GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: THE UNBUNDLING OF THE ASSETS OF THE PUERTO RICO ELECTRIC POWER AUTHORITY	**CASE NO.:** NEPR-AP-2018-0004 **SUBJECT:** April 15 Technical Conference; Presentation

MOTION TO SUBMIT PRESENTATION TO BE PROJECTED DURING THE APRIL 15, 2021 TECHNICAL CONFERENCE

TO THE HONORABLE PUERTO RICO ENERGY BUREAU:

1. On February 5, 2021, the Puerto Rico Energy Bureau of the Public Service Regulatory Board (the "Energy Bureau") issued a *Resolution and Order*[1] setting the procedural calendar for the case of caption. The procedural calendar establishes that the second Technical Conference will be held on April 15, 2021 (the "April 15 Technical Conference").

2. On April 9, 2021, the Energy Bureau issued a *Resolution an Order*[2] in which it stated that the April 15 Technical Conference will be held remotely and also, directing the Puerto Rico Electric Power Authority (the "Authority") to file a copy of the presentation to be used during the April 15 Technical Conference today, on or before 5:00 pm.

3. In compliance with the Order, the Authority hereby submits its presentation for the April 15 Technical Conference. Exhibit A.

WHEREFORE, the Authority respectfully requests the Energy Bureau to note the Authority's compliance with the Order.

RESPECTFULLY SUBMITTED.

In San Juan, Puerto Rico, this 13th day of April 2021.

[1] *Resolution and Order* entered on February 5, 2021 (the " Feb 5 Order").
[2] *Resolution and Order* entered on April 9 , 2021 (the "Order").

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CERTIFICATE OF SERVICE

It is hereby certified that, on this same date, I have filed the above motion with the Office of the Clerk of the Energy Bureau using its Electronic Filing System at https://radicacion.energia.pr.gov/login, and a courtesy copy of the filling was sent via e-mail to hrivera@oipc.pr.gov, ramonluisnieves@rlnlegal.com; manualgabrielfernandez@gmail.com; ccf@tcm.law.

In San Juan, Puerto Rico, this 13th day of April 2021.

/s Joannely Marrero Cruz
Joannely Marrero Cruz

Exhibit A

Guidehouse

Unbundled Rates for Wheeling

Technical Conference #2

PUERTO RICO ENERGY BUREAU

Puerto Rico Electric Power Authority

April 15, 2021

Purpose & Agenda

Purpose:

- Per Resolution and Order issued February 5, 2021 related to Case No. NEPR-AP-2018-0004, PREPA is required hold this Technical Conference to address the following:
  - Present preliminary findings related to the rate design and testing of the proposed unbundled rate
  - Present preliminary findings related to the work performed in the unform wheeling agreement
- To meet these requirements, PREPA's consultant, Guidehouse, has prepared the following materials and will discuss the work to date, preliminary findings and identified key challenges.

Agenda:

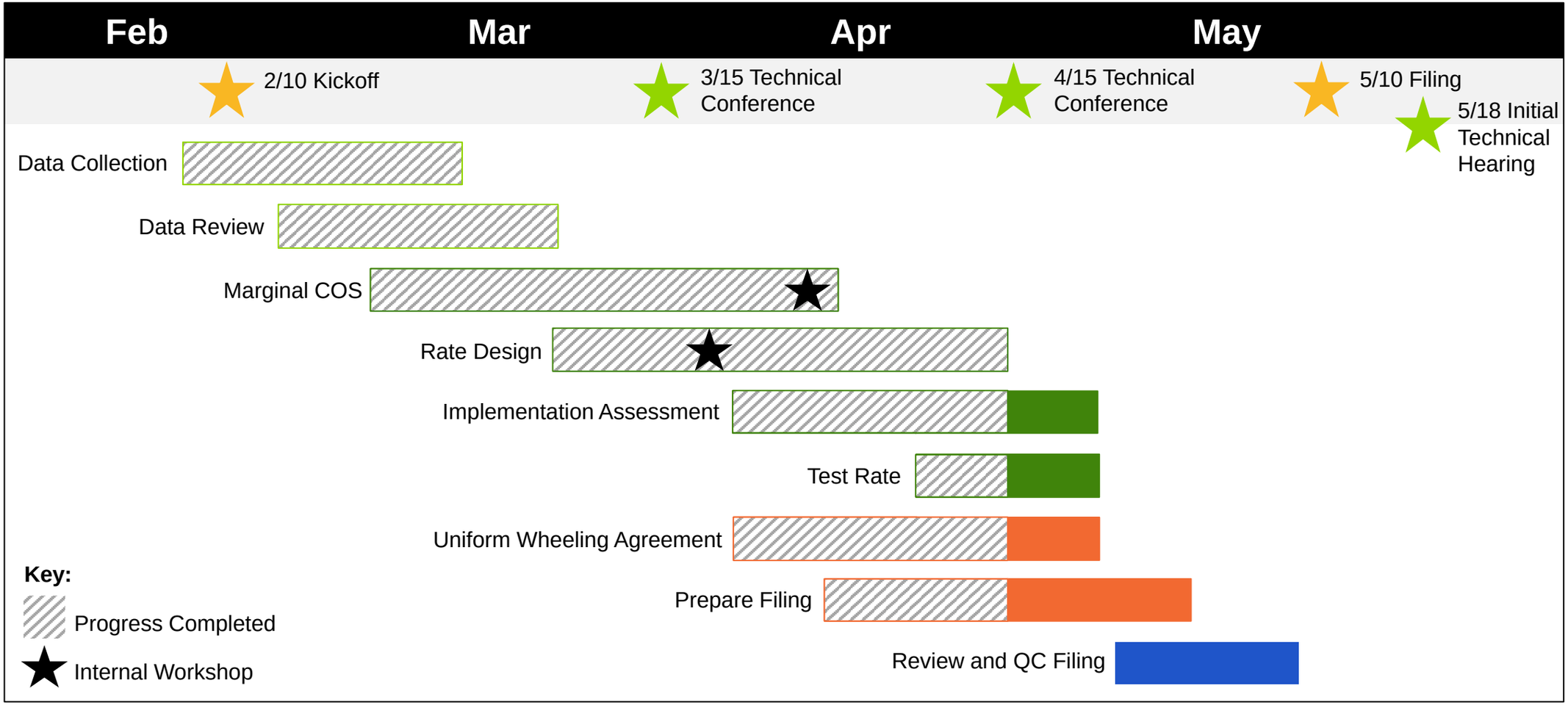
<u>Unbundled Rate Structure</u>

1. Step by step description of process to develop the unbundled rate structure
2. Preliminary results of components for unbundled rates
3. Key challenges in setting unbundled rates

<u>Uniform Wheeling Services Agreement</u>

1. Step by step description of Uniform Wheeling Services Agreement process
2. Key challenges in developing Uniform Wheeling Services Agreement

Schedule Recap



Unbundled Rate Structure
Step by Step Process

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Note: This symbol indicates a slide that will be presented during the Technical Conference. Slides without this symbol provide additional context for readers but will not be presented unless there are specific questions on the material.

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Unbundled Rates – Step by Step

Step 1: Determine "Bundles" of Services	Identify distinct functions needed to fully serve load (Generation, Transmission, Distribution, Billing)
Step 2: Determine "Marginal Costs" for each Service	Using PREPA's forecasted data, determine cost drivers and then calculate marginal costs by service
Step 3: Determine Marginal Cost RRQ	Determine total drivers by customer class and calculate marginal costs revenues by service
Step 4: Determine "Residual" Cost RRQ	Using approved revenue requirement, determine remaining, or 'residual' revenue requirement not recovered
Step 5: Determine Costs Avoided by PREPA	Identify which marginal and residual costs by service are avoided by PREPA if a customer chooses alternative supply
Step 6: Determine Incremental Costs to PREPA	Identify which marginal and residual costs by service may increase if a customer chooses alternative supply
Step 7: Calculate Cost Reflective Rates & Allocate Costs	Determine cost driver by customer class, calculate cost reflective rate & use cost reflective rate to allocate costs to class
Step 8: Determine Billing Determinants	Determine cost driver by customer class, calculate cost reflective rate & use cost reflective rate to allocate costs to class
Step 9: Calculate End-User Rates	Calculate rates by rate component and aggregate to end-user rates
Step 10: Calculate General & Wheeling Rates	Bucket components for Wheeling and calculate appropriate rates by class

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Unbundling of Services

Step 1: Determine “Bundles” of Services

Customer Receives kWh on Demand

Customer consumes energy on site, selecting an ESP, on-site generation or PREPA to provide supply

Supply	Wheeling	Delivery	Billing
On-demand energy created for customer’s use	Reliable delivery of energy to Service Driver center	Reliable delivery of on-demand (when the customer needs it) energy	
Capacity ($/kW)	**Capacity ($/kW)**	**Connections ($/Customer)**	**Meter to Cash ($/Customer)**
• Restoration of existing generation assets • Asset improvements for resiliency • New assets to meet Service Driver • New assets to meet policy objectives (e.g., environmental issues or renewable power investment	• Restoration of existing generation assets • Asset improvements for resiliency • New assets to meet Service Driver	• Connection of customers to the distribution system	• Metering, billing, collections, and customer service • Billing services for ESP • Collections for PREPA • Collections for ESP • Billing to ESP
Energy ($/kWh)	**Connections ($/Customer)**	**Capacity ($/kW)**	
• Must take energy plus remaining least Cost dispatch of energy, driven by fuel costs • Congestion can increase costs to some areas • Losses from transmission and distribution services offset by additional generation*	• Connection of generators to the transmission grid • Connections of distribution system to transmission grid	• Restoration of existing generation assets • Asset improvements for resiliency • New assets to meet Service Driver	
Ancillary Services (varies)			
• Transmission operator ensures adequate ancillary services through planning • Generators and transmission operator provide ancillary services (majority from generation)			

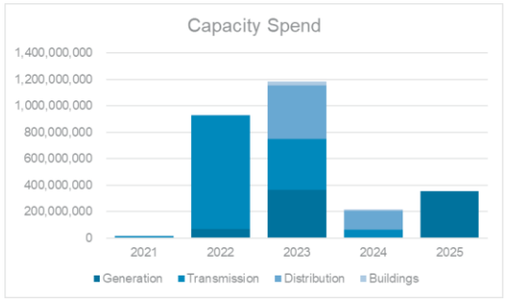
*Proposal is to have losses covered by ESP vs financially settled and PREPA physically covering

Unbundling of Services

Step 2: Determine Cost Drivers & “Marginal Costs” for each Service

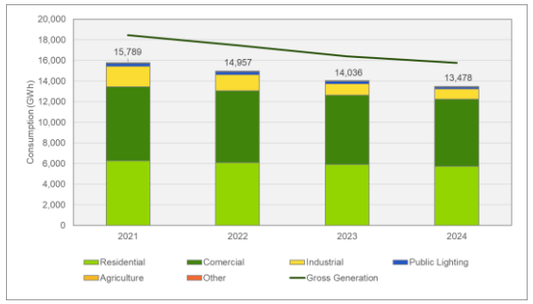
Choices for Cost Driver – measurable and tracked (proxies may be needed for some)

Total Energy (kWh) → **Time of Use Energy (kWh)** → **System Coincident Peak** → **Sum of Class Non-Coincident Peaks** → **Number of Customers** → **Connected Load**



2021 Service Capital Addition *Service Driver Related*	2022 Service Capital Addition *Service Driver Related*	2023 Service Capital Addition *Service Driver Related*	2024 Service Capital Addition *Service Driver Related*

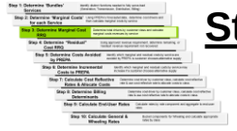
→ **Net Present Value of Service Capital Additions**



2021 Service Driver Growth	2022 Service Driver Growth	2023 Service Driver Growth	2024 Service Driver Growth

→ **Net Present Value of Service Driver Growth**

= **Service Marginal Cost**



Step 3: Determine Marginal Cost RRQ

Service Marginal Cost X **Service Marginal Cost Driver** = **Service Marginal Cost RRQ**

Marginal cost is incremental cost of producing an incremental unit

Marginal cost driver is that incremental unit that creates the marginal cost (e.g., kW, kWh, or customer)

Marginal cost revenue is revenue collected if all customers were bill the marginal cost based on their individual marginal cost driver

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Unbundling by Services & Cost Causation

Step 4: Determine Residual RRQ

Service RRQ - **Service Marginal Cost RRQ** = **Service Residual RRQ**

Approved revenue requirement is the revenue authorized by PREB to be collected by PREPA to cover costs

Residual RRQ are remaining authorized revenues not collected or over-collected from marginal costs and often include 'fixed' or 'stranded' costs

Authorized Revenue Requirement (RRQ)

Total revenue authorized by PREB for PREPA to collect, less costs 'avoided' by alternative supplies for energy and generation capacity

Supply Cost RRQ

Capacity Cost RRQ
Costs associated with building existing or future generation capacity

- **Marginal Cost RRQ**: Costs associated with building incremental generation capacity to meet Service Driver
- **Residual Cost RRQ**: Remaining 'embedded costs associated with building & maintaining generation capacity(1)

Energy Cost RRQ
Costs associated with generating a unit of energy (kWh)

- **Marginal Cost RRQ**: Incremental generate costs for both customer Service Driver and transmission and distribution losses.
- **Residual Cost**: Remaining operating or embedded costs associated with providing reliable and stable power(2)

Wheeling Cost RRQ

Capacity Cost RRQ
Costs associated with building existing or future transmission capacity

- **Marginal Cost RRQ**: Costs associated with building incremental transmission capacity to meet Service Driver
- **Residual Cost RRQ**: Remaining 'embedded costs associated with building & maintaining transmission capacity

Connections Costs RRQ
Costs associated with connecting to the transmission system

- **Marginal Cost RRQ**: Incremental costs associated with connecting a generator or customer to the transmission system
- **Residual Cost RRQ**: Costs associated with connections that are not collected in connection charges (3)

Delivery Cost RRQ

Capacity RRQ
Costs associated with building existing or future distribution capacity

- **Marginal Cost RRQ**: Costs associated with building incremental distribution capacity to meet Service Driver
- **Residual Cost RRQ**: Remaining 'embedded costs associated with building & maintaining distribution capacity

Connections RRQ
Costs associated with connecting to the distribution system

- **Marginal Cost RRQ**: Incremental costs associated with connecting a customer to the transmission system (4)
- **Residual Cost RRQ**: Costs associated with connections that are not collected in connection charges

Billing Cost RRQ

Meter to Cash
Costs associated with metering customer use, billing, collecting, and addressing service issues

- **Marginal Cost RRQ**: Incremental costs of billing due to specialization, manual operations or ad hoc requirements
- **Residual Cost RRQ**: **Average embedded costs of systems and operations to perform billing**

NOTES

(1) Includes capacity and fixed costs associated with ancillary services, such as capacity for black start
(2) Includes costs associated with providing spinning reserves and voltage support ancillary services
(3) Some connections require more upstream system upgrades that, depending upon the depth of connection charges, are not collected from the new customer directly
(4) Could include cost of connecting 'customer generator' to system if generation exports exceed customer Service Driver – costs include meters
(5) Many distribution connection charges are fixed per connection and don't' reflect the actual costs but rather the actual average cost

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Unbundling by Services for Wheeling

Step 5: Determine Costs Avoided by PREPA from Customer Choosing Alternative Supply

Avoided costs = marginal costs assumed to be avoided

Supply Cost RRQ

Capacity Cost RRQ

Avoided Cost	Residual Cost
PREPA is able to avoid building new generation to accommodate Service Driver supplied by ESP or self-supplied by customer	These costs cannot be avoided because they have either already been incurred or they are expected to be incurred to benefit all customers (e.g., restoration or resilience)

Energy Cost RRQ

Avoided Cost	Residual Cost
PREPA is able to avoid building producing an incremental kWh because Service Driver is avoided through energy efficiency, customer receives supply from ESP or customer self-supplies	These costs cannot be avoided because they are incurred whether or not the customer consumes a kWh but may require a kWh (e.g., spinning reserves for ESP or customer supply)

Wheeling Cost RRQ

Capacity Cost RRQ

Avoided Cost	Residual Cost
PREPA is able to avoid building new transmission capacity to accommodate Service Driver self-supplied by customer	These costs cannot be avoided because they have either already been incurred or they are expected to be incurred to benefit all customers (e.g., restoration or resilience)

Connections Costs RRQ

Avoided Cost	Residual Cost
Connection costs are incurred for any source of generation that will export onto the grid, either from a wholesale generator or excess from a customer generator.	These costs cannot be avoided because they have either already been incurred or they are expected to be incurred to benefit all customers (e.g., restoration or resilience)

Delivery Cost RRQ

Capacity RRQ

Avoided Cost	Residual Cost
PREPA is able to avoid building new distribution capacity to accommodate Service Driver self-supplied by customer	These costs cannot be avoided because they have either already been incurred or they are expected to be incurred to benefit all customers (e.g., restoration or resilience)

Connections RRQ

Avoided Cost	Residual Cost
Connection costs are upfront costs that allow for power to flow. Regardless of final flow, infrastructure costs are incurred.	These costs cannot be avoided because they have either already been incurred or they are expected to be incurred to benefit all customers (e.g., restoration or resilience).

Billing Cost RRQ

Meter to Cash

Avoided Cost	Residual Cost
Costs avoided as new customers directly connect to supply and thus requires no services from PREPA	These costs cannot be avoided because they have either already been incurred or they are expected to be incurred to benefit all customers (e.g., billing systems)

AVOIDED COSTS

- Marginal Generation Capacity Cost Avoided
- Marginal Energy Cost Avoided

Unbundling by Services for Wheeling

Step 6: Determine Incremental Costs to PREPA from Customer Choosing Alternative Supply

Incremental costs = marginal costs created

Supply Cost RRQ

Capacity Cost RRQ

Incremental Cost	Residual Cost

- Additional capacity costs for ancillary services for renewables;
- Capacity needs as customer returns from ESP

Energy Cost RRQ

Incremental Cost	Residual Cost

PREPA is able to avoid building producing an incremental kWh because Service Driver is avoided through energy efficiency, customer receives supply from ESP or customer self-supplies

Wheeling Cost RRQ

Capacity Cost RRQ

Incremental Cost	Residual Cost

PREPA may experience incremental transmission capacity needs resulting from customer generation exports to other Service Driver centers or 'market'

Connections Costs RRQ

Incremental Cost	Residual Cost

Incremental transmission upgrades may be needed to accommodate new generation facilities, which may or may not be explicitly included in connection charges

Delivery Cost RRQ

Capacity RRQ

Incremental Cost	Residual Cost

Connections RRQ

Incremental Cost	Residual Cost

Billing Cost RRQ

Meter to Cash

Marginal Cost Incremental	Residual Cost

Costs created as new billing structures to accommodate wheeling charges and additional metering and reporting

Incremental costs are only created for residual if Marginal costs are not appropriately collected

INCREMENTAL COSTS	Incremental Generation Capacity Cost	Incremental Energy Cost	Incremental Transmission Capacity Cost	Incremental Transmission Connection Cost	Incremental Billing Cost

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Unbundling by Services for Wheeling

Step 7: Calculate Cost Reflective Rates & Allocate Costs

Cost Component		System Cost Driver		Cost Reflective Rate		Class Cost Driver		Class Allocations
Marginal (Avoided) Cost RRQ	÷	Total Energy (kWh)	Costs increase with an incremental kWh of use, regardless of time – also useful for allocating costs based on size if demand is not available	Cost Reflective Avoided Cost Rate	=	Total Energy (kWh)	X	Marginal Costs Allocated to Class
Residual Cost RRQ		Time of Use Energy (kWh)	Costs increase with an incremental kWh of use that varies by season or different times of day	Cost Reflective Residual Costs Rate		Time of Use Energy (kWh)		Residual Costs Allocated to Class
Incremental Cost RRQ		System Coincident Peak	Costs increase with incremental kW of use during system peak.	Cost Reflective Incremental Cost Rate		System Coincident Peak	=	Incremental Costs Allocated to Class
		Sum of Class Non-Coincident Peaks	Costs increase with incremental kW of use regardless of time of day – also useful for class allocation or locational cost.			Sum of Class Non-Coincident Peaks		
		Number of Customers	Costs increase with the addition of a customer, including			Number of Customers		
		Connected Load	Costs increase with the increase or addition of a customer's connection size			Connected Load		

Must use same cost driver for cost reflective rate (system cost driver) and class allocation (class cost driver)

Treat all costs as if apply to all customer in class for purposes of developing 'Revenue Neutral' rates

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Unbundling by Services for Wheeling

Step 8: Determine Billing Determinants for End User Rates

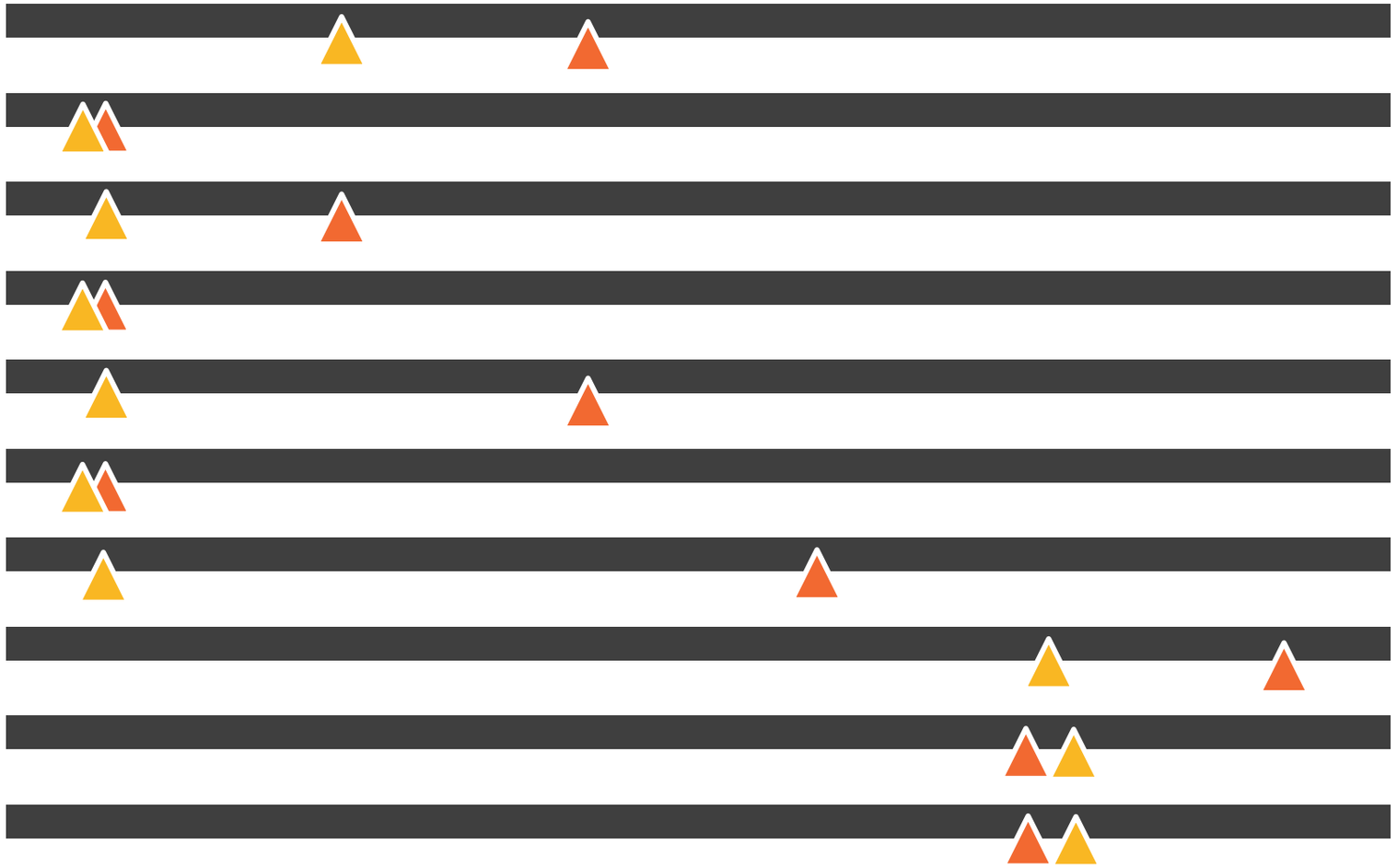
Ideal Billing Determinant

Initial Billing Determinant

Class Allocations

- Marginal Generation Capacity Cost
- Residual Generation Capacity Cost
- Marginal Energy Cost
- Residual Energy Costs
- Marginal Transmission Capacity Cost
- Residual Transmission Costs
- Marginal Distribution Capacity Cost
- Residual Distribution Costs
- Residual Customer Costs
- Marginal Customer Cost

System Cost Driver



Spectrum of Billing Determinants

- Total Energy (kWh)
- Time of Use Energy (kWh)
- System Coincident Peak
- Sum of Class Non-Coincident Peaks
- Number of Customers
- Connected Load

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Unbundling by Services for Wheeling

Step 9: Calculate General Services Rates by Class

Allocated Costs

- Allocated Marginal Generation Capacity Costs
- Allocated Incremental Generation Capacity Costs
- Allocated Residual Generation Capacity Costs
- Allocated Avoided Energy Costs
- Allocated Incremental Energy Costs
- Allocated Residual Energy Cost
- Allocated Avoided Transmission Capacity Cost
- Allocated Incremental Transmission Capacity Cost
- Allocated Residual Transmission Cost
- Allocated Avoided Distribution Cost
- Allocated Incremental Distribution Cost
- Allocated Residual Distribution Cost
- Allocated Avoided Customer Charge Cost
- Allocated Incremental Customer Charge Cost
- Allocated Residual Customer Charge

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Class & Cost Billing Determinant

- Total Energy (kWh)
- Time of Use Energy (kWh)
- System Coincident Peak
- Sum of Class Non-Coincident Peaks
- Number of Customers
- Connected Load

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Class End-User Rates by Component

- Marginal Generation Capacity Rate
- Incremental Generation Capacity Rate
- Residual Generation Capacity Rate
- Avoided Energy Rate
- Incremental Energy Rate
- Residual Energy Rate
- Avoided Transmission Capacity Rate
- Incremental Transmission Capacity Rate
- Residual Transmission Rate
- Avoided Distribution Rate
- Incremental Distribution Rate
- Residual Distribution Rate
- Avoided Customer Charge Rate
- Incremental Customer Charge Rate
- Residual Customer Rate

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Unbundling by Services for Wheeling

Step 10: Calculate General & Wheeling Services Rates by Class

Cost Components - General

- Marginal Generation Capacity Rate
- Incremental Generation Capacity Rate
- **Residual Generation Capacity Rate**
- Avoided Energy Rate
- Incremental Energy Rate
- **Residual Energy Rate**
- **Avoided Transmission Capacity Rate**
- Incremental Transmission Capacity Rate
- **Residual Transmission Rate**
- **Avoided Distribution Rate**
- Incremental Distribution Rate
- **Residual Distribution Rate**
- **Avoided Customer Charge Rate**
- Incremental Customer Charge Rate
- **Residual Customer Rate**

→ **Class General Service Volumetric Rate**

→ **Class Monthly Customer Charge**

Cost Components – Wheeling Credits

- **Marginal Generation Capacity Rate**
- Incremental Generation Capacity Rate
- Residual Generation Capacity Rate
- **Avoided Energy Rate**
- Incremental Energy Rate
- Residual Energy Rate
- Avoided Transmission Capacity Rate
- Incremental Transmission Capacity Rate
- Residual Transmission Rate
- Avoided Distribution Rate
- Incremental Distribution Rate
- Residual Distribution Rate
- Avoided Customer Charge Rate
- Incremental Customer Charge Rate
- Residual Customer Rate

→ **Class Wheeling Credits Volumetric Rate**

Cost Components – Wheeling Charges

- Marginal Generation Capacity Rate
- **Incremental Generation Capacity Rate**
- Residual Generation Capacity Rate
- Avoided Energy Rate
- **Incremental Energy Rate**
- Residual Energy Rate
- Avoided Transmission Capacity Rate
- **Incremental Transmission Capacity Rate**
- Residual Transmission Rate
- Avoided Distribution Rate
- **Incremental Distribution Rate**
- Residual Distribution Rate
- Avoided Customer Charge Rate
- **Incremental Customer Charge Rate**
- Residual Customer Rate

→ **Class Wheeling Fees Volumetric Rate**

→ **Class Monthly Wheeling Fees**

Unbundling by Services for Wheeling

Step 10: Calculate Wheeling Services Rates by Class - continued

Calculation of Rate for Customer Receiving Supply from PREPA

(PREPA Full-Service Customer)

Class General Service Volumetric Rate + **Class Wheeling Credits Volumetric Rate** + **Class Monthly Customer Charge** = **PREPA Full-Service Rate**

Calculation of Rate for Customer Choosing Alternative Supply

(Wheeling Customer)

PREPA Full-Service Customer - **Class Wheeling Credits Volumetric Rate** + **Class Wheeling Fees Volumetric Rate** + **Class Monthly Wheeling Fees** = **Wheeling Rate**

PREB order suggests credit should be equal to sum of the Fuel Cost Adjustment (FCA) and the Purchase Power Cost Adjustment (PPCA).

This has the potential to overstate the credit because some resources are 'must take' and therefore not avoidable with a customer departure. As such any credit must be adjusted for these 'must take' assets otherwise PREPA's remaining customers will pick up these costs that were incurred on behalf of the departing customer

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(1) Billing Determinant (BD)

Unbundled Rate Structure
Preliminary Results

! *Note: This symbol indicates a slide that will be presented during the Technical Conference. Slides without this symbol provide additional context for readers but will not be presented unless there are specific questions on the material.*

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Calculation of Marginal Costs

PRELIMINARY

These results show no Marginal Generation Capacity Costs

Marginal Capacity Costs

$$\frac{\text{Net Present Value of Service Capital Additions}}{\text{Net Present Value of Service Driver Growth}} = \text{Service Marginal Cost}$$

		2021	2022	2023	2024	NPV	Ratio of Cost to Load	Loading Factor	$/kW
Nominal Generation Capital	Restoration ($M)	$0.0	$7.2	$34.9	$0.0	$37.4	$3.55	3.94%	$0.14
	Resilience ($M)	$0.0	$49.0	$330.5	$0.0	$553.0	$52.49	3.94%	$2.07
	Life Cycle Replacement ($M)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.00	3.94%	$0.00
	Load Growth ($M)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.00	3.94%	$0.00
	Policy ($M)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.00	3.94%	$0.00
Load	Load (MW)	2,744.7	2,661.9	2,590.6	2,538.4	10,535.6			
	Load Growth (MW)		-82.8	-71.3	-52.2				

Marginal Energy Costs

$$\frac{\text{Hourly Marginal Energy Costs} \times \text{Hourly Generation (kW)}}{\text{Total Generation (kW)}} = \text{Weighted Average Hourly Marginal Energy Costs}$$

	Cost ($)	Demand (MW)	Avg Price ($/MW)	Avg Price (¢/kW)
2020	1,271,873,538	18,368,534	69.24	6.924
2021	1,939,316,142	18,251,839	106.25	10.625
2022	1,445,455,631	17,715,974	81.59	8.159
2023	1,439,782,286	17,178,158	83.81	8.381
2024	1,545,794,258	16,774,870	92.15	9.215

These results show the computed marginal energy costs.

Total generation costs in 2017 were ~$1.94 B

Care must be taken as these costs are highly dependent upon fuel costs, actual loads and load variability, and generation performance

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Calculation of Marginal Cost Allocated to Class

Results of Applying Cost Reflective Marginal Cost Rates to Proxy Class Loads

	Peak Calculation Example							
		Residential	Commercial	Industrial	Lighting	Other	Agriculture	Total
[1]	Load (MWh)	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	6,000,000
[2]	Load Factor	66.9%	70.2%	81.2%	49.3%	73.6%	46.8%	
[3] = [1] / [2]	Load @ 100%	1,494,768	1,424,501	1,231,527	2,028,398	1,358,696	2,136,752	9,674,642
[4] = [3] / 8760	Non-Coincident Peak (MW)	171	163	141	232	155	244	1,104
[5]	Coincidence Factor	100%	70%	85%	100%	80%	32%	
[6] = [4] * [5]	Coincident Peak (MW)	171	114	119	232	124	78	838
	Peak Calculation Based on PREPA's Forecasted Consumption (2022)							
		Residential	Commercial	Industrial	Lighting	Other	Agriculture	Total
[1]	Load (MWh)	6,088,600	6,968,300	1,563,400	271,600	40,300	24,900	14,957,100
[2]	Load Factor	66.9%	70.2%	81.2%	49.3%	73.6%	46.8%	
[3] = [1] / [2]	Load @ 100%	9,101,046	9,926,353	1,925,369	550,913	54,755	53,205	21,611,642
[4] = [3] / 8760	Non-Coincident Peak (MW)	1,039	1,133	220	63	6	6	2,467
[5]	Coincidence Factor	100%	70%	85%	100%	80%	32%	
[6] = [4] * [5]	Coincident Peak (MW)	1,039	793	187	63	5	2	2,089

Data proxies from PREPA's IRP were used to forecast peak demand by customer class to calculate marginal cost revenue

Unbundled Rate Structure
Key Findings & Challenges

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Key Findings – Unbundled Rates

FINDING #1	Marginal Costs for Generation Capacity is calculated as zero
CONCLUSION	Generation credit is limited to marginal energy costs from fuel and O&M and tied to energy (kW) by class

FINDING #2	Marginal Costs for Generation Restoration are one-time costs
CONCLUSION	These costs are considered residual and treated as expense in the year incurred

FINDING #3	Marginal Costs for Generation Resilience are system upgrade capital costs
CONCLUSION	These costs, regardless of if they are funded by FEMA should be depreciated to account for future replacement costs

FINDING #4	Capital costs are funded by FEMA grant or PREPA's cash balances
CONCLUSION	Revenue requirement for these capital expenses should be commuted without return on investments or tax gross up

Key Challenges – Unbundled Rates

CHALLENGE #1	Poor data quality for embedded costs and linkages to revenue requirement and issues related to rate freeze create uncertainty on allocation of current costs – *Allocation by function (generation, transmission, distribution and customer services)*
RESOLUTION	Establish an Unbundling Framework that can persist for the next decade, or beyond, but updated as PREPA's data improve
CHALLENGE #2	Sector restructuring creates uncertainty – namely creation of GenCo that will own and operate generation assets and sell supply to PREPA – could result in a change in marginal costs for PREPA depending on GenCo's compensation structure and "transfer pricing" to PREPA
RESOLUTION	Emphasis an Unbundling Framework that is able to accommodate market changes
CHALLENGE #3	Load data by customer group is limited: class level demand can be computed but developing demand-based billing determinants are challenged
RESOLUTION	1. Allocate based on Class Demand – *data are available* 2. Use energy as rate billing determinant – *data are available*
CHALLENGE #4	PREPA's revenue requirement is set for next three years regardless of actual energy costs and influences capital investments by PREPA & thus timing of capital expenditures is fluctuating
RESOLUTION	Base marginal cost estimates on PREPA's 10-year plan – *DTIM method is forgiving for changing of timing of capital, with changes being driven by time value of money vs costs and load linkages*
CHALLENGE #5	Given current market structures, ESPs with generation costs less than average costs (e.g., lower on the supply stack) may serve customers directly vs through PPAs with PREPA, increasing PREPA's average rate. This potentially increases costs for PREPA's customers
RESOLUTION	Develop true-up mechanism that ensure that if a customer leaves PREPA's service there are no incremental costs to PREPA's customers – *Despite reliance on marginal costs to determine the amount of credit, PREPA's actual supply costs are the average of all generation and PPAs dispatched to serve load. Until a fully functioning wholesale market is established and PREPA's rates are based on these market costs, there is the potential for cost shifting*

Uniform Wheeling Agreement
Step by Step Process

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Note: This symbol indicates a slide that will be presented during the Technical Conference. Slides without this symbol provide additional context for readers but will not be presented unless there are specific questions on the material.

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Universal Wheeling Services Agreement – Step by Step

Step 1: Determine Providers of each 'Bundled' Service	For each service, identify entities that can provide the service, including PREPA, ESPs, Wholesale Generators & Customers
Step 2: Determine Wheeling "Model"	Determine potential processes for wheeling: physical (sourcing supply and delivering) & financial (billing & payments)
Step 3: Identify Operational Scenarios - Imbalances	Determine different operational scenarios for wheeling and reconciliation with PREPA for imbalances
Step 4: Identify Operational Scenarios - Congestion	Determine different means operational scenarios for wheeling and reconciliation with PREPA for congestion
Step 5: Determine Losses Adder & Congestion Charges	Determine Losses Adder and any charges for congestion
Step 6: Determine Operational Requirements for ESP	Identify operational services & processes must the ESP or PREPA supply or follow (e.g., metering, customer enrollment)
Step 7: Determine Payments Between PREPA & ESP	Identify what payments must be made between PREPA & ESP in operations (e.g., reimbursement for collected revenues)
Step 8: Determine Credit Terms for ESP	Develop process for determining credit and collateral requirements by ESP and how they evolve over time
Step 9: Determine Customer Return Process	Determine process for customer returning to PREPA from ESP, to include reconciling balances & serving new supply
Step 10: Determine Required 'True-Up' Mechanisms	Identify proper 'true-up' mechanisms need to adjust for data uncertainty, market conditions or operational disruptions

Unbundling of Services

Step 1: Determine Providers of each ‘Bundled’ Service

Customer Receives kWh on Demand

Customer consumes energy on site, selecting an ESP, on-site generation or PREPA to provide supply

Supply	Wheeling	Delivery	Billing
On-demand energy created for customer’s use	Reliable delivery of energy to Service Driver center	Reliable delivery of on-demand (when the customer needs it) energy	
Capacity ($/kW)	Capacity ($/kW)	Connections ($/Customer)	Meter to Cash ($/Customer)
Energy ($/kWh)	Connections ($/Customer)	Capacity ($/kW)	
Ancillary Services (varies)			

Wholesale Generators	Wholesale generations provide energy and ancillary services supply through PPAs to either ESPs or PREPA	
ESPs	ESP delivers energy to PREPA to deliver to ESP’s customer on PREPA’s grid. ESP supply can be from new assets or PPAs from wholesale generators	ESP can bill & collect for supply or for all services, with ESP paying PREPA for charges incurred by not billed & collected by PREPA — **ESPs**
Customer	Customer can self supply with on-site generation — **Customer**	On-site generation requires no wheeling or delivery or that generation — **Customer**

PREPA

PREPA is Provider of Last Resort (POLR), meaning PREPA has responsibility for serving any customer who cannot or chooses to not self supply or procure supply from ESP	PREPA is wheels power from generation source to Service Driver center	PREPA is delivers power to customer on distribution system	PREPA bills & collects for services

Guidehouse recommends wheeling associated with self-generating customers should be limited to supply and any additional avoided costs associated with wheeling and delivery should be dealt with outside the wheeling tariff

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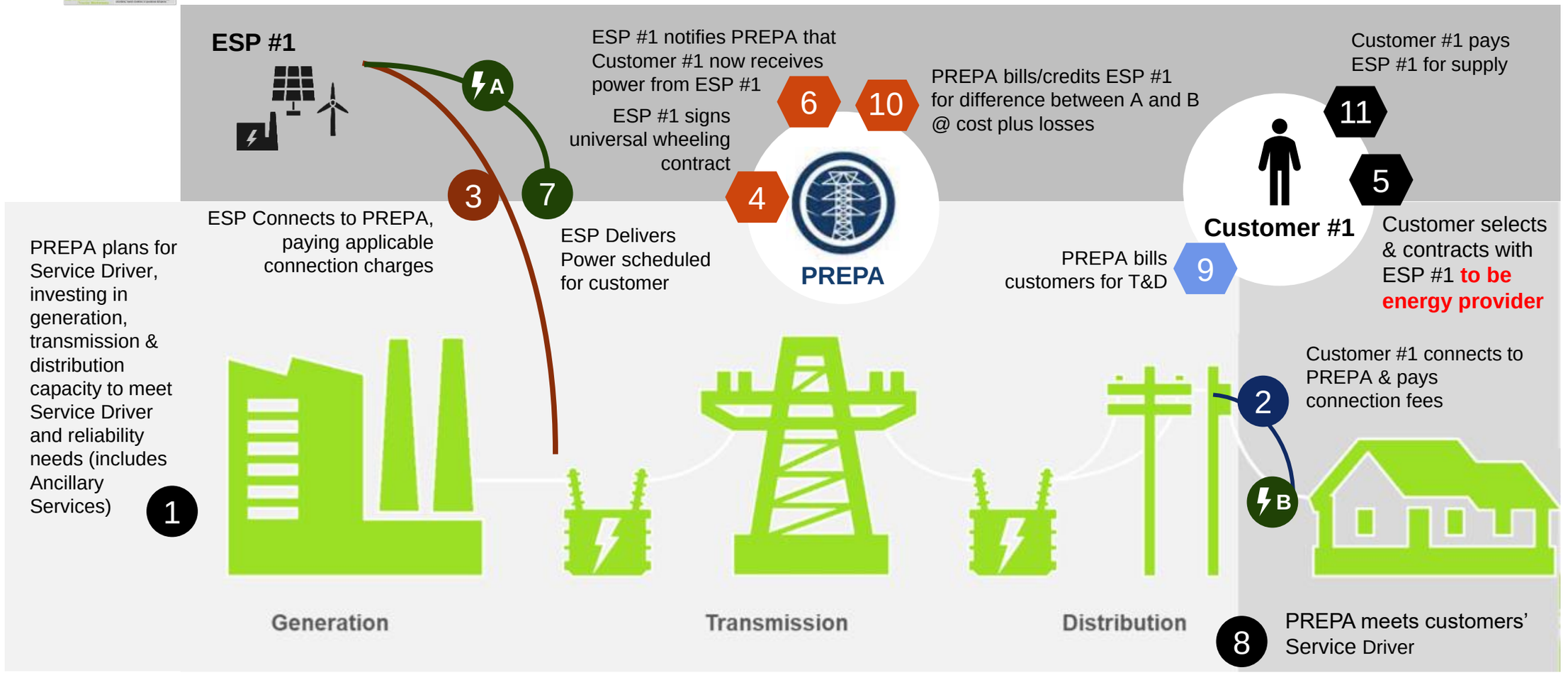
Unbundling of Services – Operating Model

Step 2: Determine Wheeling "Model" – OPTION 1: Separate Billing by Services Delivered



Supply | Wheeling | Delivery | Behind the Meter

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Energy Service Provider (ESP)

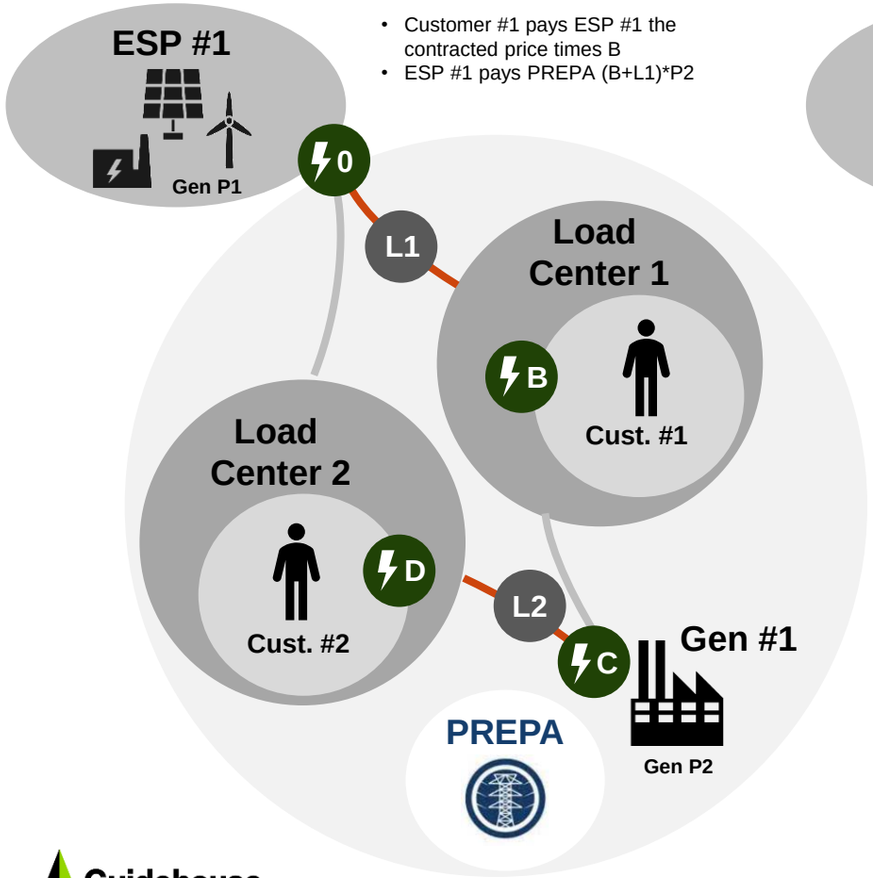
Unbundling of Services – Operating Model

Step 3: Identify Operational Scenarios - Imbalances

Scenario 1: ESP Generation Outage
(A=0, C=A+D+L1+L2)

ESP #1 cannot meet Service Driver, PREPA supplies customer

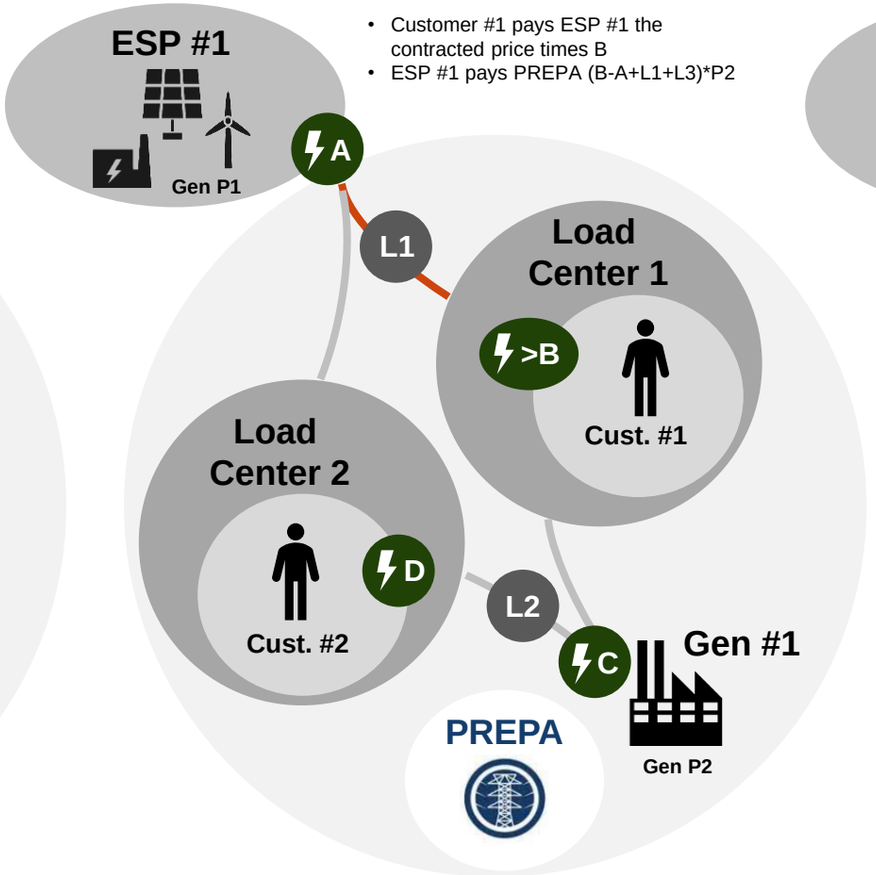
- Customer #1 pays ESP #1 the contracted price times B
- ESP #1 pays PREPA (B+L1)*P2



Scenario 2: Load Higher than Generation
(A<B, C=(B-A)+D+L1+L2)

ESP #1 schedules less Load than customer consumes

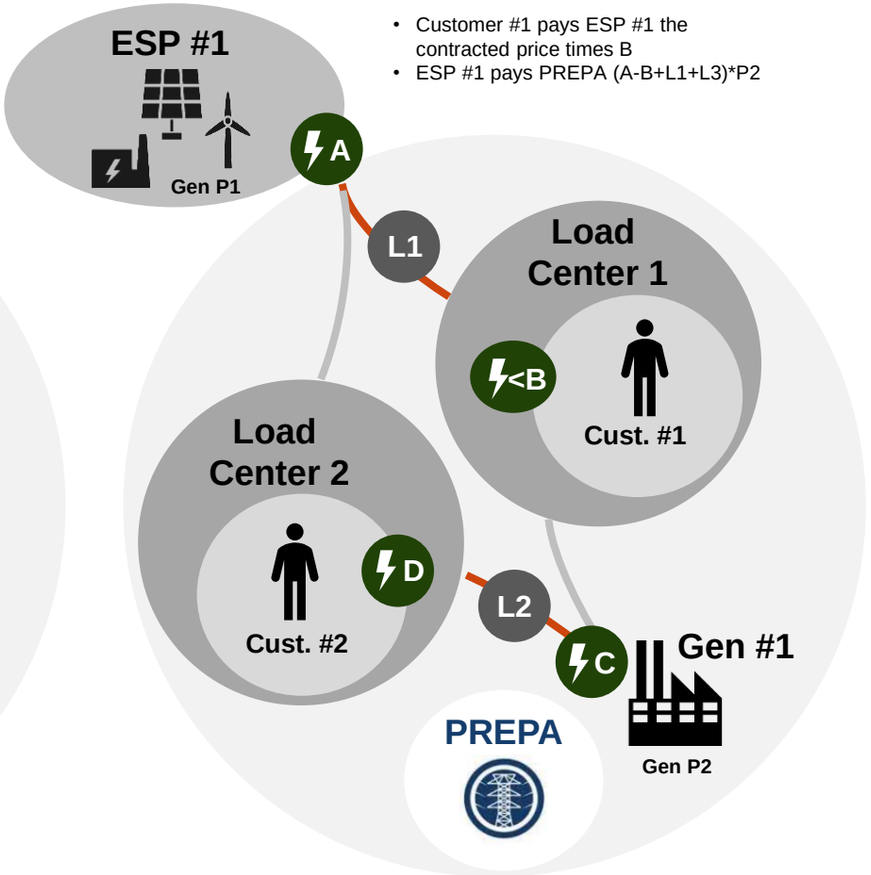
- Customer #1 pays ESP #1 the contracted price times B
- ESP #1 pays PREPA (B-A+L1+L3)*P2



Scenario 3: Load Lower than Generation
(A>B, C=(A-B)+D+L1+L2)

ESP #1 over schedules Service Driver to customer

- Customer #1 pays ESP #1 the contracted price times B
- ESP #1 pays PREPA (A-B+L1+L3)*P2



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L Losses | Power Delivered | Wheeling | Congestion | Unused Line

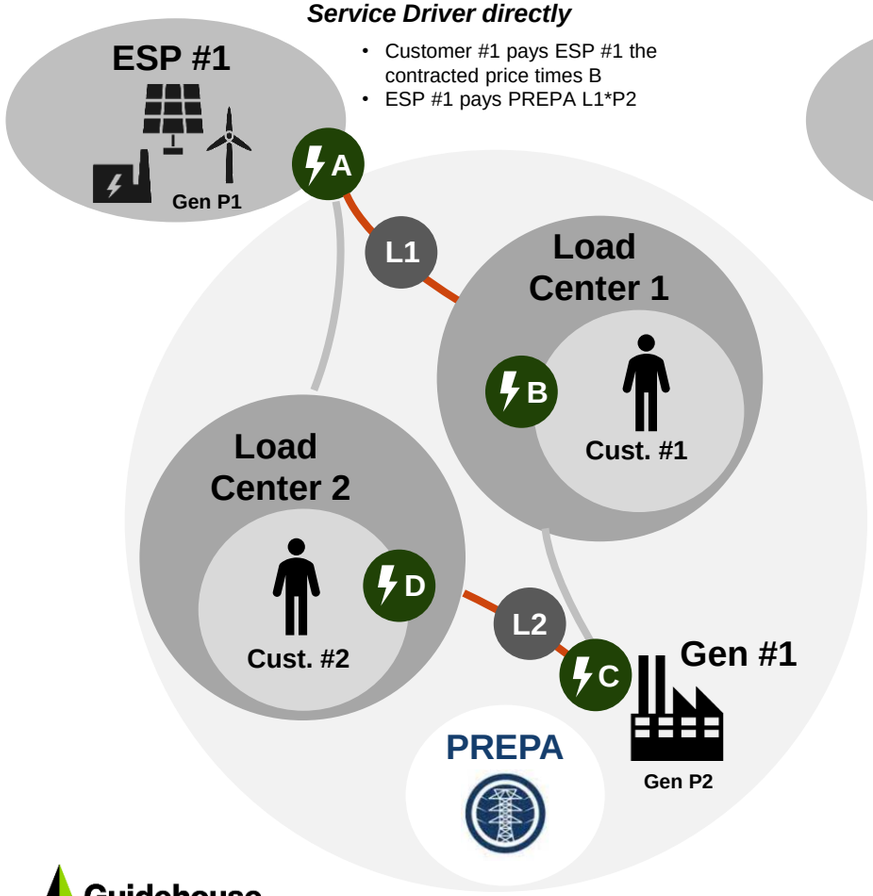
Unbundling of Services – Operating Model

Step 4: Identify Operational Scenarios - Congestion

Scenario 1: No Congestion
(A=B, C=D+L1+L2)

ESP #1 meets customer's Service Driver directly

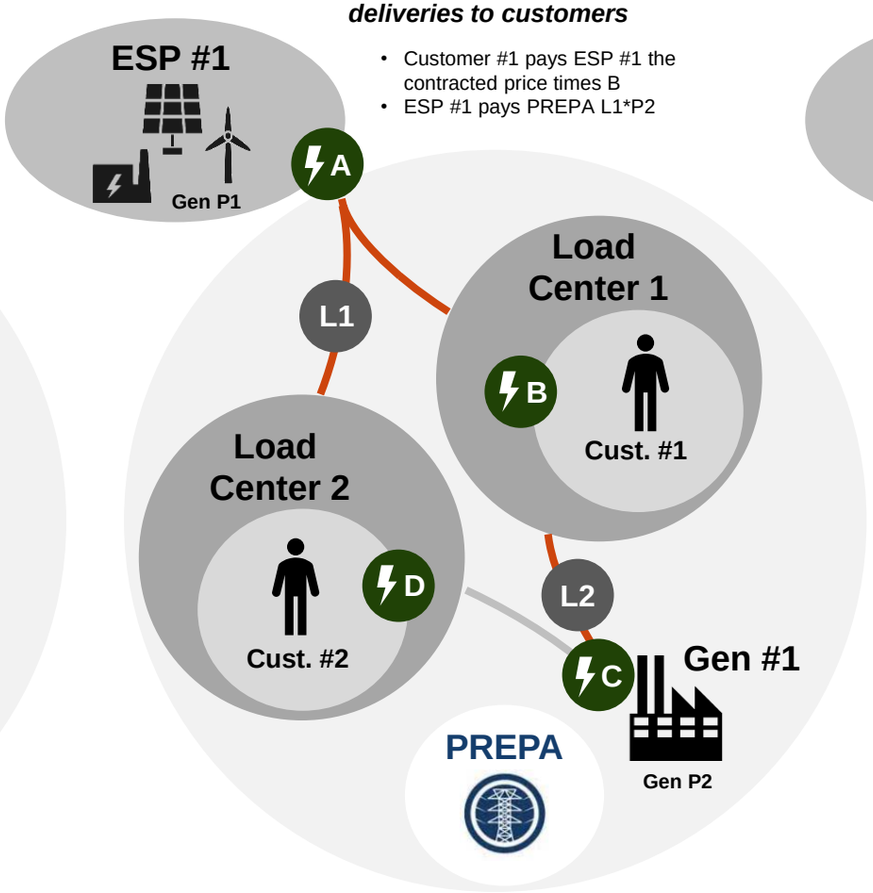
- Customer #1 pays ESP #1 the contracted price times B
- ESP #1 pays PREPA L1*P2



Scenario 2: Congestion to Load Center 1
(A=B, C=D+L1+L2)

ESP #1 & PREPA 'trade' deliveries to customers

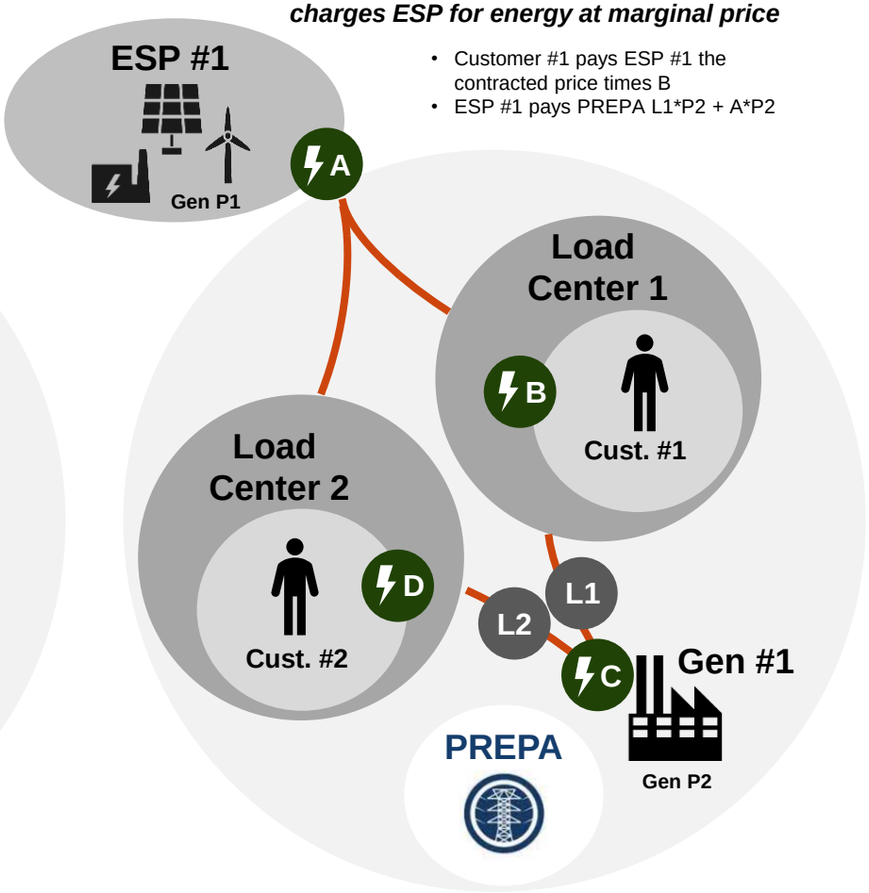
- Customer #1 pays ESP #1 the contracted price times B
- ESP #1 pays PREPA L1*P2



Scenario 3: Congestion to Load Centers
(A=0, C=B+D+L1+L2)

PREPA meets customer's Service Driver and charges ESP for energy at marginal price

- Customer #1 pays ESP #1 the contracted price times B
- ESP #1 pays PREPA L1*P2 + A*P2



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L Losses | Power Delivered | Wheeling | Congestion | Unused Line

Unbundling of Services – Operating Model

Step 5: Determine Losses Adder & Congestion Charges

1 Losses Adder

- PREPA will establish a Losses Adder as a percent of the ESP's customer's load
- The Losses Adder increases the amount of supply the ESP is required to provide at the Generation Source to offset losses between the ESP's Generator and the ESP's customer (includes Transmission and Distribution losses)
- Additional supply versus financial settlement of losses was chosen to reduce ESP credit risk to PREPA.
- Losses adder also applies to the Imbalance calculations as described later
- Per previous PREB decision, Losses Adder will be set to Line Loss Adder established in the Cost of Service Study filed in Case No. CEPR-AP-2015-00001 until such time that PREPA files updated values that are subsequently approved by PREB

2 Congestion Adder

- PREPA will establish a Congestion Adder as a per kWh charge applied to the ESP's Customer's load and charged to the ESP to account for additional costs by PREPA for accommodating congestion between the ESP's generator and the ESP's customer.
- PREPA will establish a methodology for computing the Congestion Adder based on the difference in marginal costs to serve the ESP customer's load with and without congestion
- PREPA will set the Congestion Adder to zero until such time that PREPA files the Congestion Adder Methodology as well as demonstration of capabilities to reliably compute the Congestion Adder, and PREB approves proposed methodology

Unbundling of Services – Operating Model

Step 6: Determine Operational Requirements for ESP

1 Generator Qualifies as ESP

- Generator meets ESP requirements
- Generator installs meter at point of interconnection with PREPA
- Generator signs Uniform Services Agreement becoming an ‘ESP’
- *ESP notifies PREPA of all names under which the ESP will market supply services to PREPA customers*

2 ESP Recruits Customer

- ESP notifies PREPA that Customer will now be served by ESP
- ESP provides PREPA with customer’s account number and start date
- *PREPA confirms customer agreement to be supplied by ESP*
- PREPA switches customer to class specific wheeling rate as of start date

3 ESP Supplies Customer

- ESP schedules day ahead supply to meet forecasted load of all ESP customers PLUS losses
- If ESP also has PPA with PREPA, ESP separately schedules supply to PREPA
- ESP delivers energy hourly per day ahead schedule unless curtailed by PREPA for operational reasons
- PREPA meets customer’s usage needs

4 Customer Billed

- PREPA provides ESP with customer billing data through secured portal or monthly encrypted files (provided weekly with goal of providing through secured portal daily)
- ESP bills customer separately for energy received based on contract terms
- ESP is responsible for customer collections for ESP services (1)
- PREPA bills customer for wheeling services based on tariff and meter reads
- PREPA is responsible for customer collection for PRPEA services

(1) PREPA may offer billing and collection services. If such services are offered the terms and conditions of the services will include resolution of partial payments (e.g., customer pays 50% of the bill, contract will specify whether ESP and PREPA service are prioritized or pro-rated)

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Unbundling of Services – Operating Model

Step 7: Determine PREPA's Authorized Charges to ESP

1 ESP Fees

- PREPA will establish fees associated with operational costs related to ESP services, to include but not limited to:
  - ✓ ESP registration costs for Uniform Services Agreement signing, tracking and monitoring (one time)
  - ✓ ESP account fees to cover ongoing costs (annual)
  - ✓ Generation meter and metering readings (per generation meter)
  - ✓ Customer meter reading and file transfers (monthly per customer)
  - ✓ Customer transfer (exit and return) charges (one time)

2 Imbalance Payments

- PREPA to establish an Hourly Imbalance Rate equal to the sum of Marginal Energy Rate
- PREPA monitors Hourly Imbalances as the difference between ESP's customers' meters and ESP's generation meters, less losses*
- Positive hourly differences will be credited to ESP at 95% of Hourly Imbalance Rate
- Negative hourly differences will be charged the Imbalance Rate

3 Performance Charges

- PREPA will calculate the absolute value of the difference between generation delivered and metered customer load, plus losses
- PREPA will compare those annual imbalances against predetermined annual deadbands
- ESP will be assessed additional fees equal to 10% of annual weighted average Imbalance Rate, weighted by the ESP's Hourly Imbalances times the difference between annual imbalances and bandwidth allowances (annual imbalances times bandwidth)

4 Late Payments

- Payments for Imbalances will be required within 60 days of billing.
- PREPA will establish a Monthly Carrying Charge Fee based on their costs to carry
- Payments made between 60 and 90 days of billing will be charged the Monthly Carrying Charge Fee times the outstanding payment due
- Payments made beyond 90 days will be assessed a 5% late fee plus cumulative Monthly Carrying Charge Fees for each 30 day period beyond 60 day target

5 Congestion Charges

- PREPA will establish Congestion Adders further refine charges for wheeling services to ESPs
- Congestion Adders will apply to the customer's metered load
- The Congestion Adders will be set to zero until such time PREPA can demonstrate to PREB the congestion charges as outlined in Step 5

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* Losses will be set at the Line Loss Adder established in the Cost of Service Study filed in Case No. CEPR-AP-2015-00001 until such time that PREPA files updated values that are subsequently approved by PREB

Unbundling of Services – Operating Model

Step 8: Determine Credit Terms for ESP

1 ESP Credit Ratings

- PREPA will classify each ESP into one of four short term credit classifications consistent with Moody's short-term credit ratings
- PREPA will use the established mapping of Fitch and S&P's ratings (see table to right)
- If ESP has established "Big Three" credit ratings (Moody's S&P and/or Fitch), PREPA will the lowest available credit rating for the ESP
- If an ESP has no "Big Three" credit rating, PREPA will classify that customer as "Not Prime"
- If ESP experiences a late payment PREPA will reset the ESP's credit rating to "Not Prime" and that rating will be in effect for one year, and if ESP has no further late payments the PREPA credit score resets

Moody's	S&P	Fitch
Short-term	Short-term	Short-term
P-1	A-1+	F1+
	A-1	F1
P-2	A-2	F2
P-3	A-3	F3
Not prime	B	B
	C	C
	/	/

2 ESP Collateral Requirements

- PREPA will require collateral up to four * times the ESP's customers' average monthly loads (in kWh) times the average annual Hourly Imbalance Rate from the previous year
- The actual collateral required from an ESP will be dependent upon the ESP's credit rating established by PREPA (see table to right)
- If an ESP fails to may payments within 90 days of billing, PREPA may use collateral to offset payments and suspend the Generator's ESP status until required collateral levels are required

PREPA Credit Rating	Percent Collateral
P-1	5%
P-2	25%
P-3	50%
Not prime	100%

*Four times was determined to be the possible exposure to both high use months (up to two times the 'average') and the fact that customers have 60 days to pay, and potentially 90 with minimal penalty, exposing PREPA to effectively 3 months of back payments

Unbundling of Services – Operating Model

Step 9: Determine Customer Return Process

Customer Choice – Customer Returns to PREPA	
Return Charges	Customer pays one time fee to return to PREPA based on PREPA's cost to administer
Eligibility	Customer returns to appropriate retail rate and is not-eligible for ESP services for 12 months
Service Dates	Service converts from ESP to PREPA at the end of the customer's billing period
Return Rates	Customer returns to a rate that is based on the forecasted Hourly Imbalance rates for up to 12 months
Notification	Customer requests service change from PREPA PREPA notifies ESP to include end date of customer service ESP confirms customer transition
ESP Settlement	PREPA terminates meter data transfers as of customer's service date PREPA will submit final billing for balance of costs to ESP within 30 days of customer transition

ESP Choice - Customer Returns to PREPA	
Return Charges	ESP pays one time fee to return to PREPA based on PREPA's cost to administer
Eligibility	Customer returns to appropriate retail rate and is eligible for ESP services from any ESP but the one they after 30 days from return
Service Dates	Service converts from ESP to PREPA at the end of the customer's billing period
Return Rates	Customer returns to a rate that is based on the forecasted Hourly Imbalance rates for up to 12 months
Notification	ESP notifies PREPA of customer return PREPA confirms customer return with customer
ESP Settlement	PREPA terminates meter data transfers as of customer's service date PREPA will submit final billing for balance of costs to ESP within 30 days of customer transition

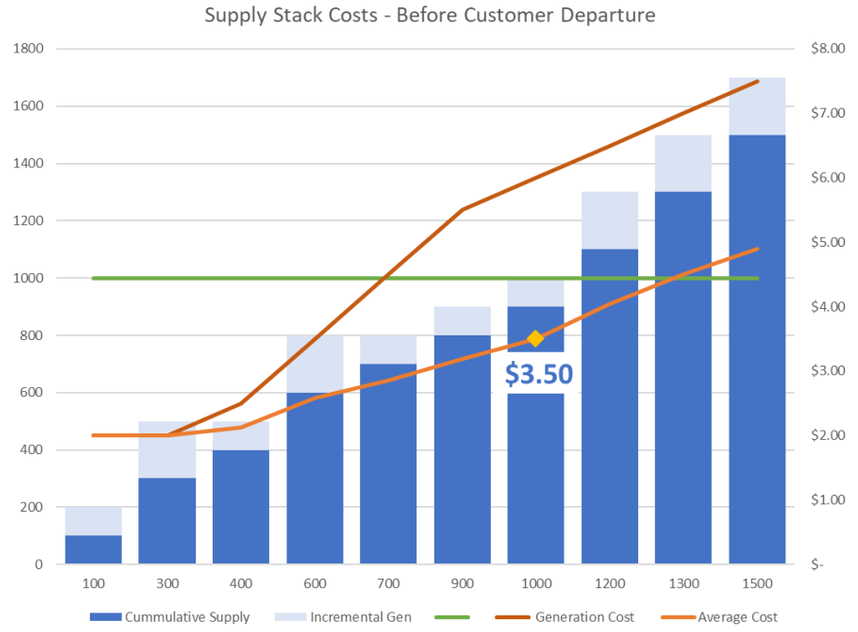
ESP Defaults – Customer Returns to PREPA	
Return Charges	ESP pays one time fee to return to PREPA based on PREPA's cost to administer
Eligibility	Customer returns to appropriate retail rate and is eligible for ESP services after 30 days from return
Service Dates	Service converts from ESP to PREPA on date of default
Return Rates	Customer returns to a rate that is based on the forecasted Hourly Imbalance rates for up to 12 months
Notification	PREPA notifies customer of ESP default and conversion to PREPA full service
ESP Settlement	PREPA terminates meter data transfers as of customer's service date PREPA will submit final billing for balance of costs to ESP, including return fees, net of collateral held within 30 days of customer transition

Unbundling of Services – Operating Model

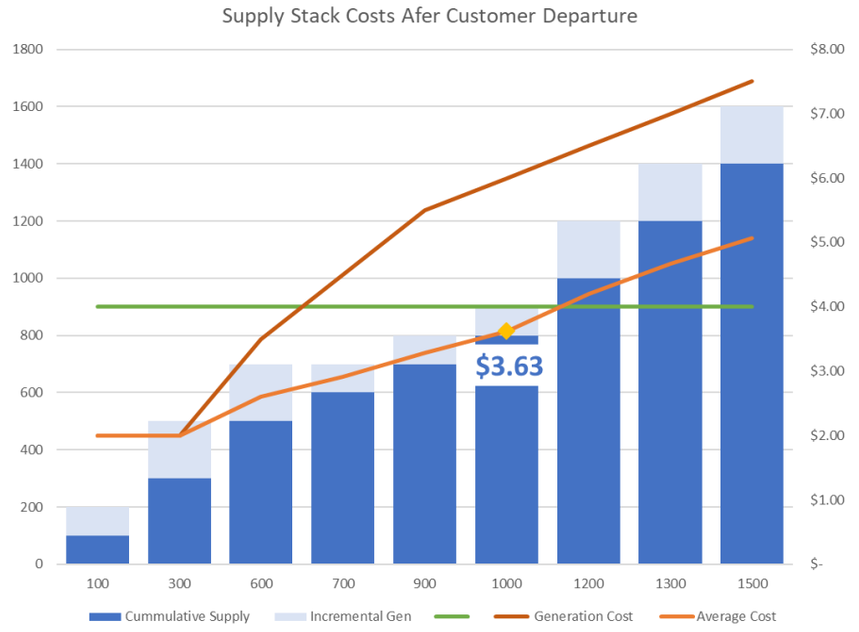
Step 10: Determine Required 'True-Up' Mechanisms

- *True-up mechanisms will most likely be required to ensure there is little to no cost shifting among customers who remain with PREPA, particularly low-income residential customers, and ESP served customers.*
- *Such mechanisms will result in change in charges between ESP and PREPA or included as discounts to export credits*
- *One example of potential sources of cost shifting is discussed here*

Average Energy Cost Adjustment



Account for change in average costs as ESPs terminate low cost PPAs in favor of service customers directly



Uniform Wheeling Agreement
Key Findings & Challenges

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Note: This symbol indicates a slide that will be presented during the Technical Conference. Slides without this symbol provide additional context for readers but will not be presented unless there are specific questions on the material.

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Key Findings – Uniform Wheeling Agreement

FINDING #1	Operating Model needs to be finalized to ensure appropriately structured Uniform Services Agreement
CONCLUSION	PREPA determine operating model, specifically relying on three key conclusions: 1. Billing: ESP bills and collects for services from ESP's customer while PREPA bills and collects for services from ESP's customer 2. Losses: ESP provides supply to cover losses (rather than financial settlement at marginal costs) to limit credit risk 3. Congestion: PREPA will 'socialize' congestion costs until PREPA is able to measure and account for congestion in separate charges

FINDING #2	Further refinement on customer return policy was needed
CONCLUSION	PREPA determine three scenarios for customer return: • Customer Choice • ESP Choice • ESP Default PREPA suggests refinements based agreement on the following principles: 1. Customer who chooses to return should be limited from opting for ESP supply for 12 months to ensure customer does not arbitrage at the expense of PREPA's remaining customers 2. Customer who returns due to ESP default or ESP Choice would be eligible for opting for ESP supply after a 30-day period to settle and address administrative issues

FINDING #3	Further refinement on collateral requirements was needed
CONCLUSION	Order allows for credit for an estimate of one month of customers fuel costs PREPA proposes two refinements: 1. Collateral should be adjusted based on customers established credit ratings (by 'Big Three') 2. Collateral requirement should be base four times the 'average costs times average load' to account for months where costs or low could be well above average (as opposed to a potential maximum bill) as well as 90 day payment terms

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Key Challenges – Uniform Wheeling Agreement

CHALLENGE #1	Sector restructuring creates uncertainty – namely creation of GenCo that will own and operate generation assets and sell supply to PREPA – could result in a change in agreements depending on GenCo's compensation structure, roles and responsibilities, and 'transfer pricing' to PREPA
RESOLUTION	Uniform Services Agreement should focus on current market structure, but fees should be segmented to allow for adjustments for GenCo provided cost. Specifically, 1. Imbalances would be based on GenCo energy rates (GenCo Bulk Services Tariffs or BST) 2. Losses Adder would be based on the actual difference between GenCo delivered energy and metered loads Once GenCo is established, a separate agreement between generators may be required and could drive fees in Uniform Services Agreement 1. Load related GenCo ancillary services charges will be included in PREPA's charges while generation related GenCo ancillary services will be charged to each generator

CHALLENGE #2	Terms and Conditions require legal input and review
RESOLUTION	PREPA file Uniform Services Agreement "Term Sheet" on May 10 and conduct a Technical Conference after May 10 to solicit input from both PREB and other stakeholders on actual legal terms and conditions

CHALLENGE #3	Sector restructuring and other policy and market rules that remain unclear create uncertainty
RESOLUTION	Emphasis an Unbundling Framework that is able to accommodate market changes

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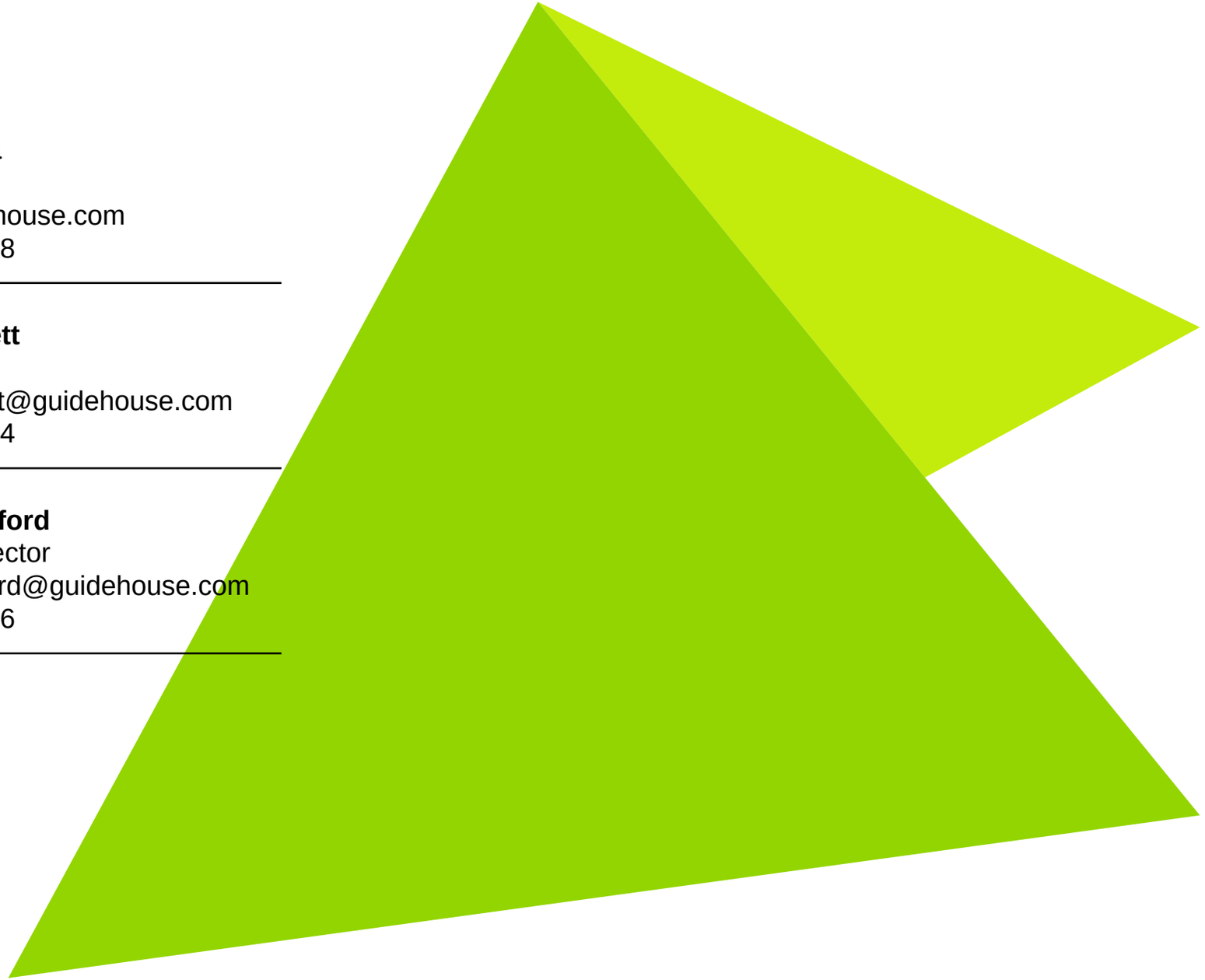

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