December 20, 2019

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Re: California Independent System Operator Corporation
Filing of CAISO Rate Schedule No. 6052

Docket No. ER20-____-000

Dear Secretary Bose:

The California Independent System Operator Corporation (CAISO) submits for filing and acceptance the Nodal Pricing Model Agreement dated December 20, 2019, between the CAISO and PacifiCorp (Agreement).[1] The Agreement sets forth the terms under which the CAISO will modify its existing day-ahead optimization systems to provide a nodal pricing model solution for PacifiCorp. This solution will produce separate day-ahead nodal pricing results within PacifiCorp's balancing authority areas, without a financial settlement or impact to the CAISO's day-ahead market. PacifiCorp intends to use the solution results as the basis for its power cost allocation among the states within which it provides retail electric service, consistent with the expectations of the associated state public utility commissions. Under the Agreement, PacifiCorp will compensate the CAISO for the annual cost to provide the service to PacifiCorp. The CAISO requests that the Commission accept the Agreement effective March 1, 2020, so that the configuration activities can be undertaken and completed prior to implementation of the nodal pricing service on January 1, 2021.

I. Background

PacifiCorp provides retail electric service in six states,[2] and has arrangements among the state public utility commissions in which it provides electric service concerning the allocation of its power costs. The current arrangements among these state public utility commissions are set to expire at

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1 The CAISO submits the Nodal Pricing Model Agreement pursuant to Section 205 of the Federal Power Act, 16 U.S.C. § 824d.

2 California, Oregon, Washington, Idaho, Utah, and Wyoming.

the end of 2023. PacifiCorp is seeking a third-party administered arrangement that includes a day-ahead, security-constrained economic solution upon which its power costs can be equitably allocated among the states in which PacifiCorp provides retail electric service.

PacifiCorp dispatches its system on a system-wide, least-cost basis, and then allocates the power costs to each state using an allocation factor based on its annual load. For example, if a state accounts for 25 percent of PacifiCorp total annual load then it is allocated 25 percent of the total power costs for that same year. The allocation factors are dynamic because they change annually based on each state's load. The ability to dynamically allocate power costs in a reasonable manner hinges on a common resource portfolio for which all states share proportionately in the resources. In the future, states will no longer participate in a common resource portfolio. In addition to providing a path for states to have unique resource portfolios, it is important to maintain the benefits of system dispatch and optimization as much as practicable.

PacifiCorp established guiding principles for developing a method to allocate its power costs among states. The allocation method should support individual states' abilities to have a unique resource portfolio mix that does not adversely impact other states. The allocation method should also assign costs to the state(s) that benefit from and/or drive those costs and provide appropriate incentives and transparency of cost drivers to better inform resource decision making. Finally, the allocation method should maximize the transparency of cost allocation and dispatch decisions and reduce reliance on subjective assumptions.

PacifiCorp researched multiple power cost allocation methods and concluded that most do not meet the guiding principles above. However, the nodal pricing model appears to provide the cost-benefit precision and transparency desired while adhering to the guiding principles. Under a nodal pricing model, each of PacifiCorp's six states would have its own metered load boundaries (and associated price) and a day-ahead locational marginal price associated with each of PacifiCorp resources. Accordingly, PacifiCorp sought a third party that would operate a dispatch engine to optimize PacifiCorp's day-ahead resources and create transparent nodal pricing to enable precise power cost tracking. The dispatch results would determine states' net power costs. Only PacifiCorp resources and market purchases would be included in this day-ahead nodal pricing model.

PacifiCorp and its stakeholders, which consist of utility regulatory agencies, customers, and certain others potentially affected by the power cost allocation procedures, executed a memorandum of understanding in September

2019 on this basis.[3] The memorandum of understanding supports PacifiCorp's reasonable and prudent investment of related capital funds, related operations and maintenance expenses, and the related ongoing services charges to develop and implement a nodal pricing model.

The CAISO operates the day-ahead market pursuant to the CAISO tariff, and has in place the people, processes, and technology necessary to support the bid-to-bill services associated with that market. The CAISO is able to leverage its existing technology platform, the full network model, and available data interfaces to provide PacifiCorp with a nodal pricing model solution. At the same time, PacifiCorp has developed the systems and data interfaces with the CAISO for submitting data and receiving settlement statements for participation in the energy imbalance market. Consequently, the proposed nodal pricing model would only require a modest expansion of PacifiCorp's bidding, scheduling, and settlement systems, while allowing access to the CAISO's security constrained unit commitment tool in the day-ahead timeframe. Likewise, the CAISO would need to make no significant changes to its systems beyond those needed to account for a solution that includes more than one balancing authority area.

The CAISO's technology platform and optimization engine algorithm is a highly advanced and sophisticated solution. All applicable rules, offered products, information on resources' characteristics and models, and transmission and scheduling constraints are in the CAISO's optimization tool. Leveraging these capabilities, in lieu of PacifiCorp's trying to mimic these involved and complex mathematical models and algorithms, will avoid costs that PacifiCorp would otherwise have to spend for an equivalent solution. Using a working technology platform that has proven its capabilities will reduce both schedule and budget risk, and allow for expedient implementation of the network power cost allocation methodology that PacifiCorp is seeking to implement based on the nodal pricing model solution.

Using the CAISO optimization tool will also ensure that the nodal pricing model is consistent with the actual CAISO day-ahead market since it will use the same tool, network model, and input data. Having the consistency of the solution provided by the CAISO optimization will simplify the comparison of nodal pricing model results with actual day-ahead market results. Similarly, using the same schedule data for internal and external resources impacting the calculation of both scheduled and unscheduled loop flows is critical when performing congestion management and enforcing physical flow transmission constraints. This requires significant daily effort to keep the information on generation schedules, interchange schedules, outage schedules, load forecasts, load

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[3] The memorandum of understanding is included in Appendix D to a filing that PacifiCorp submitted to the Public Utility Commission of Oregon on December 3, 2019, which is available at https://edocs.puc.state.or.us/efdocs/HAA/um1050haa161935.pdf.

distribution factors, and variable energy resources forecasts up to date. Using the same tool and data will ensure that the nodal pricing solution is consistent with what the CAISO day-ahead market uses.

Finally, implementing the nodal pricing model via the CAISO's optimization tool will enable PacifiCorp to continue seamless participation in the CAISO day-ahead market by bidding at existing CAISO scheduling points. This allows the solution to account for the CAISO day-ahead cleared interchange transactions as one simultaneous optimization run. The benefit of a simultaneous run is that the resources and transmission constraints inside PacifiCorp that may impact the amount of feasible cleared interchange transactions in the CAISO's day-ahead market are dynamically enforced and accounted for inside the optimization, instead of being dealt with after the fact using another optimization tool deployed by PacifiCorp.

II. Agreement

The Agreement details the contractual terms, including the scope of work necessary to provide PacifiCorp the nodal pricing model solution it seeks, and establishes the nodal pricing model services fee that PacifiCorp will pay the CAISO to compensate for the service.

A. The Agreement Establishes the Project Scope and Schedule

Attachment A to the Agreement establishes the scope of the service and the associated implementation work.[4] The CAISO and PacifiCorp will complete certain agreed-upon tasks necessary for implementation of the nodal pricing model service on January 1, 2021. This implementation date will permit PacifiCorp's timely transition from its current network cost allocation arrangements to an arrangement supported by the CAISO's nodal pricing model that will facilitate PacifiCorp's power cost allocation. In addition, the requested March 1, 2020 effective date of the Agreement will give the parties the time and assurance required to undertake the implementation activities prior to the start of the services on January 1, 2021.

The CAISO will include the two PacifiCorp balancing authority areas (*i.e.*, PacifiCorp East (PACE) and PacifiCorp West (PACW)) in the day-ahead optimization and will model them as individual balancing authority areas to deliver the nodal pricing model solution. Using software features and a technology optimization algorithm, the day-ahead software will produce optimal unit commitment and hourly energy schedules for PacifiCorp supply resources in PACE and PACW, subject to power balance and active transmission network

[4] The parties may modify Attachment A by mutual agreement. *See* Agreement, Section 3.3.

constraints. Pursuant to the Agreement, the CAISO will be able to optimize PacifiCorp generation schedules in PACE and PACW, while maintaining complete price separation with the CAISO day-ahead market.

Energy transfers between PACE and PACW will be optimally scheduled, subject to applicable scheduling limits, whereas the net energy transfer with the CAISO will be fixed at zero to prevent energy exchange between the CAISO and PacifiCorp. This avoids any impact to the CAISO day-ahead market solution. Although the net energy transfer with the CAISO will be constrained to zero, PacifiCorp will be able to continue its participation in the day-ahead market with import/export bids at any CAISO scheduling point, the same as it does today.

The nodal pricing model will use balancing authority area-specific loss penalty factors to isolate the marginal cost of losses between balancing authority areas in the same optimization solution. Similarly, the nodal pricing model will ignore shift factors to a binding transmission constraint between balancing authority areas. This isolates the marginal cost of transmission congestion solely based on transmission congestion inside the PACE and PACW balancing authority areas for PacifiCorp's resources, and solely based on transmission congestion inside the CAISO balancing authority area.

The CAISO will also be able to produce results supporting optimal procurement of ancillary services to meet the corresponding requirements in PACE and PACW by designating these balancing authority areas as separate ancillary service regions with distinct requirements. The regional ancillary services procurement results will isolate the marginal ancillary services prices between the PACE, PACW, and CAISO balancing authority areas. The day-ahead energy schedules and ancillary services awards from the nodal pricing model solution will be ignored in the energy imbalance market.

The day-ahead settlement for the nodal pricing model solution is advisory only, *i.e.*, there will be no financially binding results. Day-ahead energy and ancillary services prices for PacifiCorp resources will be provided to PacifiCorp, but they will not be published by the CAISO. Similarly, there will be no publication of locational marginal prices, and the 6-month lagging reports the CAISO makes available will not include the day-ahead energy bids of PacifiCorp resources. This is appropriate given that the nodal pricing model solution does not involve participation in a CAISO market. Results of PacifiCorp's participation in the day-ahead market will be published pursuant to the CAISO's normal procedures.

Day-ahead price correction will apply to the day-ahead energy and ancillary services prices for PacifiCorp resources, and any corrected prices will be provided after any corrections based on the applicable price correction timelines. As part of the nodal pricing model service, the customer inquiry and dispute system and the CAISO settlement dispute process will be available for PacifiCorp with regard to the advisory day-ahead settlement.

B. PacifiCorp Will Pay an Annual Services Fee to Compensate the CAISO for Its Ongoing Costs

The Agreement specifies that PacifiCorp will pay an annual services fee of $8.4 million, to be invoiced quarterly, for estimated costs incurred by the CAISO to perform the nodal pricing model service.[5] The annual services fee to which the CAISO and PacifiCorp have agreed is just and reasonable.[6] As discussed below, the CAISO based the fee on its estimated expenses to provide service to PacifiCorp under the Agreement. The CAISO leveraged its existing rate design model and activity-based costing system to determine the amount it will charge PacifiCorp.[7] The basis for the estimated cost is the direct and indirect time and expense necessary for the CAISO to perform the nodal pricing model service for PacifiCorp. This approach is similar to how the CAISO determines the grid management charge, the energy imbalance market administrative fee, and the reliability coordinator service charge pursuant to the CAISO tariff.

The CAISO estimated the service fee by performing a forward-looking cost of service study specifically for the nodal pricing model service. The CAISO referenced the 2016 cost of service study as the basis of the nodal pricing model study, because it is the most recent comprehensive cost of service study performed by the CAISO. The nodal pricing model study also accounts for the reliability coordinator service costs and the projected cost impacts necessary to support the nodal pricing model service.

The CAISO first estimated the associated direct operating expenses in order to project the cost necessary to support the nodal pricing model service. Labor will be the largest expense. The CAISO developed this estimate based on an analysis that considered internal resources necessary to provide the

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5 Agreement, Section 4.1. The Agreement also allows PacifiCorp or its scheduling coordinator to dispute an invoice following payment of the full amount due. *Id.*, Section 4.2.

6 More specifically, the annual services fee falls within the zone of reasonableness. As the Commission has explained, "the courts and this Commission have recognized that there is not a single just and reasonable rate. Instead, we evaluate [proposals under Section 205 of the Federal Power Act] to determine whether they fall into a zone of reasonableness. So long as the end result is just and reasonable, the [proposal] will satisfy the statutory standard." *Calpine Corp. v. Cal. Indep. Sys. Operator Corp.*, 128 FERC ¶ 61,271, at P 41 (2009) (citing *FPC v. Hope Nat. Gas Co.,* 320 U.S. 591, 602 (1944), and *Montana-Dakota Utils. Co. v. Northwestern Pub. Serv. Co.*, 341 U.S. 246, 251 (1951)). For the reasons explained below, the annual services fee satisfies this standard.

7 Additional information regarding the CAISO's rate structure is available at http://www.caiso.com/Documents/DraftFinalProposal-2012GridManagementChargeFeb15_2011.pdf.

nodal pricing model service and other information related to the associated functions. The CAISO also accounted for its ability to leverage existing CAISO personnel to reduce the direct costs of the services. The CAISO can do this because it already has significant resources performing activities similar to those required to support the nodal pricing model (*e.g.*, day-ahead support staff). The CAISO thus based the total labor cost estimate on the direct hours associated with each related task that existing CAISO staff would perform paired with the personnel expenses of each of the FTE positions included in the analysis. The CAISO projects that it will need approximately 14 full-time equivalent (FTE) positions to support the service. This projection includes 6 new FTE positions and 8 existing FTE positions. The CAISO also identified the projected non-labor-related costs and mapped these costs to the nodal pricing model related tasks. These costs include nodal pricing model-specific tools and applications.

The CAISO also allocated a proportionate amount of its indirect expenses to the nodal pricing model services fee. The CAISO determined the indirect portion of the estimated expense by allocating the indirect expenses identified in the CAISO's revenue requirement proportionately based on the direct cost percentages. Indirect costs represent those costs that are not assignable to a specific task associated with a CAISO service and charged to customers who receive that service. Indirect costs include labor costs from those positions considered in an indirect, rather than a direct, supporting role, as well as other components of the revenue requirement such as administrative tools and capital. The table below breaks down the nodal pricing model services fee between direct costs (which equal the sum of the costs for new resources and existing resources) and indirect costs.

	Operating Cost ($ in millions)
New Resources	$1.20
Existing Resources	$3.64
Direct Costs	$4.84
Indirect Costs	$3.56
Total Costs	**$8.4**

As noted above, PacifiCorp has agreed to the initial level of the annual services fee. Going forward, the Agreement provides for adjustment of the annual services fee.[8] The services fee will be subject to adjustment if the parties agree to a change in the scope of the services and agree that an adjustment to the fee is warranted in light of such change. The services fee will also be subject to adjustment if the CAISO provides notice that (i) its costs to continue delivery of the service exceed the fee and (ii) the CAISO operating costs have increased by at least 2 percent since the date the services fee was most recently set. This

8 Agreement, Section 4.1.

allows for appropriate consideration of the costs and, at the same time, provides for potential increases in the services fee if the CAISO costs increase and the increase is correlated with an overall increase in CAISO costs for services. Any adjustment will be submitted to the Commission for review. The Agreement therefore represents a reasonable balance between the parties' interest in preserving a level of cost certainty for their customers and appropriate allocation of the costs associated with the nodal pricing model solution.

C. The Agreement Ensures that the Nodal Pricing Model Solution Will Not Impact the Day-Ahead Market

The CAISO is committed to ensuring that the nodal pricing model solution does not impact the day-ahead market results, and the CAISO is confident that there will be no interactions between the nodal pricing model and the day-ahead market based on the proposed approach. However, the CAISO will not be able to demonstrate that there are no interactions prior to the simulation testing anticipated as part of the implementation. Accordingly, the parties have agreed that the CAISO may terminate the agreement prior to the start of the services if the CAISO reasonably determines that the nodal pricing model will adversely impact the day-ahead market.[9] This will give the CAISO the opportunity to test the solution and demonstrate to its reasonable satisfaction that there are no adverse interactions between the nodal pricing model and the day-ahead market. In turn, stakeholders will be assured that the PacifiCorp nodal pricing model services may commence without any impact on the results they experience in the CAISO day-ahead market. Indeed, the CAISO believes the nodal pricing model will benefit the day-ahead market by improving the information the CAISO uses to determine power flows on the system and will not have adverse interactions.

In addition, the CAISO is committed to ensuring that the nodal pricing model solution does not impact the timelines associated with the day-ahead market process. Solving for the PacifiCorp balancing authority areas will increase the scale of the solution that must solve within the specified timelines. However, the CAISO systems have the capability to produce a day-ahead solution for the entire western interconnection based on the current timelines. PacifiCorp represents only an incremental part of the total solution that the CAISO can deliver, and the CAISO does not anticipate any impact on its processing timelines. In the event there are conditions in the PacifiCorp balancing authority area(s) that potentially could delay the day-ahead processes, the CAISO would adhere to its timelines and address the PacifiCorp conditions through the same mechanisms the CAISO would use to resolve infeasibilities in its own balancing authority area. Accordingly, the CAISO will ensure that it maintains the day-ahead processing timelines while performing the nodal pricing model services set forth in the Agreement.

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[9] *Id.*, Section 2.2.1.

D. The Agreement Provides a Framework to Resolve Differences That May Arise

The Agreement represents a binding commitment of the parties. As such, it must provide a workable framework for the parties to resolve any differences and correct course along the way. On the other hand, the Agreement recognizes that committing to the services is a voluntary act on the part of PacifiCorp. Accordingly, the Agreement allows for termination by PacifiCorp for any reason, provided it has first entered into good-faith discussions for 30 days in an effort to resolve any differences. Likewise, the Agreement allows for termination by the CAISO if the parties are unable to reach agreement on a change in the annual nodal pricing model services fee or the CAISO is unable to demonstrate separation from the day-ahead market.[10] This and other related provisions mean that the parties must work closely together to achieve the goal of implementing the nodal pricing model and delivering the service on terms that remain just and reasonable.

E. Other Provisions

The Agreement includes a variety of standard provisions that round out the parties' commitment. These provisions are generally modeled on other terms and conditions accepted by the Commission with respect to CAISO *pro forma* service agreements, including some general provisions (Article V), dispute resolution (Article VI), uncontrollable forces (Article IX), and miscellaneous provisions (Article X). The limitation of liability and indemnification provisions (Article VIII) are segregated, with a commercial standard applicable to implementation and the CAISO tariff standard applicable to the service.

III. Treatment of Revenues Received Under the Agreement

The CAISO will treat all revenues it receives from PacifiCorp pursuant to the Agreement (*i.e.*, revenues for the annual nodal pricing model services fee) to offset the annual grid management charge revenue requirement. The formula used to calculate that revenue requirement includes an input for "CAISO Other Costs and Revenues", which the CAISO tariff defines to include penalties, interest earnings, and other revenues.[11] Therefore, the CAISO will include the annual services fee in this category, which includes offsets to the revenue

10 *Id.*, Section 2.2 *et seq.*

11 CAISO Tariff, Section 11.22.2; CAISO Tariff, Appendix F, Schedule 1, Part C.

requirement.[12] As such, the annual services fee will indirectly impact the Commission-jurisdictional rates under the grid management charge by reducing them pursuant to such offsets.

It is just and reasonable to use this existing tariff mechanism to reduce the grid management charge amounts that market participants are ultimately required to pay.[13]

IV. Effective Date

The CAISO requests that the Agreement be made effective on March 1, 2020. This will allow the parties sufficient time to complete the implementation activities prior to the service commencing on January 1, 2021.

V. Request for Waivers

The CAISO believes this filing constitutes a new service (delivery of the nodal pricing model solution) to a new customer (PacifiCorp), and is thus an initial rate schedule, subject to Section 35.12 of the Commission's rules, 18 C.F.R. § 35.12. This filing substantially complies with the requirements of Section 35.12 applicable to filings of this type. The CAISO respectfully requests waiver of any such requirement to the extent this filing does not satisfy that requirement.

Alternatively, in the event the Commission concludes that this filing is a change in a rate tariff or service agreement, the CAISO submits that the filing also substantially complies with the requirements of Section 35.13 of the Commission's rules, 18 C.F.R. § 35.13, applicable to filings of this type. In that event, the CAISO respectfully requests waiver of any such requirement to the extent this filing does not satisfy that requirement. In particular, the CAISO requests waiver of the requirement to submit Period 1 and Period 2 schedules, because, as explained above, the annual nodal pricing model services fee is based on an acceptable methodology and is subject to adjustment in the event the CAISO costs to provide the services change.

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[12] *See 2019 Budget and Grid Management Charge Rates* at 6, 55-56 (Dec. 13, 2018), available at [http://www.caiso.com/informed/Pages/StakeholderProcesses/Budget-GridManagementCharge.aspx.](http://www.caiso.com/informed/Pages/StakeholderProcesses/Budget-GridManagementCharge.aspx)

[13] *See, e.g.*, *Cal. Indep. Sys. Operator Corp.*, 149 FERC ¶ 61,232, at PP 5, 11 & n.9 (2014) (internal quotation marks omitted) (accepting as just and reasonable the CAISO's proposal to implement an Energy Imbalance Market administrative charge that "is not technically a GMC rate but, instead, a source of miscellaneous revenue that ultimately serves to reduce the revenue requirement").

In any event, good cause exists to waive filing requirements that are not material to the Commission's consideration of the Agreement.

VI. Service and Contents of this Filing

The CAISO has served copies of this filing upon all scheduling coordinators, PacifiCorp, the California Public Utilities Commission, and the California Energy Commission. In addition, the CAISO has posted the filing on the CAISO website.

Enclosed for filing is each of the following:

(1) This letter of transmittal; and

(2) the Agreement (Attachment A).

VII. Correspondence

The CAISO requests that all correspondence, pleadings, and other communications concerning this filing be served upon the following:

John C. Anders*
Assistant General Counsel
California Independent System
Operator Corporation
250 Outcropping Way
Folsom, CA 95630
Tel: (916) 608-7287
E-mail: janders@caiso.com

* Individual designated for service pursuant to Rule 203(b)(3), 18 C.F.R. § 203(b)(3).

VIII. Conclusion

The CAISO respectfully requests that the Commission accept this filing and permit the Agreement, CAISO Rate Schedule No. 6052, to be effective March 1, 2020. If there are any questions concerning this filing, please contact the undersigned.

Respectfully submitted,

By: *<u>/s/ John C. Anders</u>*

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Attorneys for the California Independent
System Operator Corporation

Attachment A – CAISO Rate Schedule No. 6052

Executed Agreement

Nodal Pricing Model Agreement between

Pacificorp and

California Independent System Operator Corporation

CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION

AND

PACIFICORP

NODAL PRICING MODEL AGREEMENT

NODAL PRICING MODEL AGREEMENT

THIS NODAL PRICING MODEL AGREEMENT ("AGREEMENT") is established this 20th day of December, 2019, and is accepted by and between:

(1) **PacifiCorp** ("PacifiCorp"), an Oregon corporation having its registered and principal executive office at 825 NE Multnomah Street, Portland, Oregon,

and

(2) **California Independent System Operator Corporation** ("CAISO"), a California nonprofit public benefit corporation having a principal executive office located at such place in the State of California as the CAISO Governing Board may from time to time designate.

PacifiCorp and the CAISO are hereinafter referred to as the "Parties."

Whereas:

A. PacifiCorp provides retail electric service in multiple states, and has arrangements among the state public utility commissions in which it provides electric service concerning the allocation of its power costs.

B. The CAISO operates the Day-Ahead Market pursuant to the CAISO Tariff and has in place the people, processes and technology necessary to support the bid-to-bill services associated with the Day-Ahead Market.

C. PacifiCorp is seeking a third-party administered power cost allocation arrangement that includes a day-ahead, security-constrained economic solution upon which market power costs can be equitably allocated among the states PacifiCorp provides retail electric service.

D. As a means to support PacifiCorp's objectives described in Recital C above, the CAISO proposes to leverage its existing Day-Ahead Market people, process and technology platform, and the full network model and data interfaces available in the Energy Imbalance Market, to provide PacifiCorp with a day-ahead nodal pricing solution (the "Nodal Pricing Solution").

E. PacifiCorp intends to use the results from the Nodal Pricing Solution as the basis for its power cost allocation among the states within which it provides retail electric service, consistent with the expectations of the associated state public utility commissions.

F. The Parties are entering into this Agreement to provide for the scope of work to implement the Nodal Pricing Solution, the ongoing nodal pricing model services that the CAISO would deliver (the “NPM Services”), and the corresponding rate that PacifiCorp would pay for such implementation work and NPM Services.

NOW THEREFORE, in consideration of the mutual covenants set forth herein, **THE PARTIES AGREE** as follows:

ARTICLE I
DEFINITIONS AND INTERPRETATION

1.1 Master Definitions Supplement. All capitalized terms and expressions used and not otherwise defined in this Agreement shall have the same meaning as those contained in the Master Definitions Supplement to the CAISO Tariff.

1.2 Rules of Interpretation. The following rules of interpretation and conventions shall apply to this Agreement:

(a) if and to the extent a matter is specifically addressed by a provision of this Agreement, the provision of this Agreement shall govern notwithstanding any inconsistent provisions of the CAISO Tariff;

(b) if and to the extent this Agreement provides that a matter shall be determined in accordance with the applicable provisions of the CAISO Tariff, the applicable provisions of the CAISO Tariff shall govern;

(c) the singular shall include the plural and vice versa;

(d) the masculine shall include the feminine and neutral and vice versa;

(e) “includes” or “including” shall mean “including without limitation”;

(f) references to a Section, Article or Schedule shall mean a Section, Article or a Schedule of this Agreement, as the case may be, unless the context otherwise requires;

(g) a reference to a given agreement or instrument shall be a reference to that agreement or instrument as modified, amended, supplemented or restated through the date as of which such reference is made;

(h) unless the context otherwise requires, references to any law shall be deemed references to such law as it may be amended, replaced or restated from time to time;

(i) unless the context otherwise requires, any reference to a "person" includes any individual, partnership, firm, company, corporation, joint venture, trust, association, organization or other entity, in each case whether or not having separate legal personality;

(j) unless the context otherwise requires, any reference to a Party includes a reference to its permitted successors and assigns;

(k) any reference to a day, week, month or year is to a calendar day, week, month or year;

(l) unless the context requires otherwise, "or" is used in the conjunctive sense; and

(m) the captions and headings in this Agreement are inserted solely to facilitate reference and shall have no bearing upon the interpretation of any of the terms and conditions of this Agreement.

ARTICLE II
TERM AND TERMINATION

2.1 Effective Date. This Agreement shall become effective upon the date the Agreement is accepted, approved or otherwise permitted to take effect by FERC, without condition or modification unsatisfactory to either Party ("Effective Date"), and shall remain in full force and effect until terminated pursuant to Section 2.2 of this Agreement.

2.1.1 Modification by FERC. In the event FERC requires any modification to the Agreement or imposes any other condition upon its acceptance or approval of the Agreement, each Party shall have ten (10) days to notify the other Party that any such modification or condition is unacceptable to that Party. If no Party provides such notice, then the Agreement, as modified or conditioned by FERC, shall take effect as of the date determined under section 2.1. If either Party provides such notice to the other Party, the Parties shall take any one or more of the following actions: (i) meet and confer and agree to accept any modifications or conditions imposed by such FERC order; (ii) jointly seek further administrative or legal remedies with respect to such FERC order, including a request for rehearing or clarification; or (iii) enter into negotiations with respect to accommodation of such FERC order, provided however, if the Parties have not agreed to such an accommodation within thirty (30) days after the date on which such FERC order becomes a final and non-appealable order, such order shall be deemed an adverse order and the Parties shall have no further rights and obligations under this Agreement.

2.2 Termination. The Parties may mutually agree to terminate this Agreement in writing at any time. In addition, the CAISO may terminate this Agreement for default in accordance with Section 2.2.1 and PacifiCorp may terminate this Agreement in its sole discretion after conclusion of the negotiation period in Section 2.2.2. The Parties acknowledge that in any case the CAISO is required to file a timely notice of termination with FERC, and that this Agreement will terminate upon acceptance by FERC of such a notice of termination in accordance with FERC requirements. In the event this Agreement is terminated, this Agreement will become wholly void and of no further force and effect, and the liabilities and obligations of the Parties hereunder will terminate, and each Party shall be fully released and discharged from any liability or obligation under this Agreement unless survival is otherwise provided.

2.2.1 Termination by CAISO. The CAISO may terminate this Agreement by giving written notice of termination pursuant to the CAISO Tariff in the event that: (1) PacifiCorp or its Scheduling Coordinator commits any material default under this Agreement that, if capable of being remedied, is not remedied within thirty (30) days after the CAISO has given the PacifiCorp written notice of the default; (2) the Parties are unable to reach agreement on a change to Attachment A as provided in Section 4.1 or Section 4.2; or (3) the CAISO reasonably determines, prior to the start of NPM Services, that the Nodal Pricing Solution will adversely impact the Day-Ahead Market. Notwithstanding any provision in this Agreement to the contrary, if CAISO terminates this Agreement under clause (3) above, PacifiCorp shall not be responsible for any costs incurred by CAISO related to implementation of the Nodal Pricing Solution.

2.2.2 Termination by PacifiCorp. Except as provided in the last sentence of this Section 2.2.2, in the event that PacifiCorp no longer wishes to pursue the Nodal Pricing Solution or, after implementation of the Nodal Pricing Solution, receive NPM Services from the CAISO, it must first notify the CAISO in writing of its intent to do so ("Notice of Intent to Terminate") and engage in thirty (30) days of good faith negotiations in an effort to resolve its concerns. If the Parties successfully resolve PacifiCorp's concerns, PacifiCorp shall notify the CAISO in writing of the withdrawal of such Notice ("Notice of Resolution"). At the time the Notice of Intent to Terminate is provided, or any time thereafter unless a Notice of Resolution is issued, PacifiCorp may provide written notice directing the CAISO to suspend the NPM Services for a specified period of time ("Notice to Suspend Service"). Upon receipt of a Notice to Suspend Service, the CAISO shall discontinue the services. The CAISO may continue processing PacifiCorp service invoices already issued pursuant to Section 4.2 of this Agreement but will not issue any new invoices for services following the issuance of a Notice to Suspend Service. Any time after 30 days from the date of the Notice of Intent to Terminate, and prior to the date of a Notice of Resolution, PacifiCorp may terminate this Agreement in its sole discretion and for any reason by providing written notice to the CAISO that it is terminating this Agreement ("Termination Notice"). Notwithstanding what is otherwise provided in this Section 2.2.2, PacifiCorp is not required to provide a Notice of Intent to Terminate and may immediately provide a Termination Notice concurrent with PacifiCorp's participation in an extended Day-Ahead Market developed by the CAISO.

2.3 No Termination Charge. The CAISO shall not levy an exit fee or other charge associated with CAISO systems, procedures, or other changes that may be required by the termination of this Agreement by either Party, unless PacifiCorp terminates this Agreement prior to the date the NPM Services commence, in which case PacifiCorp will pay the CAISO the implementation costs reasonably incurred by CAISO and agreed to by the Parties. In any event, PacifiCorp's payment obligations incurred under this Agreement prior to the effective date of such termination shall survive until satisfied by PacifiCorp or its Scheduling Coordinator.

ARTICLE III
SCOPE OF WORK AND SERVICES

3.1 Scope of Implementation Work. The Parties shall complete the work necessary to implement the NPM Services as described in Attachment A.

3.2 Scope of Services. The Parties shall perform the tasks necessary to deliver the NPM Services as described in Attachment A.

3.3 Changes to Attachment A. Either Party may propose a change in Attachment A to the other Party. If a Party proposes a change in Attachment A, the Parties shall negotiate in good faith to attempt to reach agreement on the proposal, any necessary changes in Attachment A and any other affected provision of this Agreement. The agreement of the Parties to a change in Attachment A must be memorialized in a revision to Attachment A and authorized by the Parties' designated executives, which will then be binding on the Parties without the need for execution of an amendment to this Agreement. Changes to any provision of this Agreement other than Attachment A must be reflected in an executed amendment to this Agreement, and be accepted by FERC to be binding on the Parties.

3.4 Services Review Meetings. At least once per month during the implementation phase, and at least once per quarter during the term of the NPM Services, the Parties' designated executives, or their designees, will meet telephonically or in person (at a mutually agreed to location) to discuss the continued appropriateness of Attachment A. For purposes of this Agreement, "designated executive" shall mean the individual identified in Attachment B, or their designee or successor.

ARTICLE IV
SETTLEMENTS AND BILLING

4.1 Payment for NPM Services. PacifiCorp shall pay the CAISO an annual fee of $8.4 million for costs incurred by the CAISO to perform the NPM Services (the "NPM Services Fee"). The NPM Services Fee will be subject to adjustment in either of the following circumstances: (1) if the Parties agree to a change in Attachment A in accordance with Section 3.3 and agree an adjustment to the NPM Services Fee is warranted in light of such change; or (2) the CAISO provides notice to PacifiCorp that its costs to continue delivery of the NPM Services exceed the NPM Services Fee and the CAISO Operating Costs have increased by at least two percent (2%) since the date the NPM Services Fee was most recently established and agreed upon by the Parties; provided, however, that a change in the NPM Services Fee under this clause (2) may not occur more frequently than annually. The CAISO will invoice PacifiCorp or its Scheduling Coordinator for the NPM Services Fee quarterly. Invoicing, including disputes, will be addressed by PacifiCorp or its Scheduling Coordinator.

4.2 Disputed Invoice. If PacifiCorp or its Scheduling Coordinator disputes any portion of any amount specified in an invoice delivered by the CAISO with respect to the NPM Services, PacifiCorp shall pay its total amount of the invoice when due, and identify the disputed amount and state that the disputed amount is being paid under protest. Any disputed amount shall be resolved pursuant to the provisions of Section 6.1. If it is determined pursuant to Section 6.1 that an overpayment or underpayment has been made by PacifiCorp or any amount on an invoice is incorrect, then (i) in the case of any overpayment, the CAISO shall promptly return the amount of the overpayment (or credit the amount of the overpayment on the next invoice) to PacifiCorp; and (ii) in the case of an underpayment, PacifiCorp shall promptly pay the amount of the underpayment to the CAISO. Any overpayment or underpayment shall include interest for the period from the date of overpayment, underpayment, or incorrect allocation, until such amount has been paid or credited against a future invoice calculated in the manner prescribed for calculating interest in Section 4.1. All costs necessary to deliver the NPM Services not provided for in this Agreement shall be borne separately by each Party and recovered through rates as may be authorized by their respective regulatory authorities.

ARTICLE V
GENERAL PROVISIONS

5.1 Agreement Subject to CAISO Tariff. Except as provided in Section 1.2(a), this Agreement shall be subject to the CAISO Tariff, which shall be deemed to be incorporated herein.

5.2 Communication. The Parties will develop a communication protocol for the dissemination of material information associated with the NPM Services. The designated executive listed in Attachment B will oversee the communication protocol. The Parties will mutually consult with each other during the term of this Agreement as contemplated by the communication protocol.

5.3 No Other Relationships. Nothing contained in this Agreement shall be construed as creating a corporation, company, partnership, association, joint venture or other entity, nor shall anything contained in this Agreement be construed as creating or requiring any fiduciary relationship between the Parties. No Party shall be responsible hereunder for the acts or omissions of the other Party. This Agreement is for the sole and exclusive benefit of the Parties and shall not create a contractual relationship with, or cause of action in favor of, any third party.

ARTICLE VI
DISPUTE RESOLUTION

6.1 Dispute Resolution. The Parties shall make reasonable efforts to settle all disputes arising out of or in connection with this Agreement. In the event any dispute is not settled, the Parties shall adhere to the CAISO ADR Procedures set forth in Section 13 of the CAISO Tariff, which is incorporated by reference, except that any reference in Section 13 of the CAISO Tariff to Market Participants shall be read as a reference to the PacifiCorp and references to the CAISO Tariff shall be read as references to this Agreement.

ARTICLE VII
REPRESENTATIONS AND WARRANTIES

7.1 Representation and Warranties. Each Party represents and warrants that the execution, delivery and performance of this Agreement by it has been duly authorized by all necessary corporate and/or governmental actions, to the extent authorized by law.

ARTICLE VIII
LIABILITY

8.1 Liability; Indemnification.

(a) Each Party acknowledges and agrees that the other Party shall not be liable to it for any claim, loss, cost, liability, damage or expense, including any direct damage or any special, indirect, exemplary, punitive, incidental or consequential loss or damage (including any loss of revenue, income, profits or investment opportunities or claims of third party customers), arising out of or directly or indirectly related to the other Party's decision to enter into this Agreement, or the other Party's performance under this Agreement.

(b) Each Party shall indemnify, defend and hold harmless the other Party and its officers, directors, employees, agents, contractors and sub-contractors, from and against all third party claims, judgments, losses, liabilities, costs, expenses (including reasonable attorneys' fees) and damages for personal injury, death or property damage, caused by the negligence or willful misconduct related to this Agreement or breach of this Agreement of the indemnifying Party, its officers, directors, agents, employees, contractors or sub-contractors, provided that this indemnification shall be only to the extent such personal injury, death or property damage is not attributable to the negligence or willful misconduct related to this Agreement or breach of this Agreement of the Party seeking indemnification, its officers, directors, agents, employees, contractors or sub-contractors; provided, however, that this clause (b) shall not apply to NPM Services following final implementation of the Nodal Pricing Solution. The indemnified Party shall give the other Party prompt notice of any such claim. The indemnifying Party, in consultation with the indemnified Party, shall have the right to choose competent counsel, control the conduct of any litigation or other proceeding, and settle any claim. The indemnified Party shall provide all documents and assistance reasonably requested by the indemnifying Party.

(c) Following final implementation of the Nodal Pricing Solution and upon commencement of the NPM Services, the provisions of Section 14 of the CAISO Tariff will apply to liability arising under this Agreement, except that all references in Section 14 of the CAISO Tariff to Market Participants shall be read as references to the PacifiCorp and references to the CAISO Tariff shall be read as references to this Agreement.

ARTICLE IX
UNCONTROLLABLE FORCES

9.1 Uncontrollable Forces Tariff Provisions. Section 14.1 of the CAISO Tariff shall be incorporated by reference into this Agreement except that all references in Section 14.1 of the CAISO Tariff to Market Participants shall be read as a reference to the PacifiCorp and references to the CAISO Tariff shall be read as references to this Agreement.

ARTICLE X
MISCELLANEOUS

10.1 Assignments. Either Party may assign or transfer any or all of its rights or obligations under this Agreement with the other Party's prior written consent in accordance with Section 22.2 of the CAISO Tariff and no Party may assign or transfer any or all of its rights or obligations under this Agreement without such consent. Such consent shall not be unreasonably withheld. Any such transfer or assignment shall be conditioned upon the successor in interest accepting the rights or obligations under this Agreement as if said successor in interest were an original Party to this Agreement.

10.2 Notices. Any notice, demand or request which may be given to or made upon either Party regarding this Agreement shall be made in accordance with Section 22.4 of the CAISO Tariff, provided that all references in Section 22.4 of the CAISO Tariff to Market Participants shall be read as a reference to the PacifiCorp and references to the CAISO Tariff shall be read as references to this Agreement, and unless otherwise stated or agreed shall be made to the representative of the other Party indicated in Attachment B. A Party must update the information in Attachment B of this Agreement as information changes. Such changes shall not constitute an amendment to this Agreement.

10.3 Waivers. Any waiver at any time by either Party of its rights with respect to any default under this Agreement, or with respect to any other matter arising in connection with this Agreement, shall not constitute or be deemed a waiver with respect to any subsequent default or other matter arising in connection with this Agreement. Any delay, short of the statutory period of limitations, in asserting or enforcing any right under this Agreement shall not constitute or be deemed a waiver of such right.

10.4 Governing Law and Forum. This Agreement shall be deemed to be a contract made under, and for all purposes shall be governed by and construed in accordance with, the laws of the State of California, except its conflict of law provisions. The Parties irrevocably consent that any legal action or proceeding arising under or relating to this Agreement to which the CAISO ADR Procedures do not apply shall be brought in any of the following forums, as appropriate: any court of the State of California, any federal court of the United States of America located in the State of California, or, where subject to its jurisdiction, before the Federal Energy Regulatory Commission. To the fullest extent permitted by law, each of the Parties hereto waives any right it may have to a trial by jury in respect of litigation directly or indirectly arising out of, under or in connection with this Agreement. Each Party further waives any right to consolidate, or to request the consolidation of, any action in which a jury trial has been waived with any other action in which a jury trial cannot be or has not been waived.

10.5 Consistency with Federal Laws and Regulations. This Agreement shall incorporate by reference Section 22.9 of the CAISO Tariff as if the references to the CAISO Tariff were referring to this Agreement.

10.6 Merger. This Agreement constitutes the complete and final agreement of the Parties with respect to the subject matter hereof and supersedes all prior agreements, whether written or oral, with respect to such subject matter.

10.7 Severability. If any term, covenant, or condition of this Agreement or the application or effect of any such term, covenant, or condition is held invalid as to any person, entity, or circumstance, or is determined to be unjust, unreasonable, unlawful, imprudent, or otherwise not in the public interest by any court or government agency of competent jurisdiction, then such term, covenant, or condition shall remain in force and effect to the maximum extent permitted by law, and all other terms, covenants, and conditions of this Agreement and their application shall not be affected thereby, but shall remain in force and effect and the Parties shall be relieved of their obligations only to the extent necessary to eliminate such regulatory or other determination unless a court or governmental agency of competent jurisdiction holds that such provisions are not separable from all other provisions of this Agreement.

10.8 Amendments. This Agreement may be amended from time to time by the mutual agreement of the Parties in writing. Amendments that require FERC approval shall not take effect until FERC has accepted such amendments for filing and made them effective. Nothing contained herein shall be construed as affecting in any way the right of the CAISO to unilaterally make application to FERC for a change in the rates, terms and conditions of this Agreement under Section 205 of the FPA and pursuant to FERC's rules and regulations promulgated thereunder, and the PacifiCorp shall have the right to make a unilateral filing with FERC to modify this Agreement pursuant to Section 206 or any other applicable provision of the FPA and FERC's rules and regulations thereunder; provided that each Party shall have the right to protest any such filing by the other Party and to participate fully in any proceeding before FERC in which such modifications may be considered. Nothing in this Agreement shall limit the rights of the Parties or of FERC under Sections 205 or 206 of the FPA and FERC's rules and regulations thereunder, except to the extent that the Parties otherwise mutually agree as provided herein.

10.9 Confidentiality. Each Party's confidential information will be treated in accordance with Section 20 of the CAISO Tariff and any other applicable data sharing agreements in effect between the Parties.

10.10 Counterparts. This Agreement may be executed in one or more counterparts at different times, each of which shall be regarded as an original and all of which, taken together, shall constitute one and the same Agreement.

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be duly executed on behalf of each by and through their authorized representatives as of the date hereinabove written.

California Independent System Operator Corporation

By: Petar Ristanovic

Name: Petar Ristanovic

Title: Vice President, Technology

Date: 12/18/2019

PacifiCorp

By: Joseph P. H

Name: Joseph P. Hoerner

Title: Senior Vice President, Regional Grid Solutions

Date: 12-18-19

ATTACHMENT A

SCOPE OF IMPLEMENTATION WORK AND SERVICES

[Sections 3.1 and 3.2]

I. Introduction

PacifiCorp has requested that the California Independent System Operator (CAISO) provide a Nodal Pricing Model (NPM) that can be used to clear energy supply and demand bids for the PacifiCorp Balancing Authority Areas (BAA) one day ahead. PacifiCorp intends to use the nodal prices produced by the model to calculate the Net Power Cost (NPC) for each state under its service territory. The CAISO will leverage its existing Day-Ahead Market (DAM) technology platform, the full network model, and data interfaces available in the real-time Energy Imbalance Market (EIM) to provide the NPM solution. PacifiCorp is currently an EIM Entity participating in the EIM and has already developed systems and data interfaces with the EIM in submitting data and receiving settlement statements. Consequently, the proposed solution would only require a modest expansion of PacifiCorp's bidding, scheduling, and settlement systems for the NPM, while gaining access to the CAISO's advanced security constrained unit commitment tool.

II. Nodal Pricing Model Solution

The DAM market footprint is limited to the CAISO BAA (CISO). Other BAAs are modeled as external BAAs, similarly to non-EIM BAAs in the EIM. Although supply and demand schedules in the external BAAs are not optimized, they are modeled as fixed in the DAM to produce an accurate market and power flow solution. The CAISO, as the Reliability Coordinator of the West (RC WEST), receives the demand forecast and generation schedules for the next day from EIM BAAs and external BAAs, as well as the Area-To-Area Net Schedule Interchange (AANSI) between BAAs.

For the NPM solution, the CAISO will include in the DAM footprint the PacifiCorp BAAs, i.e., PACW and PACE, which are modeled as individual BAAs in the EIM. Using software features and a technology optimization algorithm similar to the EIM, the CAISO will produce optimal unit commitment and hourly energy schedules for supply resources in PACW and PACE, subject to a power balance constraint for each of these BAAs, in addition to the power balance constraint for CISO and active transmission network constraints in CISO, PACE, PACW. Energy transfers between PACW and PACE will be optimally scheduled, subject to applicable scheduling limits, whereas the net energy transfer of CISO will be fixed at zero to prevent energy exchange between CISO and PacifiCorp that may impact the CAISO's DAM solution. The binding constraint on the CISO zero net energy transfer would provide marginal energy price isolation between CISO and PacifiCorp, while permitting wheel through.

Although the net energy transfer of CISO will be constrained to zero, PacifiCorp will be able to continue its participation in the CAISO DAM with import/export bids at any CAISO Scheduling Point, the same as it does today. These schedules are not part of any energy transfer, but they are mirrored at Mirror System Resources (MSRs) that are defined for PacifiCorp at CAISO Scheduling Points. The schedules at these MSRs are included in the PACW or PACE power balance constraints; hence, the energy associated with the imports/exports to/from CISO will be generated/consumed in PACW or PACE, accordingly. To facilitate the scheduling of MSRs, they will be defined with the Auto-Mirror functionality so that their schedules will be automatically calculated by the DAM to match associated import/export bids from PacifiCorp as they clear the DAM at the corresponding CAISO Scheduling Points.

The DAM optimization engine is a Security Constrained Unit Commitment (SCUC) application employing a Mixed Integer Linear Programming (MILP) solver that iterates with an AC power flow (ACPF) to linearize the system equations for each hourly interval in the Trading Day market horizon. Transmission losses are accounted within each BAA by the ACPF via the Area Interchange Control feature that adjusts the distributed load slack in each BAA to maintain the optimal Net Scheduled Interchange (NIC) while correcting for linearization error. Then, Loss Penalty Factors (LPFs) are used to account for the marginal transmission losses in the linearized power balance constraints enforced in the SCUC. The LPFs are loss sensitivities that are currently calculated at the ACPF solution with reference the distributed load over the market footprint. To isolate marginal transmission losses between PacifiCorp and CISO, the CAISO will implement BAA-specific LPFs with reference to the distributed load in each BAA. Using BAA-specific LPFs will isolate the marginal cost of losses between PACW/PACE and CISO in the same market run simultaneous optimization solution.

The linearized transmission constraints enforced in SCUC use shift factors that are linear sensitivities, which depend on the transmission network configuration. The shift factors to a binding transmission constraint are currently calculated with reference to the distributed load over the market footprint. To isolate congestion management between PACW/PACE and CISO, the CAISO will ignore the cross-BAA shift factors between PACW/PACE and CISO as follows: shift factors of CAISO resources on transmission constraints in PACW and PACE will be ignored; similarly, shift factors of PACW and PACE resources on transmission constraints in CISO will be ignored. Ignoring the cross-BAA shift factors in the formulation of transmission constraints will isolate the marginal cost of transmission congestion between PACW/PACE and CISO to be solely based on transmission congestion inside PACE and PACW BAAs for PacifiCorp's resources, and transmission congestion inside CISO BAA for CAISO's resources.

With the proposed changes discussed above, the CAISO will be able to optimize generation schedules in PACW and PACE while maintaining complete price separation with CISO.

The CAISO will also be able to produce results supporting optimal procurement of ancillary services to meet the corresponding requirements in PACW and PACE, by designating these BAAs as separate ancillary services (AS) regions with distinct requirements. The software also supports multiple nested AS regions to be defined within each BAA, if needed. The regional ancillary services procurement results would isolate the marginal ancillary services prices between PACW/PACE and CISO.

The ancillary services are the following:

- Regulation Up and Down;
- Spinning Reserve; and
- Non-Spinning Reserve

All ancillary services have a 10-minute ramping requirement, which is shared among the upward services. Both spinning and non-spinning reserve are contingency reserves, but non-spinning reserve can also be provided by offline resources that can start up within 10 minutes. The upward ancillary services procurement is cascaded so that spin can meet non-spin requirements, and regulation up can meet both spin and non-spin requirements, to minimize the overall procurement cost.

The CAISO also anticipates that with the implementation of the enhancements to the DAM, that the DA Flexible Ramp Up and Down, also known as imbalance reserve, will be added to the list of DAM market commodities. These are 15-minute ramping products procured one day ahead to cover uncertainty that may materialize in the Fifteen Minute Market (FMM) compared to the DAM. As these products become available for use in the FMM, they will be available for PACW and PACE and should assist with passing the EIM flexible ramp sufficiency tests.

III. Nodal Pricing Model Project Scope

The following table lists the features of the DAM solution, and identifies whether they are in or out of scope for the NPM Services. No later than March 1, 2019, the Parties will develop a detailed schedule for the work necessary to implement the NPM Services for commencement on January 1, 2021.

#	DAM Feature	NPM Scope	Comments
1	Full network model	In	Same as the network model used in the EIM.
2	Optimal unit commitment	In	Based on 3-part (start-up cost, minimum load cost, and incremental energy cost) energy bids for PacifiCorp resources, including state transition costs for multi-state resources.
3	Self-commitment	In	Achieved with a self-schedule.
4	Supply and demand power balance	In	Achieved with power balance constraints for PACW, PACE, and CISO, with an optimal energy transfer between PACW and PACE, and a zero net energy transfer for CISO. Self-schedules should be submitted for non-participating loads.
5	Transmission loss model	In	Maintaining NSI in ACPF and using BAA-specific LPFs with reference to the corresponding BAA distributed load.

#	DAM Feature	NPM Scope	Comments
6	Congestion management	In	All applicable transmission and contingency constraints will be enforced as in the EIM, including scheduling limits for energy transfers between PACW and PACE. Shift factors from PacifiCorp resources to CISO constraints and vice versa will be ignored.
7	Ancillary services procurement	In	Based on PACW/PACE ancillary services requirements and ancillary services bids from PacifiCorp resources with support for ancillary services self-provision.
8	Variable Energy Resource (VER) forecast	In	Based on the VER forecast for PacifiCorp VERs, which will be used as a cap on energy bids and self-schedules.
9	Resource Adequacy (RA)	Out	No PacifiCorp resource is registered under the RA program.
10	Virtual supply and demand bids	Out	There will be no virtual resources registered for PacifiCorp.
11	Greenhouse gas regulation	Out	There will be no GHG bid adder or attribution for PacifiCorp resources since the net energy transfer of CISO will be fixed at zero.
12	Market power mitigation	Out	PACW and PACE will be present in the market power mitigation pass, but all binding constraints in PACW and PACE will be considered competitive, hence PacifiCorp resources will not be mitigated.
13	Residual Unit Commitment(RUC)	Out	PACW and PACE will be present in the RUC pass, but load self-schedules should match the demand forecast and without RUC availability bids the RUC MW solution of PacifiCorp's resources should match closely the IFM solution. RUC schedules will not be published for PacifiCorp resources since they will be the same as the IFM schedules.
14	Congestion Revenue Rights	Out	No CRR source/sink locations will be defined within PACW and PACE in the CRR model.
15	DA Flexible Ramping Product (imbalance reserve)	In	The DA flexible ramping product will be included when the feature is included in the DAM.

#	DAM Feature	NPM Scope	Comments
16	Third-party load	In	PacifiCorp will not submit third-party load schedules; the CAISO will calculate these as the difference between the PACW/PACE demand forecast (minus a loss percentage) and the submitted PacifiCorp load self-schedules. The calculated third-party load schedules will be distributed to defined Custom Load Aggregation Points (CLAPs) in PACW/PACE based on Distributed Load Factors (LDFs) calculated by CAISO based on historical state estimator values.
17	Third-party generation	In	PacifiCorp will not submit third-party generation schedules; the CAISO will calculate third-party aggregate generation as equal to the third-party load schedules (plus a loss percentage), assuming that they are balanced (Some of the load difference may be interchange related rather than generation but this approach assumes all third-party net load is served by the third party generation). The third-party generation will be distributed as generation self-schedules to defined Generation Aggregation Points (GAPs) in PACW/PACE based on Generation Distributed Factors (GDFs) calculated by CAISO based on historical state estimator values.
18	Balancing of individual state loads	Out	The NPM optimization will not balance individual state loads. It is PacifiCorp responsibility based on the NPM results to calculate and allocate the NPC to each individual state load.
19	Intertie scheduling constraints	Out	The NPM optimization will not enforce intertie scheduling constraints for PACW/PACE interties except for optimizing the energy transfer between PACW and PACE.
20	Import/export bids at CAISO Scheduling Points	In	This is existing functionality that will be maintained using System Resources at CAISO Scheduling Points. Auto-Mirror System Resources will be defined for PACW and PACE at relevant CAISO Scheduling Points to mirror automatically associated import/export schedules in PACW or PACE power balance.

IV. Input Data and Interfaces

The following table describes the input data required from PacifiCorp for the NPM Services, as well as the interface and timing for the submission of this data. The implementation work will account for testing of the interfaces and submissions required for the NPM Services to commence on January 1, 2021.

#	Input Data	Data Interface	Timing	Comments
1	Network model for PACW and PACE.			Same as the one used in the EIM and RC.
2	Resource registration in the Master File.	Resource data template (RDT)		Similar to the one used in the EIM, but with some extra fields such as ancillary services certification, but no RUC certification.

3	Generating resource bids for the next Trading Day:
	• Start-up cost
	• Minimum load cost
	• State transition cost (for MSGs)
	• Daily energy limits
	• Hourly energy bid
	• Hourly energy self-schedule
	• Hourly capacity bid for:
	  o regulation up
	  o regulation down
	  o spinning reserve
	  o non-spinning reserve
	• Hourly self-provision for:
	  o regulation up
	  o regulation down
	  o spinning reserve
	  o non-spinning reserve
	• Hourly GDFs values (for market aggregate resources)
	• Hourly FRU bid (with enhanced DAM)
	• Hourly FRD bid (with enhanced DAM)
		SIBR	Daily by 10:00am	Hourly energy self-schedules and ancillary services self-provisions indicate self-commitment. For simplicity, regulation mileage bids should not be submitted (SIBR will generate zeros). No schedule submission for third-party generation.

#	Input Data	Data Interface	Timing	Comments

4	Non-Generator Resource (NGR) bids for the next Trading Day:
	• Initial state of charge (SOC) and daily SOC limits (for LESR)
	• Hourly energy bid
	• Hourly self-schedule
	• Hourly capacity bid for:
	  o regulation up
	  o regulation down
	  o spinning reserve
	  o non-spinning reserve
	• Hourly self-provision for:
	  o regulation up
	  o regulation down
	  o spinning reserve
	  o non-spinning reserve
	• Hourly GDFs (for market aggregate resources)
	• Hourly FRU bid (with enhanced DAM)
	• Hourly FRD bid (with enhanced DAM)
		SIBR	Daily by 10:00am	For simplicity, regulation mileage bids should not be submitted (SIBR will generate zeros).

5	Intertie Resource bids for the next Trading Day: • Hourly self-schedule	SIBR	Daily by 10:00am	Only self-schedules should be submitted for intertie resources between PAC and other BAs excluding CISO because these will clear in the market. Third-party interchange transactions will not be submitted by PAC or the third-parties to the CISO SIBR system.
6	Non-participating load resource bids for the next Trading Day: • Hourly self-schedule	SIBR	Daily by 10:00am	Only self-schedules should be submitted for load on the PACW and PACE ELAPs, excluding third-party load.

#	Input Data	Data Interface	Timing	Comments
7	Hourly VER forecast for the next Trading Day.	ALFS	Daily by 10:00am	Used as a cap on energy bids and self-schedules.
8	Hourly ancillary services requirements for PACW and PACE for the next Trading Day: • Hourly requirement for: o regulation up o regulation down o spinning reserve o non-spinning reserve	NEW (ALFS or BSAP)	Daily by 10:00am	PACW and PACE will be defined as ancillary services regions.
9	Hourly transmission corridor limits for TCORs in PACW and PACE and scheduling limits for ETSRs between PACW and PACE (not with CISO).	NEW (Similar to EIM dynamic limits)	Daily by 10:00am	Similar to the ones used in the EIM.
10	Generating resource and NGR planned outages for the next Trading Day and the following 6 days.	OMS	7 days ahead	Same as the ones used in the EIM.
11	Transmission planned outages for the next Trading Day and the following 6 days.	OMS	7 days ahead	Same as the ones used in the EIM.
12	FRU/FRD uncertainty requirements for PACW and PACE for the next Trading Day (with enhanced DAM).	NEW (ALFS)		provided by PAC
13	PACW and PACE BAAs hourly demand forecast including third-party loads for next Trading Day.	ALFS	4-7 days ahead and updated daily by 10:00am	Same as the RC used PACW and PACE BAAs' day ahead demand forecast

V. Output Data and Interfaces

The following table describes the output data available to PacifiCorp for the NPM Services, as well as the interface and timing for the retrieval of this data. The implementation work will account for confirmation of the data availability supporting the NPM Services to commence on January 1, 2021.

#	Output Data	Data Interface	Timing	Comments
1	Advisory day-ahead hourly energy schedules for PacifiCorp generating resources and NGRs.	Customer Market Results Interface (CMRI)	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity.
2	Advisory unit commitment for PacifiCorp generating resources and advisory state transitions for PacifiCorp MSGs.	CMRI	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity.
3	Advisory day-ahead hourly energy schedules for PacifiCorp intertie resources, including optimal energy transfers between PACW and PACE.	CMRI	Daily after 1:00pm	For all intertie resources, except the ETSRs between PACW and PACE, the day-ahead energy schedules will echo back the submitted intertie resource self-schedules.
4	Advisory day-ahead hourly energy schedules for PACW and PACE ELAPs.	CMRI	Daily after 1:00pm	They will mainly echo back the submitted load self-schedules.
5	Advisory day-ahead hourly ancillary services awards for PacifiCorp generating resources and NGRs.	CMRI	Daily after 1:00pm	Regulation Up/Down, Spinning Reserve, and Non-Spinning Reserve.
6	Advisory day-ahead hourly FRP awards for PacifiCorp generating resources and NGRs (with enhanced DAM).	CMRI	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity. Flexible Ramp Up and Flexible Ramp Down.
7	Advisory day-ahead hourly LMPs for PacifiCorp generating resources, NGRs and inter-tie resources.	CMRI	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity. The LMP will also be broken down by component: Energy, Loss, and Congestion. LMP publication for PacifiCorp PNodes in OASIS will be suppressed.

#	Output Data	Data Interface	Timing	Comments
8	Advisory day-ahead hourly LMPs for PACW and PACE non-participating loads and ELAPs.	CMRI/OASIS	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity. The LMPs associated with the non-participating loads are published on CMRI, whereas the associated aggregate pricing locations' LMPs of the ELAPs are published on OASIS, and CAISO will have a flag to control OASIS publication if needed. The LMP will also be broken down by component: Energy, Loss, and Congestion.
9	Advisory day-ahead hourly ancillary services marginal prices (ASMPs) for PacifiCorp generating resources and NGRs.	CMRI	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity. The ASMP will be the same for all resources in PACW or PACE. Regulation Up/Down, Spinning Reserve, and Non-Spinning Reserve. ASMP publication for PACW and PACE in OASIS will be suppressed.
10	Advisory day-ahead hourly FRP marginal prices for PacifiCorp generating resources and NGRs (with enhanced DAM).	CMRI	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity. Flexible Ramp Up and Flexible Ramp Down. FRP price publication for PACW/PACE in OASIS will be suppressed.
11	Hourly binding transmission constraints in PACW and PACE and associated shadow prices, including binding energy transfer between PACW and PACE.	OASIS	Daily after 1:00pm	Similar to the ones from the EIM, but with hourly granularity. Currently, all binding transmission constraints go to OASIS.

#	Output Data	Data Interface	Timing	Comments
12	Advisory day-ahead energy settlement statements for PacifiCorp generating resources, NGRs, inter-tie schedules, PACW/PACE ELAPs, and day-ahead energy offset.	MRI-S	Based on ISO's settlement timeline	Similar to the ones from the EIM, but with hourly granularity.
13	Advisory day-ahead ancillary services settlement statements for PacifiCorp generating resources and NGRs.	MRI-S	Based on ISO's settlement timeline	Regulation Up/Down, Spinning Reserve, and Non-Spinning Reserve.
14	Advisory day-ahead hourly FRU/FRD settlement for PacifiCorp generating resources and NGRs (with enhanced DAM).	MRI-S	Based on CAISO's Settlement timeline	Similar to the ones from the EIM, but with hourly granularity and no forecasted movement settlement. Flexible Ramp Up and Flexible Ramp Down.
15	Advisory day-ahead marginal transmission loss over-collection rebate to PACW and PACE	MRI-S	Based on CAISO's Settlement timeline	Similar to the Real-Time Loss Offset from the EIM.
16	Advisory day-ahead marginal congestion revenue rebate to PACW and PACE	MRI-S	Based on CAISO's Settlement timeline	Similar to the Real-Time Congestion Offset from the EIM.
17	Advisory day-ahead ancillary services cost allocation.	MRI-S	Based on CAISO's Settlement timeline	There will not be any "no pay" assessed on day-ahead ancillary services awards to PacifiCorp generating resources and NGRs. There are 5 ancillary services cost allocations in the DAM/RTM, but for the NPM the CAISO will produce a single cost allocation per PacifiCorp BAA, PACW and PACE.

#	Output Data	Data Interface	Timing	Comments
18	Advisory day-ahead FRP cost allocation (with enhanced DAM).	NEW MRI-S	Based on CAISO's Settlement timeline	There will not be any "no pay" assessed on day-ahead FRP awards to PacifiCorp generating resources and NGRs. Flexible Ramp Up and Flexible Ramp Down.
19	Advisory day-ahead Settlement statements would have a net zero balance on each statement.	MRI-S	Based on CAISO's Settlement timeline	This is a quality control measure. Since there are no import or exports with other EIM Entities or CAISO so neutrality and allocation should ensure each individual settlement statement sums to zero.

The day-ahead publication of results for the NPM is advisory only, i.e., there are no financially binding results that would be paid or charged. The day ahead energy schedules and ancillary services awards will be ignored in the EIM. CAISO will not impose in the EIM a must offer obligation for PacifiCorp day-ahead ancillary services awards or flexible ramping awards (contingent on future DAM enhancement).

Day-ahead energy and ancillary services prices for PacifiCorp resources will be published in CMRI for PacifiCorp, but they will not be published in OASIS in the public domain. Similarly, the publication of LMPs at PACW and PACE PNodes in OASIS will be suppressed. Furthermore, the day-ahead energy bids of PacifiCorp resources will not be published in the 6-month old reports under the Public Bids tab on OASIS.

Day-ahead price correction will apply to the day-ahead energy and ancillary services prices for PacifiCorp resources, and any corrected prices will be re-published after any corrections based on effective CAISO tariff and applicable BPM(s) related to price correction timelines.

The customer inquiry and dispute system (CIDI) and CAISO Settlement dispute process will be available for PacifiCorp regarding the advisory day-ahead Settlement as part of the NPM service.

VI. Additional Benefits of NPM Services

The CAISO's technology platform and optimization engine algorithm is recognized in the industry as a highly advanced and sophisticated market solution. All applicable rules, offered commodity products, resources' characteristics and models, transmission and scheduling constraints are already incorporated in the CAISO's optimization tool. Leveraging these capabilities instead of trying to mimic these very involved and highly complex mathematical models and algorithms will avoid costs that PacifiCorp would otherwise have to spend for an equivalent solution. Using a working technology platform that has proven its capabilities to expand to its BAAs will reduce both schedule and budget risk, and allow for expedient implementation of the NPC allocation methodology that PacifiCorp is seeking to implement based on the NPM solution.

Additionally, the CAISO optimization tool that was developed based on the principle of fair and just treatment to all market participants. The applicable rules are developed through a comprehensive, public, and transparent stakeholder process, and detailed technical and legal review and approval before it is ultimately accepted by FERC. The CAISO is fully independent from all market participants and does not own resources, participate in market transactions, or engage in other market activities. Its sole purpose is to facilitate transactions using the most efficient design and technology platform to serve this need while managing the transmission grid reliability. The CAISO as a fully independent entity and has the transparency and fairness rules for the development of any policy or developed software to support its services. Using the CAISO's optimization tool allows PacifiCorp to leverage the independence that the CAISO has established, hence saving PacifiCorp and its customers additional time and effort that would otherwise be required to achieve this level of independence.

Using the CAISO optimization tool ensures that the solution outcome is consistent with the actual CAISO market solution since it is using the same exact tool and input data. Positioning the PacifiCorp resources based on the same tool that is used in EIM and may later extend the DAM to other balancing authority areas is also an additional benefit. Having the consistency of the solution provided by the CAISO optimization tool will simplify comparison of MPM results with actual market results.

Another benefit of using the CAISO's optimization tool is the opportunity to leverage the network model that is used in the actual market run. The network model accurately models the entire WECC, and is updated monthly with each major release and daily with incremental changes. If another software optimization tool were used, it would be necessary for PacifiCorp to maintain the associated network model. Even if PacifiCorp uses another external tool and took the effort of maintaining the static network model, there are major other tasks that require dynamic data related to outages, de-rates, availability, and default switch position. These are time-consuming tasks to undertake, and still there would be no guarantee that the model is using what the CAISO actual market run uses.

Similarly, the importance of using the same schedule data for internal and external resources impacting the calculation of both scheduled and unscheduled loop flows is also critical when performing congestion management and enforcing physical flow transmission constraints. This requires significant daily effort to keep up to date the information about generation schedules, interchange schedules, outage schedules, load forecasts, load distribution factors, and variable energy resources forecasts. Using the actual market tool and data will ensure that the solution is consistent with what the CAISO market has actually used.

CAISO's tools in EIM and DAM also account for CAISO GHG policy. In the future, various states within PacifiCorp footprint may have their own GHG policies that need to be accounted for in NPC calculation. Using CAISO platform to support NPC calculation PacifiCorp may avoid expensive development of optimization tools to account for future GHG policies in member states.

Finally, the implementation of the NPM via the CAISO's optimization tool enables PacifiCorp to continue to participate in the CAISO DAM by bidding at existing CAISO Scheduling Points. This allows the NPM solution to account for the CAISO DAM cleared interchange transactions as one simultaneous optimization run. If another optimization tool were used, then the CAISO DAM cleared interchange transactions must be fixed in the optimization run and could not be allowed to change after the CAISO DAM has run. The benefit of simultaneous run via the CAISO's tool is that the resources and transmission constraints inside PacifiCorp that may impact the amount of feasible cleared interchange transactions in CAISO's DAM are dynamically enforced and accounted for inside the optimization rather than dealing with the situation after the fact in third party optimization tool.

ATTACHMENT B

NOTICES

[Sections 5.2 and 10.2]

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