

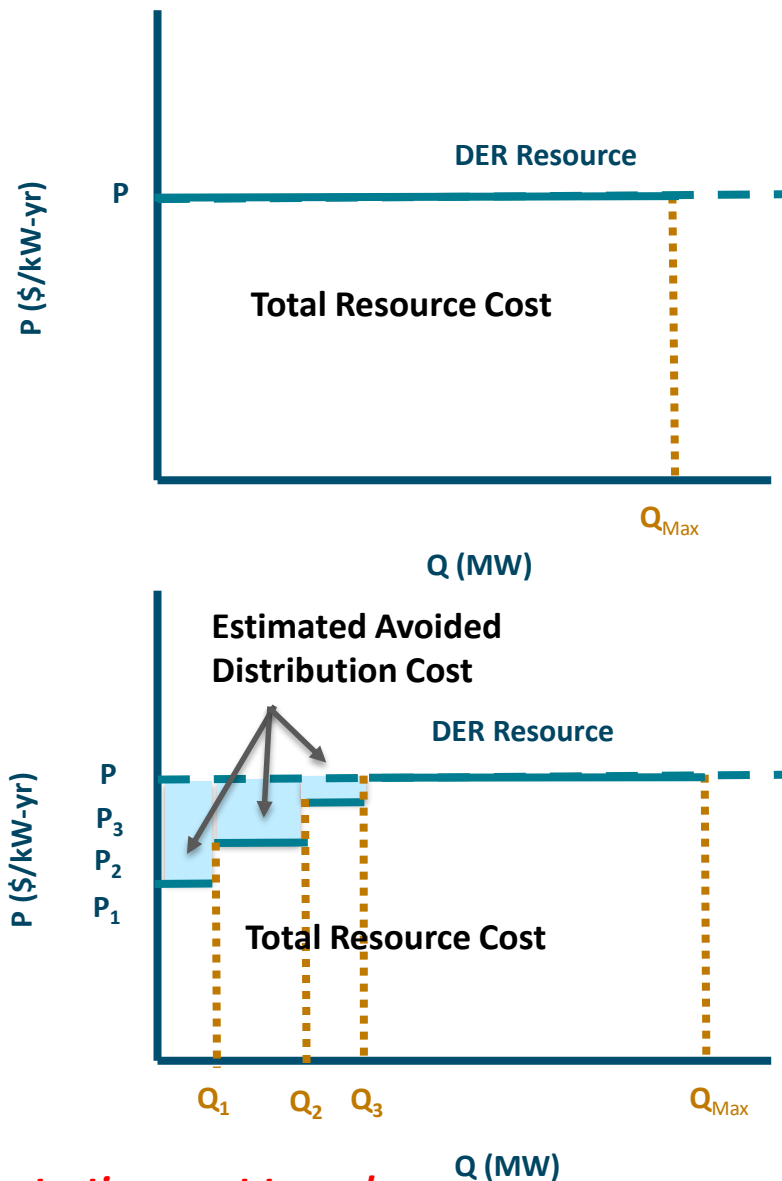
Inputs for Estimating IRP DER Avoided Distribution Cost in the RESOLVE Model

June 29, 2018



Estimating IRP DER Avoided Distribution Costs in the RESOLVE Model

- The RESOLVE model uses DER resource supply curves to estimate the Total Resource Cost (TRC) for candidate DER resources.
- TRC of a given quantity of a resource is the product of the supply curve price (P), and quantity (Q) of that resource, which is equivalent to the area under the supply curve up to Q_{Max} .
- **2017-2018 IRP**
 - RESOLVE did not capture the value of avoided distribution in DER supply curves.
- **2019-2020 IRP**
 - E3 proposes to modify RESOLVE for the 2019-2020 cycle by decrementing “P” to estimate the potential for certain quantities of DERs (Q_1 , Q_2 , Q_3) to avoid distribution upgrades (i.e. the curved supply curve to the bottom right).
- The Joint IOUs support E3’s approach to estimating DER Avoided Distribution Costs in the RESOLVE Model



“Note: This modeling results in order-of-magnitude estimates which are contingent upon assumptions and proxies, such as extrapolating 5-year needs over 30 years. In addition, estimating avoided distribution costs in this manner assumes that distribution needs can be effectively targeted/sourced with DER.”

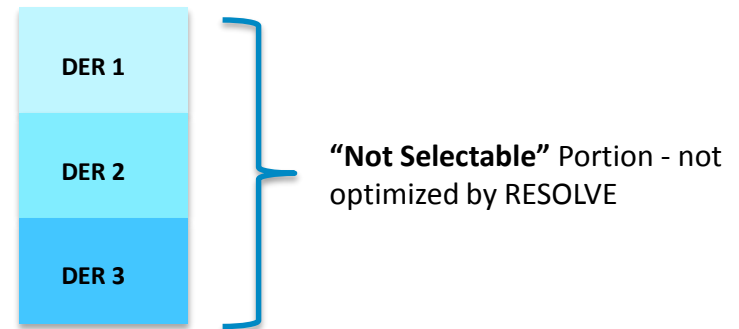
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Data Needed to Model Avoided Distribution Costs

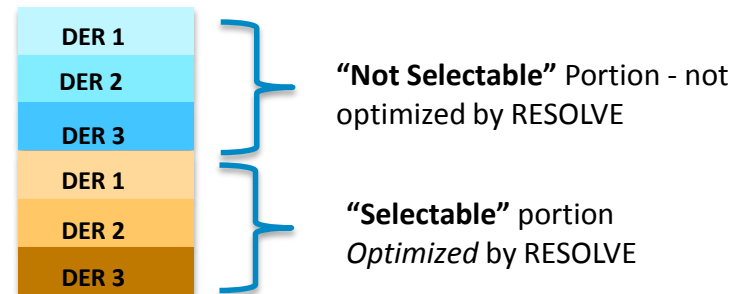
- **2017-2018 IRP**
 - **Most** future DERs set as a fixed input assumption
 - Estimated Avoided Distribution Costs are not modeled.
- **2019-2020 IRP**
 - DERs proposed to be broken apart into two portions:
 - A **“Not selectable”** portion, which will be fixed in the base case and not optimized – *examples include codes and standards and low income programs.*
 - A **“Selectable”** portion, which will be optimized in the RESOLVE model

Developing an accurate estimate of potential avoided distribution costs available for a given scenario of “Selectable DER” and “Not Selectable DER” requires a separate distribution planning run that reflects that specific scenario.

Candidate DER Portfolio with only “Not Selectable” DERs

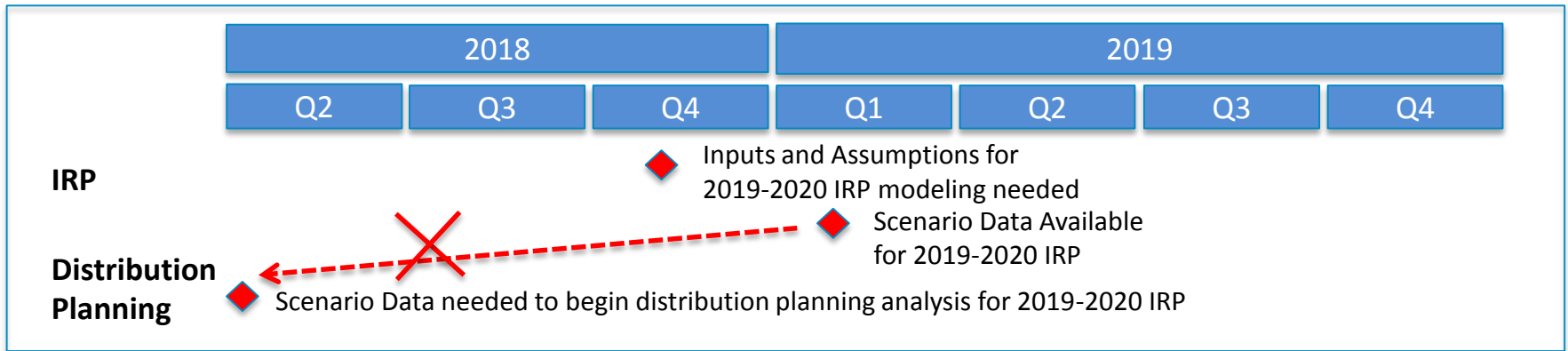


Candidate DER Portfolio with both “Not Selectable” and “Selectable” DERs



Challenges in Meeting the Deadline for IRP modeling Inputs

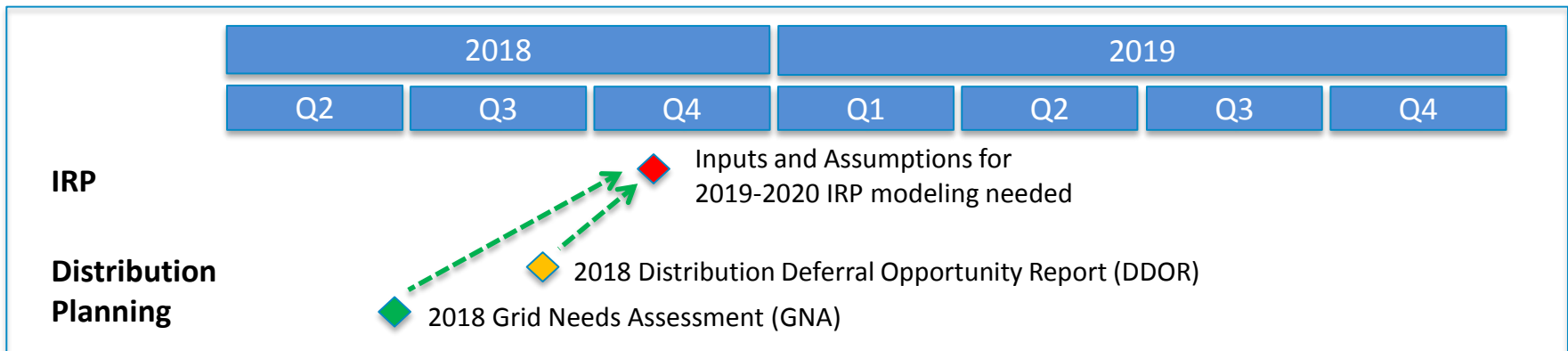
- Developing an accurate estimate of potential avoided distribution costs available for a given scenario of “Selectable DER” and “Not Selectable DER” requires a distribution planning run that reflects that scenario.
- The scenarios to be modeled are unknown at this time, and will not be available until **Q1/Q2 2019**. Inputs and Assumptions for 2019-2020 IRP modeling needed by **Q3 2018**.



2019-2020 Scenario Data is not available in time to perform distribution planning runs

Interim Method to Meet the Deadline for IRP modeling Inputs

- Joint IOUs propose to use the data in the 2018 **Grid Needs Assessment (GNA)** and **Distribution Deferral Opportunity Report (DDOR)** as an *interim methodology* to estimate the upper and lower bounds of avoided distribution costs for IRP modeling, in lieu of unavailable scenario data.
- The joint IOUs intend to identify available data to could be used to assess the reasonableness of this approach.
- If these avoided distribution cost estimates result in material impact to resource selection, the Joint IOUs will work towards refining the methodology with additional scenario data.



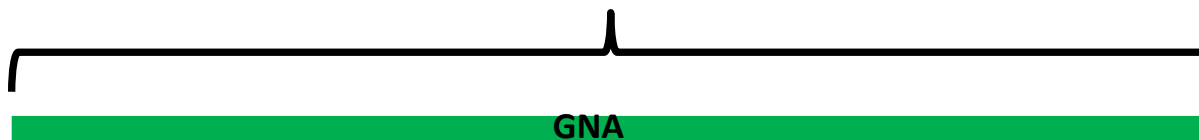
2018 GNA and DDOR data
will be available in time
for 2019-2020 IRP
modeling

Using GNA and DDOR to Estimate Avoided Distribution Costs

- **Grid Needs Assessment (GNA)** - a report summarizing grid needs that result from the annual distribution planning load forecast. These needs include a significant portion of needs that can be met with low-cost/no-cost projects. *IOU GNAs filed June 1, 2018*

- The GNA can be used to simulate the impact of removing distributed energy resources (DERs) from the Trajectory Demand forecast. It can be used to represent the (Q) of potential avoided distribution cost for a **High Demand Scenario** associated with removing forecast DER from the distribution planning forecast, i.e. “DERs Out” Scenario

All MW Peak Load Deficiencies (“Q”)



- **Distribution Deferral Opportunity Report (DDOR)** - a report providing additional detail on a subset of the GNA, which are candidate deferral projects. *IOU DDORs due September 1, 2018*

- The DDOR can be used to simulate the potential avoided distribution cost resulting from a Trajectory Demand forecast inclusive of DERs. It can be used to represent the (“P) and (“Q”) of potential avoided distribution cost for a **Low Demand Scenario** associated with “DERs In.”

Deferrable MW “Projects”



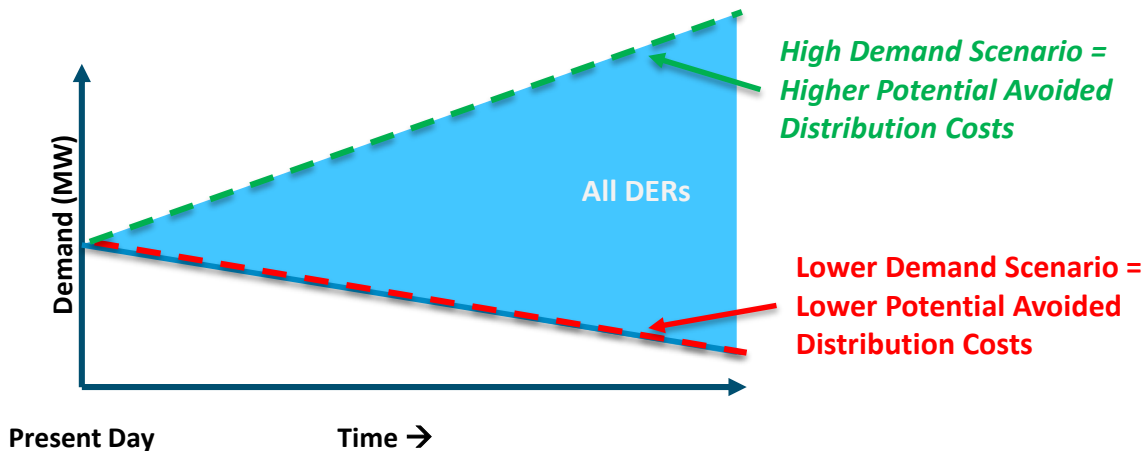
Illustrative – not to scale DDOR/GNA information for planning purposes only

Avoided Distribution Costs are Dependent on Growth Scenarios

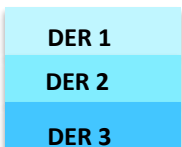
Candidate DER Portfolio with only
"Not Selectable" DERs



"Not Selectable"



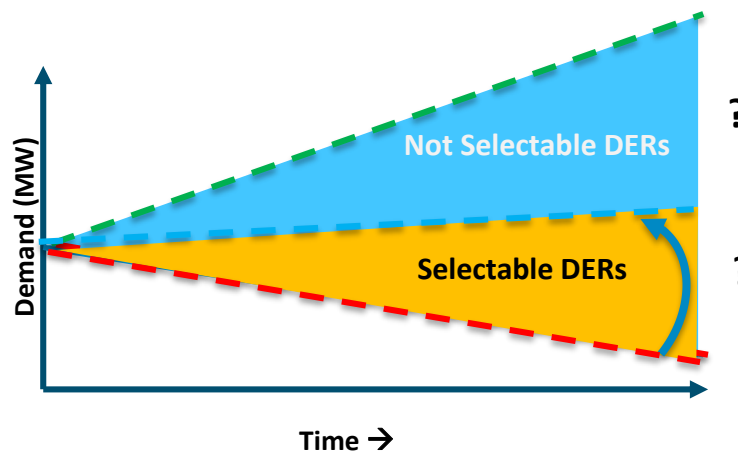
Candidate DER Portfolio with both
"Not Selectable" and "Selectable"
DERs



"Not Selectable"



"Selectable"

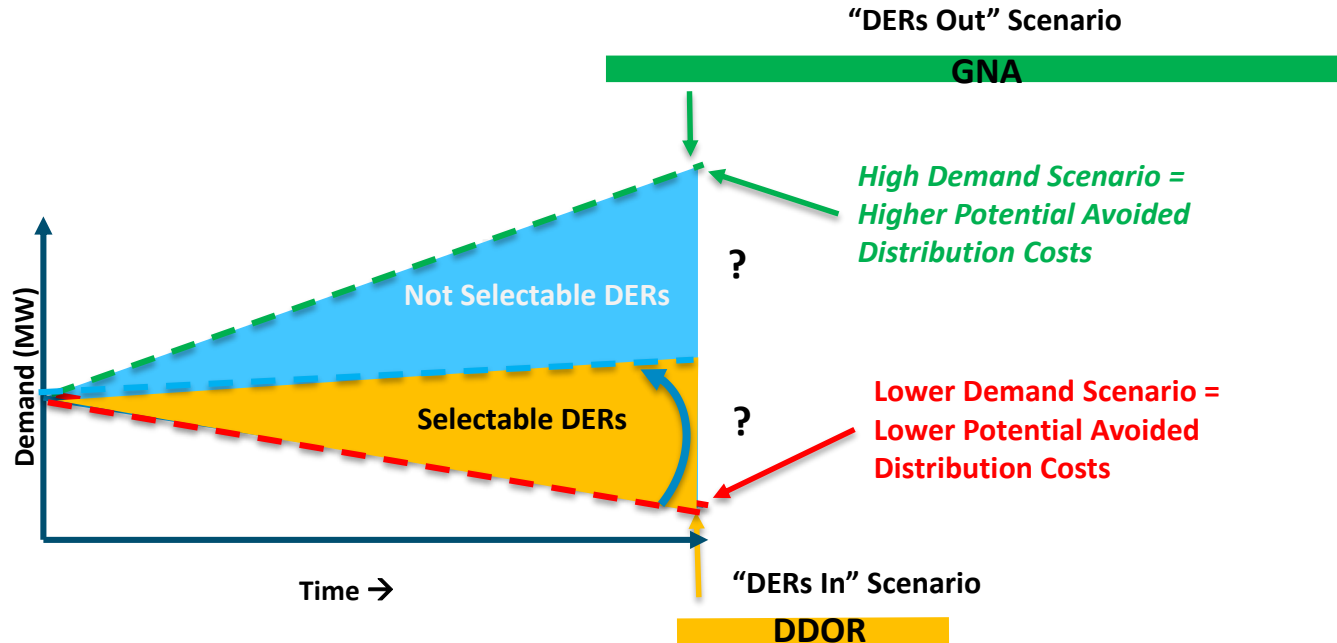


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Avoided Distribution Costs – Bounding the Analysis

- The **GNA** identifies all **Grid Needs**, inclusive of Distribution Deferral Opportunities, as well as other needs typically mitigated by low cost and no cost solutions.

- Information from the **GNA** can be used to estimate the **Quantity (Q)** of Avoided Distribution Costs for a “**DERs Out**” Scenario.



- The **DDOR** identifies **Distribution Deferral Opportunities** in which DERs could defer or avoid distribution costs incremental to a trajectory demand scenario.

- Information from the **DDOR** can be used to estimate the **Value (P)** and **Quantity (Q)** of Avoided Distribution Costs for a “**DERs In**” Scenario.

Translating GNA and DDOR Into Supply Curves

1. For DER In Scenario - Use DDOR from each IOU to Develop Price ("P") and Quantity ("Q")

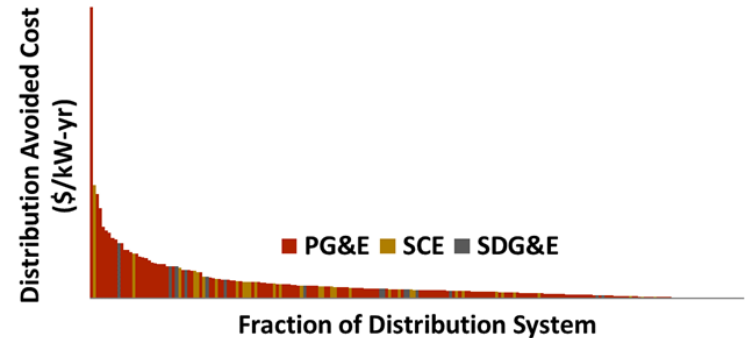
DDOR includes the following attributes for each candidate deferral location:

- Expected magnitude of need (MW)
- Unit cost of traditional upgrade (\$)

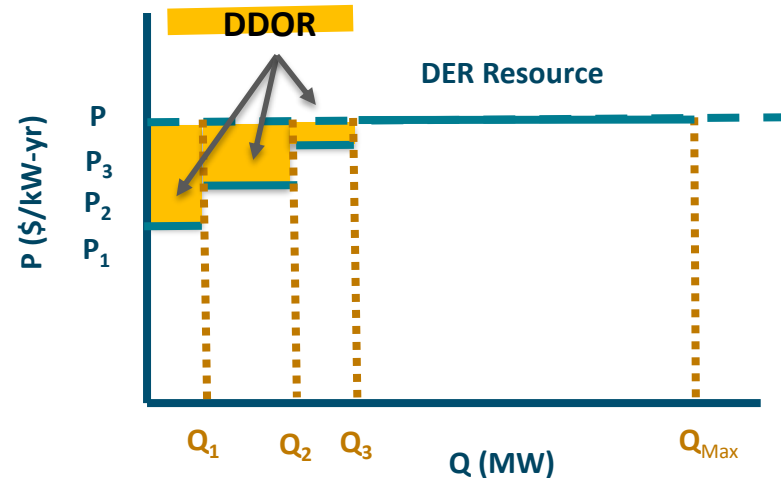
2. Arrange DDOR information from Highest price to lowest price ("P"), into "P-Q" Pairs

Bin	Estimated Average Cost of Distribution Upgrade (\$/KW-year)	Quantity of Projected Peak Overload (MW)
Highest Price	P1	Q1
Mid-Price	P2	Q2
Lowest Price	P3	Q3

3. Arrange "P-Q" Pairs from each IOU from Highest to Lowest



4. Bin "P-Q" Pairs to simplify modeling in RESOLVE, and subtract bin values from DER Resource Supply Curve.



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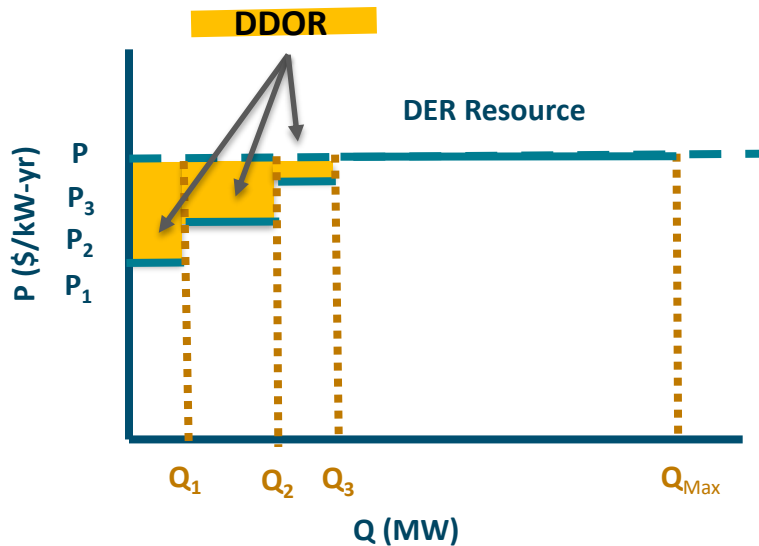
DDOR/GNA information for planning purposes only

Translating GNA and DDOR Into Supply Curves

GNA does not include a Price values (“P”) for all projects, as the majority of needs identified can be mitigated by low-cost/no cost solutions

5. For DER Out Scenario – start with DDOR Price (“P”) and Quantity (“Q”) Information

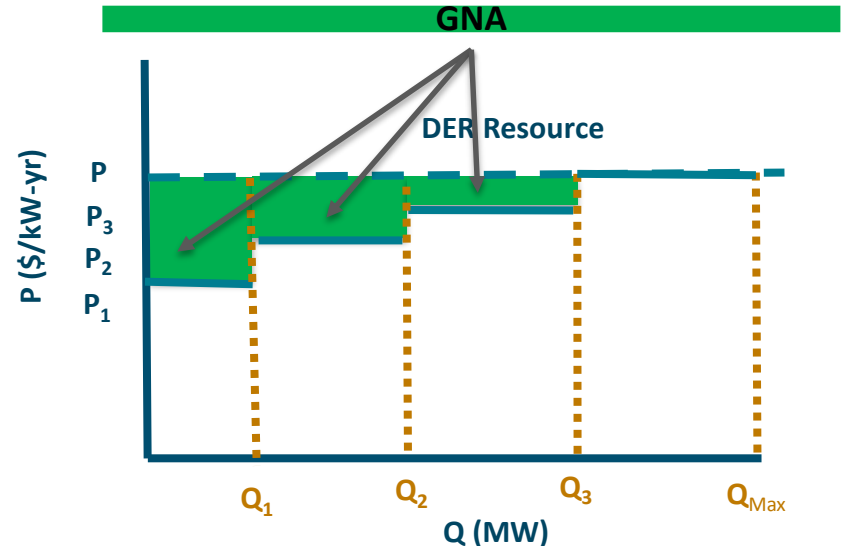
Bin	Estimated Average Cost of Distribution Upgrade (\$/KW-year)	Quantity of Projected Peak Overload (MW)
Highest Price	P1	Q1
Mid-Price	P2	Q2
Lowest Price	P3	Q3



6. Expand DDOR “Q” bins proportionately to the GNA “Q” information

GNA includes the following attribute for each identified Grid Need:

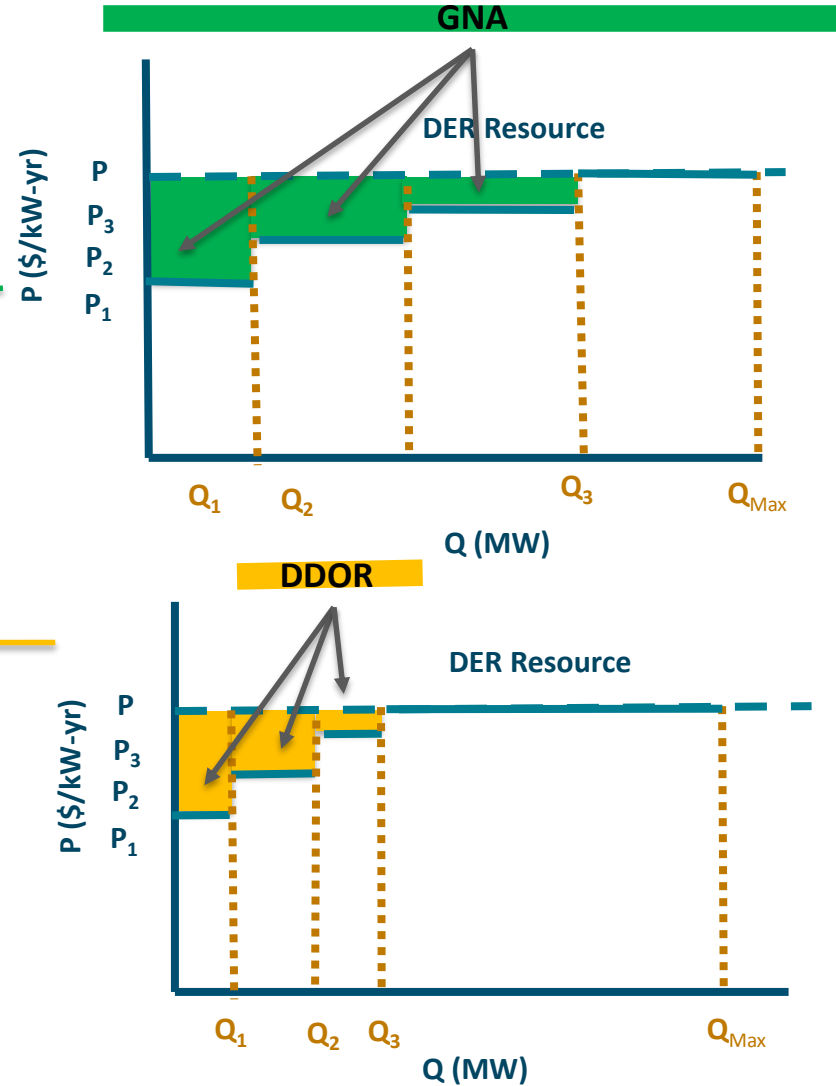
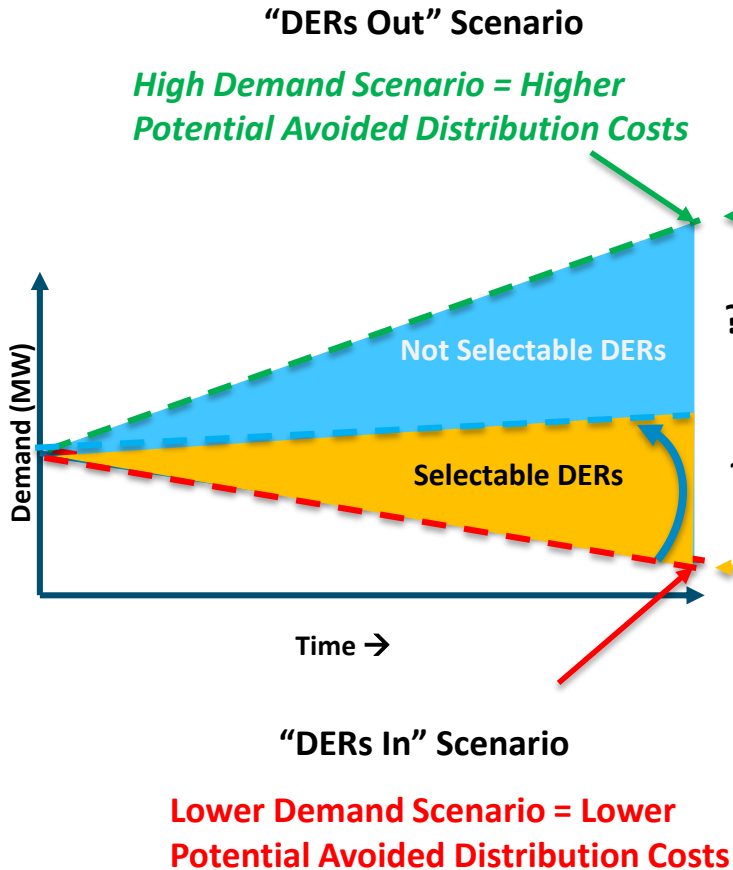
- Expected magnitude of need (MW)



Illustrative – not to scale DDOR/GNA information for planning purposes only

Avoided Distribution Costs – Bounding the Analysis

Utilize GNA and DDOR as an *interim method* to bound the analysis (Higher Avoided Distribution Costs – “DERs Out” Scenario and Lower Avoided Distribution Costs – “DERs In” Scenario) in lieu of unavailable scenario data.



Defined terms

- **Selectable Resource:** An individual resource that can be selected by the RESOLVE model to build a resource portfolio.
- **Not Selectable Resource :** An individual resource that cannot be selected by the RESOLVE model to build a resource portfolio and which is included in the resource portfolio.
- **Autonomous DERs:** The subset of Selectable Resources that are DERs and which are included in the load forecast, such as those which are reasonably expected to occur through existing ratepayer-funded programs and tariffs.
- **Avoided distribution cost:** The value of distribution infrastructure avoided by the deployment of DERs.
- **Bin:** The Quantity (MW) of DER adoption at each price (P) based on estimated avoided distribution cost along a resource supply curve.
- **Grid Needs Assessment (GNA):** An annual IOU planning document that identifies grid needs that result from the annual distribution planning process.
- **Distribution Deferral Opportunity Report (DDOR):** An annual IOU planning document comprised of a set of GNA projects based on technical and timing screens used to identify distribution deferral candidate projects.
- **Supply Curve:** A monotonically increasing relationship between Price (P) and Quantity (Q) of avoided distribution projects used in the determination of the Total Resource Cost (TRC) of a Selectable Resource.