

ercot

Intermittent Renewable Resources



2026_07 IRRs

Greetings
and
Introductions

- Attendance
- Questions
- Presentation materials
- Recording for internal purposes

PROTOCOL DISCLAIMER

This presentation provides a general overview of the Texas Nodal Market and is not intended to be a substitute for the ERCOT Protocols, as amended from time to time. If any conflict exists between this presentation and the ERCOT Protocols, the ERCOT Protocols shall control in all respects.

For more information, please visit:

http://www.ercot.com/mktrules/nprotocols/

Purpose	Format	Title
Pre-requisite	WBT	Resources in ERCOT
		Resource Responsibilities in ERCOT
Core Courses	ILT	Resources in ERCOT Market Operations
		Energy Storage Resources
		Intermittent Renewable Resources
		Operational Requirements
		IRRs in the ERCOT Markets
		Financial Considerations
		Combined Cycle Generation Resources
Post-requisite	WBT	IRR Forecasting
		Quick Start Generation Resources

Operational Requirements

Topics in this module include:

1. Basic definitions
2. Current Operating Plan
3. Telemetry Requirements
4. Voltage Support and PFR Requirements

Intermittent Renewable Resource (IRR)

A Generation Resource that can only produce energy from variable, uncontrollable Resources, such as wind, solar, or run-of-the-river hydroelectricity

WGRs and PVGRs are aggregations of equipment:

- Same Electrical Bus
- Generally, same model and size
- Does not reduce ERCOT's ability to model

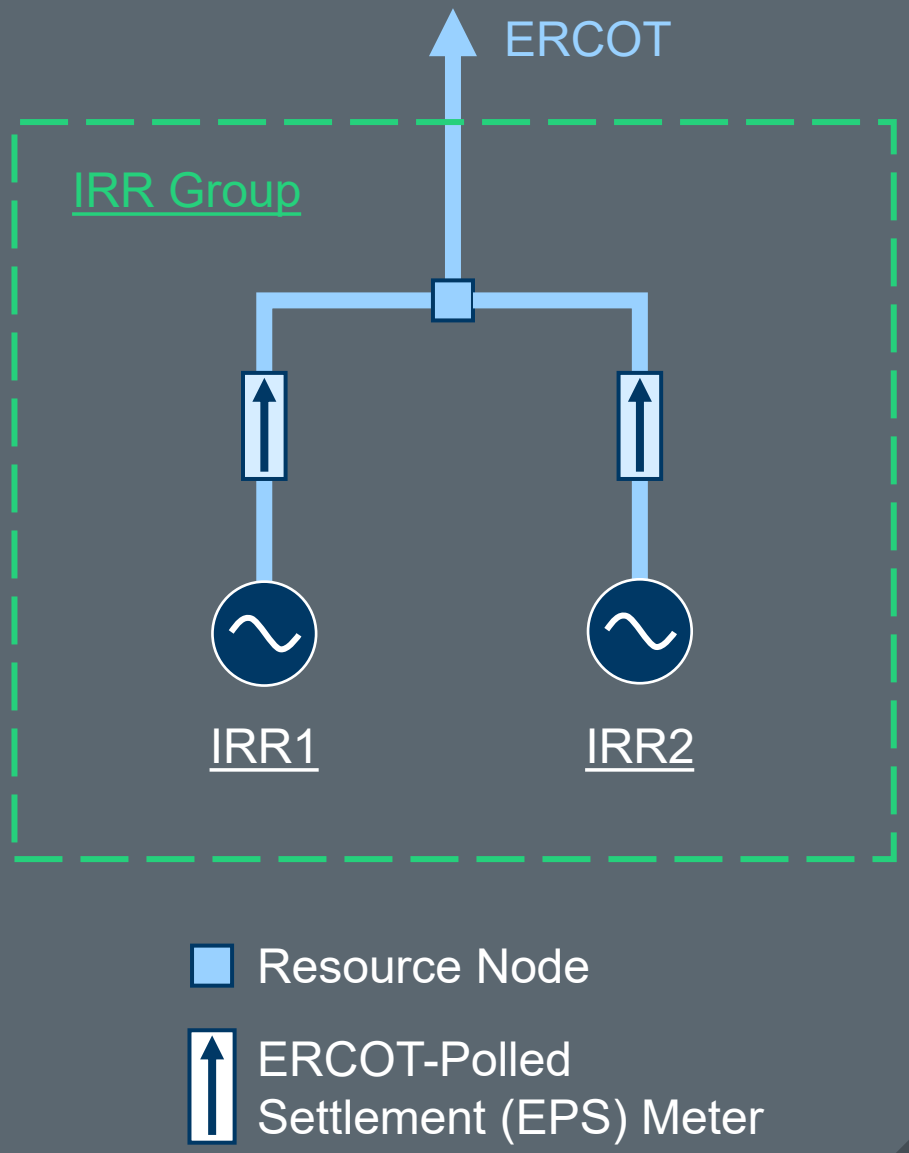
Wind Generation Resources (WGRs)

Photovoltaic Generation Resources (PVGRs)

IRR Group

A group of two or more IRRs whose response to Security-Constrained Economic Dispatch instructions will be assessed and settled as an aggregate

- All IRRs must have the same Resource Node
- No Split Generation Resources



A Resource Entity wants to build a single generation site with both wind generation and photovoltaic systems

1. *Can they create a single IRR?*

2. *Can they create an IRR Group?*

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Communicates expected Resource Capabilities

Current Operating Plan												
Resource Name	Resource Status	Resource Limits				Ancillary Service Capabilities						
		HEL	HSL	LSL	LEL	Reg-Up	Reg-Dn	RRSPF	RRSFF	RRSUF	ECRS	NSRS
WGR1	ON	127	127	0	0	0	0	-	-	-	40	100
WGR2	ON	185	185	0	0	0	20	-	-	-	0	0
PVGR1	ON	162	162	0	0	0	0	-	-	-	0	0
PVGR2	OUT	83	83	0	0	0	0	-	-	-	0	0

Used in the RUC process

Discussion: HSL for a Weather-Dependent Resource?

Wind Generation Resources (WGRs)

Photovoltaic Generation Resources (PVGRs)

Topics in this module include:

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Sample Resource Telemetry Data Received from QSEs

ICCP Resource Telemetry											
Name	Operational Status and Limits						Ancillary Service Capabilities				
	Status (Code)	Power (MW)	HSL (MW)	LSL (MW)	Up Ramp (MW/Min)	Dn Ramp (MW/min)	Reg-Up (MW/min)	Reg-Dn (MW/min)	RRS (any subtype)	ECRS (MW/min)	NSRS (MW/min)
WGR1	ON	122	122	0	40	40	0	0	-	12	4
WGR2	ON	175	175	0	40	40	0	20	-	0	0
PVGR1	ON	170	170	0	36	36	0	0	-	0	0
PVGR2	OUT	0	0	0	0	0	0	0	-	0	0

Based on current capabilities

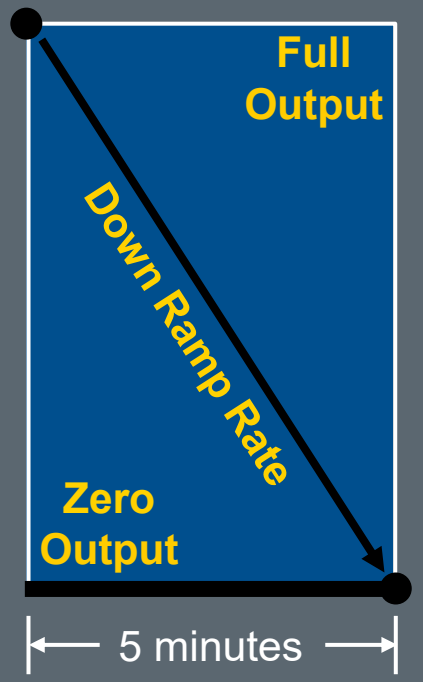
Limited by Protocols

Must be updated every 2 seconds

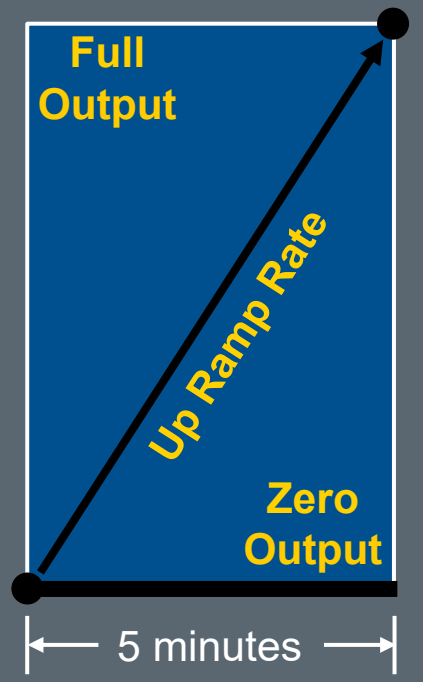
Limited to 20% of Nameplate Rating per minute

Why is this necessary?

When curtailed by ERCOT



When released from curtailment by ERCOT



Resource Site Telemetry Data Received from QSEs

ICCP Resource Telemetry									
Name	Meteorological Data						Equipment Status		
	Wind Speed (MPH)	Wind Direction (degrees)	Barometric Pressure (millibars)	Temperature (°C)	Back Panel Temperature (°C)	Plane of Array Irradiance (W/m^2)	Turbines or Inverters Online	Turbines or Inverters Offline	Turbines or Inverters Unknown
WGR Site	12	190	1025	29	-	-	88	2	0
PVGR Site	8	194	1029	30	35	905	49	0	1

Must be updated every 10 seconds

Topics in this module include:

1. Basic definitions
2. Current Operating Plan
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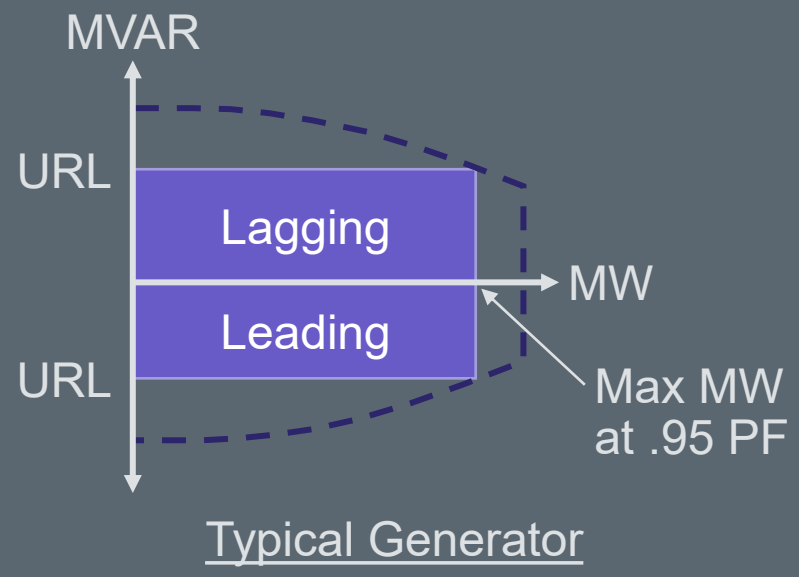
All Generation Resources must produce Reactive Power

IRRs Operating at or above 10% Nameplate Rating

- Support voltage set point at Point of Interconnect
- Up to Unit Reactive Limit (URL)

If output is below 10% of Nameplate, ERCOT may request shutdown

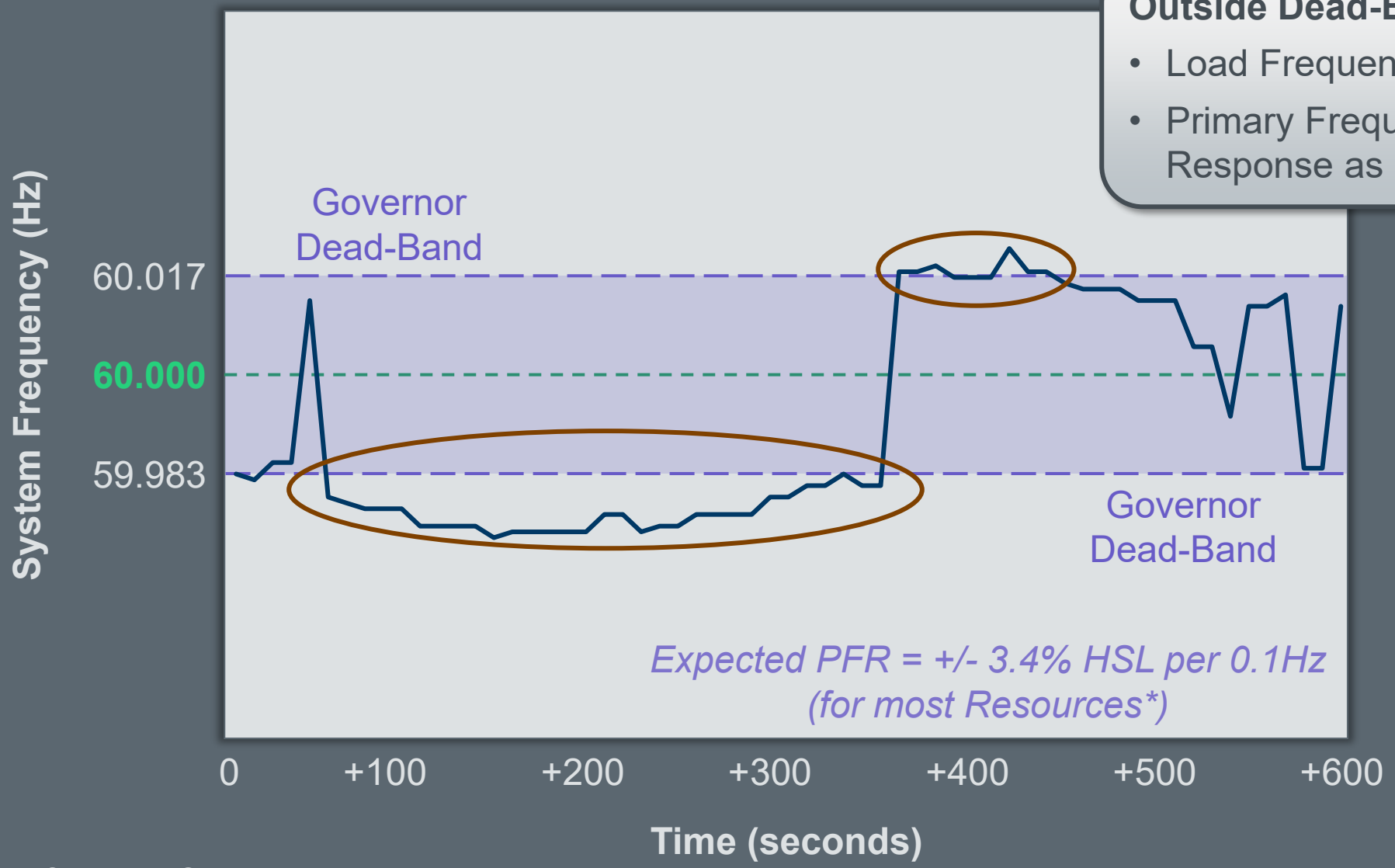


Typical Generator

Primary Frequency Response Requirement

Outside Dead-Bands:

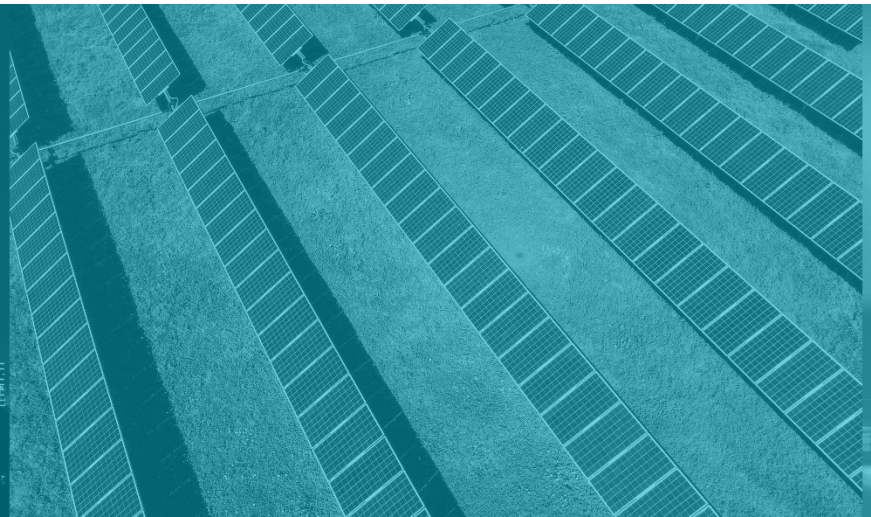
- Load Frequency Control
- Primary Frequency Response as capable



* See Nodal Operating Guide Sections 2 and 8 for more details



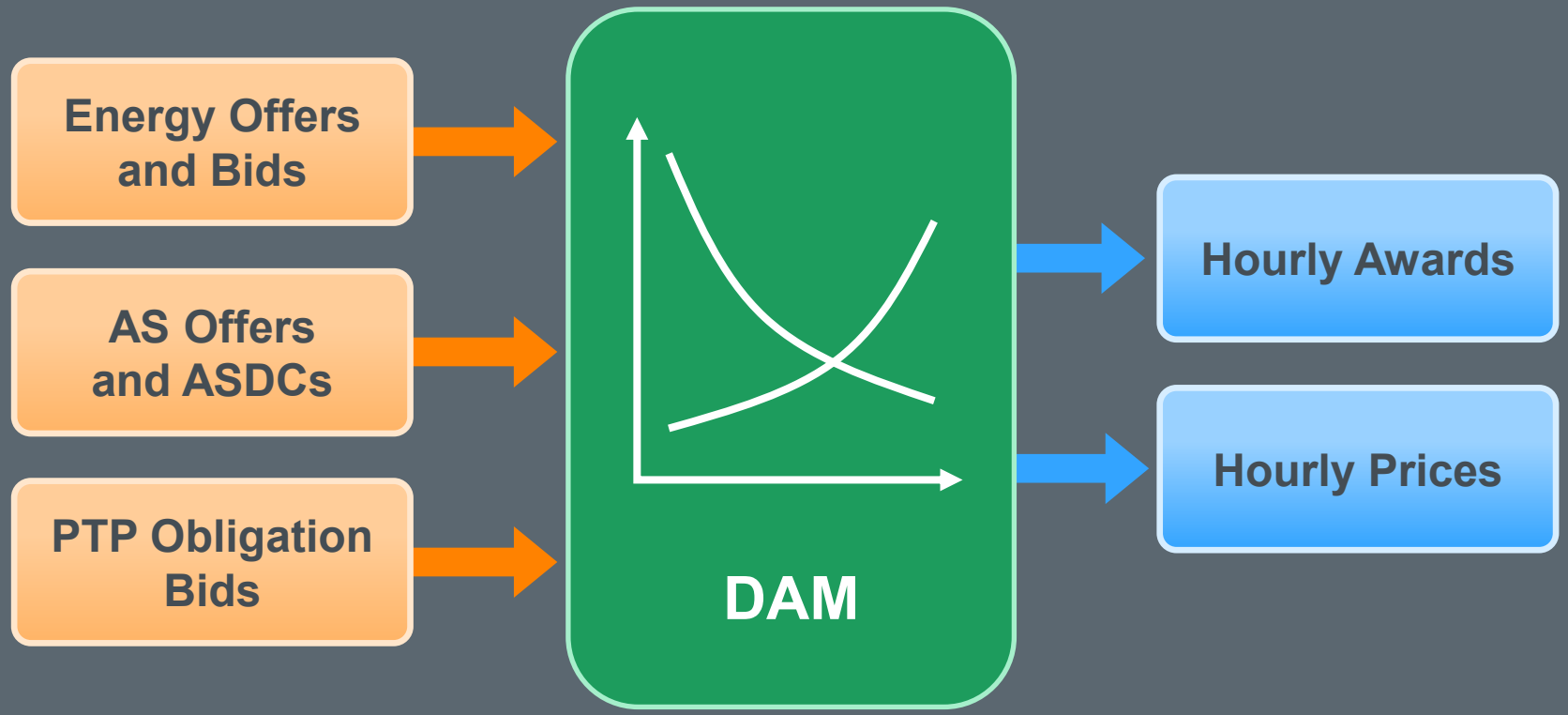
IRRs in the ERCOT Markets

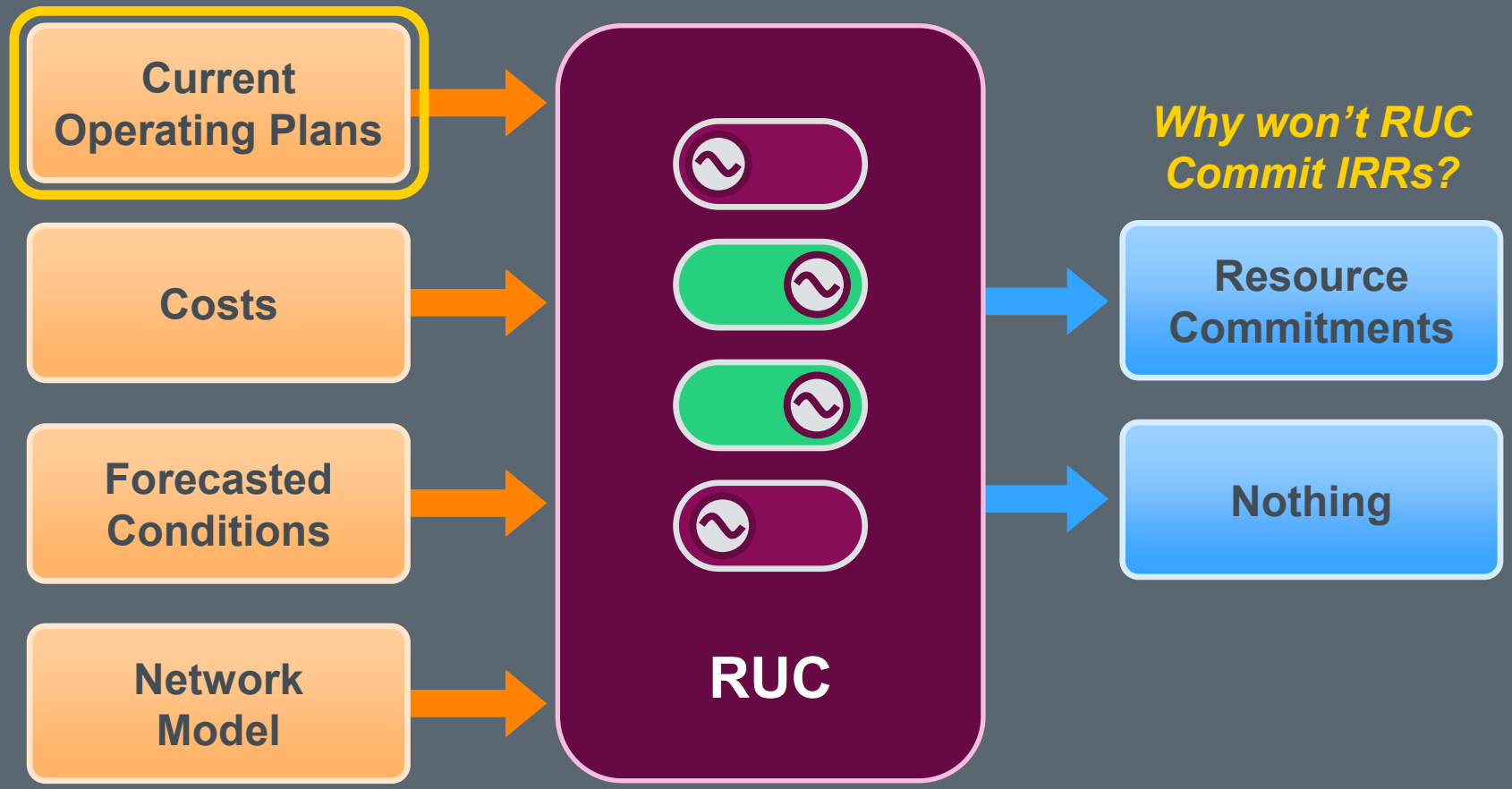

Topics in this module include:

1. DAM and RUC
2. SCED and IRRs
3. Dispatch Scenarios

WGRs and PVGRs generally do not participate in DAM



Considers expected Capacity contribution from IRRs



Topics in this module include:

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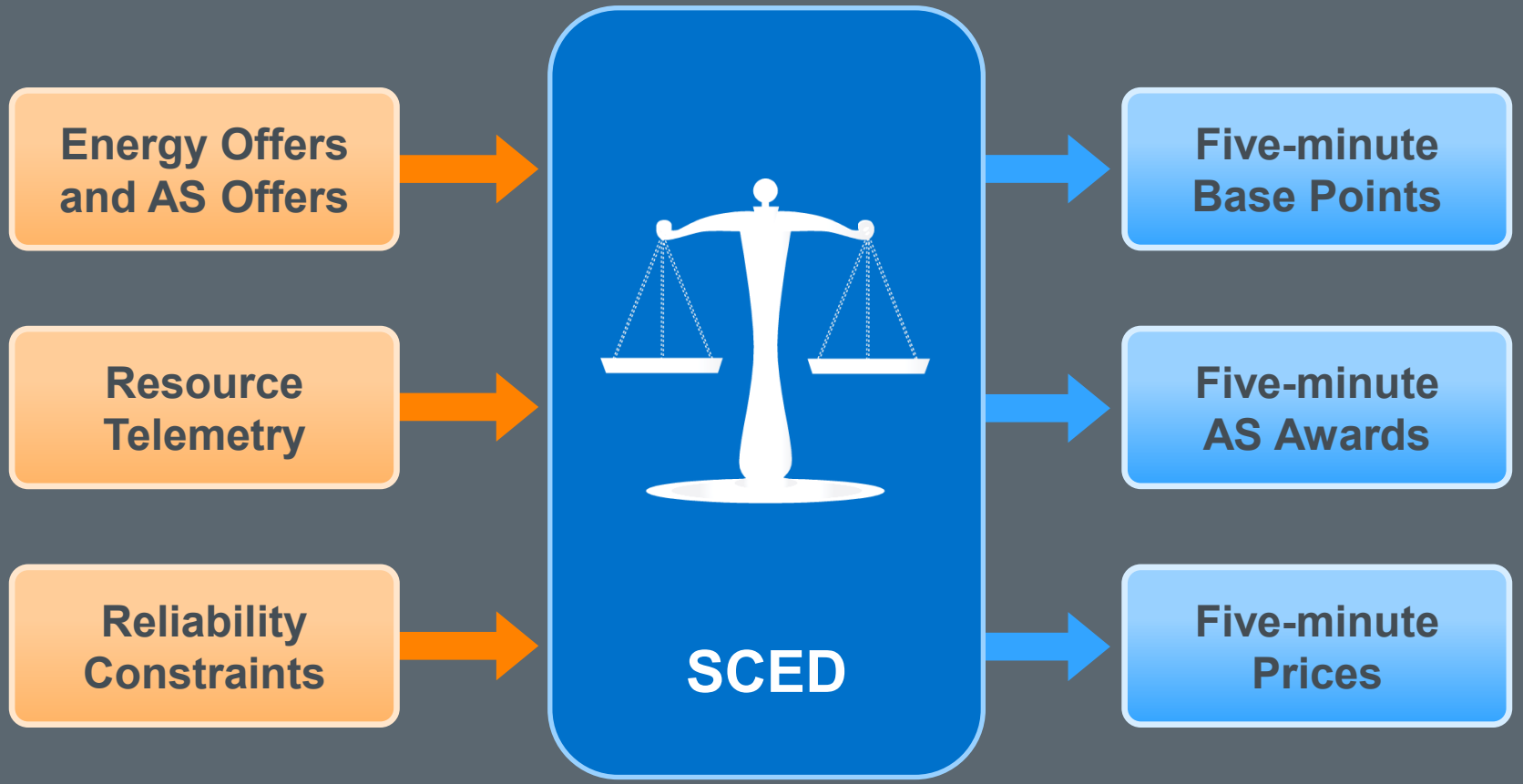
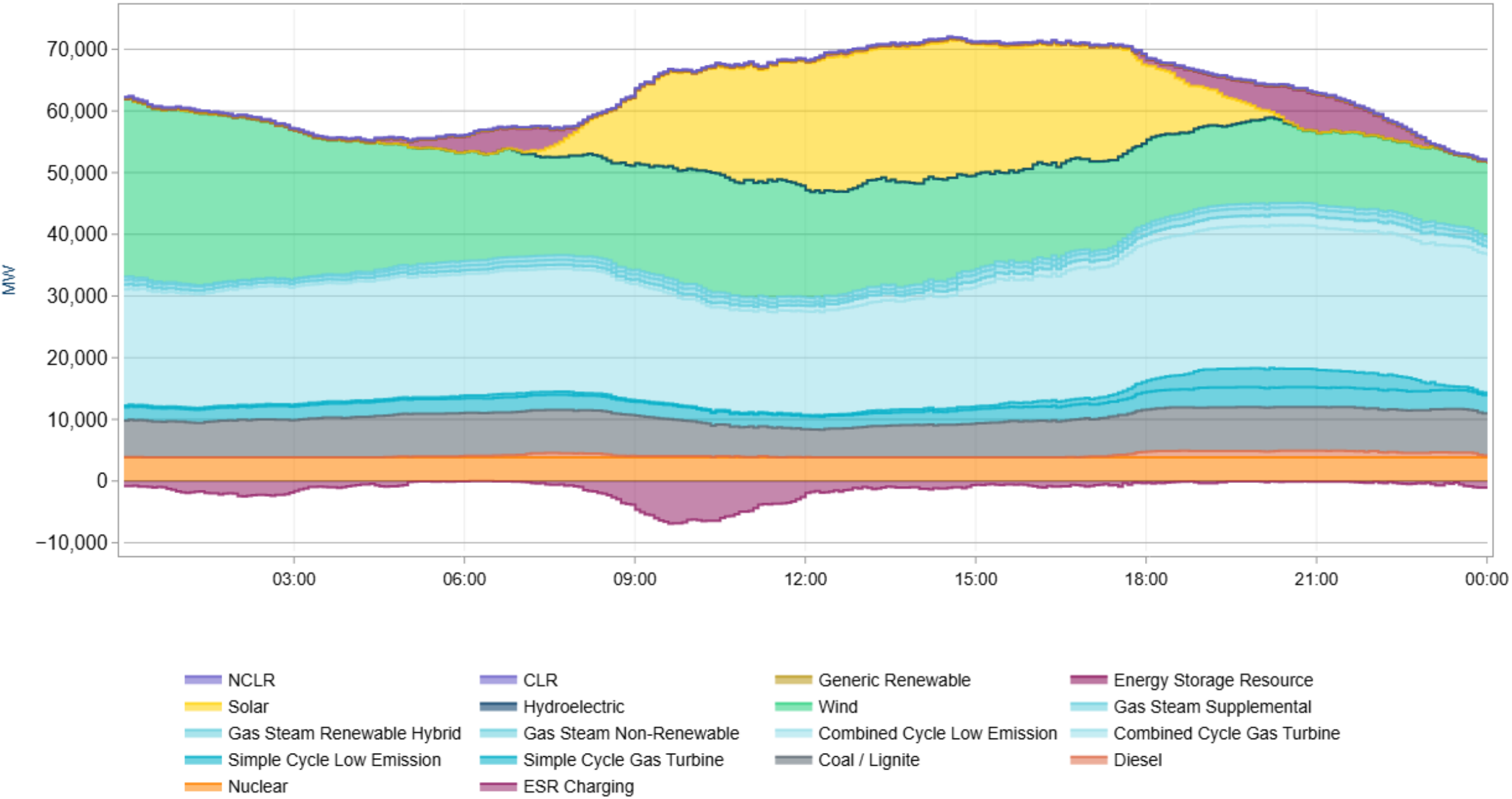
3. Dispatch Scenarios

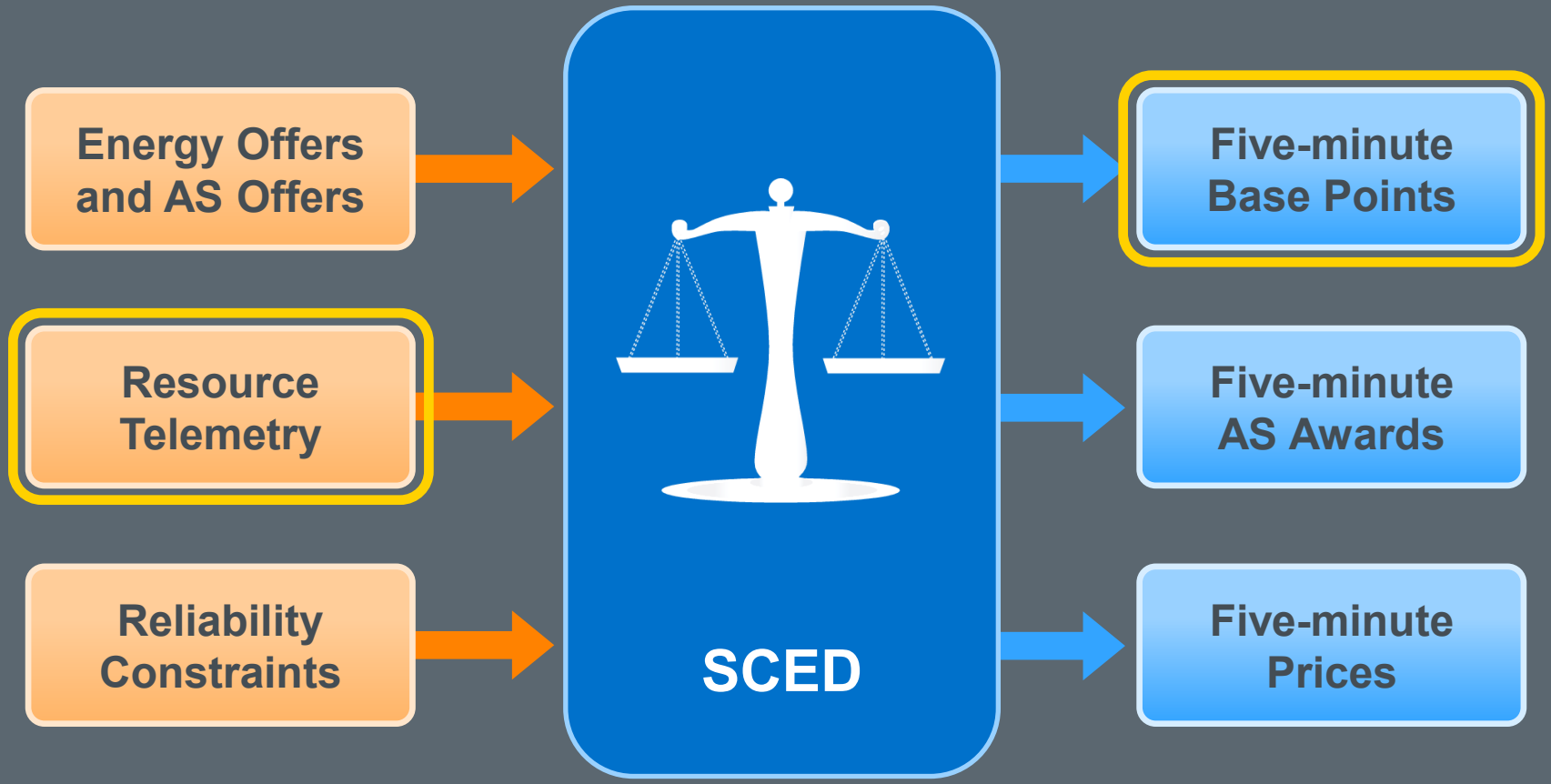
IRRs are a significant portion of Resources in SCED



Energy Production Resource Mix



Relationship between Base Point and output is reversed



Non-IRRs chase their Base Points

IRRs chase their energy supply

- Run at max capability (unless curtailed)
- Base Point is permissive

Goals of IRRs

1. Dispatch to follow energy supply
2. Operate at max capacity

Goals of SCED

1. Dispatch to manage reliability
2. Operate the system at the least cost

Are IRR's goals competing with SCED's goals?

Reconciling SCED goals and IRR goals

1. *How does a QSE tell SCED how many MWs the IRR has to offer?*

2. *How can a QSE make SCED take everything the IRR has to offer?*

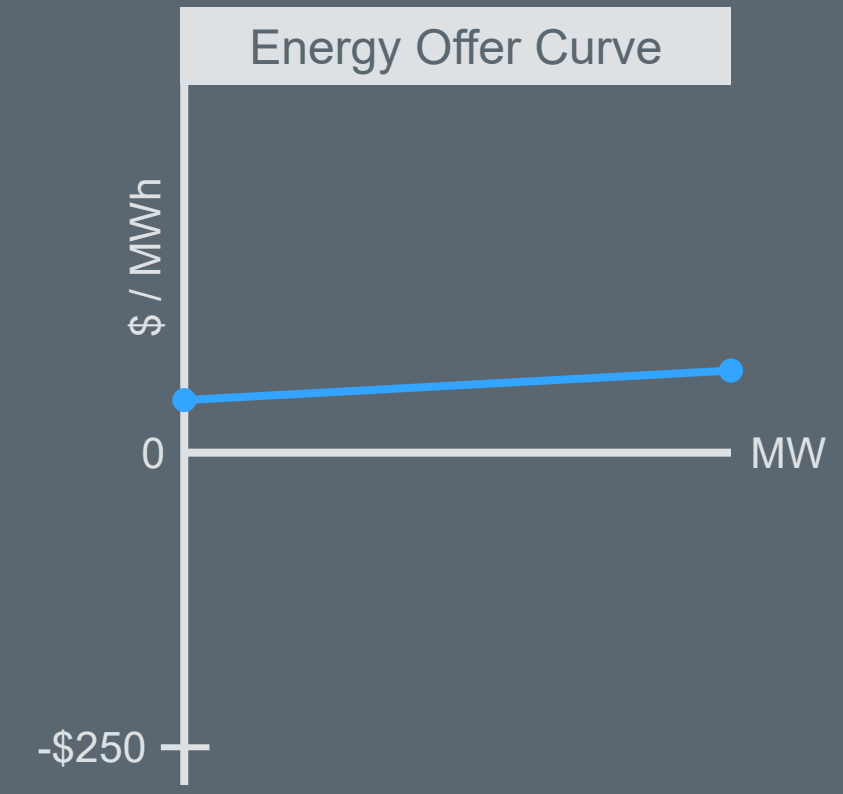
Discussion: Enticing SCED to take ever thing the IRR has to offer

All Energy Offer Curves

- Priced between -$250/MWh and RTSWCAP
- May be submitted anytime before SCED

Energy Offer Curves for IRRs

1. *What price range?*
2. *What MW range?*



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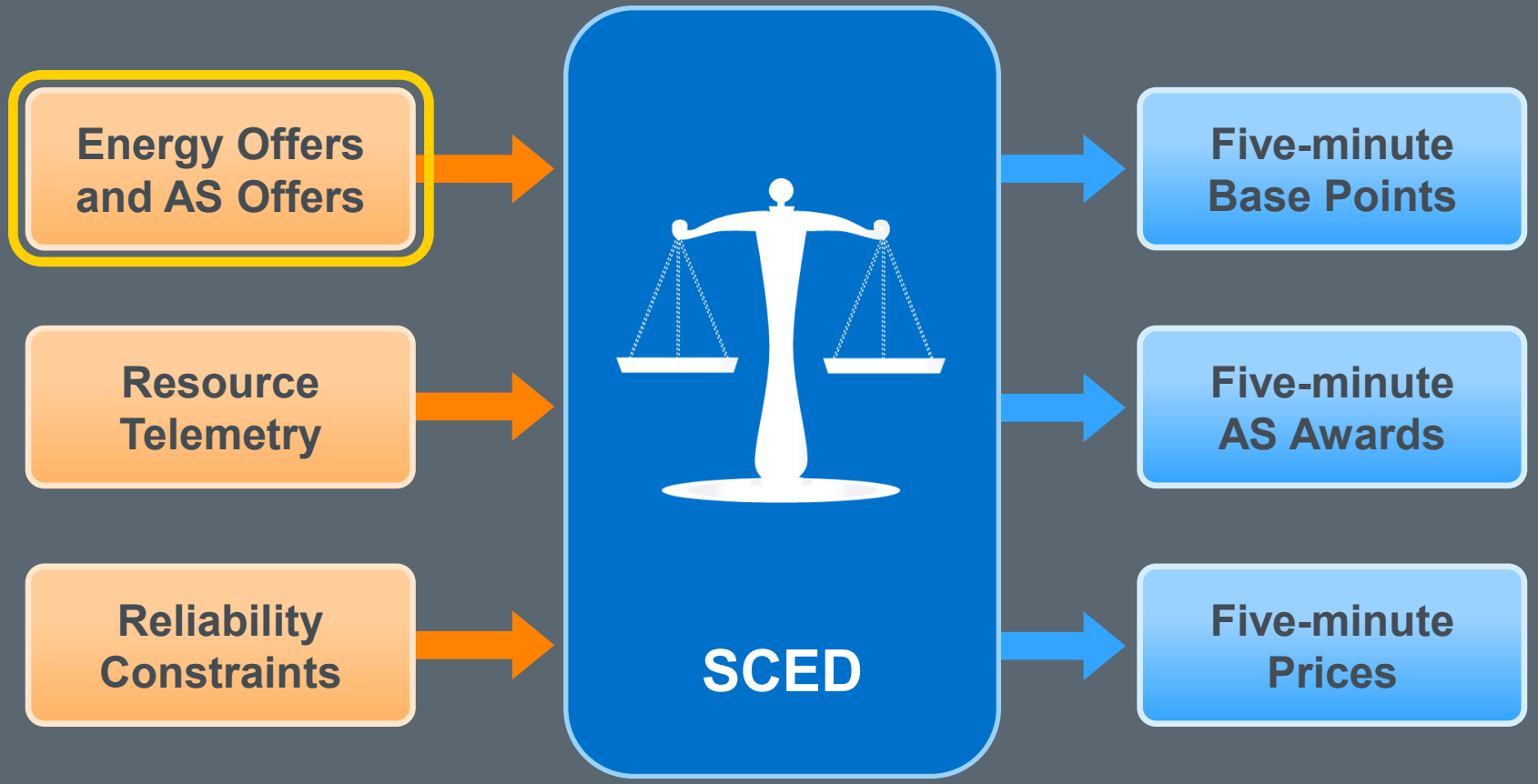
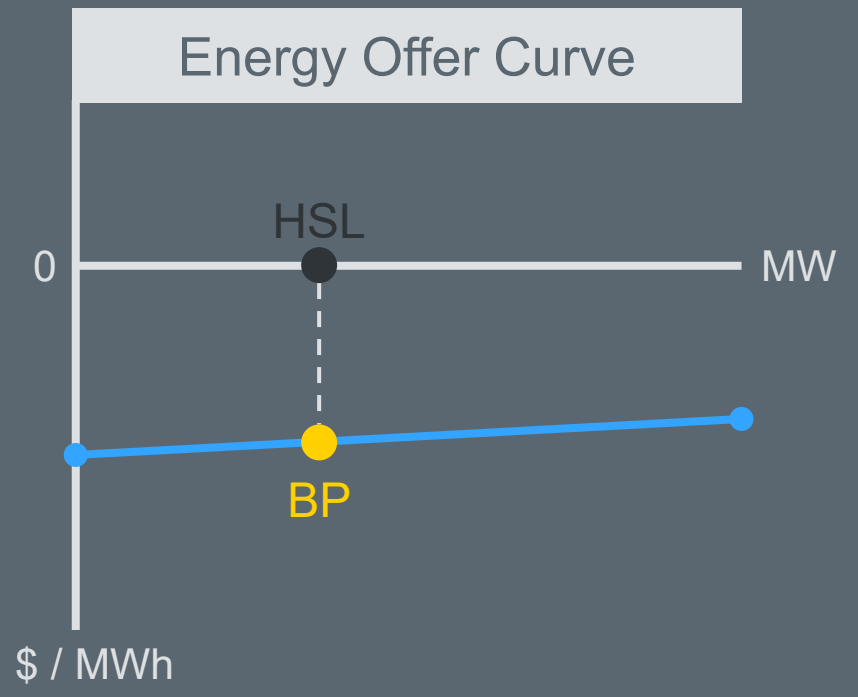
Energy Offer Curves



IRR is available for dispatch and not impacted by any binding transmission constraints

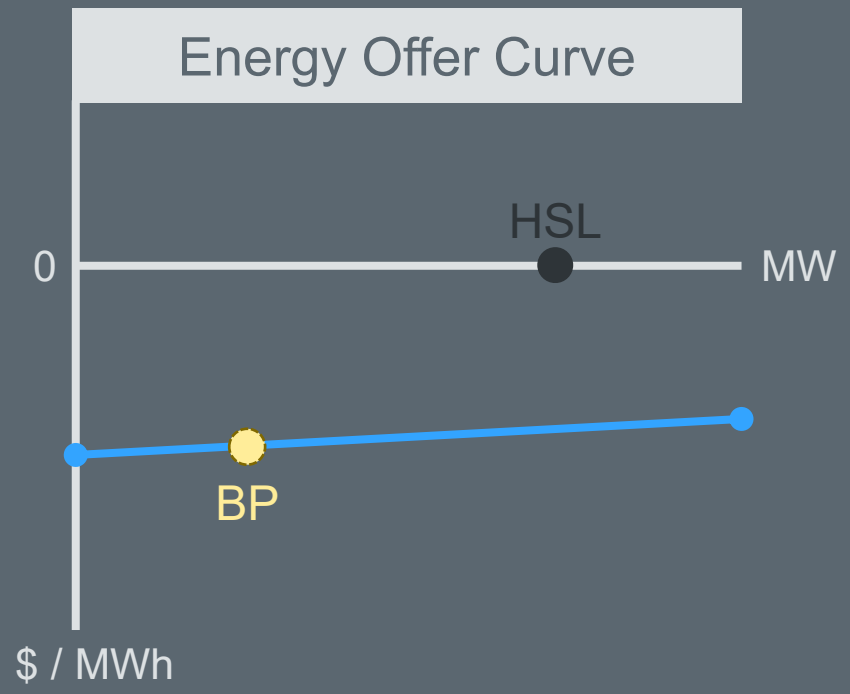
- IRR is a “Price-Taker”
- IRR runs at HSL
- Base Point follows HSL



IRR has positive shift factor on a binding transmission constraint and must be curtailed

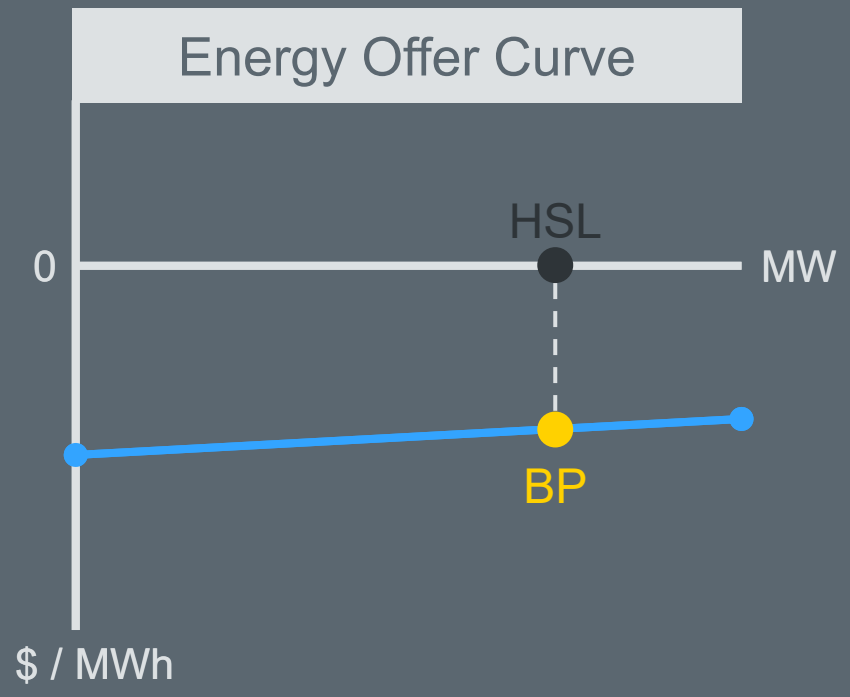
- IRR Energy Offer Curve sets LMP
- QSE must comply with Base Point
- HSL must continue to represent current output capability

May be awarded ECRS or Non-Spin if qualified



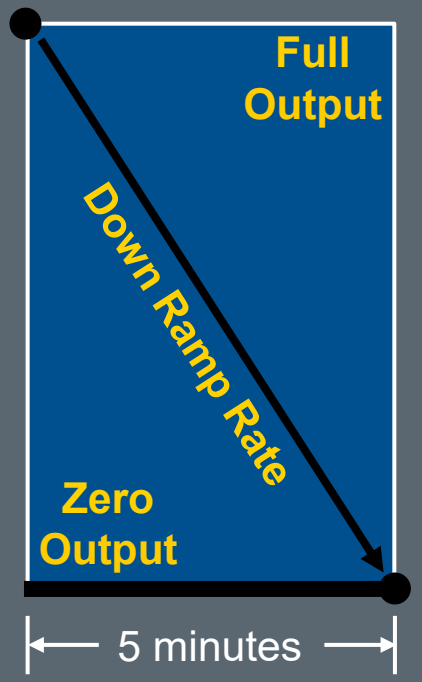
IRR has positive shift factor on a binding transmission constraint and must be curtailed

- IRR becomes “Price Taker” again
- SCED will set Base Point to HSL again

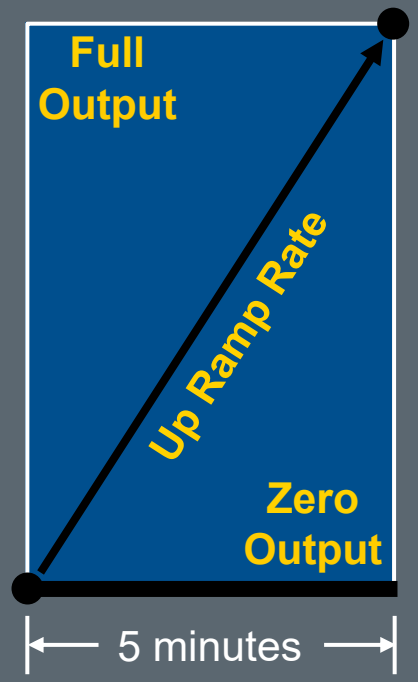


IRR must limit actual ramping to 20% of Nameplate Rating per minute

When curtailed by ERCOT



When released from curtailment by ERCOT

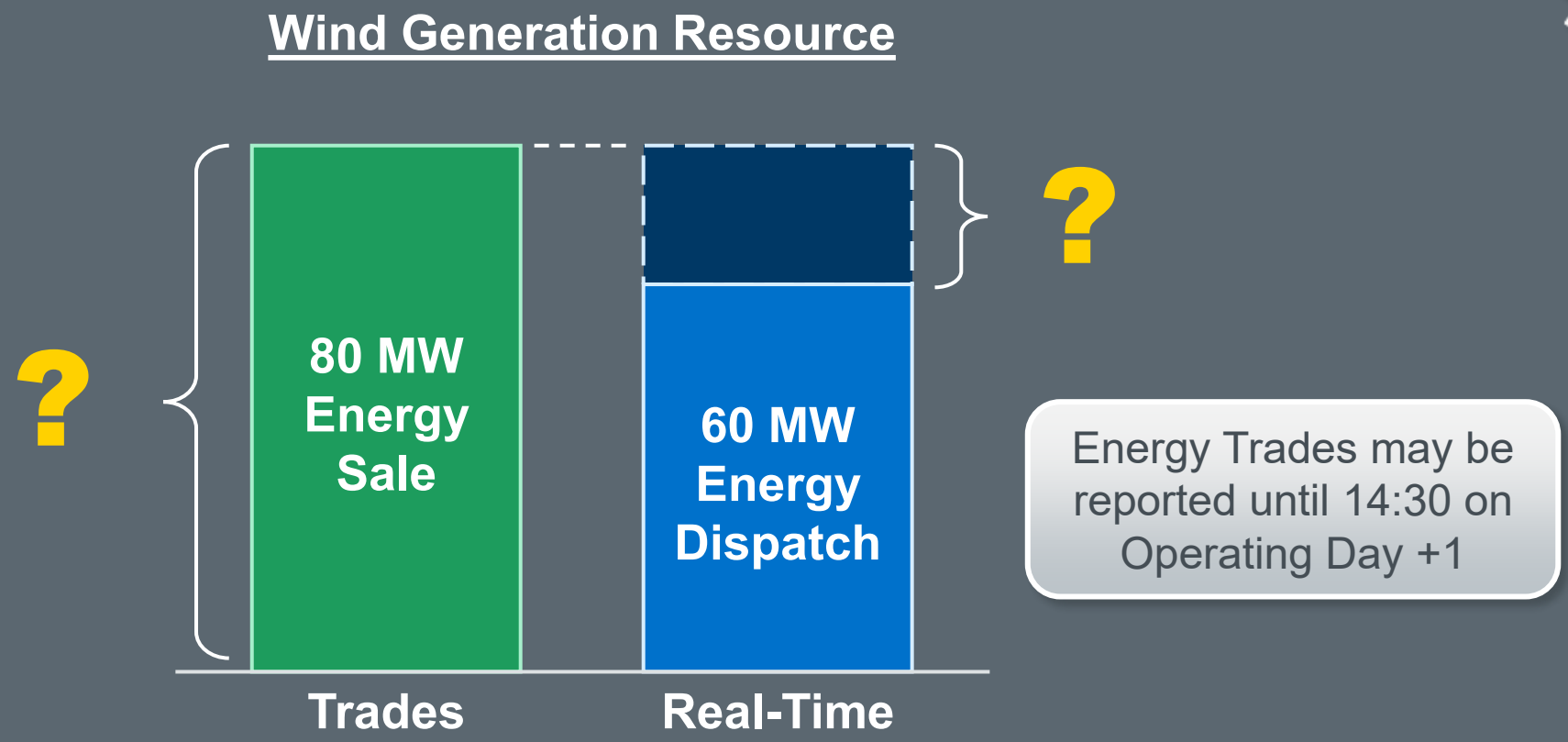


Financial Considerations

Topics in this module include:

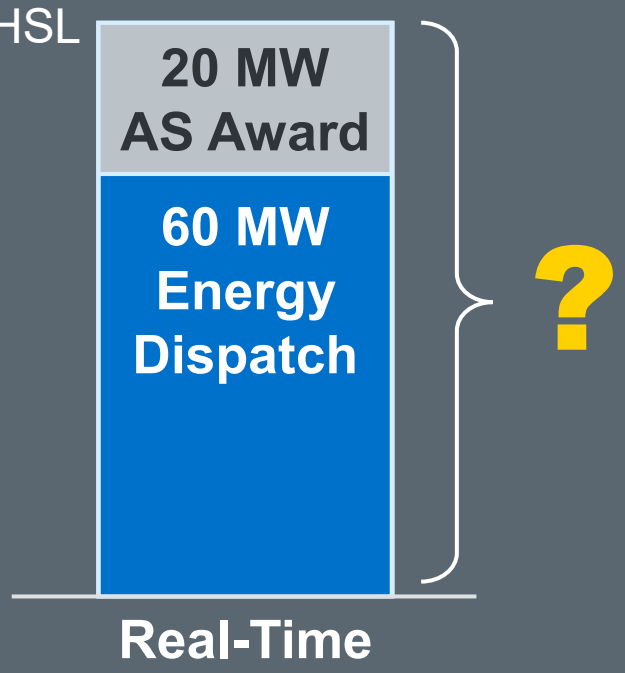
1. Energy (and Ancillary Services?)
2. Set Point Deviation Charge

QSE has transactions for their Resource



IRR with no Trades is dispatched in Real-Time

What is happening here?

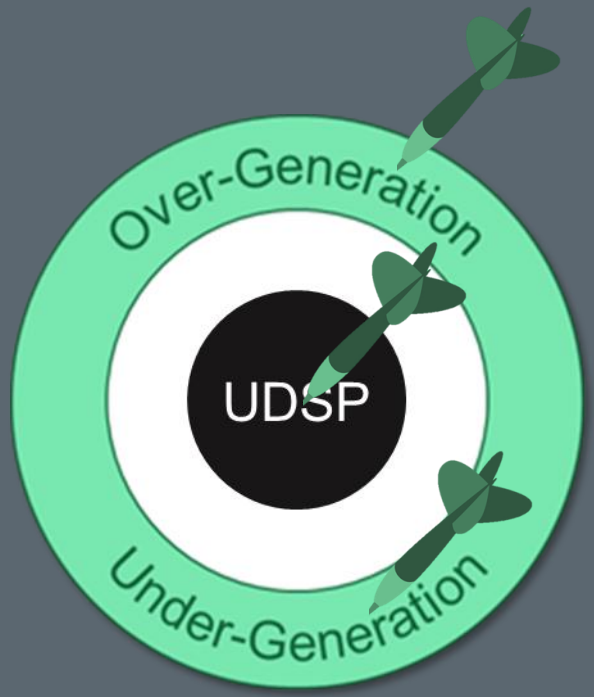


Topics in this module include:

1. Energy (and Ancillary Services?)
2. Set Point Deviation Charge

Resource shall follow Updated Desired Set Point (UDSP)

QSE may be charged if Resource outside tolerance

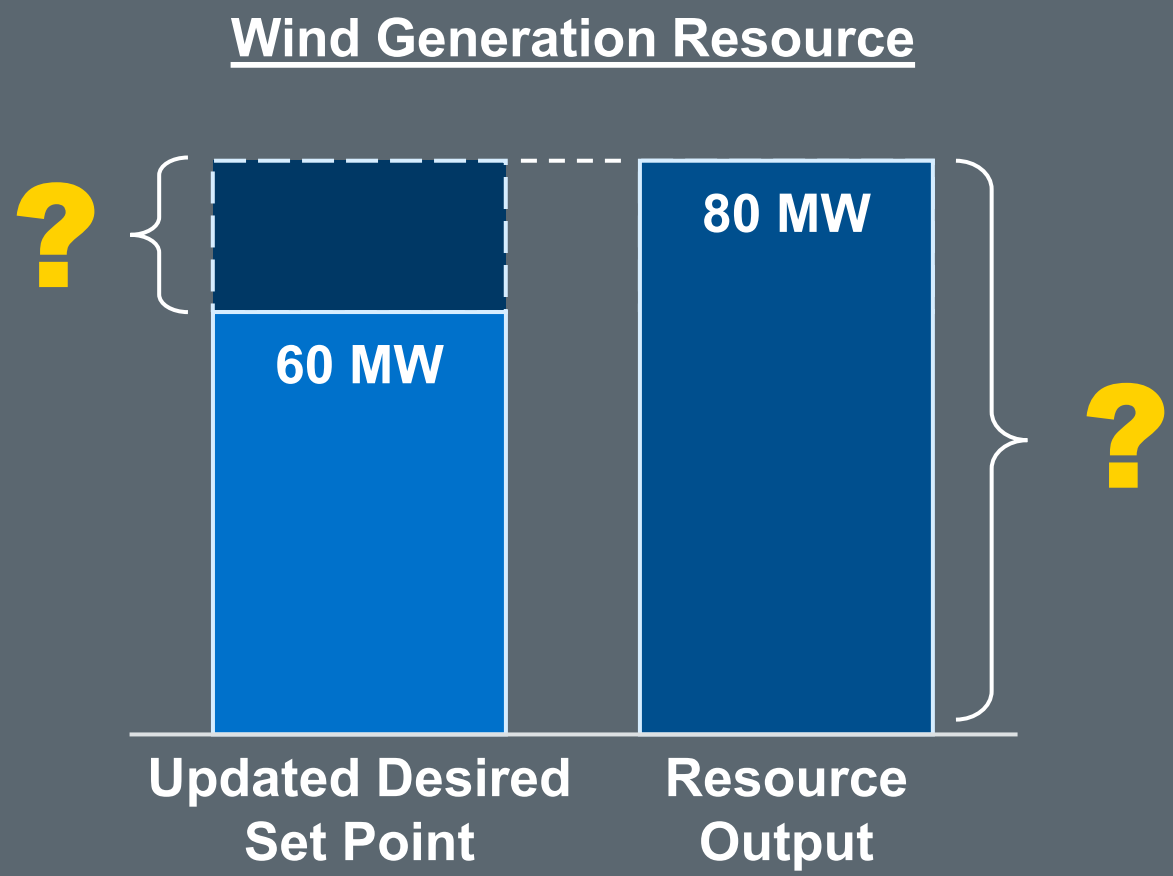


Only applies when IRR is curtailed

	IRR output ***within*** UDSP + 5%	IRR output ***exceeds*** UDSP + 5%
Curtailment Flag is not set	No Charge	No Charge
Curtailment Flag *is* set	No Charge	***Charge***

IRR Groups are assessed as an aggregate

IRR over-generates while curtailed



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