Avoided Costs Associated with Distributed Generation and the Intersection of DG Valuation and Integrated Resource Planning

Docket No. 15-035-114

Net Metering Workgroup Session II

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Tommy Vitolo, PhD

Synapse Energy Economics

- Founded in 1996 by CEO Bruce Biewald
- Leader for public interest and government clients in providing rigorous analysis of the electric power sector
- Staff of 30 includes experts in energy and environmental economics and environmental compliance

Benefit and Cost Categories

Benefit Categories

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
Generation Capacity	Resource value, due to avoided or deferred construction (e.g. peaker method) or market transactions
T&D Capacity	Contribution to avoiding or deferring T&D resource costs
Losses	Value of avoided energy losses *and* reduction in any needed generation capacity, T capacity, and D capacity due to losses not incurred
Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
CO_2 / CPP Compliance	Value of regulatory compliance, modeled as a CO_2 price or compliance with the expected Clean Power Plan regulations
RPS Compliance	Reduced REC costs necessary for compliance with state RPS
Price Suppression	Total value of price effect caused by the introduction of new supply on energy and capacity markets
Risk	Financial value of risk reduction associated with fuel costs, capital expenditures necessary for potential future environmental regulations, or other exposure to risk
Environ. Externalities	Societal cost of pollution in excess of costs already included
Econ. Development	Value of additional economic development within study region

Cost Categories

Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
Integration	Incremental resource acquisition costs or benefits associated with studied resource not already captured in Energy, Generation Capacity, and T&D Capacity category
Administration	Administrative costs associated with program – billing, processing applications, etc.
Lost Revenue	Value of lost revenue associated with reduced sales due to studied resource
Resource	The costs associated with purchasing, installing, and operating the studied resource

Benefit and Cost Matrices

Benefit – Exercise Matrix

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Energy	Yes	Yes	Yes
Generation Capacity	Yes	Yes	Yes
T&D Capacity	Not Included	T:Yes; D:Not Inc.	Yes
Losses	Not Included	Yes	Yes
Grid Support	Yes	Not Included	Yes
CO_2 / CPP Compliance	Not Included / ?	No / Yes	Yes / No
RPS Compliance	*Not Applicable*	Yes	Yes
Price Suppression	*Not Applicable*	*Not Applicable*	*Not Applicable*
Risk	Not Included	Yes	Not Included
Environ. Externalities	*Not Applicable*	Not Included	Yes
Econ. Development	*Not Applicable*	Not Included	Not Included

Cost – Exercise Matrix

Costs	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Grid Support	Yes	Not Included	Yes
Integration	Not Included	Yes	Not Included
Administration	Not Included	Not Included	Yes
Lost Revenue	*Not Applicable*	*Not Applicable*	Yes
Resource	*Not Applicable*	Yes	Yes

A Closer Look at Benefits

Benefit Category: Energy

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
Generation Capacity	Resource value, due to avoided or deferred construction (e.g. peaker method) or market transactions
T&D Capacity	Contribution to avoiding or deferring T&D resource costs
Losses	Value of avoided energy losses *and* reduction in any needed generation capacity, T capacity, and D capacity due to losses
Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
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Energy

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Energy	Yes	Yes	Yes

- 8760 consecutive hour economic dispatch modeling

- Requires
  - DG unit's hourly energy production forecast
  - production forecast of hydro and other non-dispatchable units
  - demand forecast
  - fuel price and other variable cost input forecasts
  - generating capacity forecast
  - transmission capacity forecast

Benefit Category: Generation Capacity

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
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Generation Capacity

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Generation Capacity	Yes	Yes	Yes

- Calculate capacity value (kW) of DG unit
- Calculate value of capacity to system $/kW-yr
- Include the avoidance of capacity to meet the resource adequacy reserve margin (13% for PacifiCorp)

Benefit Category: T&D Capacity

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
Generation Capacity	Resource value, due to avoided or deferred construction (e.g. peaker method) or market transactions
T&D Capacity	Contribution to avoiding or deferring T&D resource costs
Losses	Value of avoided energy losses and reduction in any needed generation capacity, T capacity, and D capacity due to losses
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Transmission & Distribution Capacity

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
T&D Capacity	Not Included	T:Yes; D:Not Inc.	Yes

- Calculate value of transmission investments avoided or deferred
- Calculate value of distribution investments or costs avoided or deferred
- Calculate quantity of T avoided per kW of DG
- Calculate quantity of D avoided per kW of DG

Benefit Category: Losses

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
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Losses

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Losses	Not Included	Yes	Yes

- Avoided energy losses on T&D system
  - marginal losses, not average losses
  - hourly is more accurate than on-peak/off-peak is more accurate than annual

- Avoided necessary capacity because peak required generation is reduced

Benefit Category: Grid Support

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Grid Support

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Grid Support	Yes	Not Included	Yes

- Ancillary services required in excess of or avoided relative to the ancillary services that would be required otherwise

- Any other change in costs related to the operation of the grid not captured in Energy or other category

Benefit Category: CO_2 / CPP Compliance

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
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CO_2 / Clean Power Plan Compliance

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
CO_2 / CPP Compliance	Not Included / **?**	No / Yes	Yes / No

- CO_2 price should be included in dispatch simulation, but often reported separately for clarity

- Clean Power Plan Compliance should be included in dispatch simulation and capacity expansion planning; requires a "but for" simulation and planning exercise to model savings (or cost) associated with CPP compliance due to DG PV

Benefit Category: RPS Compliance

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
Generation Capacity	Resource value, due to avoided or deferred construction (e.g. peaker method) or market transactions
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RPS Compliance

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
RPS Compliance	*Not Applicable*	Yes	Yes

- Net metered generation manifests itself as reduced sales, thereby decreasing the number of RECs necessary for compliance

- Additional RECs (or S-RECs) may have a price suppression effect as well

Benefit Category: Price Suppression

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
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Price Suppression

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Price Suppression	*Not Applicable*	*Not Applicable*	*Not Applicable*

- Requires competitive marketplace
- Can apply to energy and/or capacity
- A small price reduction applied to all sales may result in significant savings
- Robust studies in PJM, ISO-NE

Benefit Category: Risk

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
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Risk

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Risk	Not Included	Yes	Not Included

- Risk is not always quantified or monetized well within the industry or within an IRP
- Fuel price risk: NYMEX for gas, long term contracts for coal
- Future environmental regulatory risk: rarely quantified

Benefit Category: Environmental Externalities

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Environmental Externalities

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Env. Externalities	*Not Applicable*	Not Included	Yes

- Modeling the quantity of each pollutant emitted (SO_2, NOx, CO_2, O_3, PM 2.5, PM 10, Hg, etc.) straightforward with dispatch modeling combined with capacity expansion and retrofit model
- Determining the cost per unit of each pollutant more challenging
- Must not double count costs already included in Energy or CO_2 categories

Benefit Category: Economic Development

Energy	Total fuel, variable O&M, emission allowance costs, and wheeling charges of marginal unit
Generation Capacity	Resource value, due to avoided or deferred construction (e.g. peaker method) or market transactions
T&D Capacity	Contribution to avoiding or deferring T&D resource costs
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Economic Development

Benefits	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Econ. Development	*Not Applicable*	Not Included	Not Included

- Utilities and intervenors often find opportunities to discuss "jobs"

- IMPLAN, REMI, RIMS II, and other tools exist to estimate direct, indirect, and induced economic activity within a region

A Closer Look at Costs

Cost Category: Grid Support

Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
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Administration	Administrative costs associated with program – billing, processing applications, etc.
Lost Revenue	Value of lost revenue associated with reduced sales due to studied resource
Resource	The costs associated with purchasing, installing, and operating the studied resource

Grid Support

Costs	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Grid Support	*Not Applicable*	Not Included	Yes

- Ancillary services required in excess of or avoided relative to the ancillary services that would be required otherwise

- Any other change in costs related to the operation of the grid not captured in Energy or other category

Cost Category: Integration

Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
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Integration

Costs	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Integration	*Not Applicable*	Not Included	Yes

- Requires a “but for” IRP-style analysis
- Likely $0 for low penetrations of DG PV

Cost Category: Administration

Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
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Administration	Administrative costs associated with program – billing, processing applications, etc.
Lost Revenue	Value of lost revenue associated with reduced sales due to studied resource
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Administration

Costs	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Administration	*Not Applicable*	Not Included	Yes

- Incremental administrative costs associated with DG customers
- May have one-time fixed, per-customer, and/or per-kW portions
- Fairly allocating one-time fixed costs may require forecast of future participation to avoid under- or over collection

Cost Category: Lost Revenue

Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
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Lost Revenue

Costs	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Lost Revenue	*Not Applicable*	Not Included	Yes

- May be compensated for or exacerbated by non-DG PV issues
- A number of ratemaking techniques exist to minimize or eliminate lost revenues

Cost Category: Resource

Grid Support	Costs or benefits associated with ancillary services or other changes in grid operation explicitly because of studied resource
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Resource

Costs	Exercises		
	Utah PURPA	Utah IRP	Nevada E3 Study
Resource	*Not Applicable*	Not Included	Yes

- Forecasting the cost of DG PV systems has gotten easier in absolute terms because prices are lower

- Past forecasts have typically overestimated the future cost of DG PV systems

Moving Forward

Ready, Aim, *Then* Fire

- Determine categories of benefits and costs appropriate for the cost-benefit analysis
- Determine methodology to determine value of cost or benefit
- Where appropriate, use or modify existing processes to determine the value of that cost or benefit
- Determine process for determining remaining costs and benefits, perhaps calculated in concert with a pre-existing docket or forum

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Tommy Vitolo, PhD
tvitolo@synapse-energy.com
617.453.7036