	• If Gross Load <u>with</u> Transmission Loss is entered, also enter the associated Transmission Loss (Code 1010) • If Gross Load <u>without</u> Transmission Loss is entered, then it is not necessary to enter the associated Transmission Loss.		
1008	Net load with transmission loss (Energy)	Net load = Gross load - Incremental committed EE - AAEE – DG_BTM – DR – EV - Storage - Pumping load (if included in L&R); • If Net Load <u>with</u> Transmission Loss is entered, also enter the associated Transmission Loss (Code 1010). • If Net Load <u>without</u> Transmission Loss is entered, then it is not necessary to enter the associated Transmission Loss.		
1009	Net load without transmission loss (Energy)			
1010	Transmission losses (Energy)		X	
1051	DG_BTM - Installed capacity	DG_BTM = Behind-the-meter (BTM) Distributed Generation (DG) Facilities = small-scale (to date, mostly solar PV) installations that individual customers would install to avoid buying electricity from an electric utility. (DDVM, P.15, P.23 and P.33)	X	X
1052	DG_BTM - Monthly maximum		X	X
1053	DG_BTM - Monthly energy		X	
1054	DG_BTM - Monthly peak impact	The Pdgen for a DG-BTM in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]
1061	Committed Incremental EE - Projected capacity	Committed Incremental EE = projected committed EE that are not already included in the Gross Load - in case the Gross Load only include EE for the base year, and not the projected EE.	X	X
1062	Committed Incremental EE -		X	X

[10] This quantity should reflect the system conditions that are modeled in the PF. For example, this quantity will be the peak impact if peak conditions are modeled in the PF.

	Monthly maximum			
1063	Committed Incremental EE - Monthly energy		X	
1064	Committed Incremental EE - Monthly peak impact	The EE value in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]
1071	AAEE - Projected capacity	AAEE = Additional Achievable Energy Efficiency Savings, new entry to reflect uncommitted EE beyond what is already included in Gross load.	X	X
1072	AAEE - Monthly maximum		X	X
1073	AAEE - Monthly energy		X	
1074	AAEE - Monthly peak impact	The AAEE value in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]
1081	DR_Control - Projected capacity under the control of the BAA	DR_BA = Demand Response (DR) under the control of the BAA = customer reduction in electricity usage, such that the customer's normal consumption pattern is reduced in response to price changes or incentive payments designed to lower electricity use at times of system stress or high market prices. (DDVM, P.13 and P.24 and P.33).	X	X
1082	DR_Control - Monthly maximum		X	X
1083	DR_Control - Monthly energy		X	
1084	DR_Control - Monthly peak impact	The amount of DR, if used in the PF case for the Peak conditions, should be one of the monthly peak impact values	X	X[10]
1091	DR - Projected capacity NOT under the control of the BAA	DR = Demand Response (DR) NOT under the control of the BAA = customer reduction in electricity usage, such that the customer's normal consumption pattern is reduced NOT in response to price changes or incentive payments designed to lower electricity use at times of system stress or	X	
1092	DR - Monthly maximum		X	

1093	DR - Monthly energy	high market prices. (DDVM, P.13 and P.24 and P.33)	X	
1094	DR - Monthly peak impact	The amount of DR not under the control of the BAA, if used in the PF case for the Peak conditions, should be one of the monthly peak impact values	X	
1101	EV - Projected capacity	EV = Electric Vehicle charging, new entry because EV charging can have different characteristic than customer load.	X	X
1102	EV - Monthly maximum		X	X
1103	EV - Monthly energy		X	
1104	EV - Monthly peak impact	The EV load in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]
1111	Storage_BTM - Installed Capacity (Discharging = positive value)	BTM Storage, e.g. battery (DDVM P.13, P.19)	X	X
1112	Storage_BTM - Installed Capacity (Charging = negative value)		X	X
1113	Storage_BTM - Monthly maximum (Charging or Discharging)		X	X
1114	Storage_BTM - Monthly Energy (Discharging)		X	
1115	Storage_BTM - Monthly Energy (Charging)		X	
1116	Storage_BTM - Monthly peak impact	The BTM Storage in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]

1121	BTM_Pumping Load - Installed Capacity	BTM Pumping Load = pumping load for water delivery (e.g., State pumps) to the extent it is included in the load - new entry because some pumping loads are combined with customer loads	X	X
1122	BTM_Pumping load - Monthly maximum		X	X
1123	BTM_Pumping load - Monthly Energy		X	
1124	BTM_Pumping load - Monthly peak impact	BTM Pumping Load in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]
1131	Transmission-Connected Non-Pumped Storage Pumping load - Installed capacity	Pumping load (e.g., for water delivery) = remove from the Gross load if they are included by individual BAs in their L&R data submittal (DDVM, P.18 and P.23). Pumping Loads are typically modeled as non-conforming Load at the PF Bus.		X
1132	Transmission-Connected Non-Pumped Storage Pumping load - Monthly maximum			X
1133	Transmission-Connected Non-Pumped Storage Pumping load - Monthly Energy			
1134	Transmission-Connected Non-Pumped Storage Pumping load - Monthly peak impact	The Transmission Connected Pumping Load in the PF case for the Peak conditions should be one of the monthly peak impact values		X[10]
1141	Climate change effect - Projected Capacity	If available, hourly impacts of higher temperature due to climate change. In some hours this may increase hourly demand due mainly to an increase	X	X

1142	Climate change effect - Monthly maximum	in air conditioning units. In other hours this may decrease hourly loads due to higher temperature and less need for heating units. If hourly climate change impacts are not available then submit the annual peak and energy impacts due to higher temperatures	X	X
1143	Climate change effect - Monthly Energy		X	
1144	Climate change effect - Monthly peak impact	If available, the load impacts of climate change in the PF case for the Peak conditions should be one of the monthly peak impact values	X	X[10]

2. BTM DER, BTM EV, BTM Storage, Committed Incremental Energy Efficiency (EE), Additional Achievable Energy Efficiency (AAEE) and effects of Climate Change (if separately forecast).

   Requests for Transmission Losses and BTM DER have been implemented in the 2020 Supplemental Data request. Entities have also been requested to submit the associated Transmission Losses in MW and monthly MWh. Effects of Climate Change data will likely need further work to clarify the requirements before implementing. The timing of requesting the remaining Load elements should be determined by PCDS in consultation with PCMS, the WECC staff and the NERC LAR submitters.

Recommendation 1.b (Issue 2)

Issue a supplemental Bus Load modifier data request to transmission Data Submitters for:

1. Information (including the Pdmax, Pdmin and Pdgen values included in the Data Submitter's composite load model and resource types) for BTM DER, EV, Storage, and EE, AAEE, and effects of Climate Change.

Similar to recommendation 1.a, the LRTF concluded that data on the effects of Climate Change will need further review to ensure that all data requirements are clearly identified and described before recommendation 1.b is implemented. The SRS should determine the timing of remaining Load elements in consultation with PCDS, MVS, the WECC staff, and the Data Submitters.

The Proposed Supplemental Code and the applicability to the L&R Submitters and PF Data Submitters are summarized in Table 1 below. Please see also Appendix 3 for the detailed input format.

Recommendation 2 (Issue 2)

Clarify Definitions of some Distribution Elements (see Appendix 4 for the proposed supplemental definitions)

When developing the Supplemental Data Requests discussed in recommendation 1 the LRTF found that some definitions of distribution resources need to be clarified to promote communication between

the various BAs and the committees developing data and models for the ADS. For example, to be applicable to the North American Continent in general, the current NERC definition for BTM does not explicitly specify that a BTM resource is one that connects to the system of the end-user (or the end-use customer's side of the meter). This definition for BTM can lead to confusion in WECC's[11] data development process. The LRTF concluded that supplemental definitions applicable to WECC were needed to help guide the provision of data for the following (see Appendix 4):

1. In Front of the Meter (IFOM) DG
2. Behind-the-Meter (BTM) DG
3. Energy Storage (ES)
4. Electrical Vehicles (EV)
5. Distributed Energy Resource Aggregation (DERA)

Recommendation 3 (Issue 5, Issue 6)

Implement a Resource Data Repository to map resources between the PF and the PCM (see Appendix 5 for input format).

The LRTF developed the Resource Data Repository concept, which would include resource information as shown in Table 2.

PF cases are used for many different types of transmission planning studies, some of which may require modeling unique system configurations and/or specific system conditions. If such cases are also used to prepare the topology to be exported to the PCM, additional and sometime significant work may be needed to reconcile the differences between the PF case and the PCM dataset. A further complication is that current processes within WECC use bus numbers or bus names to map the generators between the PF and the corresponding PCM dataset. However, if the cases originate from different planning cycles, bus numbers and bus names may not necessarily align between the PF cases, which creates mapping inconsistencies. Past experiences have shown that the effort to address these differences can be extremely time consuming and complex and create opportunity for errors to be introduced into the PCM dataset. The ADSTF and LRTF have both recognized this as a significant issue that needs to be addressed as a high priority initiative. PCDS is developing a document on the Lessons Learned and will provide more information as it becomes available.

Such occurrences may not be completely avoidable from planning cycle to planning cycle, given the number of engineers from diverse companies and agencies preparing the transmission data. Nevertheless, the LRTF believes that existing WECC processes and procedures used to develop PF base cases can be greatly improved. When resources are added or removed from the PF, it may be difficult

[11] Please see https://www.wecc.org/Administrative/BTM%20or%20Not.pdf for more details.

to identify those resources that are part of the NERC LAR submittal, and should be included in the ADS, and those that are not. After consideration of several possible solutions, the LRTF concluded that the most efficient approach to align specific resources between the PF and the PCM datasets was to assign a unique Generator ID to consistently identify resources. This will help determine whether certain resources should be included in the PCM dataset. This unique Generator ID would be associated with the resource from one planning cycle or base case to another. Mapping for the PCM dataset would be done using the unique Generator ID, which should not change over time unless the generator is materially modified, in which case a new Generator ID would be assigned. The PCDS began work with the SRS to develop the required data format for this unique Generator ID. Once complete, the required process and form should be documented in the DDVM.

Fictitious Element

During its work, the LRTF found that there were different and sometime competing interpretations of the term "Fictitious Element" which included well known terms such as "future" and "planned" resources. Based on discussion within the LRTF and its review of "Fictitious Elements"[12] in the Project Coordination, Path Rating and Progress Report Processes, the LRTF clarifies that a "Fictitious Element" is different from "planned resources." A Fictitious Element is one that most planners would agree is unlikely to materialize in the time frame simulated in the study. To better understand the status of "planned resources," the LRTF leveraged the resource "Level" definitions in the Project Coordination, Path Rating and Progress Report Processes, and the resource "Tier" definitions in the WECC 2020 Loads and Resources Collection Manual to form "Resource Categories."[13] The Resource Categories reconcile the differences between the two processes and can be used to promote better communication, and to identify those resources, which should be included in the PCM ADS.

Since some of the data in the Resource Data Repository are the same as the PF data, the Stability Data, and the PCM data, it may be most efficient for the WECC staff to populate and maintain this spread sheet. L&R submitters and Data Submitters would provide updates.

Table 2: Information included in the Resource Data Repository

Column Title		Description
	PF Gen Bus Number	

[12] See discussion of Fictitious Element Page 95 in https://www.wecc.org/Reliability/Project_Coordination_Path_Rating_and_Progress_Report_Processes_20170316.pdf

[13] Please see https://www.wecc.org/Administrative/Comparison%20of%20Resources_2020-02-06.pdf for more detailed information.

Column Title		Description
	PF Gen Bus name	
	PF Gen Unit ID	
	Resource name	
	EIA ID	
	Unique Gen ID	TBD, this can be the Long ID or equivalent, e.g., the EIA # plus the unit #, to enable mapping between PF and PCM
Resource Category[14, 15]		
	in L&R submittal	1 = existing or under construction;
		2 = w/signed agreements, e.g., signed GIA, signed PPA
		3 = w/regulatory approval, e.g., approved CPCN, approved PPA, approved Power Plant Siting Certification
		4 = under generation interconnection study;
		5 = Application for regulatory approval (e.g., of CPCN, Power Plant Siting) submitted
		6 = generic; interconnection point uncertain - identified as part of a group of resources in a specific area
		7 = generic small resources, bus numbers assigned by Data Submitter
		8 = generic small resource, bus number assigned by PCDS based on distribution factors
		9 = small resources netted with Load in L&R Submittal but NOT netted with Load in PF
		10 = repowered;
		11 = retired

[14] The PF Data Submitter should assign this category in consultation with the L&R submitter. If an entity fails to assign a category to a resource, the PCDS will assign a category code and inform the entity.

[15] Category 1 = Path Rating Process Level 1; NERC Existing Gen + Tier 1 (under Construction)
Categories 2-3 = Path Rating Process Level 2; NERC Tier 1
Categories 4-5 = Path Rating Process Level 3; NERC Tier 2
Categories 6-9 = Path Rating Process Level 4; NERC Tiers 2 and 3

Column Title		Description
	Not in L&R Submittal but in Other Studies	See examples for "in L&R Submittal"
Generator Information		
	Name Plate (MW)	
	Stability File Pmax (MW)	
	Stability File Pmin (MW)	
	Station Service Load (MW)	
	Bus # of Station Service load	Bus # where Station Service load is modeled
	Generator Type	Examples: Thermal, Hydro, Solar, Wind, Lithium-ion, Nuclear, etc.
	Fuel Type	Examples: Natural Gas, Coal, Wind, Solar, Water, Lithium-ion, Nuclear, etc.
	Turbine Type	Examples: CC, CT, Steam, Wind-Type3, Wind-Type4, Solar-Non-Tracking, Solar-Tracking, Solar Thermal, etc.
	Manufacture Model	To be used for heat rate assessment. Examples: GE LM6000, GE LMS100, etc.
	Is Cogen?	
	Inverter Loading Ratio (ILR)[16] for Inverter based Resources only	If ILR is not available, the PCDS will provide an average ILR assuming that the resource capacity provided in the L&R is AC capacity.
	Commission Date	As stated in the L&R submittal
	Retirement Date	As stated in the L&R submittal
	Owner	
Resource Location		
	State	

[16] A solar photovoltaic (PV) system's panel capacity is often reported in direct current (DC), while operating capacity in the United States is reported as it is delivered to the grid in alternating current (AC). For economic and engineering reasons, capacity values reported in DC typically are 10% to 30% higher than those reported in AC capacity. This ratio is often referred to as the inverter loading ratio (ILR). (See https://www.eia.gov/todayinenergy/detail.php?id=35372.)

Column Title		Description
	County	
	City	
Resource Coordinates		
	Latitude	Latitude of the coordinate where the resource is located
	Longitude	Longitude of the coordinate where the resource is located

Recommendation 4 (Issue 2, Issue 5)

Capturing Small Resources

Based on the work that it has performed, the LRTF, like the ADSTF, concluded that explicitly modeling all known resources in the PCM dataset, including those defined as "small," would augment the accuracy of the results from using that dataset. The LRTF reasoned that, while small resources may not materially affect the performance of the grid, when considered in the aggregate, the impact of such small resources on PCM study results could be significant because they can amount to thousands of MW. If left unaccounted for, this discrepancy can adversely affect the accuracy of the PCM studies, resulting in the wrong economic dispatch and inaccurate information for policymakers.

The LRTF recommends that WECC and its members try to model all known resources, small or otherwise, explicitly. However, the LRTF acknowledges that explicitly modeling some of the small resources in the PF may not be practical for several reasons. For example, the transmission provider may not have access to the resource information, or the time and personnel required to build electrical models for each resource. In these cases, the transmission providers should be given an opportunity to document these limitations as part of the data collection process. This documentation should be included in the DDVM and updated when the limitation changes.

As to the recommendation itself, the LRTF understands that, in the L&R BA Load forecast, small BTM resources can be netted with Load. In the PF, the general practice has been to net very small resources below a size threshold with the bus load,[17] whether they are BTM or IFOM. In other words:

- DERs that are netted with BA Load (from L&R) are mainly BTM.
- DERs that are netted with bus loads in the PF can be either BTM or IFOM.[18]

[17] "Netted with load in PF" means there is a generator at a bus physically, but not modeled explicitly in the PF. Instead the bus load (MW) is reduced accordingly at the same bus (or at adjacent buses).

[18] For example, a 9 MW generator connecting IFOM (of an end user) to the low side of a distribution substation transformer, will usually not be netted against BA Load in the L&R; but can be netted against bus load in the PF.

In the L&R submittals, BTM DERs are usually represented as a reduction in forecast load and the IFOM DERs are explicitly listed as resources. To facilitate the implementation of recommendation 4, the LRTF concluded that separate processes to address BTM DERs and IFOM DERs were required. These processes are described below and should be documented in the DDVM.

Recommendation 4.a (Issue 2)

Capturing and Populating BTM DER and other quantities (see Figure 2 and Appendix 6).

As part of its work, the LRTF developed and has proposed a process to populate any PF case with DERs. For the purpose of supporting the ADS, start with the PF used for exporting the topology to the PCM and perform the following:

1. Determine whether the BA L&R submittal includes BTM DER forecasts explicitly[19] (see Appendix 3). If the L&R submittal does not explicitly include BTM DER forecasts, the PCDS will work with the L&R submitter. If the BTM information is not available by a date certain (to be specified by PCDS), the WECC staff will use the BA Net Load provided and proceed to Step 2.d below.
2. For BAs that explicitly include BTM DER in their L&R load projections, map the BTM data from L&R submittal to the PF using the following steps, which will be applied in succession as needed (see Appendix 6):
   a. If the BA submits bus numbers and other characteristics associated with its BTM DERs, then use the bus numbers provided.
   b. If no bus number is provided, check to see whether Composite Load Models are provided, spread the BTM DERs to buses based on the Pdmax[20] derived from in Composite Load Model in the corresponding PF case.
   c. If no Composite Load Model is provided, consult the Data Submitter(s) on bus number(s) and other characteristics associated with its BTM DERs.
   d. If Data Submitter(s) do not provide the bus information within a date certain (as specified by the PCDS), the PCDS will assume that the PF bus loads contain BTM DER, and spread the BA Net Load from the current L&R load projection to the buses based on the PF bus

[19] BTM Quantities = Incremental committed EE + Additional Achievable Energy Efficiency (AAEE) + BTM DG + Demand Response (RDR) + Electric Vehicle (EV) + Energy Storage + Pumping load (if included in L&R).
Gross Load = BA load reduced only for existing Energy Efficiency (EE) Savings and losses in the distribution system.
Net load = Gross load – BTM Quantities

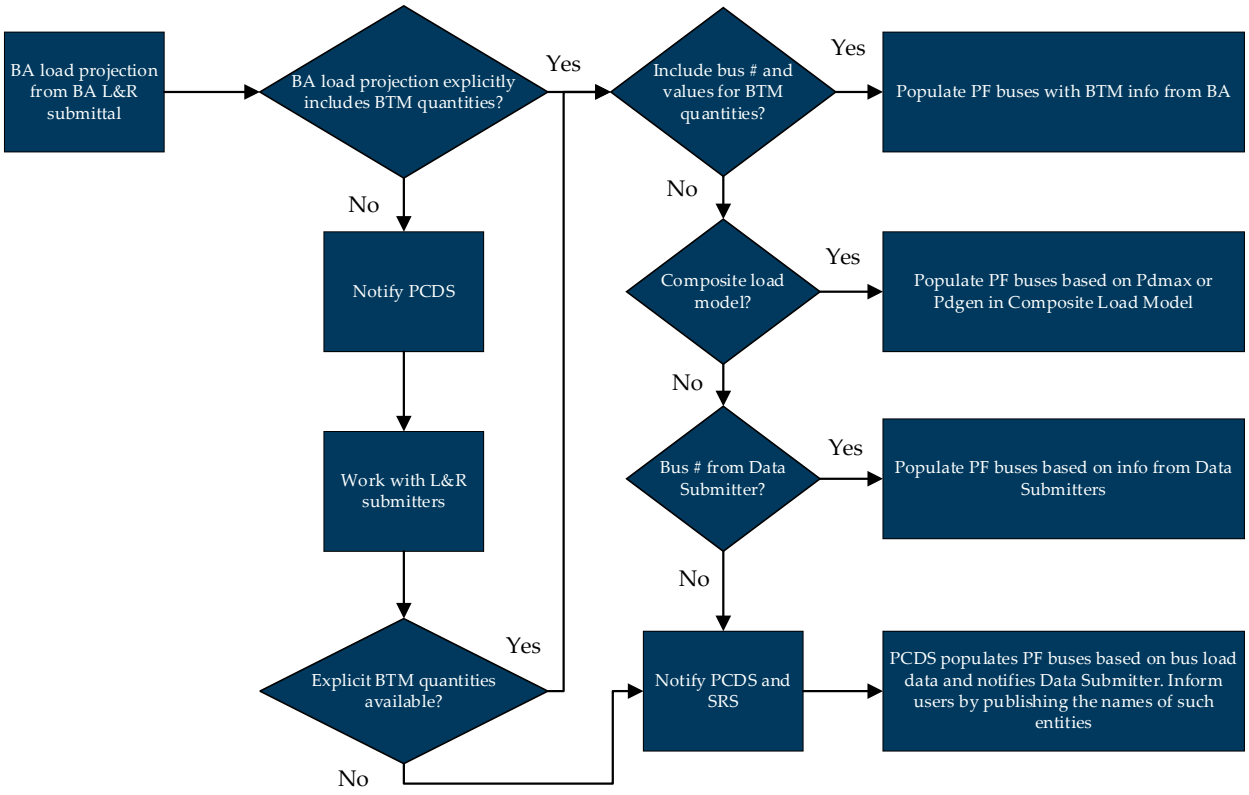
[20] If only Pdgen is provided, deduce the Pdmax based on the season, the load level and the time of day simulated in the PF.

loads in the starting point PF case. Applying this assumption will impact the accuracy of the modeled bus loads if the loads in the starting point PF case are representative of a different time (hour and day-of-year) than the time (hour and day-of-year) of the BA Net Load. For example, the starting point PF case may be for an afternoon peak in August, but the BA Net Load could be for an evening peak in September. The performance of BTM DER would obviously be different in these two time periods. Hence, applying this assumption will impact the accuracy of study results. The PCDS will publish the name(s) of the entities that do not provide the BTM information, so that the users of the PCM case can be informed.

BTM hourly profiles can then be developed for BTM DER per the DDVM at each bus thus assigned.

A diagram illustrating the proposed process to populate BTM quantities in bus loads is shown in Figure 2.

Figure 2: Proposed Process to Populate BTM Quantities in Bus Loads



Recommendation 4.b (Issue 5)

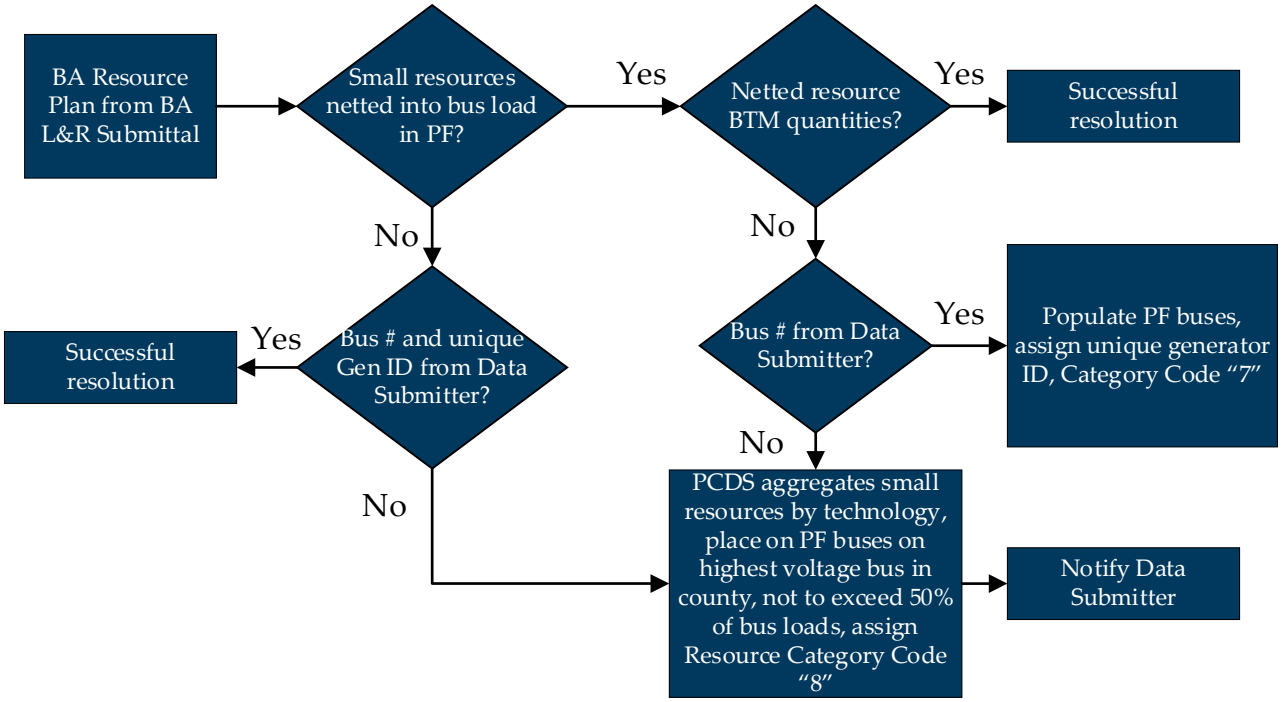
Mapping small IFOM resources (see Figure 3):

This process covers those small resources that are submitted explicitly in the BA L&R but are netted from load in the PF case. As such, the BTM DERs should be filtered out:

1. From the list of resources in the L&R Submittal, identify the resources that are not BTM resulting in a list consisting of IFOM resources.
2. From this list of IFOM resources, identify those IFOM resources that are explicitly modeled in the PF. Find the corresponding bus numbers and unique generator IDs. If either the bus number or unique generator ID cannot be found in the PF case, contact the Data Submitter. If the Data Submitter does not provide the bus number within a date certain (as specified by the PCDS), go to Step 3.c below.
3. From the list of IFOM resources not explicitly modeled in the PF, find the corresponding buses in the PF using the following steps, which will be applied in succession as needed:
   a. If the corresponding bus number exists in the PF, assign the bus number and the unique generator ID to the resource(s).
   b. If the corresponding bus number cannot be found in the PF case, consult the Data Submitter(s) on the bus numbers assignment; when the Data Submitter(s) provides the bus numbers, assign Category Code 7 to the bus in the Resource Data Repository.
   c. If the Data Submitter(s) does not provide the bus mapping within a date certain (as specified by the SRS), PCDS will aggregate the small resources, by technology within the county and place the aggregate quantity on the highest voltage bus(es) in the same county, not to exceed 50% of bus loads. This bus selection is intended to avoid overloads on sub-transmission systems that would be otherwise addressed in future system studies. Assign Category Code 8 to the corresponding bus in Resource Data Repository.
4. PCDS will work with SRS, Data Submitters and Regions to validate and map planned L&R resources to the bus.

   A diagram illustrating the proposed process for modeling IFOM small resources that have been netted into bus load is shown in Figure 3.

Figure 3: Modeling IFOM small resources that have not been explicitly modeled in the PF



Recommendation 5 (see 5.3 for Issue 4)

Software Enhancements

Once the spreadsheets for the supplemental data requests for Loads and Resources in the Appendices 3 and 5 are implemented, the PF and PCM software programs can be modified to provide faster L&R mapping and error screening which will facilitate a more timely round-trip process while minimizing errors in the resultant dataset. Based on its consideration of existing processes, the LRTF concluded that WECC may want to request vendors to update the PCM and PF programs to allow more input entry fields to store parameters such as BTM quantities. This way, the parameters that can be made part of topology input can be automatically associated with the buses in the base case, eliminating the need for Supplemental Data Requests. These steps should be further refined after WECC staff and WECC members gain more experience working with the spreadsheet in Appendices 3 and 5. The LRTF suggests the following:

1. Load Buses:

a. Add load bus format input fields to PF and PCM to allow for Load Components: Pdmax, Pdmin and Pdgen[21] for BTM DER, EV, Storage, EE, AAEE, and spare fields for entries on Climate Change and other future parameters.
b. Automate the processes to map and populate BTM resources between PCM and PF onto load buses for the corresponding 10th year PF case and PCM case. This will allow initial populating and screening of data to reduce the number of resources that will need further attention.

2. Resource Buses:

   Add input fields to generator bus format to incorporate data from the Resource Data Repository. This will enable the same generator information to carry from PF to PCM and back.

3. For power plants that are modeled as aggregated generators representing all units in the power plant in the ADS PCM, it is important to ensure that the correct number of generating units are modeled on-line overall operating conditions in transmission planning studies. Because generators that are off-line will not provide reactive support, inaccurate generator commitment can impact the stability of the system. Even though this problem can be avoided by requiring that all generators in the same power plant be modeled explicitly, this may be too restrictive when conducting PCM studies.

   Therefore, if the generating units in the same power plant have been aggregated in the topology for system conditions at one load level, vet the process with the SRS and StS for unit commitment and de-commitment in the round trip to obtain PFs at different load levels to ensure that they will result in the appropriate number of units on-line. (This addresses the initially identified Issue 4.)

4. Database Management
   a. Form a task force to develop and maintain a relational database, such as Microsoft Access.

      The data to be maintained in the proposed spreadsheets (Supplemental Load Data and Modifier for L&R Data—Appendix 3 and the proposed Resource Data Repository—Appendix 5) may be complicated to maintain; and complication can increase the chance of errors. A relational database may streamline the management of the data and reduce errors. One of the benefits is the streamlining of the more common data mapping processes and identification of exceptions. This will allow the WECC staff and PCDS to focus on the exceptions instead of remapping all loads and resources every ADS cycle. It can also reduce the number of times L&R submitters and transmission Data Submitters are required to

[21] There is already an entry filed for Pdgen in the Composite Load Model, but not for Pdmax and Pdmin.

provide the same data, thereby reducing potential errors. This relational database was also proposed earlier in the ADSTF[22]. This is also being discussed the SRS.

In addition, the data in these two spreadsheets may only be a subset of the data needed to run transmission planning (steady state and stability) and PCM studies. There are also other types of data, like data for geomagnetic disturbance studies and short-circuit studies, to be managed as we move forward. The LRTF recommends that RAC form a task force to:

- Investigate the scope of a relational database.
- Develop and implement this relational database.

This task force can assess the scope of the data that can benefit from a relational database; but will focus initially on developing and implementing the relational database needed to support the common data in the PF (power flow and stability) and the ADS PCM. The scope assessment will allow the task force to take a broad view and structure orderly expansion, as needed, of the database to cover other types of data.

Appendices

All appendices, except Appendices 1 and 2, will be reviewed for updates as part of the DDVM development process and DPM changes.

Appendix 1—LRTF Charter
Appendix 2—LRTF Members
Appendix 3—Proposal for Supplemental Load Format for L&R (to address Issue 2)
Appendix 4—Proposed Supplemental BTM and DER Definitions (to address Issue 2)
Appendix 5—Proposed Resource Data Repository (to address Issue 5 and Issue 6)
Appendix 6—Capturing and Populating BTM DER and other quantities (to address Issue 2)

[22] See the October 17, 2019, RAC meeting document folder: https://www.wecc.org/_layouts/15/WopiFrame.aspx?sourcedoc=/Administrative/DeShazo%20-%20ADSTF%20Transmittal%20Letter%20ver1.3.pdf&action=default&DefaultItemOpen=1

Appendix 1—LRTF Charter

Establishment and Authority

The Loads and Resources Task Force (LRTF) was established by the Data Subcommittee (DS) in partnership with the Anchor Data Set Task Force (ADSTF). The LRTF's initial disband date was March 31, 2020. Due to ongoing work, the disband date was moved to September 30, 2020. Further, due to a restructuring of the Reliability Assessment Committee (RAC) and the dissolution of the ADSTF, the LRTF now reports directly to the RAC.

Purpose and Responsibilities

The purpose of the LRTF is to develop and recommend processes to identify and reconcile inconsistencies between (i) load and resource (L&R) data submitted to WECC by WECC data submitters in response to NERC Loads and Resources (LAR) process, and (ii) L&R included in the power flow (PF) data submitted to WECC by WECC data submitters in response to WECC PF data requests. To further the ADS goal of developing a PF case and production cost model (PCM) case, which includes common and consistent data, the LRTF will work to reconcile differences between data definitions and applications in PF, PCM, and other databases.

The LRTF will:

1. Review terminology, definitions, and interpretations of L&R data, like planned resources, used in LAR, PF base cases, PCM, and ADS processes.
2. Identify inconsistencies in the L&R terminology and definitions used to create the Long-Term Reliability Assessments (LTRA), PF base cases, and PCM.
3. Recommend and document common terminology and definitions for L&R data.
4. Identify similarities and differences in the L&R data used for the NERC LAR process, PF base cases, and PCM data development and validation processes.
5. Recommend changes to the LAR Data Collection Manual, Data Preparation Manual (DPM), and Data Development and Validation Manual (DDVM) to reconcile inconsistencies in L&R data definitions.
6. Recommend to the DS additional data collection and verification processes needed to supplement L&R requests, resolve data inconsistencies between the NERC LAR submittals and data submitted by other parties, and facilitate ADS development.
7. Recommend processes to promote L&R data consistency into the DS structure.
8. Recommend adjustments to the Base Case and ADS development schedules.

9. Perform other tasks as assigned by RAC.

Committee Composition and Governance

1. **Membership**
   a. The members of the LRTF were originally appointed by a committee consisting of one WECC staff member, and the DS, System Data Work Group (SDWG), PCM Data Work Group (PDWG), and ADSTF chairs. The current membership as of May 8, 2020, will continue as members of the LRTF. The RAC may appoint members to replace those no longer able to serve or to augment the LRTF as necessary. The LRTF's original members included:
      i. Three members from the DS.
      ii. One member from the ADSTF.
      iii. Two members that report L&R data annually.
   b. The WECC staff liaison will maintain a list of the LRTF members.
   c. The LRTF will also include a liaison, appointed by WECC management, as a member.
2. **Leadership**
   a. The chair of the DS appointed one of the LRTF members to serve as the chair. In the event of a vacancy in the chair's or vice chair's positions, the RAC chair will appoint a replacement.
   b. The LRTF will appoint one of the LRTF members to serve as the vice chair.
   c. The chair will manage the committee and its meetings.
   d. The vice chair will perform the duties of the chair in the chair's absence or in case of a vacancy in the office of chair.
   e. The chair will assign a committee member or WECC staff member to prepare minutes of LRTF meetings for the committee's approval.
3. **Meetings**
   a. The LRTF will meet as often as required to carry out its responsibilities. Meetings will be held according to the WECC Meeting Policy.
   b. A quorum for meetings will be a majority of committee members.
   c. All decisions of the LRTF will be made during noticed meetings.
   d. Action taken by the LRTF will strive for consensus (the decision is one that all present can agree to accept, even if their preference would be for a different decision).

i. If the LRTF cannot reach consensus, the decision will require a majority vote of the members present. Voting may be by any means the chair determines appropriate.

ii. All such votes, along with the majority and minority viewpoints, will be presented to the RAC for consideration. The RAC may, at its discretion, endorse, reject, or suggest changes to recommendations made by the LRTF.

e. LRTF meetings may be in person, by webinar, or by conference call, as determined by the chair.

f. The chair (or designee) will give notice by email to each member of the LRTF of the time and place of all meetings and will post notice of all meetings on the WECC website. Notice will be given no less than:

30 days before in-person meetings.

10 days before a webinar.

g. An agenda, containing the items for which action may be taken, will be provided no less than five days before each meeting.

h. Any person who wants notice of LRTF meetings may notify the chair by email. The chair (or designee) will then email a copy of the notice and agenda of future meetings to that person when the committee members receive the notice and agenda.

Reporting

The LRTF will report to the RAC on its activities and any recommendations.

Review and Changes to the Charter

The LRTF will review this charter as necessary and recommend any changes to the RAC.

Approved by the RAC: May 8, 2020

Appendix 2—LRTF Members

Loads and Resources Task Force Members

- Data Subcommittee (DS) representative: Ron Schellberg, Northern Tier Transmission Group
- DS representative: Lukas Boler and Alexander Stewart, Bonneville Power Administration
- DS representative: Chifong Thomas, Smart Wires
- Anchor Data Set Task Force (ADSTF) representative: Jan Strack, San Diego Gas and Electric
- Loads and Resources (L&R) submitter: Matt Prindle, California Independent System Operator
- L&R submitter: George Nail, Public Service Company of New Mexico
- WECC liaison: Colby Johnson, Amanda Sargent

Acknowledgements

The LRTF gratefully acknowledges the contributions from the WECC staff (especially, Camille Jones and Byron Woertz), and the many stakeholders (especially, Jamie Austin, Gary DeShazo, Radha Soorya, and Yi Zhang), whose help and support have greatly improved the quality of the work product.

Appendix 3—Proposed Supplemental Load Format

Link to the proposed format for supplemental load.

Appendix 4—Proposed Supplemental BTM and DER Definitions

The following uses NERC's definitions as a starting point and modifies them for use in WECC's Anchor Data Set (ADS) power flow and production cost modeling.

- **In Front Of the Meter (IFOM) Distributed Generation (DG):**
    - Any generating unit or multiple generating units connecting to the Distribution Provider's system and modeled at a bus in the WECC Grid. An IFOM DG can be owned and/or operated by 1) the distribution utility, or 2) a merchant entity. IFOM DG includes IFOM Energy Storage Facilities (ES).
- **Behind-The-Meter (BTM) Distributed Generation:**
    - A generating unit or multiple generating units or Energy Storage Facilities modeled at a bus in the WECC Grid (regardless of ownership), of any nameplate size, on the end-use customer's side of the meter that measures the end-use customer's electric energy withdrawals from, and/or injections to, the Distribution Provider. All electrical equipment from, and including the generation set up to, the metering point is considered behind the meter.
- **Energy Storage Facility (ES):**
    - An energy storage device or multiple devices at a single location (regardless of ownership), on either the utility side or the customer's side of the meter used to measure the end-use customer's electric energy withdrawals/injections from/to the Distribution Provider's system. May be any of various technology types.
- **Electrical Vehicles (EV)**
    - An electrical vehicle or fleet of electrical vehicles powered wholly or partially by one or more energy storage devices at a single location (regardless of ownership), on either the utility side or the customer's side of the meter used to measure the end-use customer's electric energy withdrawals/injections from/to the Distribution Provider's system. An EV can be a virtual resource formed by aggregating electrical vehicles by location at its "virtual" point of interconnection at a particular T-D interface, or an actual resource that represents a charging station of electrical vehicles and is modeled at a bus in the Western Interconnection.
- **Distributed Energy Resource (DER) Aggregation (DERA):**
    - A virtual resource formed by aggregating multiple IFOM DG, BTM DG, IFOM ES, or BTM ES devices by technology. DERA may include electric vehicles as well as other load management programs (such as energy efficiency and demand response). The DERA

may be modeled as a single resource at its "virtual" point of interconnection at a particular bus representing a T-D interface.

Reference

From NERC Glossary of Terms, Distribution Provider:

Provides and operates the "wires" between the transmission system and the end-use customer. For those end-use customers who are served at transmission voltages, the Transmission Owner also serves as the Distribution Provider. Thus, the Distribution Provider is not defined by a specific voltage, but rather as performing the distribution function at any voltage.

Appendix 5—Proposed Resource Data Repository

Link to the proposed data repository.

Appendix 6—Populate BTM DER into Load Buses

Recommendation 4.a—Capture Behind-the-Meter (BTM) Distributed Energy Resources (DER) and Populate the ADS PCM with Corresponding Discrete Resources

DERs that may affect forecast baseline loads include distribution voltage class (i) generating resources that are connected both in front of the meter and BTM (including storage devices), and (ii) demand-side impacts that may decrease or increase forecast baseline loads. [23] However, of these DERs, only the subset that contains BTM generating resources are addressed in this procedure. These BTM DERs will be modeled as *net* generation, that is, any station service load associated with the BTM generator will be deducted from the gross generator capability when modeled in the PF program. Similar to other distribution quantities, such DER net generation typically impacts the load forecasts in the BA L&R submittal. While separating the load forecasts into Gross load and DER quantities is important to the study work, it is not a requirement. Therefore, some BAs do not provide separate forecasts for load and DER quantities. For the BAs that provide separate forecasts for load and DER quantities, the challenge would be to map the DER quantities to the buses in the BA so they can be modeled as bus load modifiers. Below is a process to take the BA projected BTM DERs and map them to the BA load buses in the PF as discussed in Recommendation 4.a of the Report:

1. Determine whether the load forecast in the L&R data submitted by the BA includes BTM quantities as separate entries: WECC staff reviews L&R submitters' ten-year-out data submittal to WECC for the NERC L&R filing. WECC staff will:
    a. Identify BAs where the load forecasts in their NERC L&R data Submittals have accounted for BTM DER (i.e., net load forecast[24]). Notify the PCDS of the BAs that have not accounted for the BTM DER. PCDS will work with the BA to see whether such data are available.

[23] Demand-side impacts that can modify, baseline load projections include Electric Vehicles, Energy Efficiency, Additional Achievable Energy Efficiency, etc. The process to populate them into the load buses are similar. However, their input convention (e.g., whether they would be considered resources or load) into the L&R may change. This process can be updated as needed at a later date.

[24] Gross Load = BA load reduced only for existing Energy Efficiency (EE) Savings and losses in the distribution system.

Net load = Gross load – BTM Quantities.

BTM Quantities = Incremental committed EE + Additional Achievable Energy Efficiency (AAEE) + BTM DG + Demand Response (RDR) + Electric Vehicle (EV) + Energy Storage + Pumping load (if included in L&R).

b. For BAs where NERC L&R data Submittals have accounted for BTM DER data (i.e., net load forecast and BTM DER separately), extract and tabulate (if provided):
    i. Installed BTM DER capacity
    ii. Transmission bus numbers for that capacity
    iii. The 8,760-hour expected output profile for a megawatt of installed BTM DER capacity
c. Document where any parameter is missing in 1.b. Go to (step 7.)

2. SRS requests BTM DER information for the PF buses from the Data Submitter: In parallel to step 1, SRS issues a data request to each transmission Data Submitter requesting that a ten-year-out PF case, corresponding to the L&R submitters' ten-year-out data, be created for a specific hour, for example, noon on July 15. This ten-year-out PF case will incorporate (among other resource data included in the L&R data submittals), BTM quantities modeled as "Pdmax," "Pdmin," and "Pdgen" values.[25] The "Pdgen" values will correspond to the specified hour at the corresponding Load buses. If there is any missing BTM DER data, the BA will indicate the type(s) of data missing. (If such data are unavailable, the BA will also so indicate.) These Pdmax or Pdgen values will represent:
    a. The installed BTM DER capacity (Pdmax) identified in the WECC staff tabulation, or
    b. The BTM DER Pdgen value for the requested hour, or
    c. The entity's best estimate of future installed BTM DER capacity.

    Based on this set of BTM DER data from the BA, Transmission Data Submitter develops and submits the requested ten-year-out PF data to WECC.

    From this PF case, the SRS will develop a PF suitable for exporting the topology to the corresponding PCM (i.e., "ADS Reference PF").

3. For the BAs that did not provide the information in step 1.b (i.e., BTM DER provided separately, but no bus information provided), WECC staff develops a BTM DER hourly profile from an agreed upon public source. WECC staff will use the "ADS Reference PF" to spread the BTM DERs based on Pdmax entries associated with the composite load model, if available, at the PF buses:
    a. Find buses that include Pdmax, Pdmin, or Pdgen. WECC staff will develop a matrix that associates each of these buses with the corresponding hourly output profile from the agreed-upon source.

[25] Consistent with the BTM DER from the L&R, the net values of Pdmax, Pdmin and Pdgen (that is, without the station service load associated with the BTM generator) will be modeled in the PF. Pdmin can be a positive or negative value. A negative Pdmin value can represent the installed charging capacity of an energy storage device.

   b. For buses with Pdmax, and/or Pdmin, record the Pdmax and Pdmin (if provided) in the matrix developed in step 3.a.
   c. For buses with Pdgen only, calculate the Pdmax based on the specific hour requested in the PF[26] and record the Pdmax in the matrix developed in step 3.a. (The same process can be used if the Pdgen value is negative.)

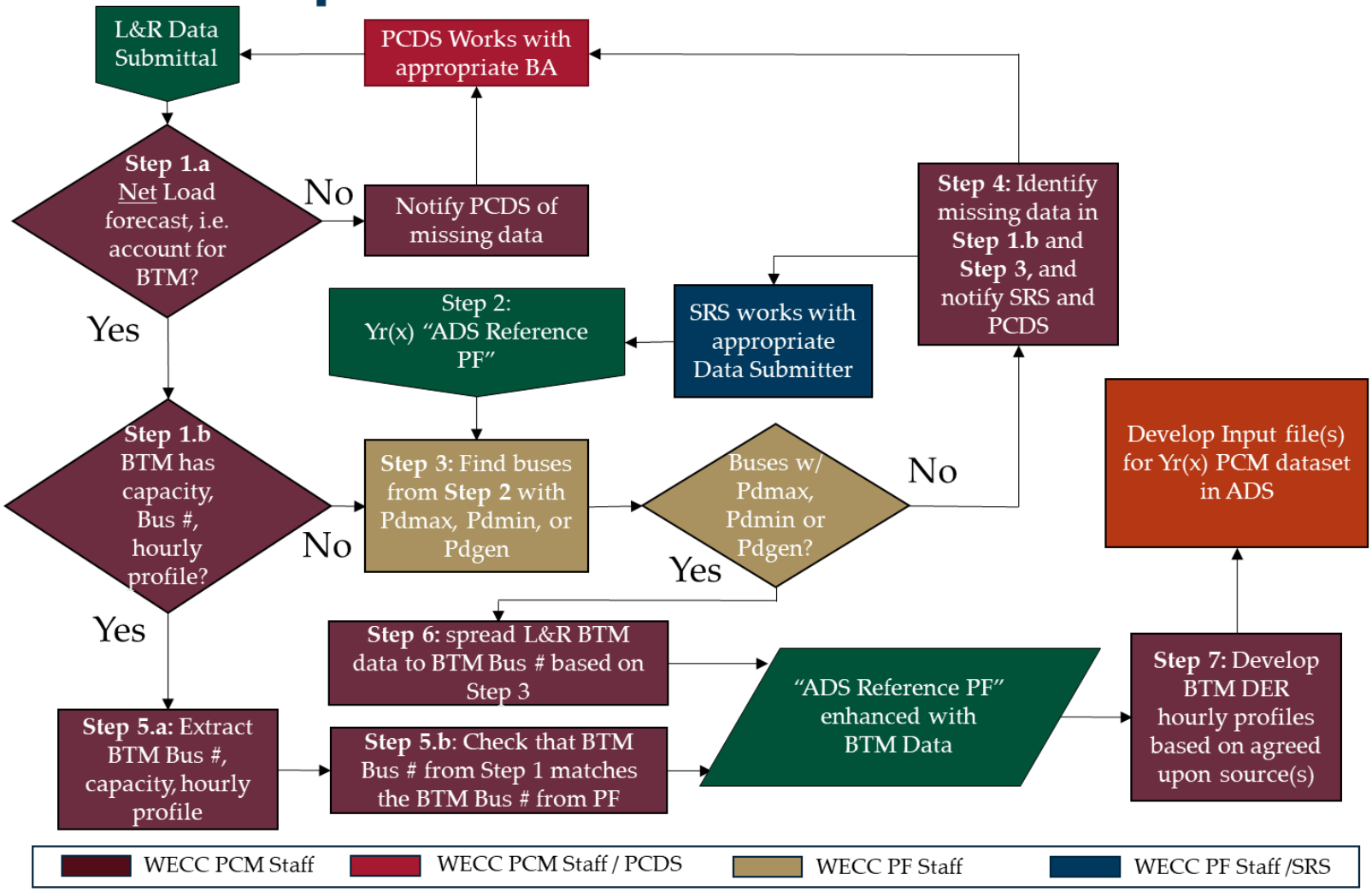
4. WECC staff will tabulate and compare the information gathered in step 1 and step 3. For Transmission Areas that do not provide the BTM information in Step 1.b in the L&R data submittal, or the Pdmax or Pdgen information in the PF in step 2, WECC staff will notify the SRS and the PCDS. SRS will contact the Data Submitters to see BTM DER or Pdmax (or Pdmin) data is available.
5. If the BTM bus information (for example, bus numbers and DER profile) is provided in step 1, WECC staff, a) compiles L&R-consistent PF input based on the data submittals, and, b) checks that these BTM bus numbers from step 1 match bus numbers with corresponding Pdmax, Pdmin or Pdgen in PF. This PF input will be incorporated in the "ADS Reference PF." Notify the SRS of any discrepancies between the bus numbers provided in the L&R submittal and the ADS Reference PF. SRS will contact the Data Submitted to resolve discrepancies.
6. If the BTM information (for example, bus numbers) is not provided in step 1, WECC staff will develop L&R-consistent PF input based on Pdmax and the corresponding BTM DER profiles identified in step 3. The PF input will be incorporated in the "ADS Reference PF."
7. If the BA did not provide any information (i.e., no separate BTM DER data from the L&R submittal) and no bus data, such as Pdmax from the ADS Reference PF, is available, WECC staff will notify PCDS and SRS. PCDS will assume that the PF bus loads contain BTM DER and spread the BA Net Load to the buses based on the PF bus load. The PCDS will publish the name(s) of the entities that do not provide the BTM information, so that the users of the PCM case, for example, the StS, can be informed.
8. Using the data import routine, WECC staff develops and populates the PF with BTM DER resources from the L&R-consistent PF input files developed in Steps 5 and 6.
   The data import routine will automatically create discrete BTM generating resources in the PCM by using the data found in the "Pdmax" data field to calculate an installed BTM DER capacity equivalent and locating this BTM DER capacity at the transmission bus number with Pdmax. WECC staff will populate the PCM with the applicable hourly generation profiles. PCDS will check to see whether the data import routine would need to be enhanced to ensure the new entries in the PF are included.

Note that the proposed process does not actually "populate the BTM DER into the load." Rather it populates the PCM with discrete BTM DER generators as part of the bus loads. This is necessary to

[26] For cases in which the Pdgen = 0, it may not be feasible to deduce the Pdmax or Pdmin. The WECC staff will then notify the SRS; and the SRS will work with the Data Submitter to get the relevant Pdmax (or Pdmin).

model the hourly output profiles of the BTM DER generators at the appropriate transmission bus numbers. For PCM purposes, BTM DER needs to be identified explicitly.

Populate BTM DER into Load



For reference, please see "PCM ADS Work Flow Enhancement Initiative – SDWG/PDWG Proposal Yr(x) Ver 1.8 (9/26/2019)": DeShazo - PCM ADS Work Flow Enhancement Initiative_January 2020