Moving Beyond Average Reliability Metrics

Presented by

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A Look at the Past – 5 Decades of Reliability Metrics

DEC(SAIDI)
&
FEC (SAIFI)

Early 1970's
Most common metrics established

SAIDI (DEC)
System Average Interruption Duration Index

SAIFI (FEC)
System Average Interruption Frequency Index

1988
First commercial OMS starts being developed, leading to better visibility and quality of data

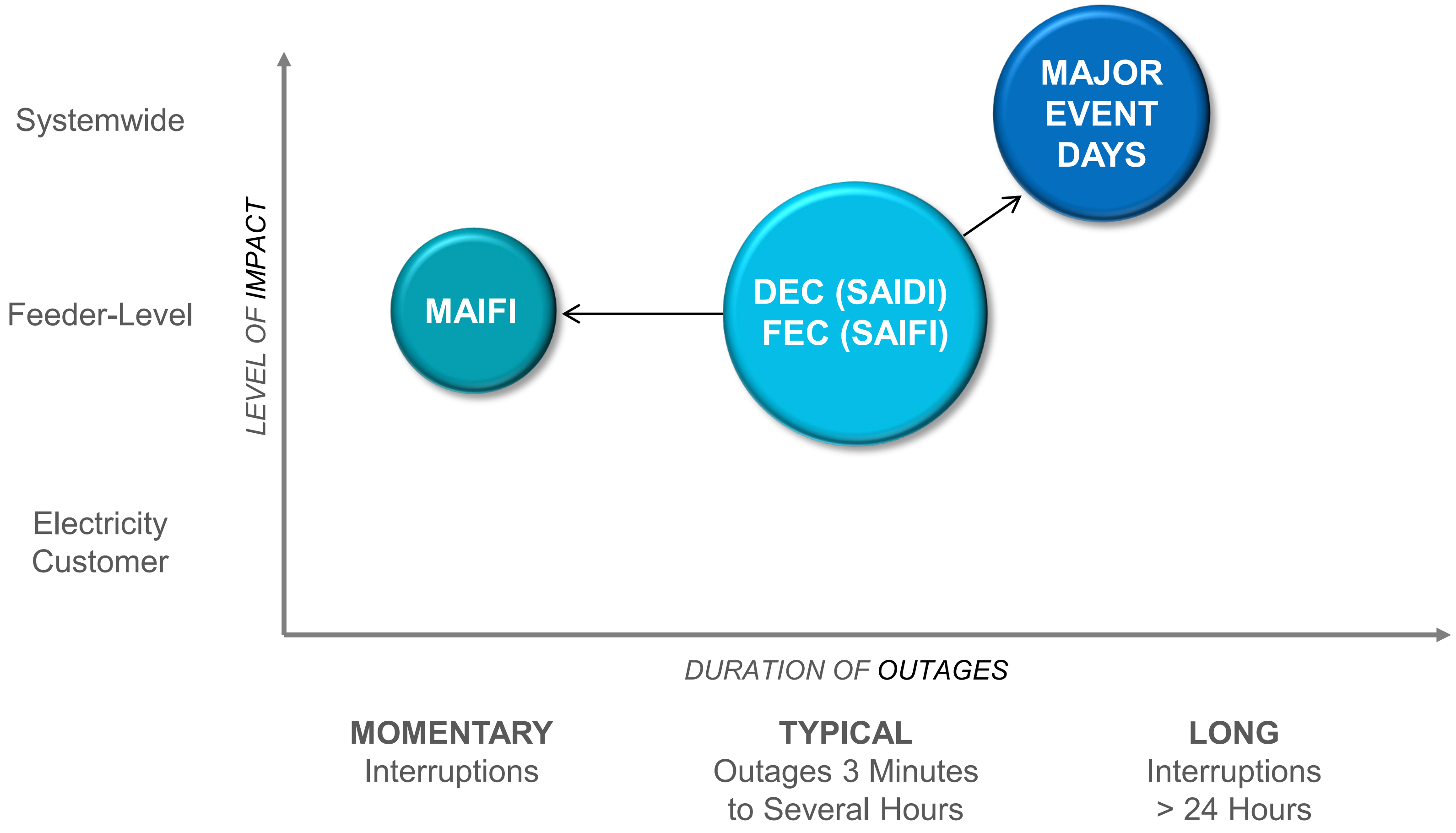
1998
IEEE 1366 first published, defining key metrics & benchmark data

Adoption of new customer-centered metrics

2000's

Past Present Future

Most Commonly Used Metrics – 5 Decades of Reliability Metrics



DEC (SAIDI)
System Average Interruption Duration Index

FEC (SAIFI)
System Average Interruption Frequency Index

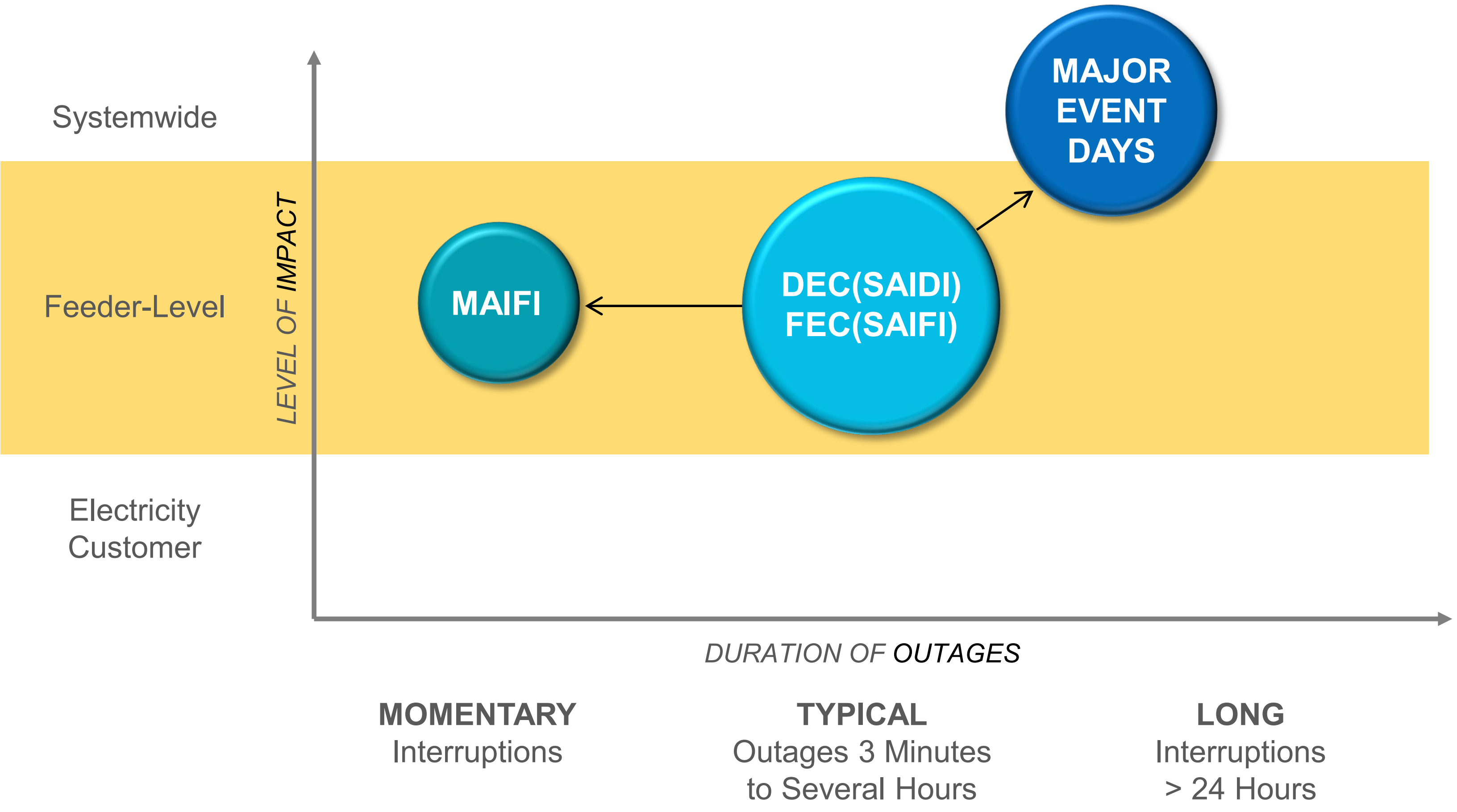
MAIFI
Momentary Average Interruption Frequency Index

CAIDI
Customer Average Interruption Duration Index

Size of Circle *= Relative Level of Utility Use of this Metric*

Past | Present | Future

Most Commonly Used Metrics - Moving Beyond **Average** Reliability Metrics



__Size of Circle__ = Relative Level of Utility Use of this Metric

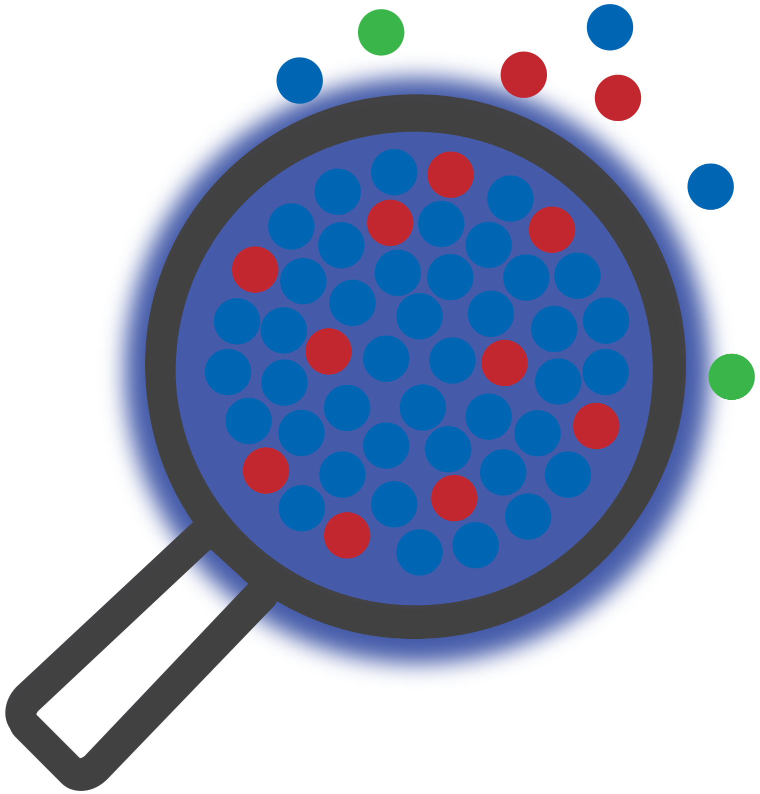
Past Present Future

DEC (SAIDI)
System **Average** Interruption Duration Index

FEC (SAIFI)
System **Average** Interruption Frequency Index

MAIFI
Momentary **Average** Interruption Frequency Index

Two big problems with the Big Average Reliability Indices



Data Aggregation

- Misses real experience
- Misses problem areas
- Poor investment decisions

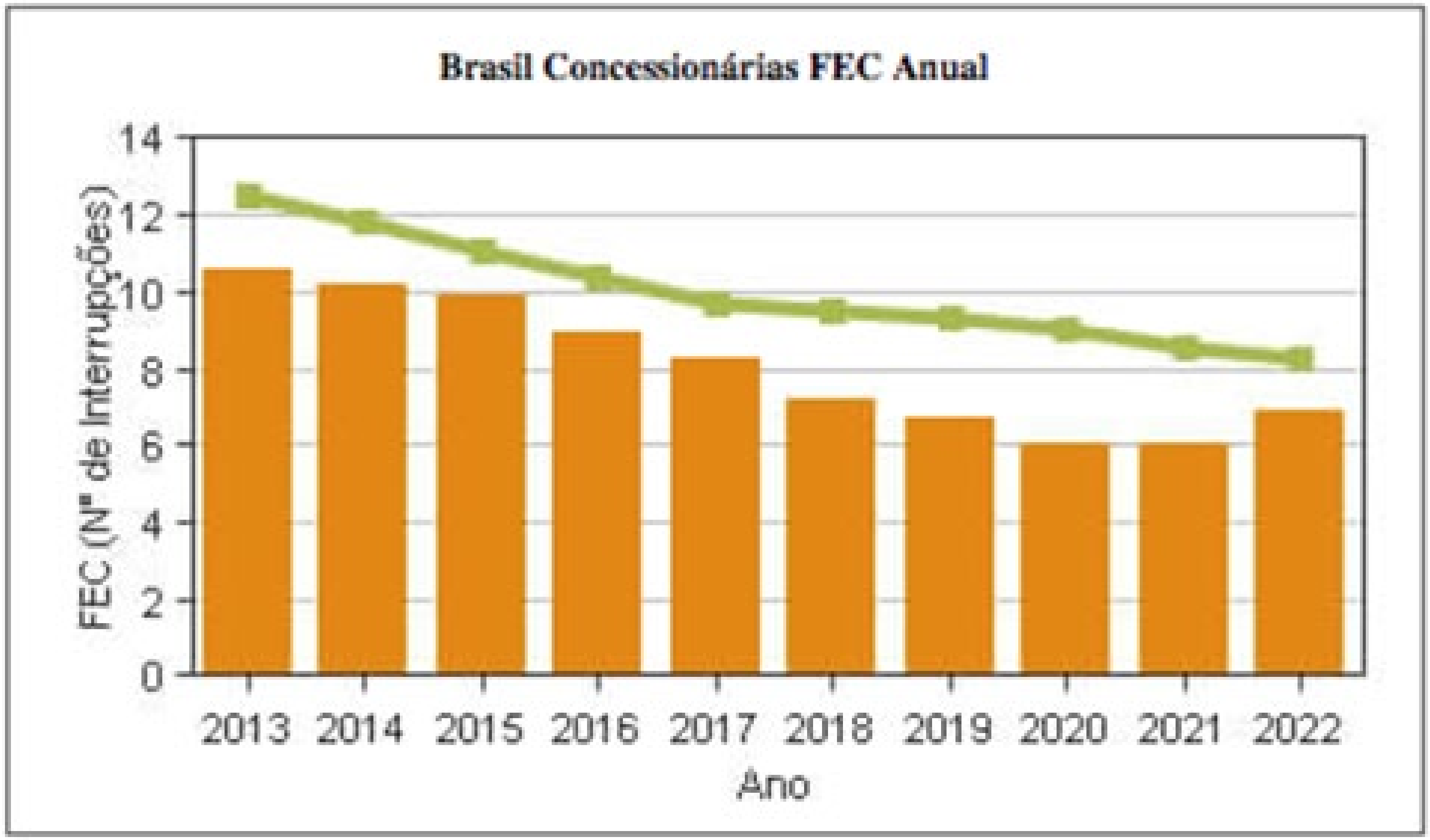
The Data that is Missed

- Significant impact on customers
- Major Event Days
- Momentary outages

Past Present Future

Real-World Checkpoint – Brasil FEC excluding major events

Average **number** of interruptions per year

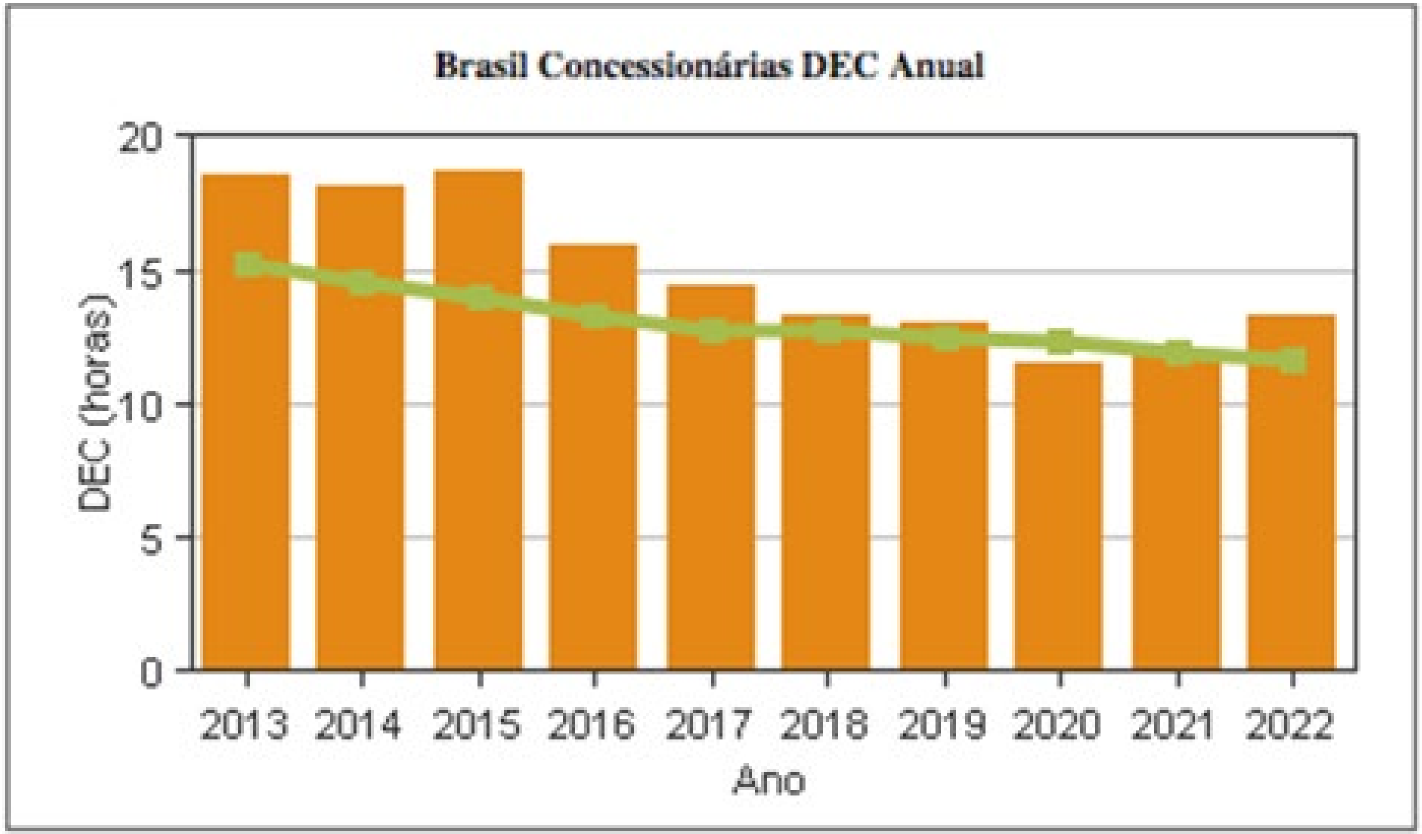


Source: ANEEL website

Past
Present
Future

Real-World Checkpoint – Brasil DEC excluding major events

Average **hours** of interruption per year

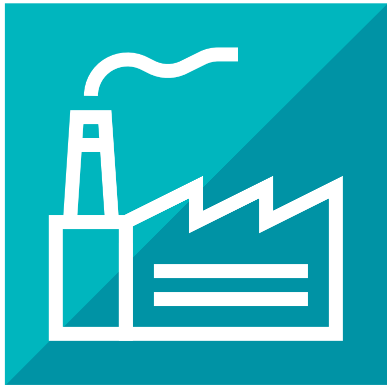


Source: ANEEL website

Past Present Future

Changing Energy Landscape - Meeting the Shift to Digital

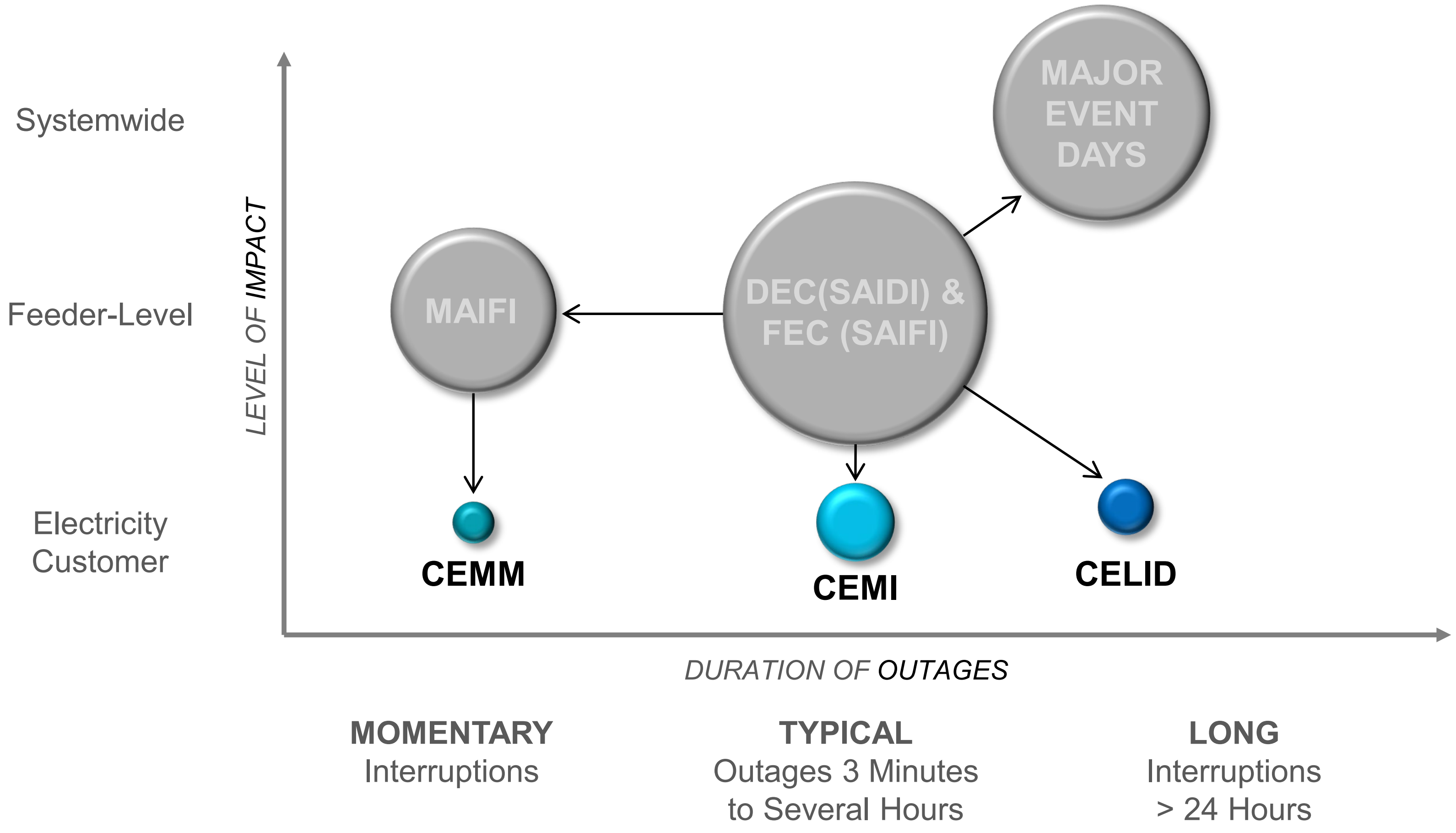
Residential



Manufacturing

Retail

Evolution to Customer Centric Metrics - Meeting rising customer expectations



CEMM
Customers Experiencing Multiple Momentaries

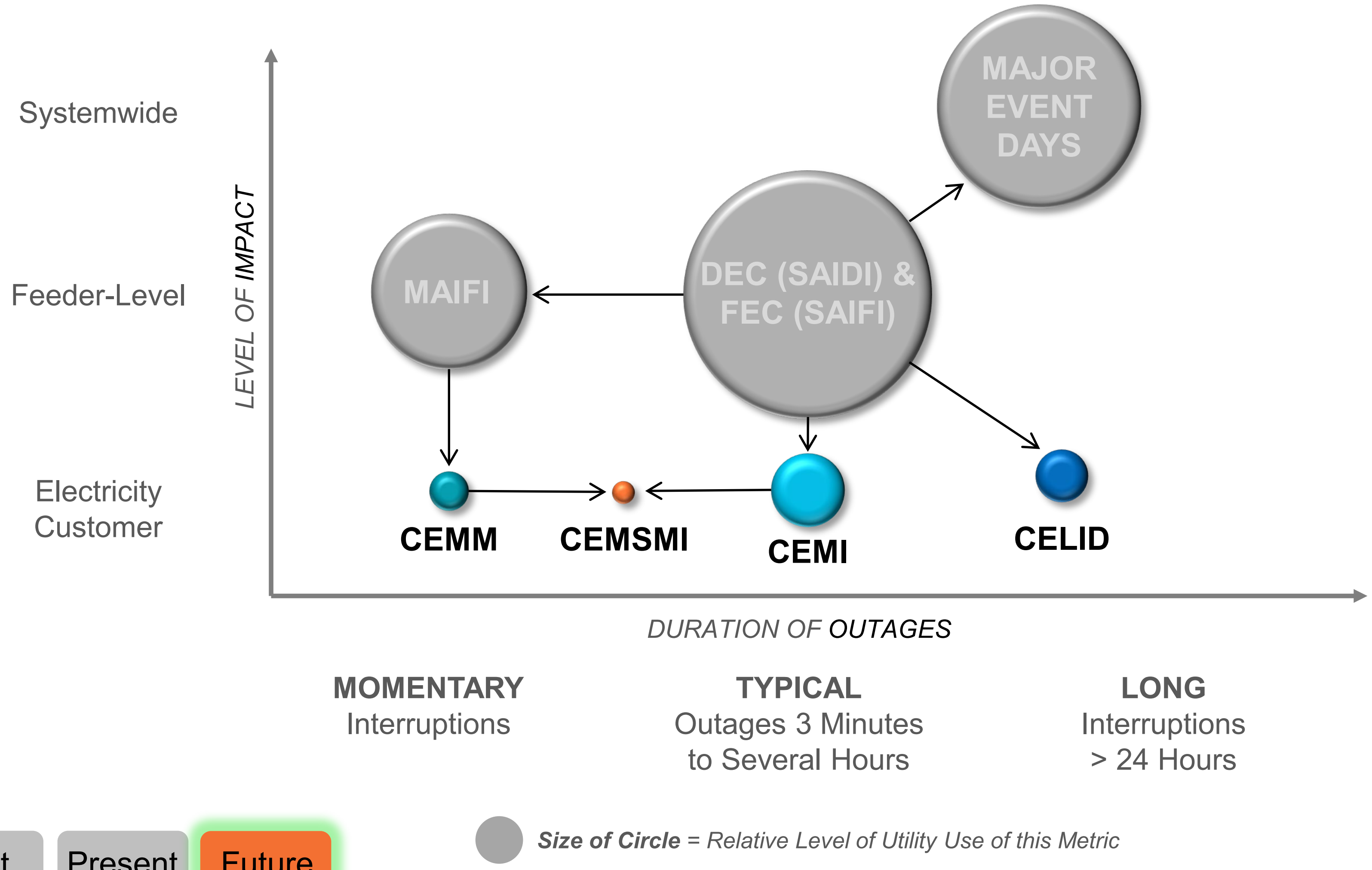
CEMI
Customers Experiencing Multiple Interruptions

CELID
Customers Experiencing Long Interruption Durations

Size of Circle *= Relative Level of Utility Use of this Metric*

Past | Present | Future

Looking Toward the Future – Every Outage Counts

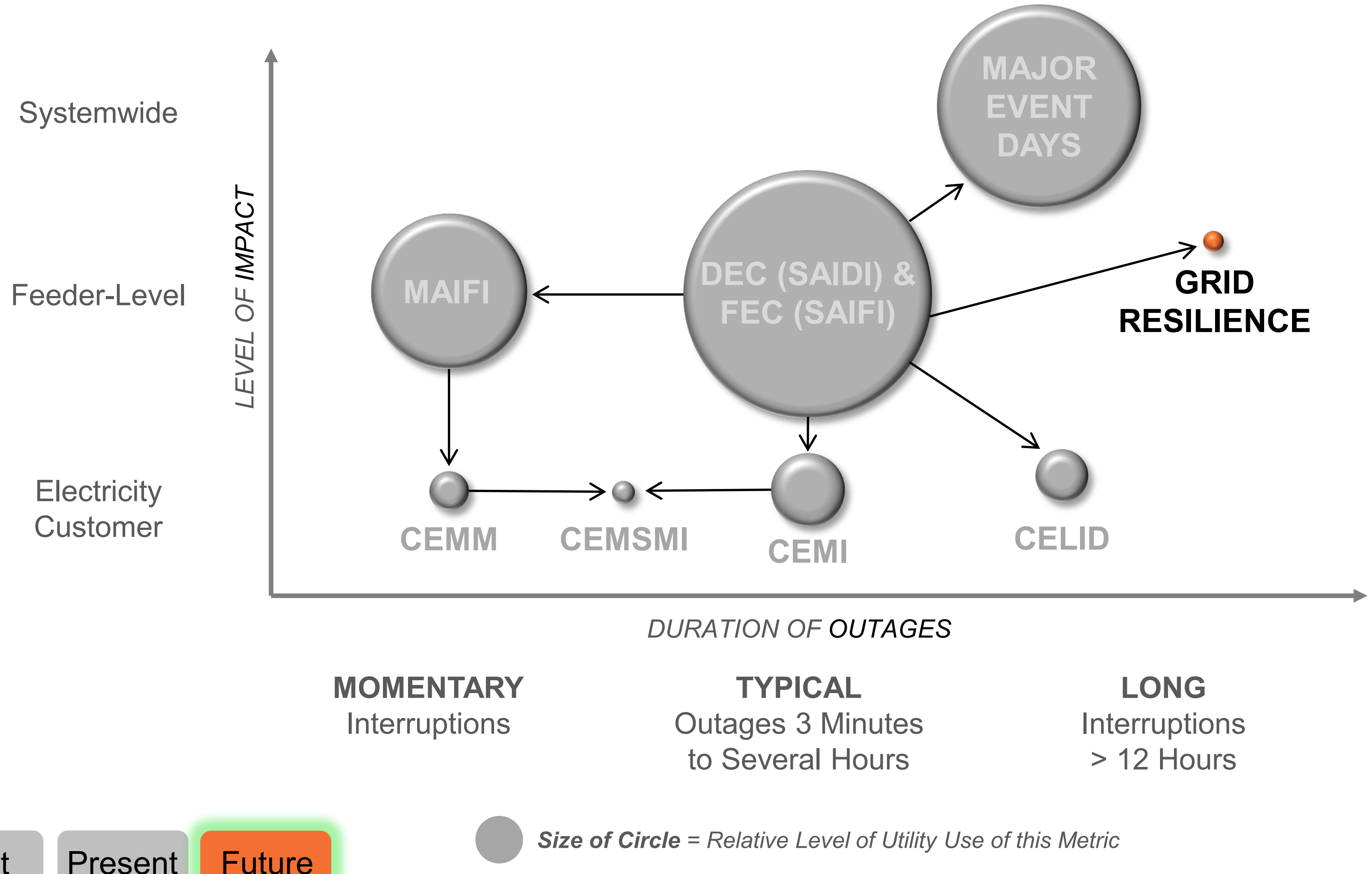


CEMSMI

Customers Experiencing Multiple Sustained Interruptions and Momentary Interruptions Events

Past | Present | Future

Looking Toward the Future – Every Outage Counts

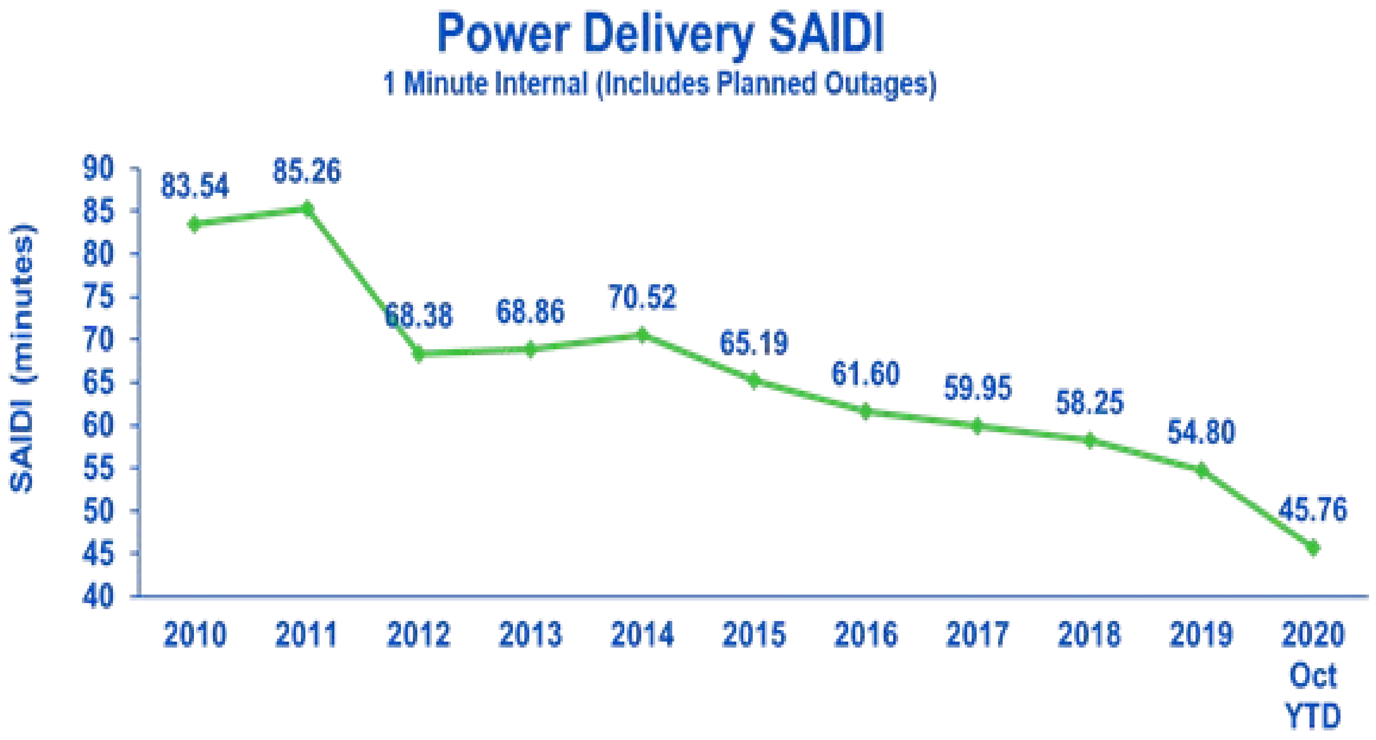


Past | Present | Future

Real-World Checkpoints - Traditional reliability metrics still provide insight

- Florida Power & Light uses:
  - SAIDI, SAIFI, MAIFI
  - Benchmarkable in industry
  - System-focused, feeder and lateral
  - Masks specific customer issues

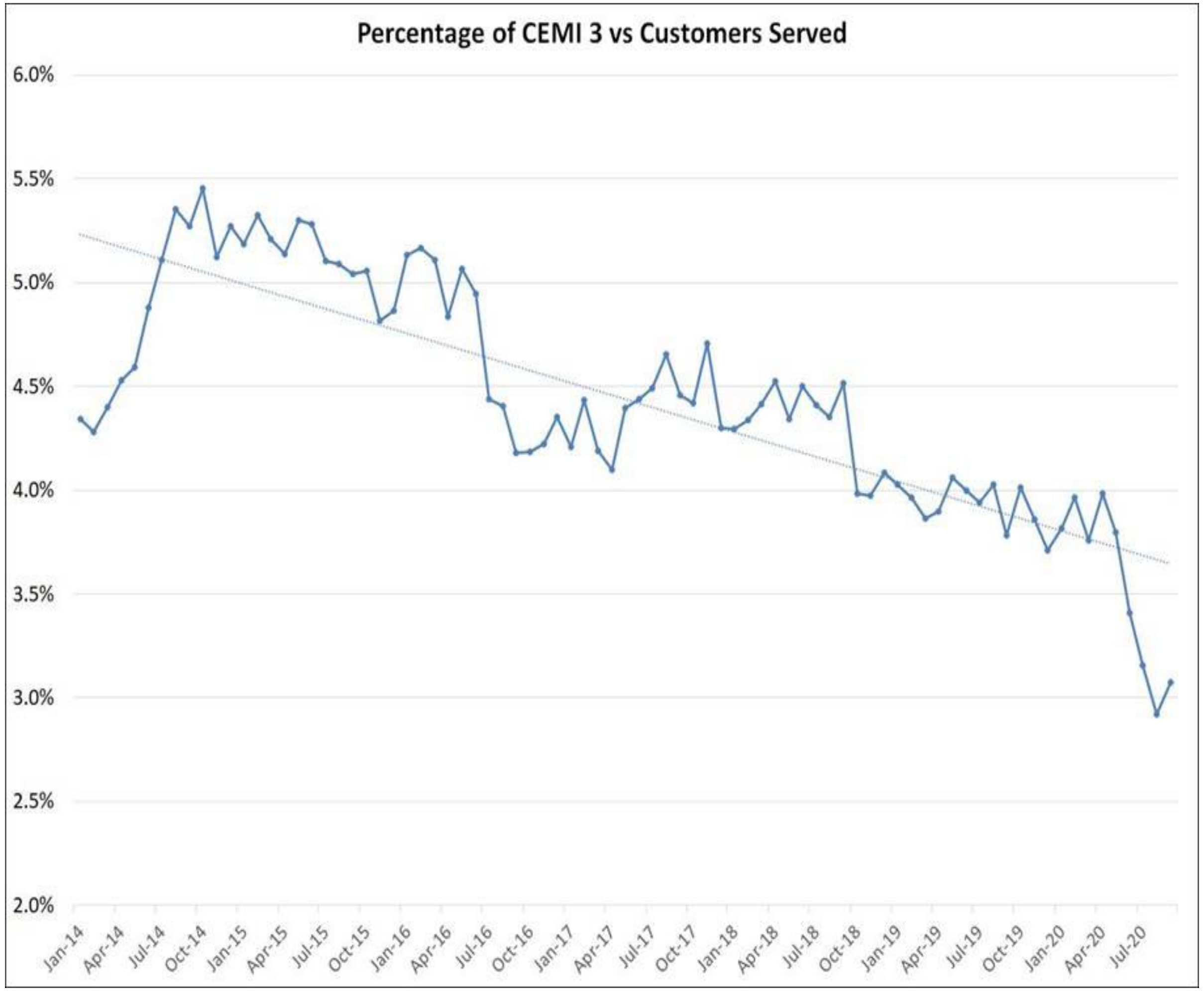
- Improvement opportunities:
  - Traditional reliability programs
  - Smart Grid devices
  - Restoration process improvements



Past Present Future

Real-World Checkpoint - Customer metrics enhance traditional indicators of reliability

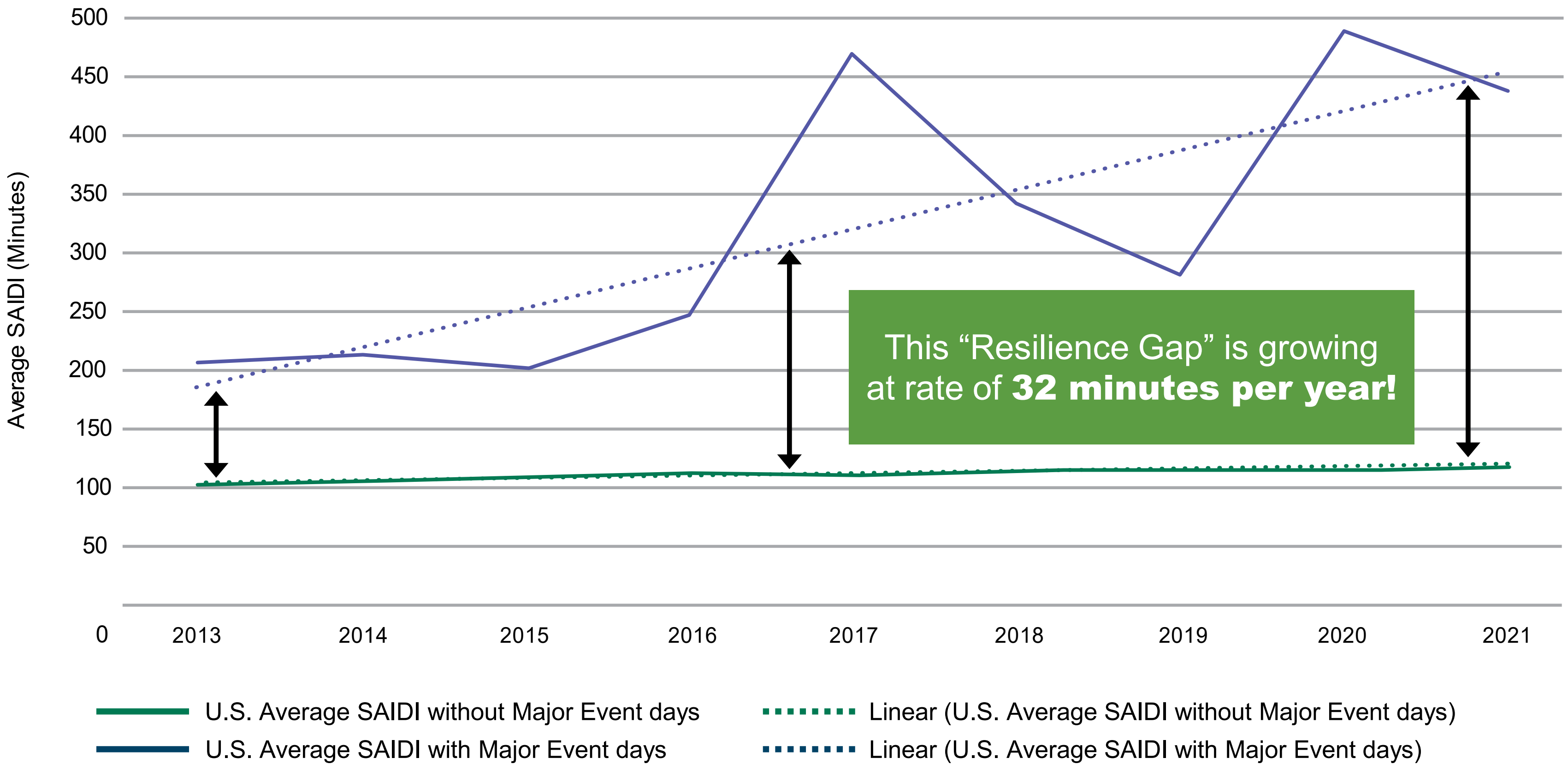
- FPL uses:
  - CEMI 3, 5, and 8
  - CEMM 15, and 25



Past Present Future

Real-World Checkpoint - Growing Resilience Gap in many countries

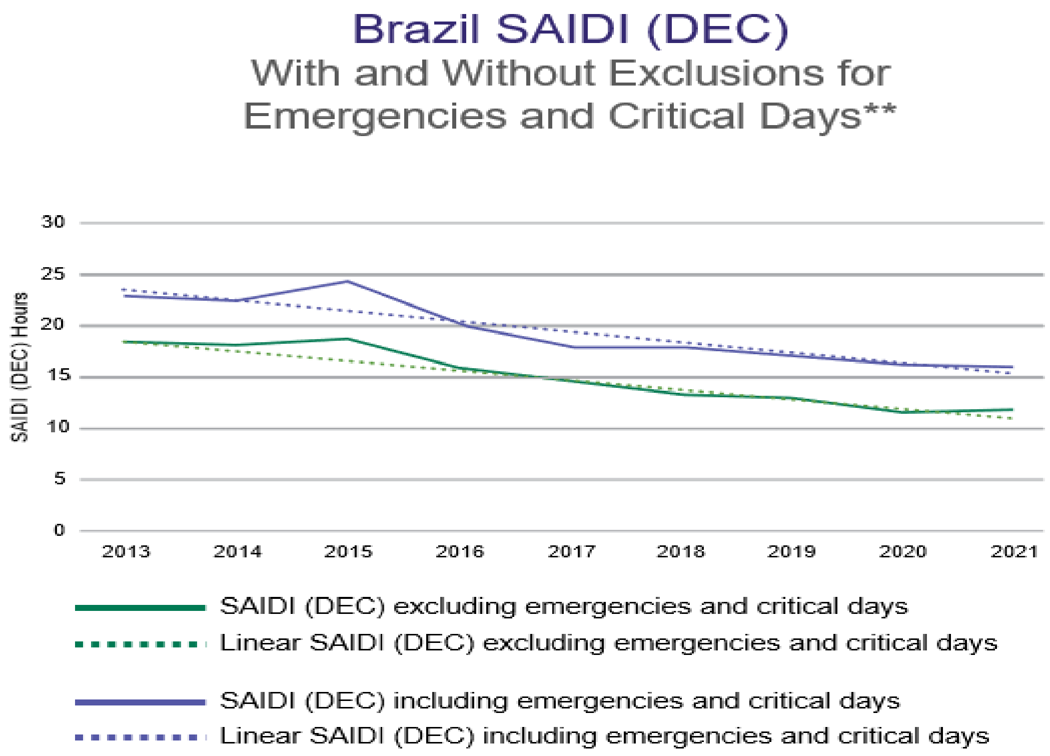
Expanding gap between SAIDI **including and excluding major events** highlights growing resilience challenge



Past | Present | Future

Real-World Checkpoint - Growing Resilience Gap in many countries

However, the gap is not growing for Brazil, but large difference in absolute terms



Past Present Future

Real-World Checkpoint – Resilience Improvements

- Resiliency Indicator
  - Hardened feeders perform 41% better every day
  - Tropical event restoration
- A resilient system can drive improvement on all reliability indicators

Saffir-Simpson Scale	Category 3	Category 4
Maximum sustained wind (mph)	120	130
Customers affected (millions)	2.1	4.4
% of FPL customers affected	75	90
50% customers restored (days)	5	1
75% customers restored (days)	8	3
95% customers restored (days)	15	7
100% customers restored (days)	18	10

Past Present Future


There is always
more
to the story

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