

1.1: Metrics Analysis

(Foundational Analysis for GMLC Establishment)



Project Description

This project assesses the feasibility and usefulness of metrics for measuring change in the evolving electricity infrastructure. Metrics and associated methods are being developed to assess the power grid’s evolution with respect to characteristics that are organized into the following six categories: **Reliability, resilience, flexibility, sustainability, affordability, and security.**

Expected Outcomes

- Validation and adoption of metrics with stakeholders and regional partners
- Enhanced metrics that enable DOE to better set priorities on modernization research and development

Significant Milestones	Date
Begin implementing pilot tests with partners	9/2017
Publish validation of new metrics as result of pilot tests	9/2018
Develop final report/briefing material	9/2018

Progress to Date

- Technical report about emerging metrics (March 2017)
- Webinars with key stakeholders, including five federal agencies, seven associations, two regional transmission organizations, three state entities, and one utility
- Working with American Public Power Association (APPA) to implement value-based System Average Interruption Duration Index (SAIDI) on its web platform for use by municipal utilities by summer 2017.

Reliability

New metrics for distribution to represent value-based planning

New metrics for system impacts using North American Electric Reliability Corporation transmission/generation availability data

Approach and tool for and demonstration of probabilistic enhancement of existing transmission planning metrics

Flexibility

Developed large set of candidate metrics that represent network properties of flexibility and lack of flexibility, engaging stakeholders to identify most useful metrics

Lagging indicators

- Requires statistical analysis of market and grid conditions to reveal curtailments, loss of load, or other economic impacts caused by insufficient flexibility.

Leading indicators

- Requires production cost simulations with weather and other uncertainties to design for sufficient flexibility.
- Use production cost models to examine tradeoffs between different sources of flexibility.

Affordability

Cost Burden Metrics (emerging)

- Customer electricity cost burden
- Electricity affordability gap
- Affordability gap headcount
- Temporal indices of these metrics

Decreasing Affordability
Increasing Affordability

Resilience

Analysis Process

Results

Sustainability

Ability of federal greenhouse gas data products to capture changes in electric-sector CO₂ emissions that might result from future grid modernization varies, depending on coverage of certain energy sources anticipated to grow.

Biomass	MSW	A B C
Storage		A = No coverage B = Partial coverage* C = Full coverage
Geothermal	Hybrid	*Either the data product has no coverage or the data are reported separate from the electric sector
Dist. Gen.	CHP	EPA eGRID EPA GHGI (elec. gen.) EPA GHGRP (power plants) EPA CAMP
Biomass		EIA AEO (electric power) EIA MER (electric power) EIA EP Annual
Storage	MSW	EIA STEO (electric power)
Geothermal	Hybrid	
Dist. Gen.	CHP	

GHGI = GHG Inventory; GHGRP = GHG Reporting Program; CAMP = Clean Air Markets Program; Dist. Gen = distributed generation; CHP = combined heat and power; MSW = municipal solid waste (non-biogenic portion)

Security

Protective Measures Index

- Determines protective security posture of an entity.
- Initially developed for and applied by Department of Homeland Security (DHS).
- Stakeholder agreement for use as physical security metrics for Electric sector.
- Allows comparison of physical security posture for similar entities.
- Has been applied to 400-plus electric facilities.

Overall PMI

Existing Scenario