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Using Benefit-Cost Analysis (BCA) to Evaluate Distributed Energy Resources

Maryland Public Service Commission

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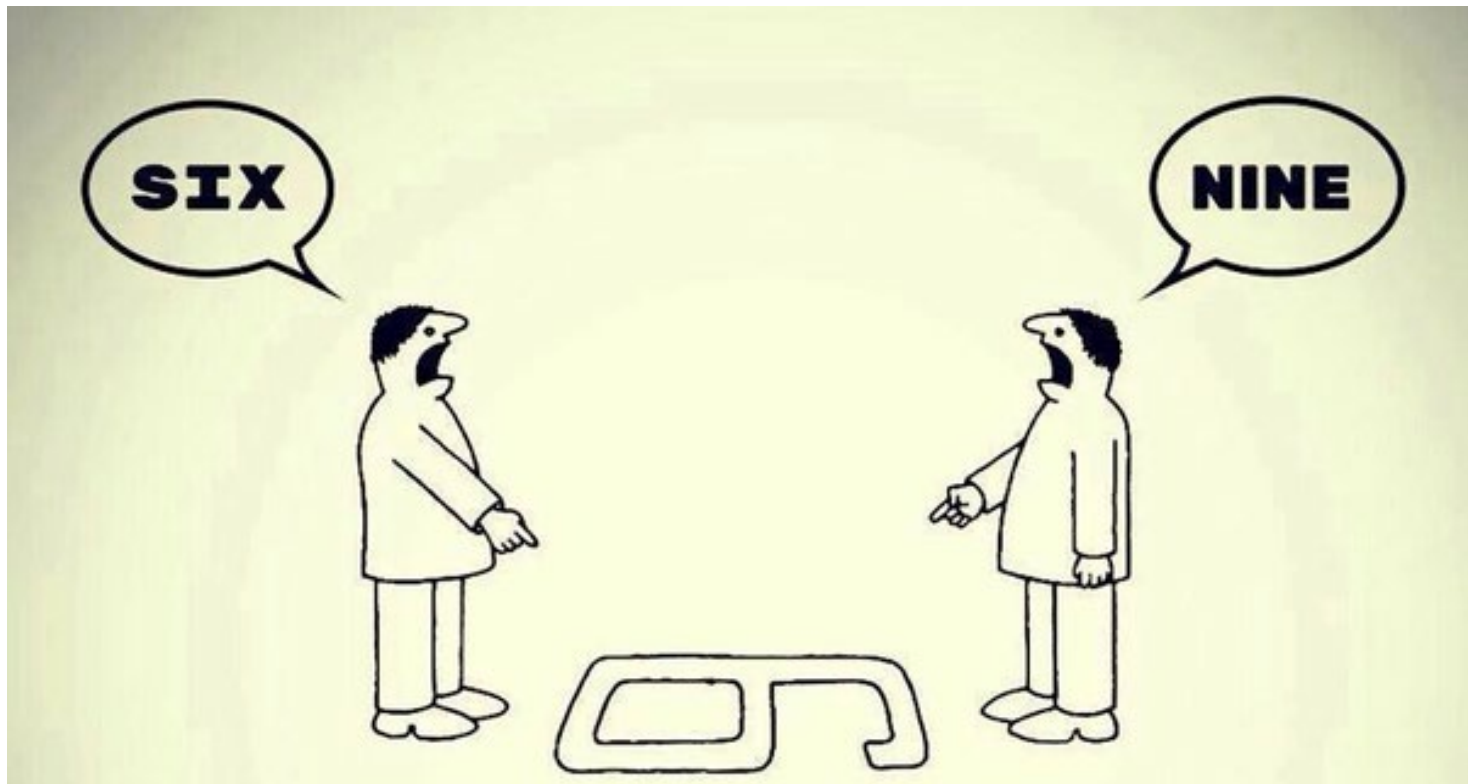
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BCA Basics

- Estimate lifetime costs of a potential action in present dollars
- Estimate lifetime benefits in present dollars
 - *Avoided cost = benefit*
- If benefits exceed costs, the contemplated action is “cost-effective”



Benefits and Costs Look Different from Different Perspectives



Traditional BCA Tests

Test	Perspective	Key Question Answered	Impacts Accounted For
Utility Cost Test (UCT)	The utility system	Will utility system costs be reduced?	Includes the benefits and costs experienced by the utility system
Total Resource Cost (TRC) Test	The utility system plus participating customers	Will utility system costs plus program participants' costs be reduced?	Includes the benefits and costs experienced by the utility system, plus benefits and costs to program participants
Societal Cost Test (SCT)	Society as a whole	Will total costs to society be reduced?	Includes the benefits and costs experienced by society as a whole
Participant Cost Test (PCT)	Customers who participate in a program	Will program participants' costs be reduced?	Includes the benefits and costs experienced by the customers who participate in the program
Rate Impact Measure (RIM)	Impacts on rates paid by all customers	Will utility rates be reduced?	Includes the benefits and costs that will affect utility rates, including utility system benefits and costs plus lost revenues

Source: [National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources](#), August 2020.

How Is BCA Changing?

Trends

Societal mandates

↑ clean energy

↑ variable resources

↑ DERs

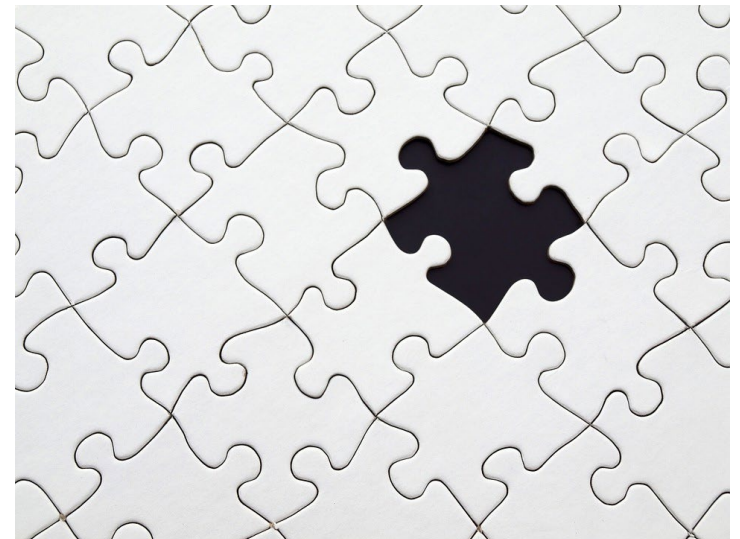
↑ electrification

Implications

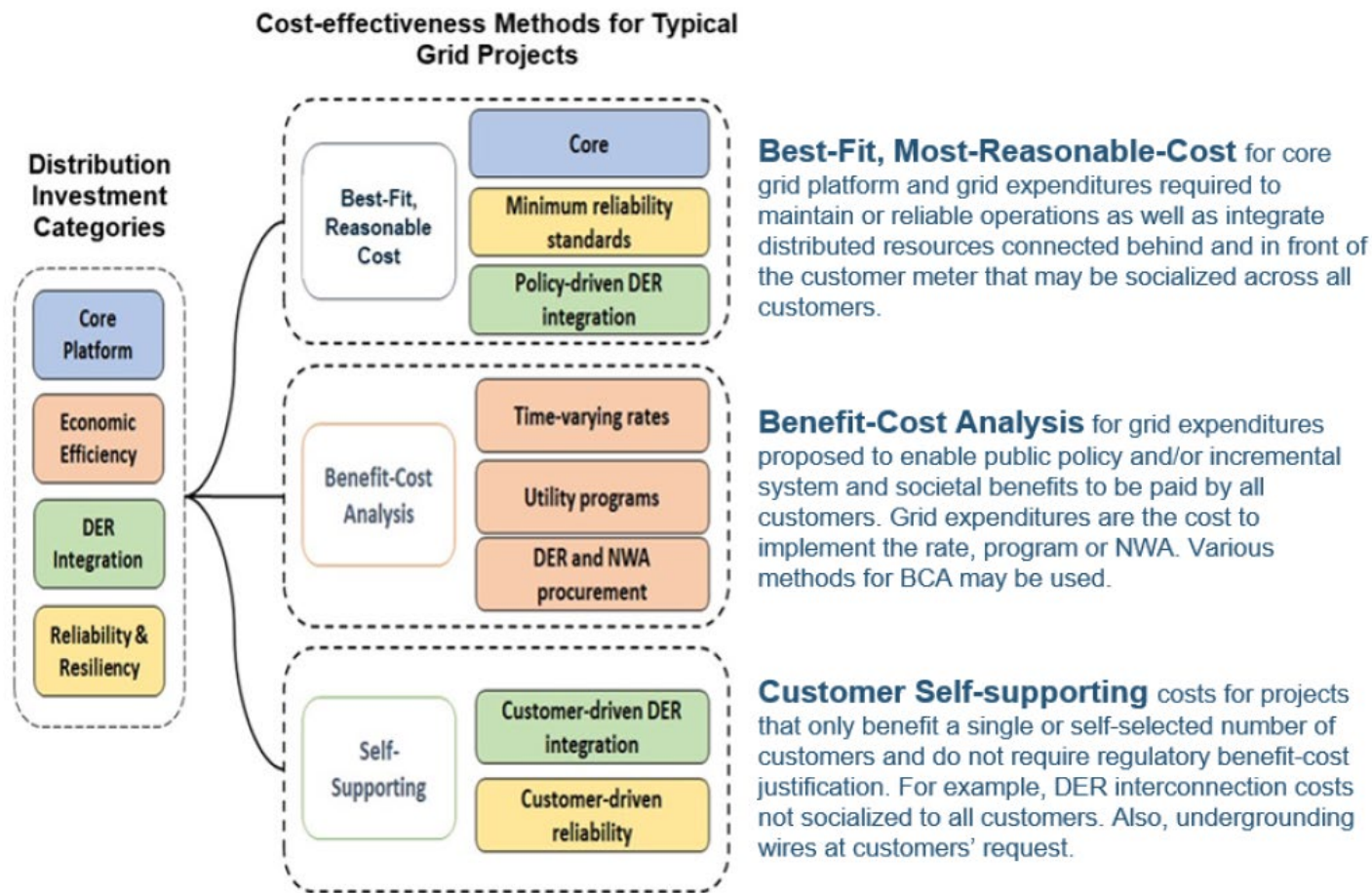
- May change the lens
- Can affect which impacts are relevant for analysis
- Shifts in benefits and costs for included impacts
- Changes to net load shapes, increases importance of time-varying and locational impacts, changes the benefits
- Disconnects between BCA and LCBF can lead to suboptimal decisions
- Increases importance of assessing 'other fuels' impacts, can change 'direction' of some impacts

Least Cost/Best Fit (LCBF) Methods

- “Traditional” investments in utility-owned infrastructure are usually evaluated using methods that seek the LCBF solution to identified needs
- Key differences:
 - LCBF doesn’t require estimate of benefits
 - LCBF *presumes* investment is needed; BCA determines if benefits exceed costs



When Is BCA the Right Tool?



Source: US DOE, *Modern Distribution Grid: Strategy and Implementation Planning Guidebook (Volume IV)*, June 2020.

The Crucial Questions

- When will you use BCA?
- What tests and methods will you use?
- How will you use the results?

The Role of BCA in Different Regulatory Settings

Context	Application	Goal of BCA	Role of Costs & Benefits
Programs	EE, DR, DG, Storage, EVs	determine whether to implement the program	compare program benefits to costs
Procurement	DERs, NWAs, PPAs,	determine the ceiling price	ceiling price should equal the benefits of the procurement
Pricing	Rate design	estimate long-run marginal costs	long-run marginal costs should equal the benefits of modifying consumption
	DER compensation	determine the value of DER	value of DER is the sum of benefits
Planning	Optimize DERs	identify optimal DER portfolio	compare portfolio benefits to costs
	DP, IDP, IRP, IGP	identify preferred resource scenario	compare scenario benefits to costs
	GHG plans	achieve GHG goals at low cost	compare GHG plan benefits to costs
	State Energy Plans	identify resources to meet state goals	compare state plan benefits to costs
Infrastructure Investments	Grid Mod, AMI, EV infrastructure, etc.	determine whether to make the investment	compare investment benefits to investment costs
Prudence Reviews	Retrospective review	determine whether past utility decision was appropriate	compare benefits and costs using test in place at the time the decision was made
	Prospective review	determine whether proposed utility decision is appropriate	compare benefits and costs using test currently in place

BCA Methods Can Be Integrated into a DSP Process



Establish
Planning
Assumptions



Develop Load
Forecasts



Describe the
Future
Trajectory



Identify System
Needs



Explore
Solutions to
Address Gaps



Evaluate and
Apply Criteria
to Determine
Preferred
Solutions



Finalize
Solutions and
Publish Plan



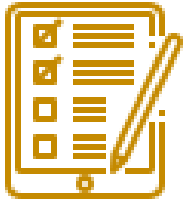
Implement
Solutions



- Load and DER Deployment Forecasts
- Non-Wires Alternatives

Which Test Should I Use?

Wide variety of approaches across states - NSPM principles offer guidance



Treat DERs consistently with other resources.

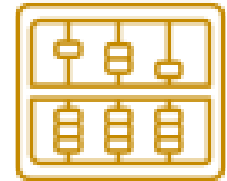


Conduct forward-looking, long-term, incremental analysis

Align primary test with applicable policy goals.



Avoid double-counting



Ensure symmetry across benefits and costs.



Transparently present BCA and results.

Account for all relevant, material impacts.



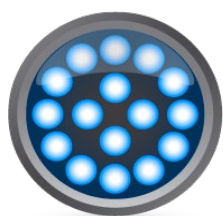
Conduct BCA separate from Rate Impact Analyses



Common Weakness in Current BCA Practice



- Inconsistency across DERs
 - States/utilities often use different tests for each type of DER
 - May also apply the tests differently (e.g., different assumptions about inputs)



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How to Use BCA Results?

- Yes/No investment decisions
- Setting investment levels
- Designing programs
- Setting priorities
- Supplemental information

Recommended Reading

- NESP, *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources*
- Woolf, *Benefit-Cost Analysis for Utility-Facing Grid Modernization Investments*
- ICF, *Review of Recent Cost-Benefit Studies Related to Net Metering and Distributed Solar*
- US DOE, *Modern Distribution Grid: Strategy and Implementation Planning Guidebook (Volume IV)*

About RAP

The Regulatory Assistance Project (RAP)[®] is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org



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Illustration of Why Cost Test is Crucial for Electrification

Impacted Party	Impact Category	Cost Impact	UCT	TRC	SCT	JST
Electric Utility System	Generation	\$ 1,150,000	\$1,150,000	\$ 1,150,000	\$ 1,150,000	\$ 1,150,000
	Transmission	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ 50,000
	Distribution	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000	\$ 100,000
	Other	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000
Host Customer	Host Contribution	\$ 200,000		\$ 200,000	\$ 200,000	\$ 200,000
	Other Fuels	\$(1,500,000)		\$(1,500,000)	\$(1,500,000)	\$(1,500,000)
Other Fuel Systems	Capacity	\$ (50,000)			\$ (50,000)	
	Other	\$ (25,000)			\$ (25,000)	
Society	Climate/GHG	\$ (50,000)			\$ (50,000)	\$ (50,000)
	Other	\$ (25,000)			\$ (25,000)	
		NET COST	\$1,325,000	\$ 25,000	\$ (125,000)	\$ (25,000)