Resource Adequacy for a Decarbonized Future

EPRI Initiative

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Resource Adequacy Initiative: Deliverables and Outcomes

RA Process

- Recommended Metrics and Criteria
- Future Scenario Database and Tool

Models and Data

- Emerging Resource & Demand Side Models
- Model Data Development Tools

Analysis Tools

- Existing RA Tool Capabilities
- New Algorithms and open-source code

Case Studies — Evaluation of existing and development of new capabilities based on 4-6 regional RA case studies covering differing RA issues and tools.

Tech Transfer — Reports and workshops to be conducted to disseminate results and to promote broad adoption in commercial tools.

Resource Adequacy Project Participants and Prospects

Project Members

Advisory Group

External Advisory:

- DOE
- E3
- Energy Futures
- ESIG
- G-PST
- GridLab
- IEEE
- ISU
- MRO
- NARUC
- NATF
- NERC
- NPCC
- NWPCC
- NYSRC

R&D Partners:

Telos Energy, Astrapé Consulting, GE Energy Consulting, NREL, IKIM ltd

Looking to engage industry broadly through outputs of project

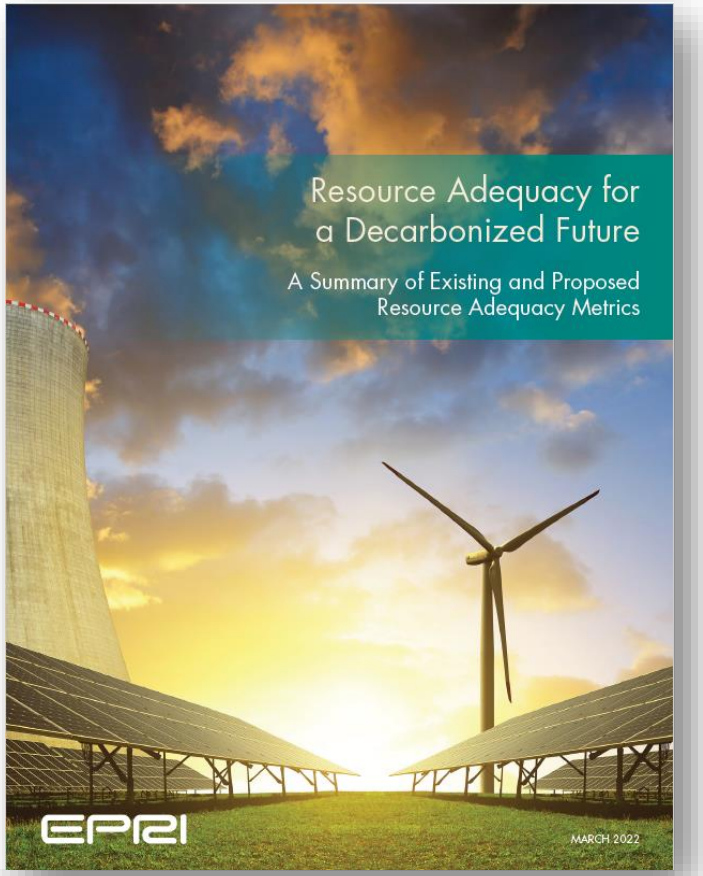
Metrics and Criteria for Resource Adequacy

Motivation

The metrics traditionally used to assess adequacy risk and the criteria established for planners to adhere to may not perform as expected in the future

Objective

Identify appropriate adequacy assessment metrics and minimum criteria for low carbon systems in changing climate/weather extremes.



Work to date

» White paper published in March 2022 summarizes existing and proposed RA metrics (visit https://www.epri.com/resource-adequacy to download)

Future work

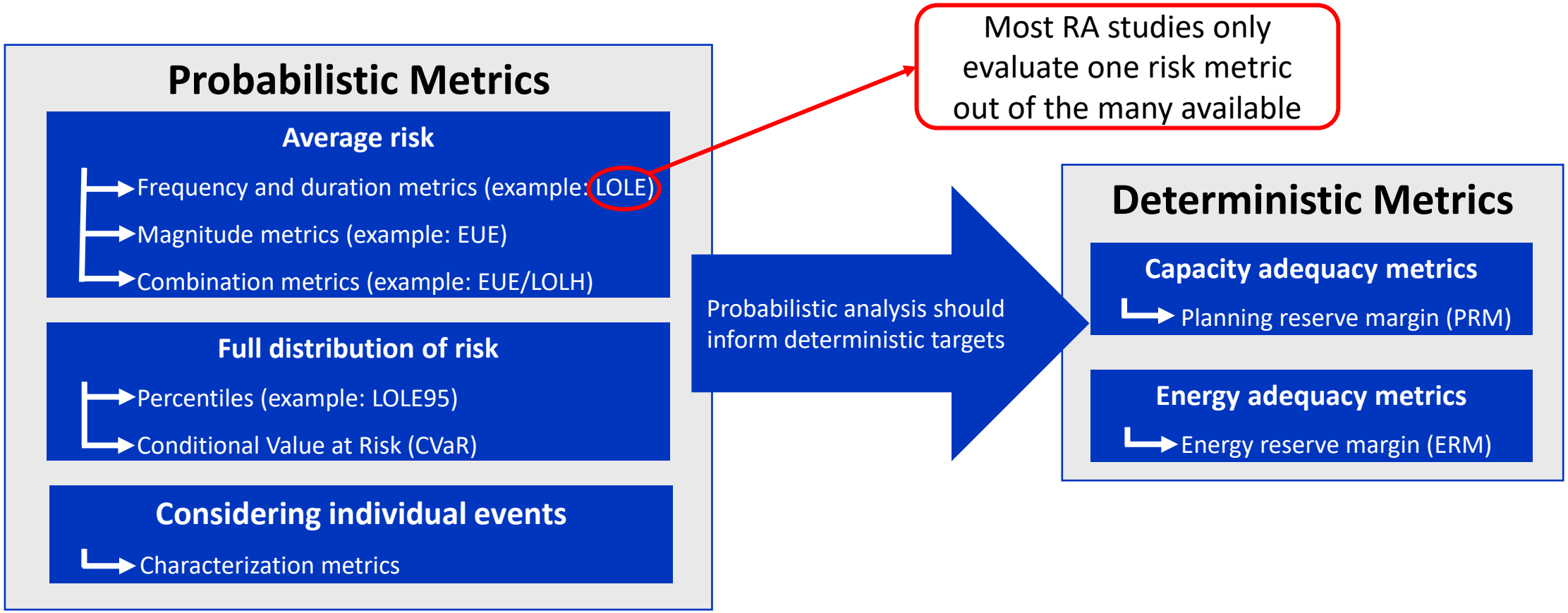
» Complementary “Resource Adequacy Philosophy” document to be publicly released by EPRI team in Q3 2022

» A suite of RA risk and capacity valuation metrics to be evaluated through case studies

» A second white paper published in Q1 2023 will propose recommendations for metrics use and minimum criteria setting, based on system characteristics and intended study uses.

Metrics and Criteria for RA – Key Insights

1. Avoid relying on a single metric
2. Better leverage existing metrics
3. Ensure metrics are appropriate for intended uses and systems studied



RA Tools Review and Gap Analysis

Motivation

Current resource adequacy tools make require significant modifications to enable new and changing technologies and behaviors.

Objective

Document the capabilities of the main commercial and open-source tools available for resource adequacy, identify gaps and suggest areas for new metric, model and algorithm improvements.

Work to date

- Created a survey which was sent to resource adequacy tool vendors and published on the EPRI website
  - It contains 54 questions (most multiple-choice) organized into several subcategories
- Analyzing tool vendor responses
  - 21 responses received so far
  - Tool responses to be compiled across several subcategories
- New tool capabilities are being tested across different tools within case studies

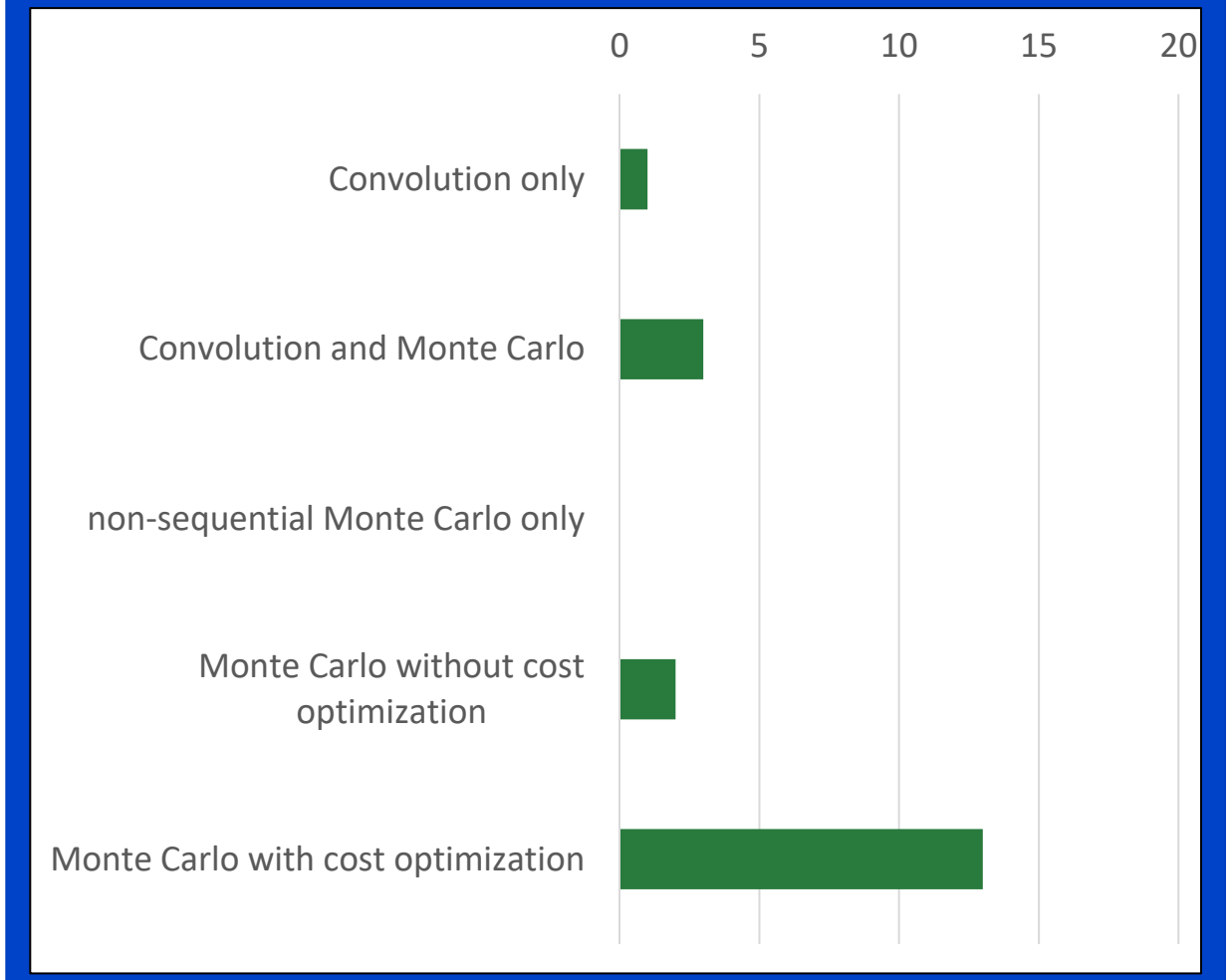
Resource Adequacy Tools Request for Information

The EPRI Resource Adequacy for a Decarbonized Future Initiative has put out a Request for Information to gather information about resource adequacy tool capabilities and methods used. Understanding the current and developing tool capabilities for assessing adequacy will allow the team to identify gaps and determine how new models and methods can be integrated into commercial and research tools.

DOWNLOAD

RFI Responses – Tool Engine

1. What solving algorithm does your tool use?



Interesting observations

- Most tools use a sequential Monte Carlo algorithm with cost optimization. This is likely that most tools in the RFI are really production cost tools that can be adapted for resource adequacy.
- Some tools have both convolution and Monte Carlo solvers. The features available for each solver are likely different.

Open questions

- How are the production cost tools set up to easily run stochastic or probabilistic studies?
- How can we differentiate between *sequential* and *chronological* models. Just because an analysis includes 8760 hours, doesn't mean it's truly sequential where the availability in one hour depends on availability in others.

Gap analysis

- Is the future for all resource adequacy analysis to use production cost tools adapted to resource adequacy, rather than separate tools?
- Computational feasibility of sequential Monte Carlo tools with cost optimization may be a problem

Key Feedback from Members and Advisors– 1/2

- Overall:
  - Case studies are an essential part of the initiative and must be chosen carefully
  - Enacting change amidst a variety of decision makers is challenging
  - There is a need for a clearer delineation of what an RA study should encompass

- Metrics:
  - Ranked #1 priority by project members
  - Capacity accreditation metrics of high interest
  - Metrics must be easy to use and interpret, and tailored to the study goal

- Scenarios:
  - Modeling and quantifying the impact of low-frequency-high-impact events is of high interest

Key Feedback from Members and Advisors – 2/2

- RA Simulation Tools:
  - Issues with data availability, computational tractability, and ease of implementation prohibit a lot of existing tool functionalities from being used
  - Tools will need to bridge the gap between production cost, capacity expansion, and resource adequacy disciplines

- Demand and Supply-Side Models:
  - Need for correlated outage risk modeling
  - High interest in more accurate energy storage models
  - Technology characteristics are evolving very rapidly, and their corresponding models need to be updated with greater frequency

- Data:
  - Need for more complete correlated wind/solar/hydro/temperature/load datasets
  - Load shapes need to consider DER, electrification, and climate change
  - Guidelines for when to use historical data vs. synthetic data would be useful

Next Steps for Project

Project Tasks

- Metrics report published March 2022
- Gap analysis on tools
- Scenario tool development
- Reference models being drafted

Case Studies

- 6 case studies and 3 auxiliary studies
- 5/6 case studies started and in various stages of completion, with initial results shared with individual members

Member and Stakeholder Engagement

- Member workshops every 3 months
- Advisory meetings every 6 months
- Feedback is always welcome at any time

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