Toolset for Benefit-Cost Analysis (BCA) of Distributed Energy Resources (DERs) in Michigan

A review of activities from Case U-20898

Michigan Public Service Commission

Tayler Becker

Carmen Wagner

Luke Dennin

April 10, 2025

MPSC
MICHIGAN PUBLIC SERVICE COMMISSION

Michigan has long pursued a standardized BCA framework for DER assessments

Summary of NSPM Process in Michigan: MPSC Case U-20898 Activities

Source: Adapted from National Energy Screening Project (2025) – Link

Steps	References
1. National Energy Screening Project presents to Commission staff and interested parties about NSPM BCA framework in the context of distribution system planning.	N/A
2. Commission staff makes recommendation to the Commission to use the NSPM to develop a consistent BCA test for all DERs.	U-20898-0004 (Report)
3. Commission issues order for utilities to develop BCA for DERs guided by the NSPM. Utilities develop BCA framework using NSPM multi-step process, recommending the proposed Michigan-specific jurisdiction specific test (JST) be applied at scale.	U-20898-0005 (Order); U-20898-0009 (Order); U-20898-0022 (Report)
4. Commission invites public comment on the utilities' proposed BCA, focusing on key questions including impacts (or value streams) to include, methodologies to account for impacts, and whether to develop a transparent BCA spreadsheet-based tool.	U-20898-0033 (Order)
5. Interested parties file comments responding to the Commission's set of questions.	U-20898-0034 through U-20898-0039 (Comments)
6. Commission issues order adopting a BCA framework based on the utilities' proposed JST with modifications per interested party comments—ensuring alignment with Michigan's broader policy goals—and initiating efforts to secure an open-source BCA for DERs tool.	U-20898-0040 (Order)
7. Commission issues order announcing partnership with E4TheFuture, ICF, Recurve, and Lawrence Berkeley National Laboratory project partners to develop the open-source BCA for DERs tool.	U-20898-0044 (Order)
Timeframe: Fall 2021 – Fall 2024	

At present, the primary objective is to secure a spreadsheet-based or similar open-source tool

October 12, 2023 Order in MPSC Case U-20898

- "IT IS ORDERED that the Commission shall launch a collaborative for the purpose of developing a spreadsheet-based or similar open source tool which will establish a new platform as a model for the required benefit cost analysis that accompanies requests for pilots, to be ready for use in 2024." (Page 30)

Staff efforts led to partnership with E4TF, ICF, Recurve, and LBNL team

- Proposed an open-source BCA for DERs tool aligning with the National Standards Practice Manual and capable of modeling Michigan's jurisdiction-specific test for DERs

November 21, 2024 Order in MPSC Case U-20898

- "IT IS ORDERED that the Commission Staff shall continue work on the collaborative for the purpose of developing a spreadsheet-based or similar open-source tool which will begin establishing a new platform as a model for the required benefit-cost analysis that accompanies requests for pilots, to be ready for use in 2026." (Page 5)

BCA for DERs Tool – Project Mission Statement

Through Case U-20898, the Michigan Public Service Commission established a Benefit-Cost Analysis (BCA) framework for Distributed Energy Resources (DERs). Currently, BCAs for DERs are expected to align with this framework to the extent possible, with full compliance required once the forthcoming tool is finalized. The tool is being specifically designed to support the standardized application of the framework. Looking ahead, future Commission orders will likely require the use of the tool across a broad range of applications.

Staff anticipates this accessible, user-friendly tool will prove valuable to all interested parties for mandatory compliance and beyond. Following initial implementation and a period of user learning, the tool will act as a structured platform to improve system understanding, enable robust “apples-to-apples” comparisons between demand-side and supply-side options, and ultimately support more informed and cost-effective decision-making.

Open-Source Benefit-Cost Analysis Model (OpenBCA Model)

Michigan Benefit-Cost Analysis Tool Collaborative Meeting
Docket U-20898

April 10, 2025

Julie Michals, E4TheFuture
David Pudleiner, ICF
Adam Scheer, Recurve

Meet the OS-BCA Model Project Team Leads

Adam Scheer
Recurve
Principal Analyst

David Pudleiner
ICF
BCA Modeler & Evaluator

Abhishek Jain
ICF
Manager, Energy Consulting

Julie Michals
NESP/E4TheFuture
Director

Meeting Agenda and Objectives

1. Review of BCA Tool Development – what this project is, and what it isn't…
2. Project Phases/Schedule – and where we are in the process
3. BCA Impacts Methodology Matrix – purpose, development and input to date
4. Q&A
5. Next Steps

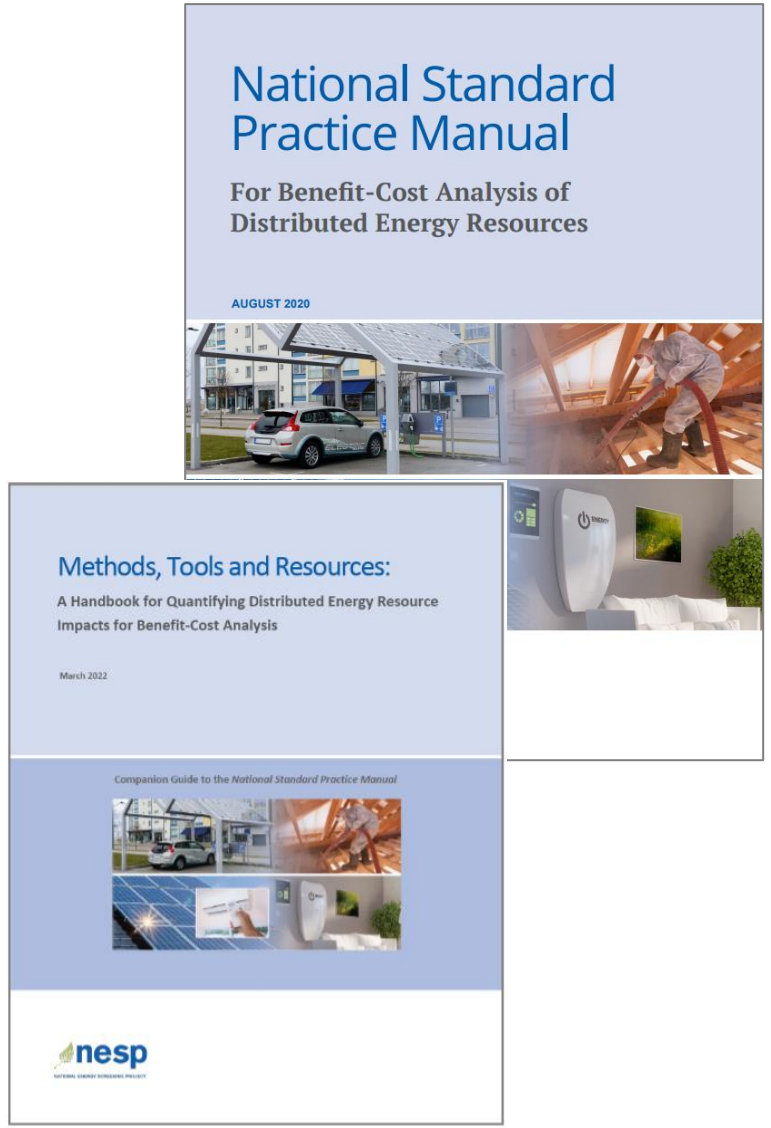
OpenBCA Tool – Informed by Key Resources

National Standard Practice Manual (NSPM) for Distributed Energy Resources (DERs) - key principles and guidance on developing and applying BCA tests

Methods, Tools & Resources – A Handbook for Quantifying DER Impacts in BCA - "MTR Handbook" (2022) – companion guidance to the NSPM describing how to quantify DER impacts

MI PSC Order in U-20898, that sets forth impacts to include in MI's benefit-cost analysis test

Michigan BCA Tool Collaborative input to impact methodology calculations and data formats



Collaborative Input: Methodological Options for BCA Impacts

(Michigan JST / Societal Cost Test Impacts from PSC order U-20898)

Impact Categories	Approach (Monetized, Quantified, and/or Qualitative)
ELECTRIC UTILITY SYSTEM	
Energy Generation	Monetized
Capacity	Monetized
Environmental Compliance	Monetized*
RPS Compliance	Monetized*
Market Price Effects	Monetized*
Ancillary Services	Monetized
Transmission Capacity	Monetized
Transmission System Losses	Monetized
Distribution Capacity	Monetized
Distribution System Losses	Monetized
Distribution O&M	Monetized
Distribution Voltage	Qualitative
Financial Incentives	Monetized
Program Administration Costs	Monetized
Utility Performance Incentives	Monetized
Credit and Collection Costs	Monetized*
Risk	Monetized*
Reliability	Monetized
Resilience	Monetized**
SOCIETAL IMPACTS	
Resilience	Monetized*
Greenhouse Gas Emissions	Quantitative
Other Environmental	Monetized*
Public Health	Monetized*
Economic Development / Jobs	Monetized*
Energy Security	Monetized*

Impact Categories	Approach (Monetized, Quantified, and/or Qualitative)
GAS UTILITY SYSTEM IMPACTS	
Fuel and Variable O&M	Monetized
Capacity	Monetized
Environmental Compliance	Monetized*
Market Price Effects	Monetized*
Financial Incentives	Monetized
Program Administration Costs	Monetized
Utility Performance Incentives	Monetized
Credit and Collection Costs	Monetized*
Risk	Monetized*
Reliability	Monetized
Resilience	Monetized*
HOST CUSTOMER/PARTICIPANT IMPACTS	
Measure Costs	Monetized
Transaction Costs	Monetized*
Interconnection Fees	Monetized
Risk	Qualitative
Reliability	Qualitative
Resilience	Qualitative
Tax Incentives and Donations	Monetized
Non-Energy Impacts (Low Income)	Monetized*
Non-Energy Impacts (Non-Low Income)	Qualitative
Other Fuel	Monetized

*Quantified, if monetization is not possible **Qualitative or quantified, if monetization is not possible

OpenBCA Tool – Reminder #1

Core model vs state specific configuration

- **OpenBCA is the 'core' model**
  - Collaborative input to proposed model capabilities, features, interface and usability, methodological options, inputs variables and outputs
  - We are not addressing specific input values to calculations (see state configuration below)

- **State-specific configuration**
  - OpenBCA tool can then be configured to Michigan and other interested states, where each state would configure the tool to be compatible with its JST and key BCA parameters.
    - Note: this involves tailoring the model for Michigan use **using the 'core' model framework**, this does not include additional features that Michigan might want to add, which would require additional time and funding

OpenBCA Tool – Reminder #2
Two different BCA Modeling ‘Pathways’

The tool will support two types of user pathways.

- **Stand-alone pathway** - will enable users to input data using a straightforward Excel input template.
  - Data Input/Output: Stand-alone tool will extract data from the input template and export summary results to a “human-readable” Excel workbook, as well as detailed results to CSV files.
- **Integrated pathway** - Users can integrate the tool into their existing analysis frameworks. The open-source tool allows users to add in or utilize the codebase to fit into their existing BCA modeling programs.
  - Data Input/Output: will support data input and output through formatted CSVs for seamless integration with existing frameworks

OpenBCA Tool Development Schedule

Collaborative Input during Project Phases

Phase 1: Assessment and Requirement Gathering

- Team to gather input on full range of BCA impact methods from MI BCA Tool Collaborative, working with the technical subgroup (February to mid-April)

Phase 2: Tool Architecture, Enhancements and Customization

- Team to incorporate MI feedback from Phase I and develop model architecture (April-July)

Phase 3: User Interface and Integration

- Team to provide ‘visioning” session and feedback on model interface development (late May/early June)
- Build minimum viable product (June through September), in consultation with technical subgroup (June-July)

Phase 4: Testing and Refinement

- Beta version of tool to MI BCA Tool Collaborative for review (October)
- MI BCA Tool Collaborative meeting to gather feedback and validate beta version of tool and performance (early Nov)

Phase 5: Documentation and Release (December 2025-January 2026)

Phase 6: Outreach and Engagement with States (Q1 2026)

Collaborative Meeting Example Topics/ Questions

- Phase 1-2 - Back End Model Requirements
  - What type of calculation methodologies are required to handle each value stream?
  - What granularity of data should the tool require versus have options for?

- Phase 3 - Front End Model Requirements
  - How should inputs be grouped for clarity?
  - What selections and questions up front could help reduce screen clutter an input overload?

- Phase 4 - Model Mechanics and Interface
  - What's intuitive and what's clunky?
  - What improvements would you make to the tool so that it would better suit your needs?

OpenBCA Tool Development – Phase I

Assessment and Requirement Gathering - Process to Date

- Team developed matrix with full range of BCA impact methods and requested utility review and input on current practice (Consumers Energy, DTE, I&M)
- Team reviewed utility responses along with guidance in MTR Handbook to inform proposed methods
- Team identified gaps where current utility practice doesn’t exist, and areas needing clarification
- Team met with Technical subgroup (on April 4) to review proposed methods, focusing on areas requiring clarification and gaps.
- Additional time provided for Technical Subgroup input this week

Example Methodological Calculations Reviewed with Technical Subgroup

C.2 | Societal | GHG Emission Impact

$$GHG\ Impacts = ACC_y * E_{GHG,h,y} * \frac{\Delta E_{E\,h,y}}{1 - L_{ME(D \rightarrow G)}} \quad [Electric]$$

Key Question(s):	New Value Stream; Does the calculation methodology make sense?		
Variables	**Description**	**Units**	**Notes**
ACC_y	Avoided Cost of Carbon	$/ton	
$E_{GHG,h,y}$	Emission rates	ton/kWh	• Hourly or Annual values | Should Match Avoided Energy Cost format
	DER Energy Impact	kWh	
$L_{ME(D \rightarrow G)}$	Line Loss	%	

Sample Calculation – GHG Impact

DER Measure Inputs

- Elec Savings = 1 MWh per year
- Gas Savings (mmbtu)
- Other Fuel Savings (mmbtu) EUL = 5 years

Utility System Inputs

- Line loss = 5%
- Emission Factor = 0.5 tons CO2e/MWh

General/Societal Inputs

- SCC = 130 $/ton CO2e
- Discount Rate = 5%

Intermediate Calculations

1. Total avoided CO2e = (1 MWh / (1-0.05)) x 0.5 = 0.526 tons
2. Annual Avoided GHG Impact = 130 x 0.526 = $68.42 per participant per year
3. NPV of Value Stream = NPV (5%, $68.42, 5) = $296.23 per participant

Output
$296.23 per participant

Further Aggregations

A.17 | Electric Utility | Risk

A.17

$$Electric\ Utility\ System\ Risk = V_{OR_y}\left(\frac{\$}{kWh}\right) * \frac{\Delta E_y(kWh)}{L_{ME(D\rightarrow G)}} \qquad OR \qquad = NB_{UB} * \%_m$$

Key Question(s):	• New Value Stream; Does the calculation methodology make sense ?		
Variables	**Description**	**Units**	**Notes**
V_{OR_y}	Value of Reduced Risk	$/kW-yr OR $/kWh	
ΔE_y	DER Energy Impact	kWh	
NB_{UB}	Net Utility System Benefits	$	
$L_{ME(D\rightarrow G)}$	Line Loss	%	

Sample Calculation – Electric Utility System Risk

Method 1

DER Measure Inputs

- Elec Savings = 1 MWh per year
- EUL = 5 years

Utility System Inputs

- Line loss = 5%
- Value of Reduced Risk = 1.45 $/MWh

General Inputs

- Discount Rate = 7% (Utility WACC)

Intermediate Calculations

1. Total avoided energy = 1 MWh / (1-0.05) = 1.05 MWh
2. Annual Avoided Risk Impact = 1.05 x 1.45 = $1.52 per participant per year
3. NPV of Value Stream = NPV (7%, $1.52, 5) = $6.23 per participant

Output
$6.23 per participant

Further Aggregations

Method 2

Utility System Inputs

% Multiplier for Risk = 1.5%

Net Benefits

Annual Utility System Net Benefits = $100

Intermediate Calculations

1. Annual Risk Impact = 1.5%*100 = $1.5
2. NPV of Value Stream = NPV (7%, $1.5, 5) = $6.15 per participant

Output
$6.15
per participant

Table 83. Examples of jurisdictions that require accounting for energy efficiency risk benefits

Entity	Value of reduced risk from efficiency	General Approach
District of Columbia Sustainable Energy Utility	5%	Proxy for the value of reduced risk as an adder to the other benefits of energy efficiency (see DC SEU 2016)
Maryland	$0.007/kWh	Included as an adder to avoided cost of energy calculation to reflect the avoided costs of both avoided business risks and avoided ancillary services
NW Natural	$0.37/MMBTU	Levelized average fuel-price risk avoidance used in integrated resource planning and cost-effectiveness testing for natural gas energy efficiency (see NW Natural 2018)
Northwest Power and Conservation Council	$0.02/kWh	Accounting for reduced risk of efficiency in utility resource planning compared to other resource options (see ETO 2107)
Pacific Power	$0.00145/kWh	Levelized average fuel-price risk avoidance used in integrated resource planning and cost-effectiveness testing (see ETO 2017)
Portland General Electric	$0.0058/kWh	Levelized average fuel-price risk avoidance used in integrated resource planning and cost-effectiveness testing (see ETO 2017)
Vermont	5% - 10%	Costs of gas DERs are reduced by 10% and costs of electricity DERs are reduced by 5% to reflect the net risk reduction benefits of DERs (see VT PUC 2020)

Source: ACEEE 2020 Three Rs, pages 10-11, Table 1.

Q&A

Next Steps

- Project team to complete and finalize methodology / value stream table with additional Technical subgroup input on utility and non-utility system impacts by end of April.
- User interface and integration work (May-July) – timing for input from Technical subgroup and BCA Tool Collaborative TBD.
  - In consultation with MPSC.
  - Will provide update with schedule for engagement by end of this month.

Thank you!

Julie Michals – E4TheFuture
jmichals@e4thefuture.org

Adam Scheer - Recurve
adam@recurve.com

David Pudleiner - ICF
David.Pudleiner@icf.com

OS-BCA Model Project: Funding and Team Roles

Project is funded by US Department of Energy with support from E4TheFuture, plus in-kind services from E4TheFuture, as well as some in-kind from ICF and Recurve.

E4TheFuture: Coordinate project team

- Convene and lead stakeholder input to inform model functionality and scope.
- Provide guidance and strategic direction throughout project.
- Promote, disseminate, and support open-source tool within the industry.

ICF: Act as overall project manager, support E4 coordination with stakeholders.

- Develop value streams, time series calculations, and evaluation methods.
- Map DER impact categories and develop input file structure to align with NSPM.
- Lead stakeholder meetings on model functionalities, tool interactivity and feedback sessions.
- Develop validation cases to ensure compliance with methods.

Recurve: Design software architecture for the open-source BCA tool, building on existing FLEXvalue

- Develop value streams, time series calculations, and evaluation methods.
- Implement user-friendly interface for seamless interaction with the BCA tool.
- Integrate tool with existing analysis frameworks using standardized CSV formats.
- Conduct thorough testing, bug fixing, and quality assurance of the tool.

LBNL: Manage subcontracts with ICF and Recurve

- Identify data sources/inputs that can be leveraged from DOE and National Lab resources.
- Assist with technical assistance.