



PJM Strawman Proposal

Special MIC DER
November 17, 2017



1. Not Demand Response, not Generation: proposal is for 3rd ruleset for DER.
 - DER can choose to participate as either Gen, or DR, or under new DER rules. Participation under new DER rules is voluntary.
2. Individual DER and aggregated DER can participate under new DER rules.
3. All DER sites must have interconnection approval from the EDC and come through the PJM queue.
4. DER behind a customer meter must also be approved by EDC for wholesale participation.
5. Unless otherwise specified, DER rules (e.g., for telemetry) = Generation rules.
6. Individual DER & aggregations are managed through electronic DER Hub.
7. Option for “Marketer” intermediary as per Generation status quo.
8. Strawman for discussion: DER day-ahead schedules are shared with EDC upon request.

10 MW standalone “front-of-meter” distribution-connected:

1. Solar farm selling energy.
2. Battery storage selling Regulation.
3. Microturbine selling energy, Regulation, and Synchronous Reserves.
4. 4 MW gas engine wired with 3 MW load.
5. 500 kW coal combined heat and power at a 200 - 500 kW load.
6. 2MW of solar and 2MW of battery storage wired with 3MW load.
7. 200 kW of solar wired with 100 kW of load.
8. 20 separate DER Unit, each with 2-12 kW of load and 5 kW of battery storage.

(Note: Capacity to be treated in subsequent stages of discussions)

#	<i>Phase I Scope: DER providing ancillary services and/or wholesale energy</i>	A (PJM Strawman)
1	Market participation and engineering study requirements for injections beyond the POI to the distribution or transmission system for participation in PJM markets. (This requirement applies only for wholesale DER that inject. Does not apply to retail-only net energy metering)	
1.1	DER market participation approval process	Status Quo Generation framework: "behind the customer meter DER"
1.2	Network engineering study	Status Quo Generation framework: "behind the customer meter DER"

Jurisdiction Over Interconnection and Sales of Generation/Storage on Distribution Facilities

Is this a Net Energy Metering (NEM) facility without excess generation at the end of a billing period?

YES



Physical Interconnection Sales Jurisdiction

NO 1. A NEM Facility with excess sales or 2. Not a NEM Facility

Is this a Qualifying Facility (QF) selling under a PURPA rate to the interconnected EDC?

YES



Physical Interconnection Sales Jurisdiction

NO 1. QF not selling to interconnected EDC at PURPA rate or 2. Not a QF

Is this a Qualifying Facility (QF) not selling to interconnected EDC at a PURPA rate?

YES



Physical Interconnection Sales Jurisdiction

NO 1. Not a QF

Is this a generator interconnecting to a non-OATT distribution facility?

YES



Physical Interconnection



Sales Jurisdiction

1. On a distribution line with prior FERC jurisdictional sales or 2. On a transmission line

NO

Physical Interconnection Sales Jurisdiction





PJM Tariff Interconnection Options

- To participate in front of the meter in the wholesale market, a PJM Interconnection Request is required.
- For PJM Tariff interconnection procedures to apply, request must be FERC jurisdictional
 - If state jurisdictional: final agreement - Wholesale Market Participation Agreement
 - If FERC jurisdictional: final agreement - Interconnection Service Agreement
- Forms of Tariff Interconnection Requests for inverter-based DER generation:

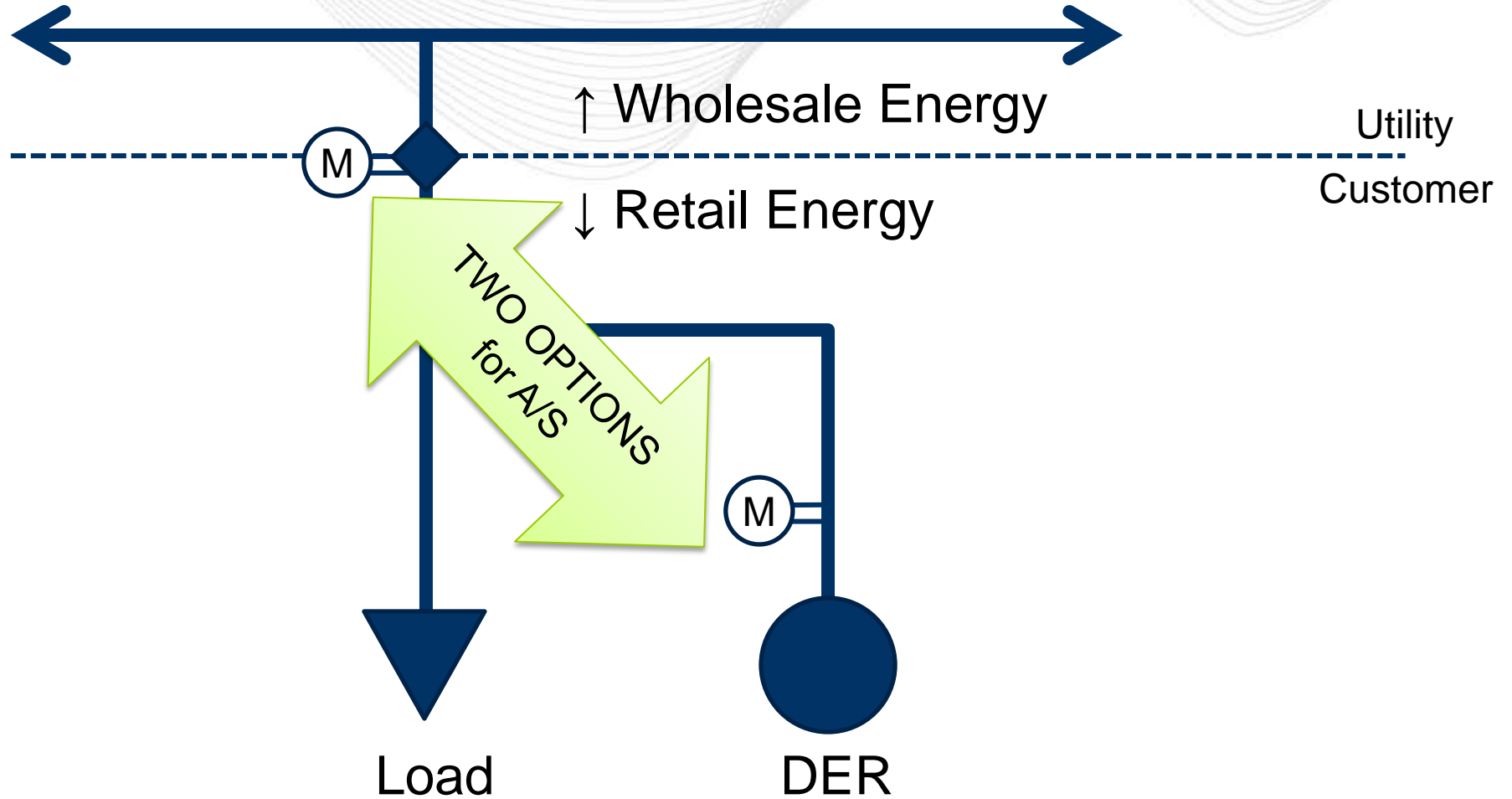
PJM Tariff Attachment	Applicable PJM Tariff Section	Applicable to	Deposit Costs ¹	Tariff Duration from queue window close ² to ISA Assumes Qualifications Met
BB	112B	≤ 10 kW inverter-based	\$500	23 days
Y	112A	>10 kW & up to 5 MW inverter-based	\$2k/3k/5k	1-3 months
N	110 (Capacity) or 111 (energy-only)	<ul style="list-style-type: none"> ➤ 5 MW & ≤ 20 MW inverter-based ➤ All Capacity Requests 	\$10k/12k/15k or expected cost in Transmission Owner zone.	4-12 months* * PJM will seek to expedite study process

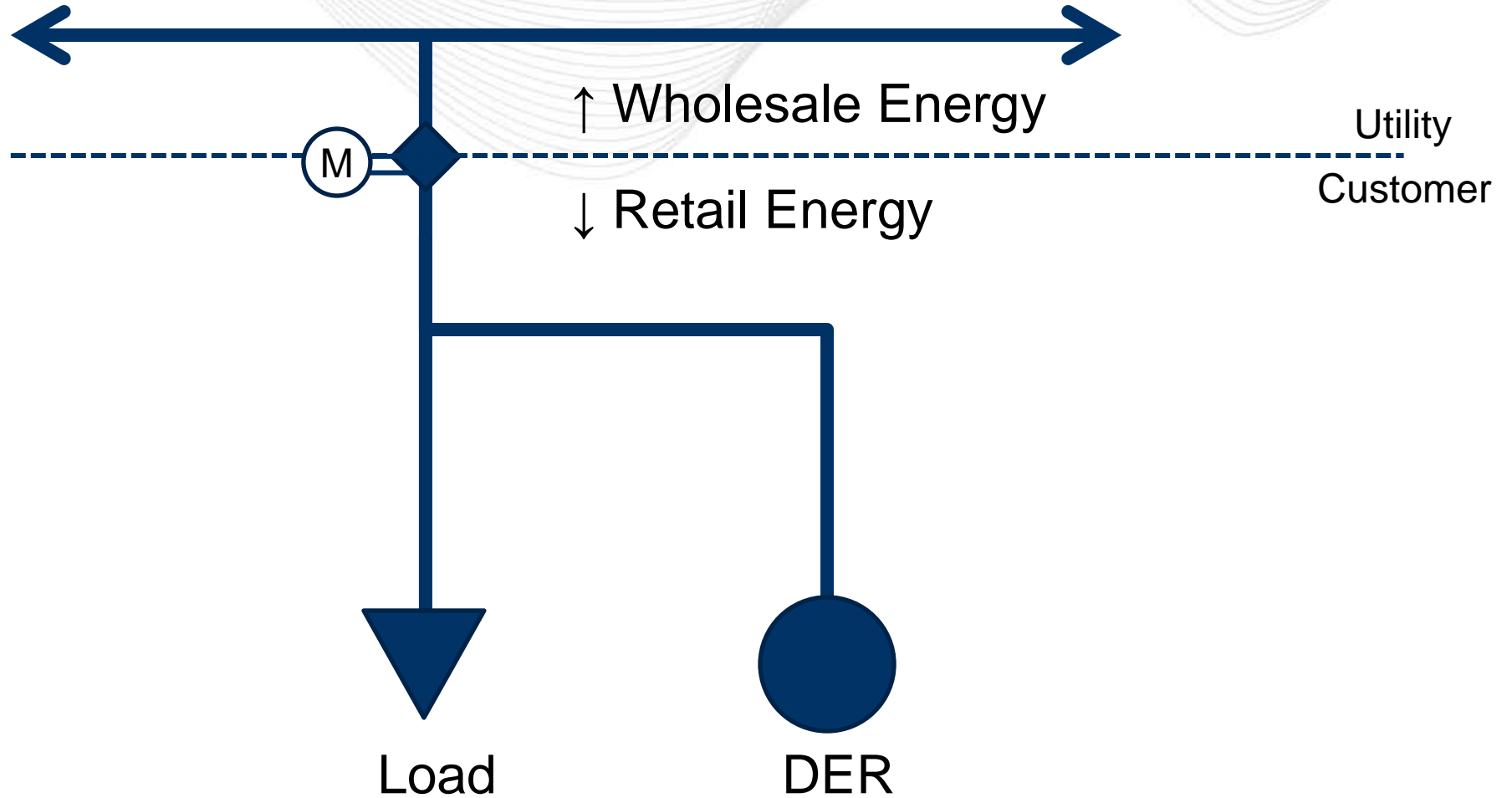
¹ Customer responsible for actual costs: study, agreements, system upgrades, metering, and telemetry.

² Special PC Session: New Service Request Study Methods working to remove the need for queue window to close.

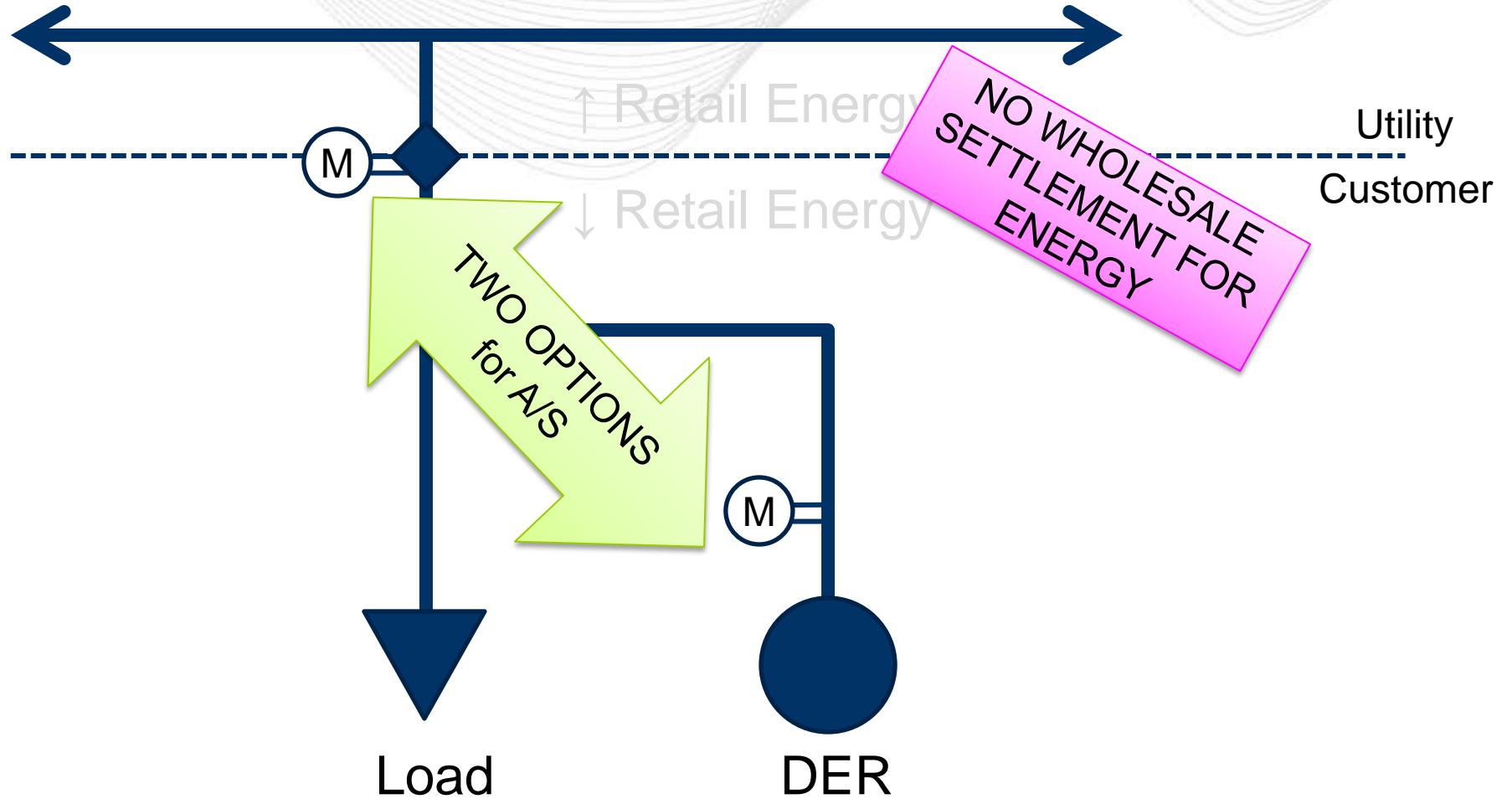
	#	Phase I Scope: DER providing ancillary services and/or wholesale energy	A (PJM Strawman)	B
	2	Wholesale market measurement, accounting, and associated metering points.		
Behind the customer meter only	2A.1	PJM Ancillary Services: Method to measure wholesale activity and performance Note: PJM Ancillary Services are wholesale only, no need to distinguish wholesale from retail	<i>Option A: Either measure at POI, or option to directly meter DER (i.e. Sub-meter). TBD rules to ensure performance is zeroed out if disconnected from grid due to a distribution system outage.</i>	
	2A.2	PJM Energy Market: Method to measure wholesale energy vs ordinary end-use retail energy (e.g. kWh / MWh)	<i>Option A: Withdrawals are retail, injections are wholesale</i>	
	2A.3	Method to measure self-supplied station power vs. retail-purchased station power.	<i>Option A: No remote or interremopral self-supply of station power unless specially arranged with EDC.</i>	
	2A.4	Method to separate and measure retail vs. wholesale activity (CAPACITY) Parking Lot	<i>PARKING LOT</i>	

Ancillary Services Performance Measurement Concept





"Ancillary Services Only" Concept



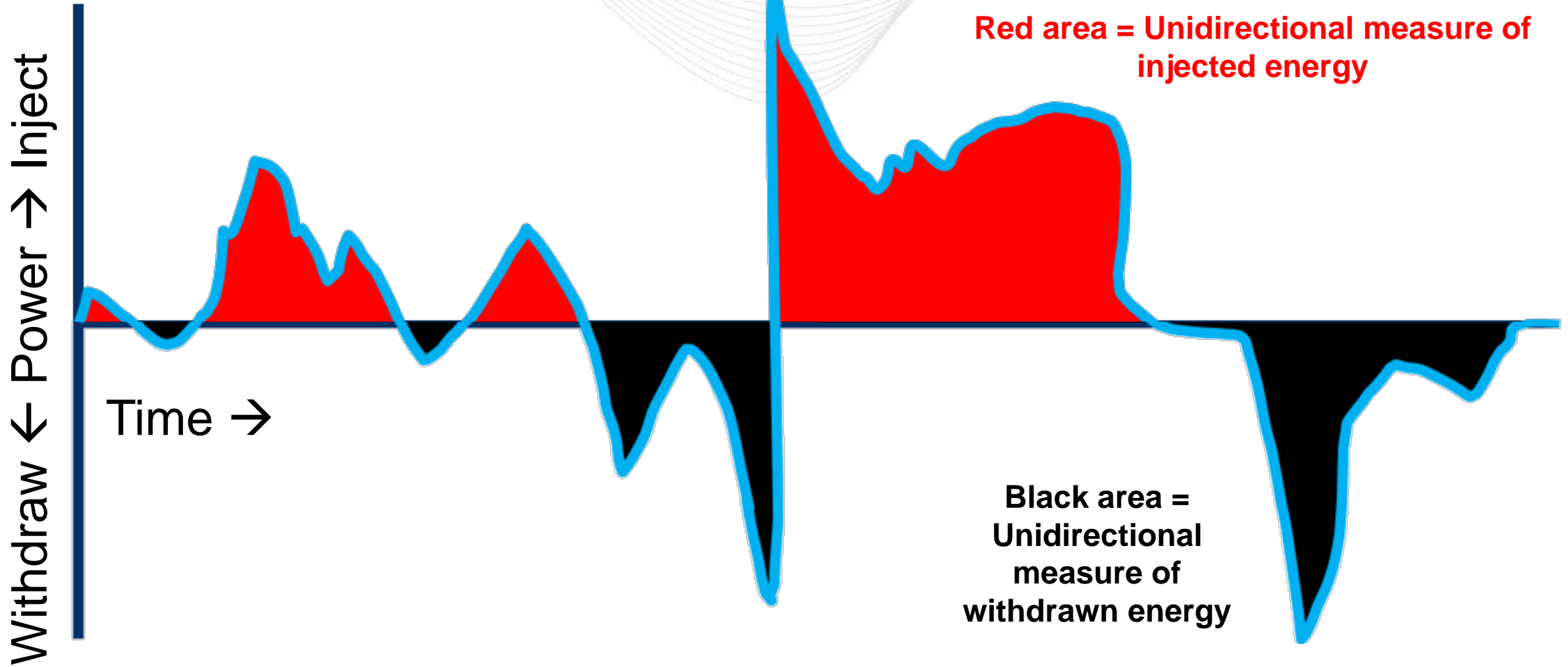
#	<i>Phase I Scope: DER providing ancillary services and/or wholesale energy</i>	A (PJM Strawman)
2B.1	PJM Ancillary Services: Method to measure wholesale activity and performance Note: PJM Ancillary Services are wholesale only, no need to distinguish wholesale from retail	Option A: Either measure at POI, or option to directly meter DER (i.e. Sub-meter). TBD rules to ensure performance is zeroed out if disconnected from grid.
2B.2	Method to measure retail vs. wholesale energy for primarily front of the meter resources that occasionally serve load	Option B: All energy is either wholesale or station power. Non-fleet Station Power: fleet netting is not allowed for Front of Meter DER with a pigtail that can directly serve adjacent load. If it meets the PJM definition of Station Power (e.g., power used for plant equipment), monthly net consumption at DER POI is a retail purchase of station power. Front of meter DER with a pigtail may not directly serve adjacent load using power withdrawn from the grid. DER may only directly serve load if consistent with state rules and laws.
2B.3	Method to separate and measure retail vs. wholesale activity (CAPACITY) Parking Lot	PARKING LOT

Front of meter

- Energy market proposal: follow status quo for customer-sited wholesale generators wired-with-load on “sell excess” basis:
 - Energy injected to the distribution grid at the Point Of Interconnection (POI) is paid by PJM at wholesale LMP.
 - Energy withdrawn from the distribution grid at POI is settled by EDC at retail.
- To be eligible for wholesale energy settlement, customers must have unidirectional retail metering that records only withdrawals (see slide 13).
- Customers with retail meters that record injections, and customers that have retail compensation for injected energy, will **not** be settled at wholesale for injected energy.

*Ancillary Services + Energy + Aggregation = first draft of a standalone package.
Consider this package a starting point for discussion.*

Unidirectional metering depiction



#	<i>Phase I Scope: DER providing ancillary services and/or wholesale energy</i>	A (PJM Strawman)	B
3.1	Size-related rules for aggregation to meet minimum market size threshold of 100 kW (many to one)	Same as Status Quo Demand Response: No minimum DER size. Max of one 100+ kW DER per aggregate. Minimum aggregate size of 100 kW.	
3.2	Size-related rules for aggregation related to maximum market size limit	Option D: 1 MW	
3.3	Location-related rules for aggregation to meet minimum market size threshold of 100 kW (many to one)	Option F: has to be within same EDC	
3.4	Ancillary Services: rules for aggregation for PJM market Performance Compliance purposes	Same as Status Quo Generation	

- EDC has primary responsibility for maintaining safe and reliable distribution.
- This aggregation proposal is designed to recognize the central role the EDC plays in DER activity:
 - The EDC is central to the interconnection process for each DER under applicable regulatory oversight.
 - The EDC plays an important role at each step of the aggregation process.
 - The importance of operational coordination with the EDC.

Note: aggregation here does not mean “DER market participation”. It means “bringing together multiple separate units into one resource”.

1. Purpose of aggregation: **allow small DER to meet 100 kW min size threshold***.
2. Multiple DER units may aggregate in order to reach 100 kW minimum size.
3. DER aggregates on same or adjacent feeders must be approved by EDC.
4. DER cannot aggregate beyond a single EDC.
5. Aggregates implemented as aggregate-nodal (like composite combined cycle units today), not zonal.
6. Maximum aggregate size limit of 1 MW.
 - No more than a single “anchor” DER > 100 kW per aggregate.
7. Key discussion point: rules for cost-based offers and offer parameters.
 - Should all DER in aggregate share the same injected energy settlement track (wholesale vs. retail)?

**PJM position: aggregation for managing risk in complying w/ performance requirements should be identical for DER & Generators.*

- Managing initial DER set up and updates.
- **“DER Unit” vs “DER Market Resource”**.
- **DER Unit** details:
 - Physical: address, owner, etc.
 - Retail: account number, compatibility with wholesale energy settlement.
 - Interconnection approval and reference.
- **DER Market Resource** details:
 - List of one or more associated DER Units (aggregated or individual).
 - Wholesale market-related details.
- Initial set-up is subject to approval process.
- Parameters can be updated in DER Hub subject to (possibly different) approval process.

#	Phase I Scope: DER providing ancillary services and/or wholesale energy	A (PJM Strawman)	B	C
4	Approval processes			
4.1	DER unit approval process	For new DER units: EDC confirms basic site details are correct when DER can serve a retail customer account (either directly or through pigtail(s) or both) for each retail customer served. 10 business days to confirm.	For changes to existing DER units: EDC confirms basic site details are correct when DER can serve a retail customer account (either directly or through pigtail or both) for each retail customer served. 10 business days to confirm. DER unit details can only be changed with EDC approval. DER unit must continue to meet market obligations even if changes are declined.	For new DER units that intend to sell PJM Regulation, or existing DER units that intend to start selling PJM Regulation for the first time, EDC reliability approval is required. EDC has 30 days to provide reliability approval or decline. New DER units that announce their intent to sell Regulation in their interconnection application, and are approved for interconnection, are deemed to have EDC reliability approval for providing Regulation.
4.2	Aggregation approval process	For new DER aggregations: EDC approves aggregations when multiple DER units are on the same or adjacent feeder.	For changes to existing DER aggregations: EDC approves aggregations when multiple DER units are on the same or adjacent feeder. DER aggregation must continue to meet market obligations even if changes are declined.	
4.3	Who ensures each site is properly implemented for metering configuration and meter data arithmetic? Which jurisdiction oversees appropriate metering configuration, implementation, and meter data arithmetic?	Option B: For Energy and Capacity Interconnecting TO (or EDC) ensures each site is properly implemented under jurisdictional oversight as per the interconnection agreement. PJM ensures each site is properly implemented and has oversight over Ancillary Services.		

- DER Unit:
 - EDC interconnection approval required, either via WMPA (under state jurisdiction) or ISA (under FERC jurisdiction). Note PJM queue study of transmission impacts also required for either case.
 - EDC to confirm correct retail account number and other basic details.
 - For wholesale energy settlements coordination: EDC to confirm whether retail load metering is unidirectional—only measures consumption (or not).
- DER Market Resource:
 - If resource is aggregated, and if any DER units in the aggregate are on the same or adjacent feeders: EDC to confirm no reliability impacts from coordinated activity of DER units.

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5	Delegation of market relationship: unit owner <-> PJM (presence of intermediary)	Status quo Generation		
6	Hardware requirements for meter and related hardware (for market participation)	For DER aggregates: telemetry, if required, is a single stream for the entire aggregate representing the sum of the associated values. Market Seller is responsible for maintaining 2 years of per-unit telemetry data of at least a 10-second sample rate for auditing purposes.	To be eligible for wholesale energy settlement, Behind the Customer Meter DER must have unidirectional wholesale metering that records only the sum of power injections, and must have unidirectional retail metering that records only the sum of power withdrawals.	For Behind The Customer Meter DER with retail settlements for energy injections that do not participate in the capacity market, PJM requirements for metering related to energy and Capacity are waived. Only PJM requirements for ancillary services metering and telemetry are applicable.
7	Framework (participation model)	Option A: DER (if not otherwise specified, use Generation rules, e.g. for telemetry)		
8	Wholesale DER observability requirements when performing non-wholesale activity	TBD		
9	Solution Implementation Details	TBD		
10	RERRA (Relevant Electric Retail Regulatory Authority) coordination	TBD		

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11	EDC Coordination	DER day-ahead schedules are shared with EDC upon request	DER telemetry, if it is required by PJM, is shared with EDC upon request (if EDC does not already have telemetry).	List and basic details for DER in EDC territory is available to EDC

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12	Miscellaneous Market Rules	<p>For settlements of injected energy, DER in aggregate must all use retail or all use wholesale.</p>	<p>For Aggregations: ex ante MW weighting across nodes for the energy offers is adjustable with offer. Ex post, settlements are based on actual PowerMeter submissions per DER unit.</p>	<p>For Wholesale DER that directly serve load at one or more customers, either BTCM or via pigtail(s) or both, the load reduction at each respective customer must be measured at hourly intervals to 1% accuracy and provided to PJM post-facto. For Wholesale DER \leq 10kW, the load reduction may be estimated rather than directly measured. PJM will add back the load reduction for the purposes of planning. PJM will also make the load reduction available to EDCs for potential add back in allocation Network Service Peak Load charges (aka, 1CP) and Capacity charges (aka, 5CP).</p>

#	<i>Phase I Scope: DER providing ancillary services and/or wholesale energy</i>	D	E	F	G
12	Miscellaneous Market Rules	DER must be online when providing Synchronized Reserve and otherwise follow the rules of Generators providing Synch Reserve, including resource-specific rules for availability for Tier I estimates.	No energy offer and no lost opportunity cost for DER that are submetered for ancillary services.	No energy offer, self scheduling to sell energy, and no lost opportunity cost for DER that settle injected energy at retail.	No Estimated Tier I Synch for submetered DER or DER settled at retail for injected energy. (They may offer as a Tier II Synch resource).