



AHEAD OF WHAT'S POSSIBLE™

Taking Control of Smart Meters with Diagnostic Data

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10/19/2017



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Agenda

- ▶ Utility industry trends
- ▶ Challenges and current methods to solve them
- ▶ The need for a new approach
- ▶ *m*Sure[®] technology overview
- ▶ Using actionable insights and the ROI to utilities
- ▶ Next steps
- ▶ Q&A

Utility Industry Trends

AMI Deployments Are Transforming the Utility Business



Meter Reading



Data Mining



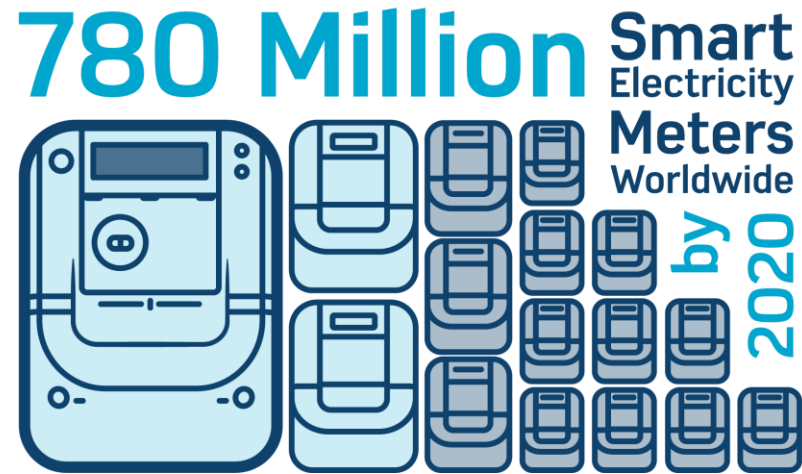
More Customer Choices



Better Service

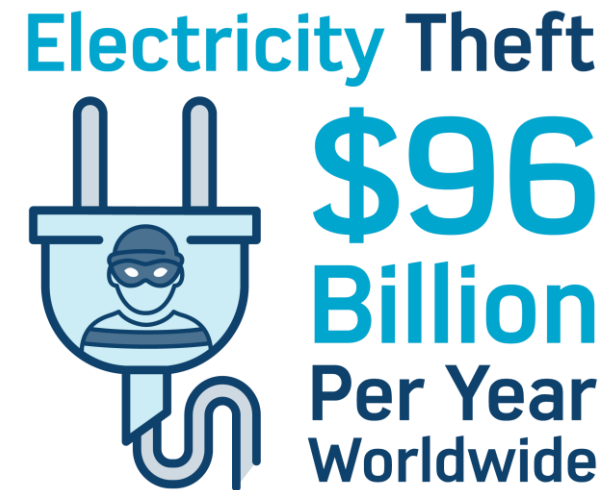
Challenges

Limited visibility into the health of millions of meters



Source: ABI Research, July 2015

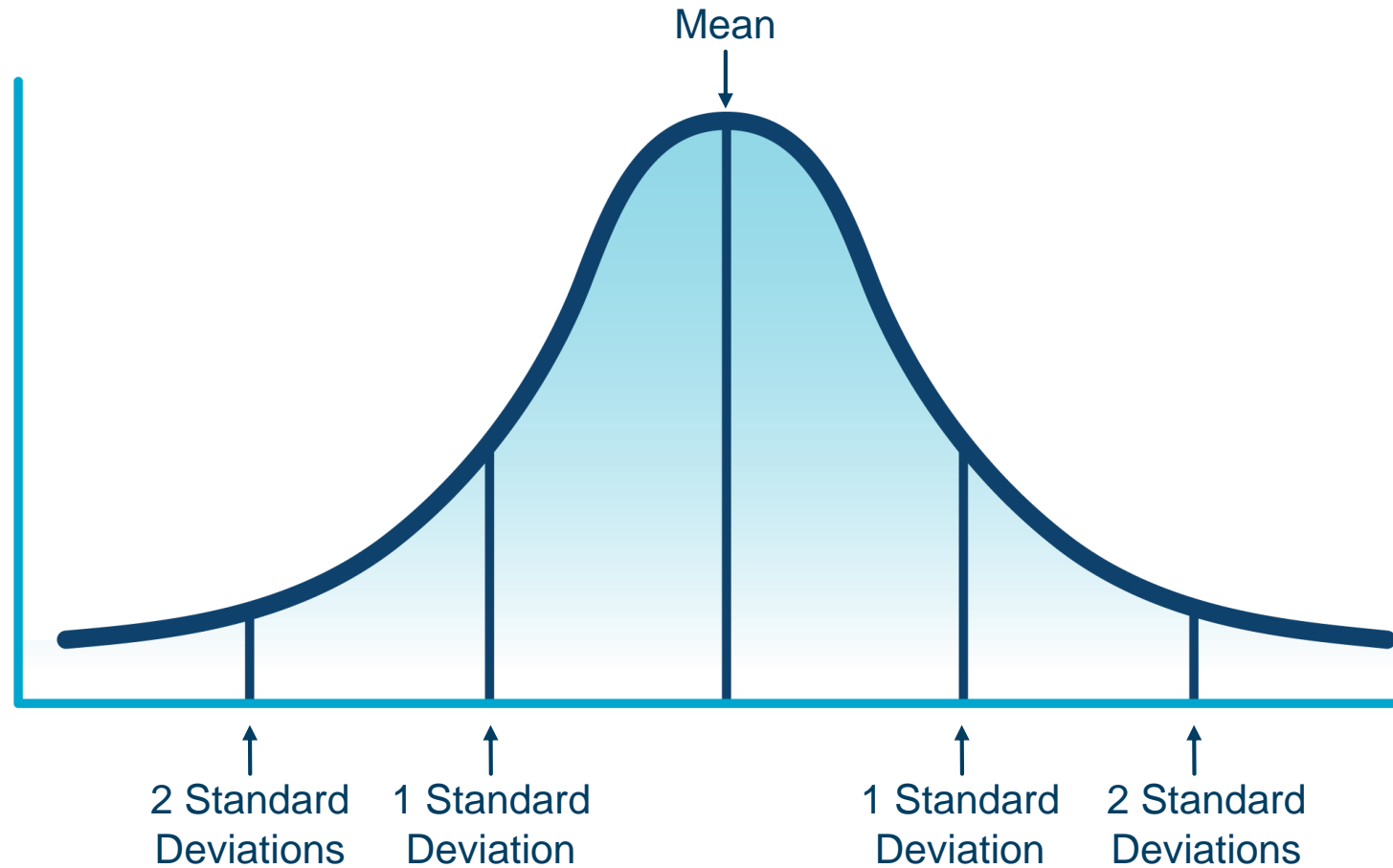
Electricity theft is still growing



Source: Northeast Group, May 2017

Verifying Meter Accuracy—Sample Testing

Possibility of leaving hundreds of bad meters in the field!



Current Methods

Managing Risk—Possibility of Overbilling



“ We had a meter that ran slightly fast and overcharged customers. We had to find all meters in the batch, replace them, work out refunds, and manage PR. It’s expensive. ”

—Asset Manager at European Utility


Current Methods

Meter Replacement—Based on Probability

99% meters that are thrown out are still good!



Bath tub curve (Weibull function)—represents the expected rate of failure for the entire population, not an individual device.

Electricity Theft

up to **30%**
of All Electricity
Generated in
Some Countries

Tamper Detection



False Positives



Can't Locate Meter



Can't Estimate the
Amount of Tamper

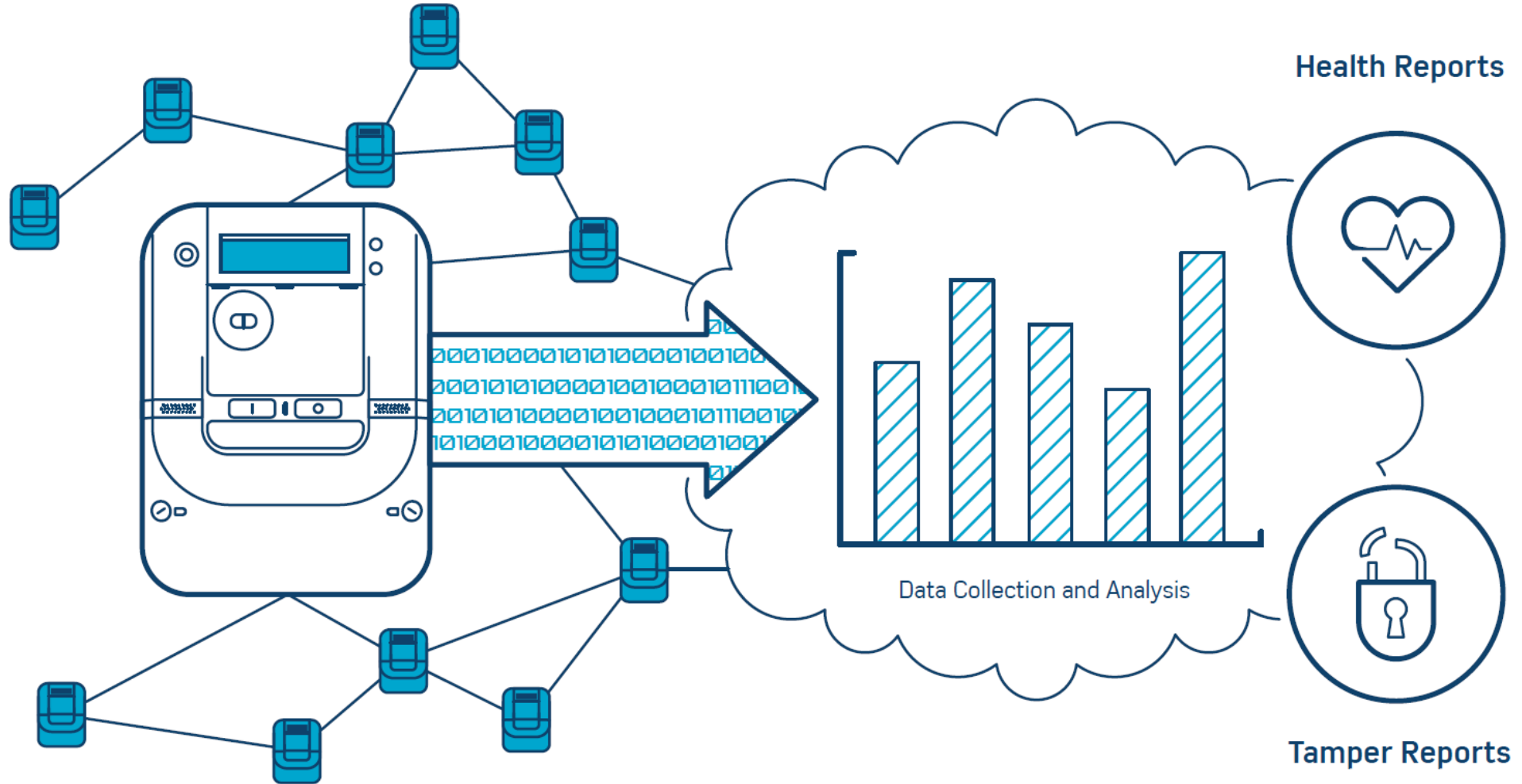


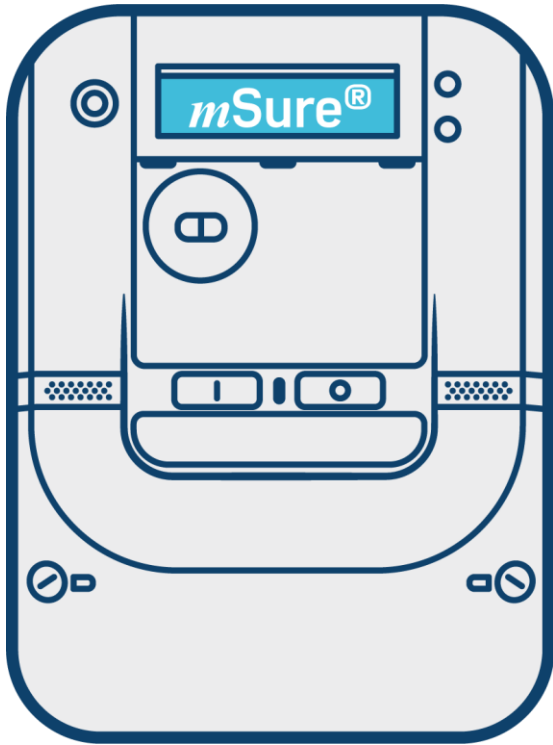
Can't Discover
New Tamper Types



Based on Historical
or Neighbor Data

A New Approach Is Needed

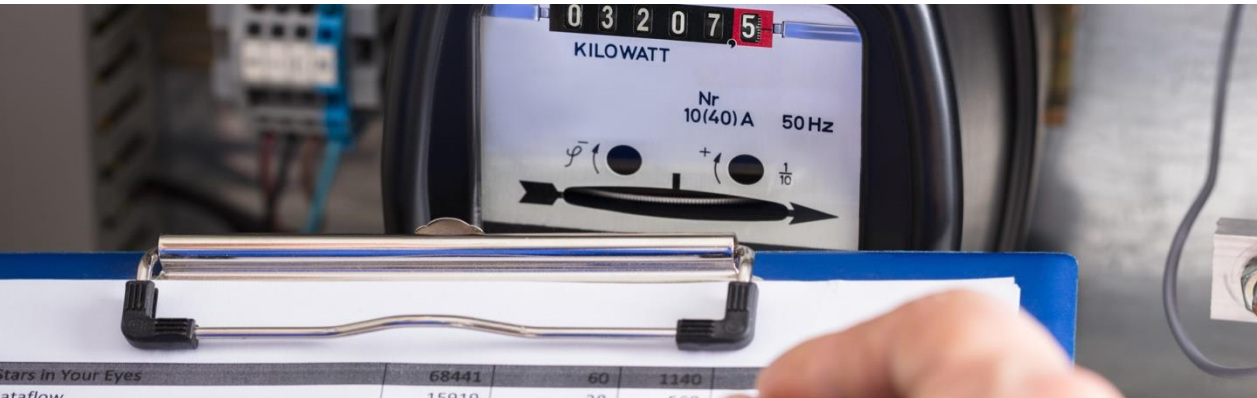




Real-Time Health
Monitoring and Intelligence

Get Visibility into Your
Entire Meter Population

With *mSure*®



Eliminate In-Field Testing



Extend Meter Lifetime



Predictive Maintenance



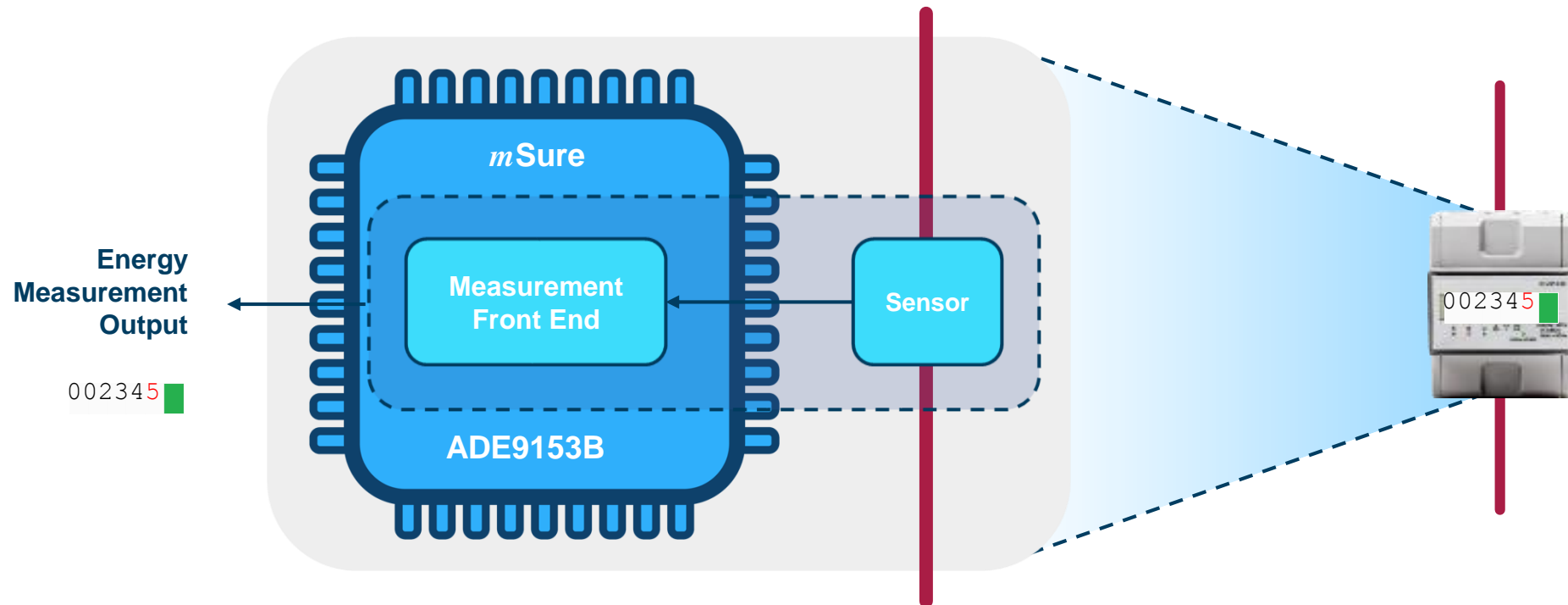
More Revenue Protection

Technology Overview

*m*Sure® Diagnostics

*m*Sure in the ADE9153B

*m*Sure[®] is a technology that resides in the energy measurement IC, and it provides accurate monitoring and self-testing capability for the entire system, including the sensor.



mSure® Servo Loop Monitor

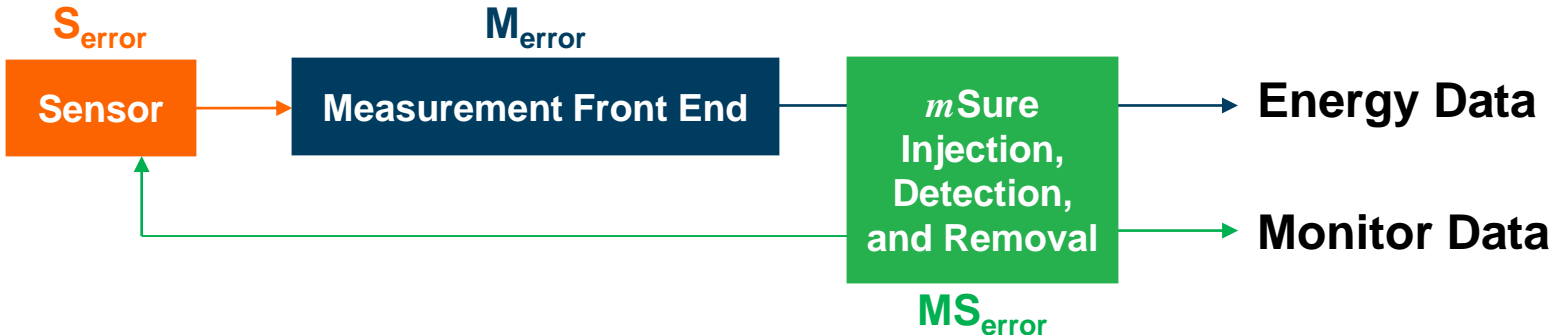
► Open-loop (existing systems)

- Each component made precise, but accuracy is only known when meter is manufactured



► Servo control loop monitors and reports measurement accuracy

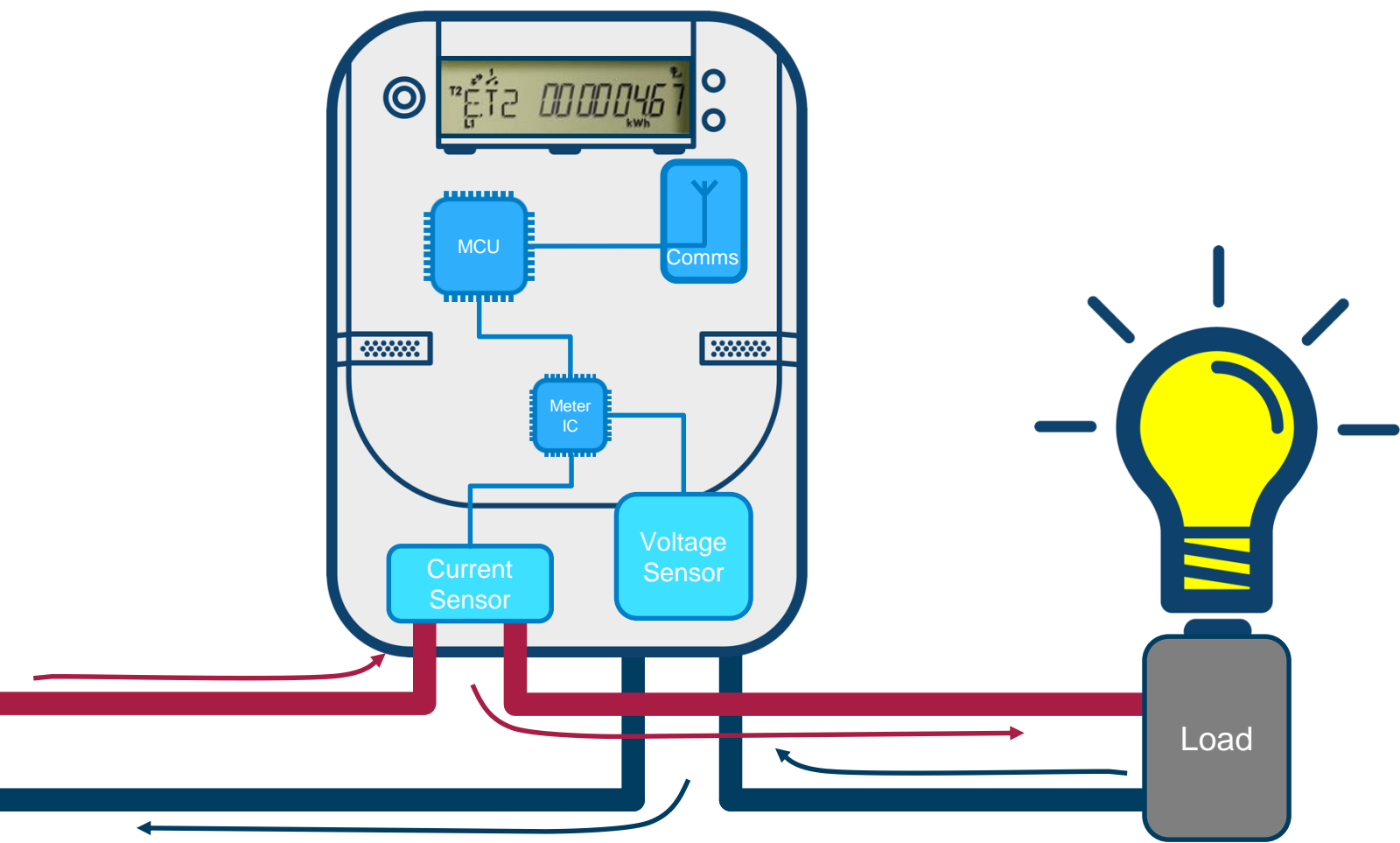
- Control loop works in parallel to normal open-loop systems to monitor sensor



- Initial accuracy stored at manufacturing, but system provides continuous monitoring of the whole chain's accuracy relative to factory settings

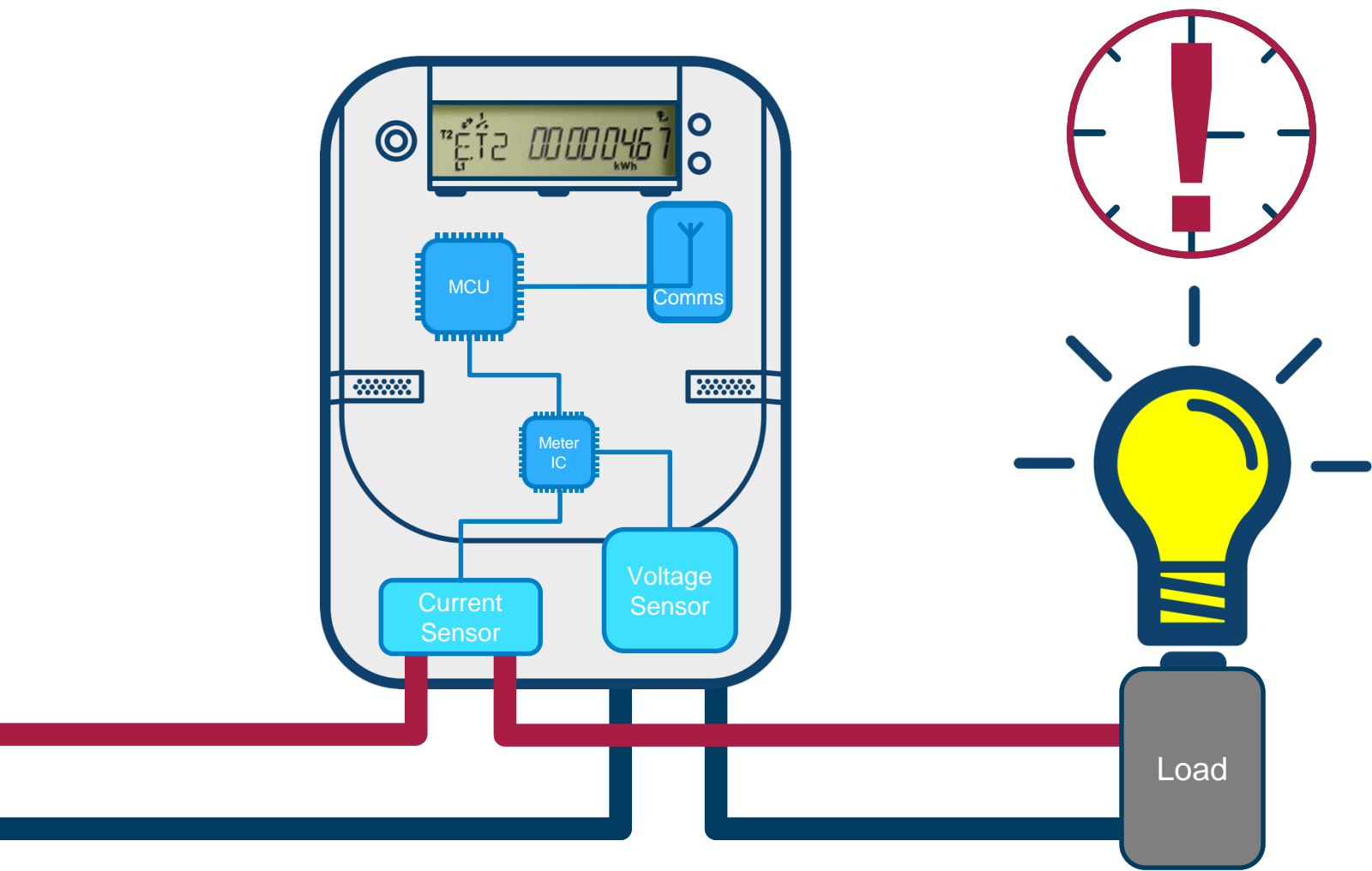
- System does not interfere with normal metrology or energy data

What's Inside an Electricity Meter



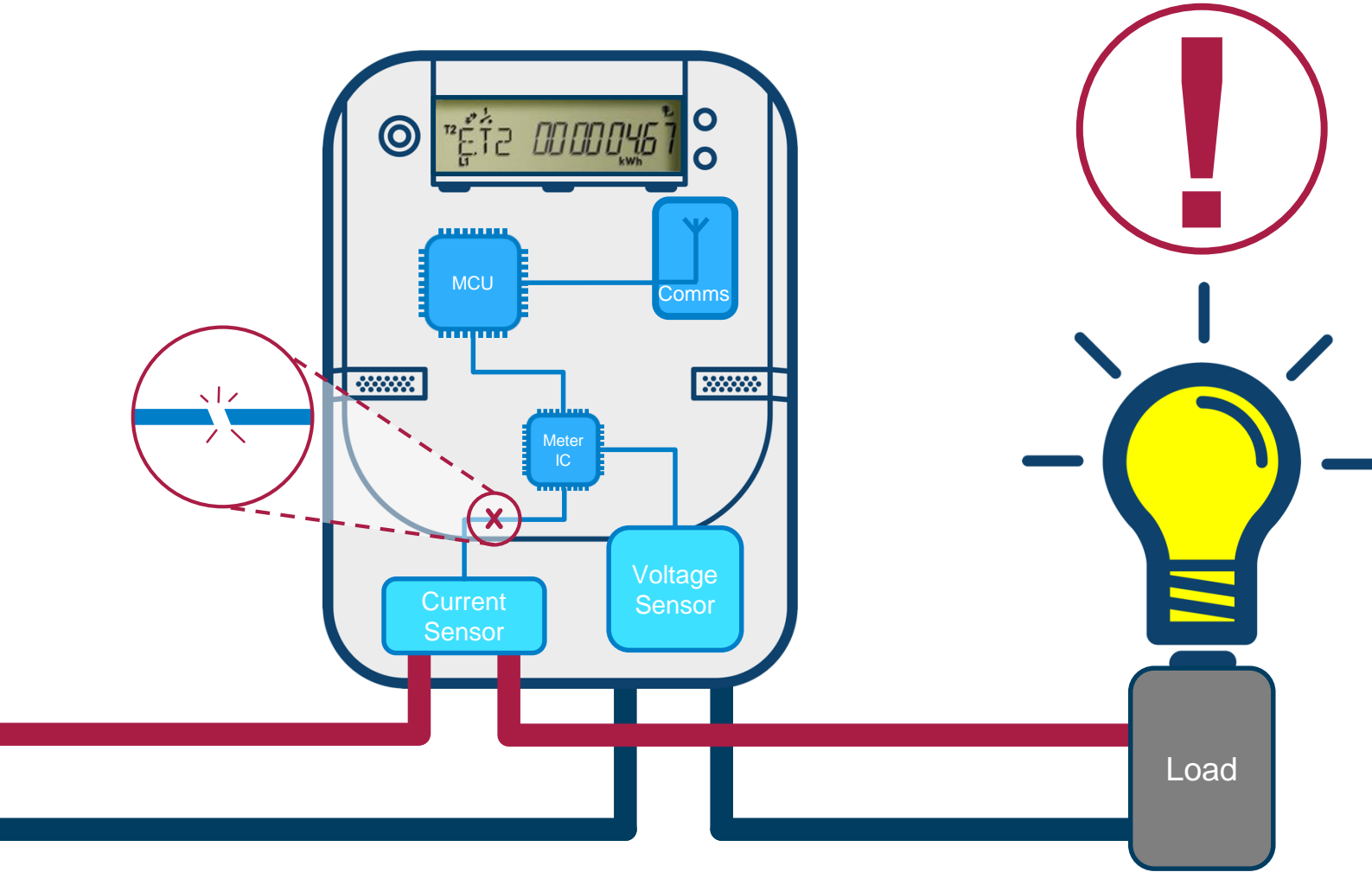
Identifier	Accuracy	Out of Spec	Tamper	Failure
Meter 1	0.03%	Ok	Ok	Ok
Meter 2	-0.02%	Ok	Ok	Ok
Meter 3	0.06%	Ok	Ok	Ok
Meter 4	0.02%	Ok	Ok	Ok
...	...			
Meter X	-0.04%	Ok	Ok	Ok

Aging—Out of Spec Meters



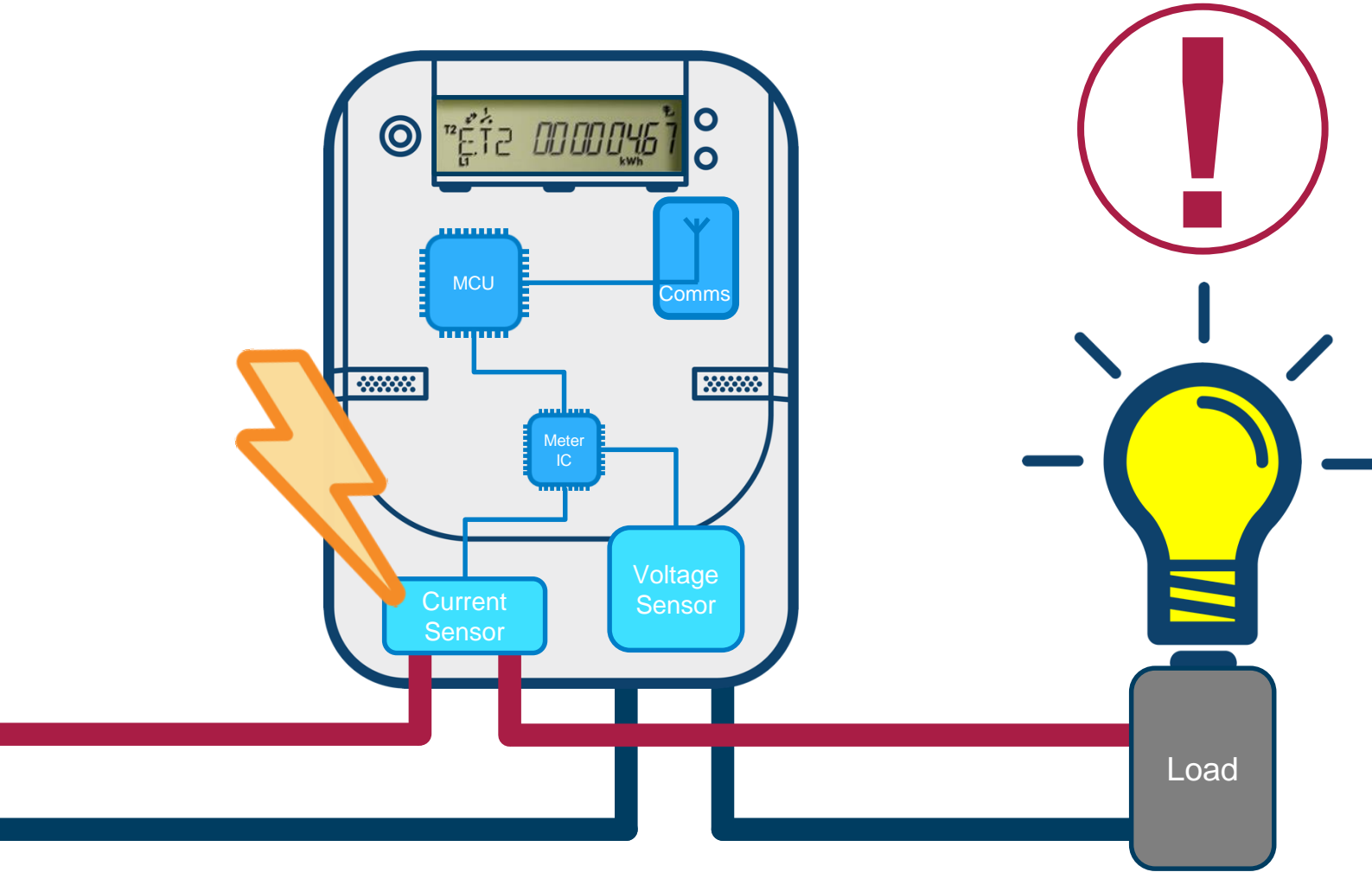
Identifier	Accuracy	Out of Spec	Tamper	Failure
Meter 1	0.03%	Ok	Ok	Ok
Meter 2	-0.02%	Ok	Ok	Ok
Meter 3	0.06%	Ok	Ok	Ok
Meter 4	0.02%	Ok	Ok	Ok
...	...			
Meter X	-0.04%	Ok	Ok	Ok

Sensor Fault—Damaged Meter



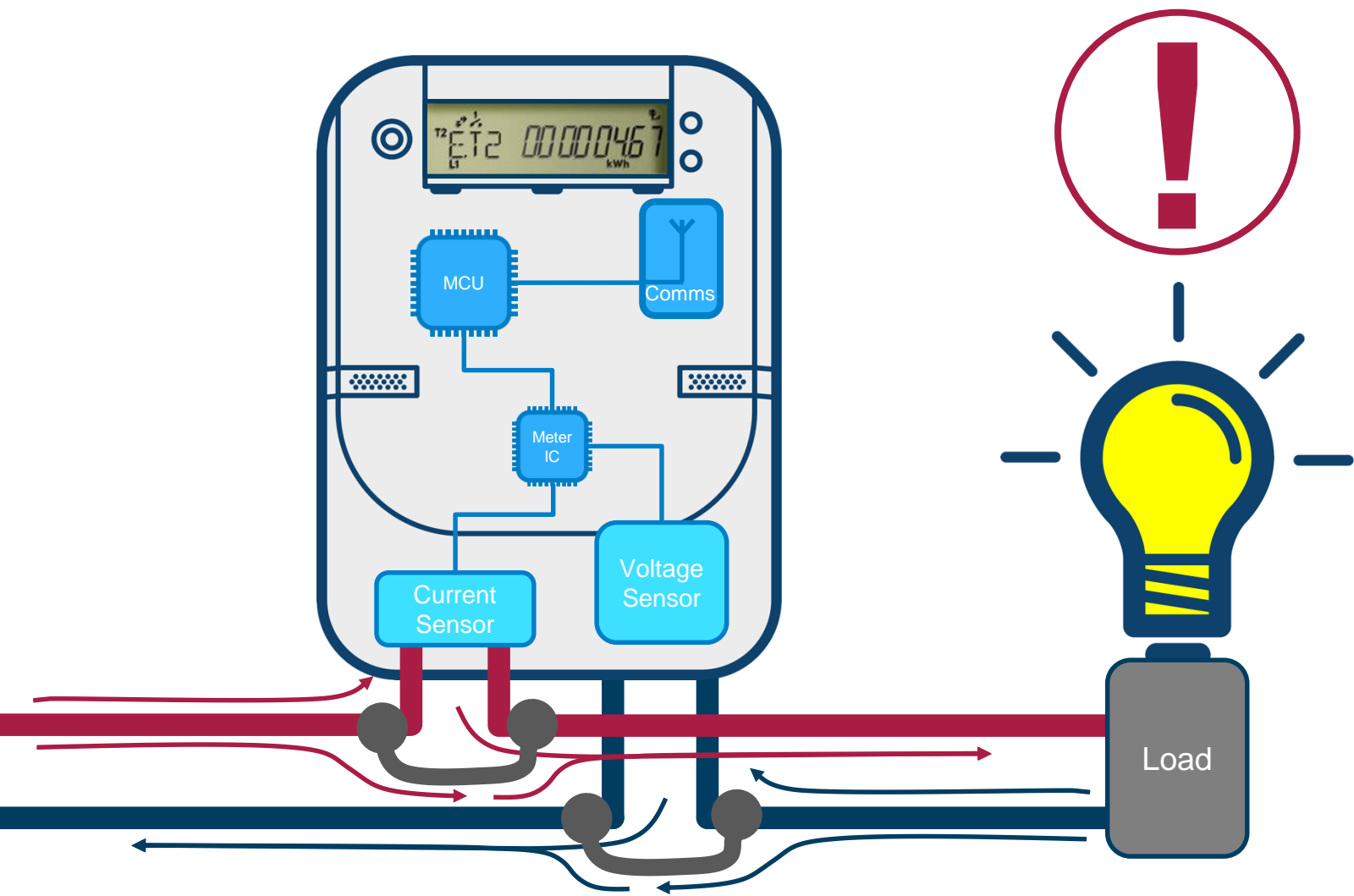
Identifier	Accuracy	Out of Spec	Tamper	Failure
Meter 1	-1.41%	Alert	Ok	Ok
Meter 2	-0.02%	Ok	Ok	Ok
Meter 3	0.06%	Ok	Ok	Ok
Meter 4	0.02%	Ok	Ok	Ok
...	...			
Meter X	-0.04%	Ok	Ok	Ok

Sensor Fault—Overcurrent Damage



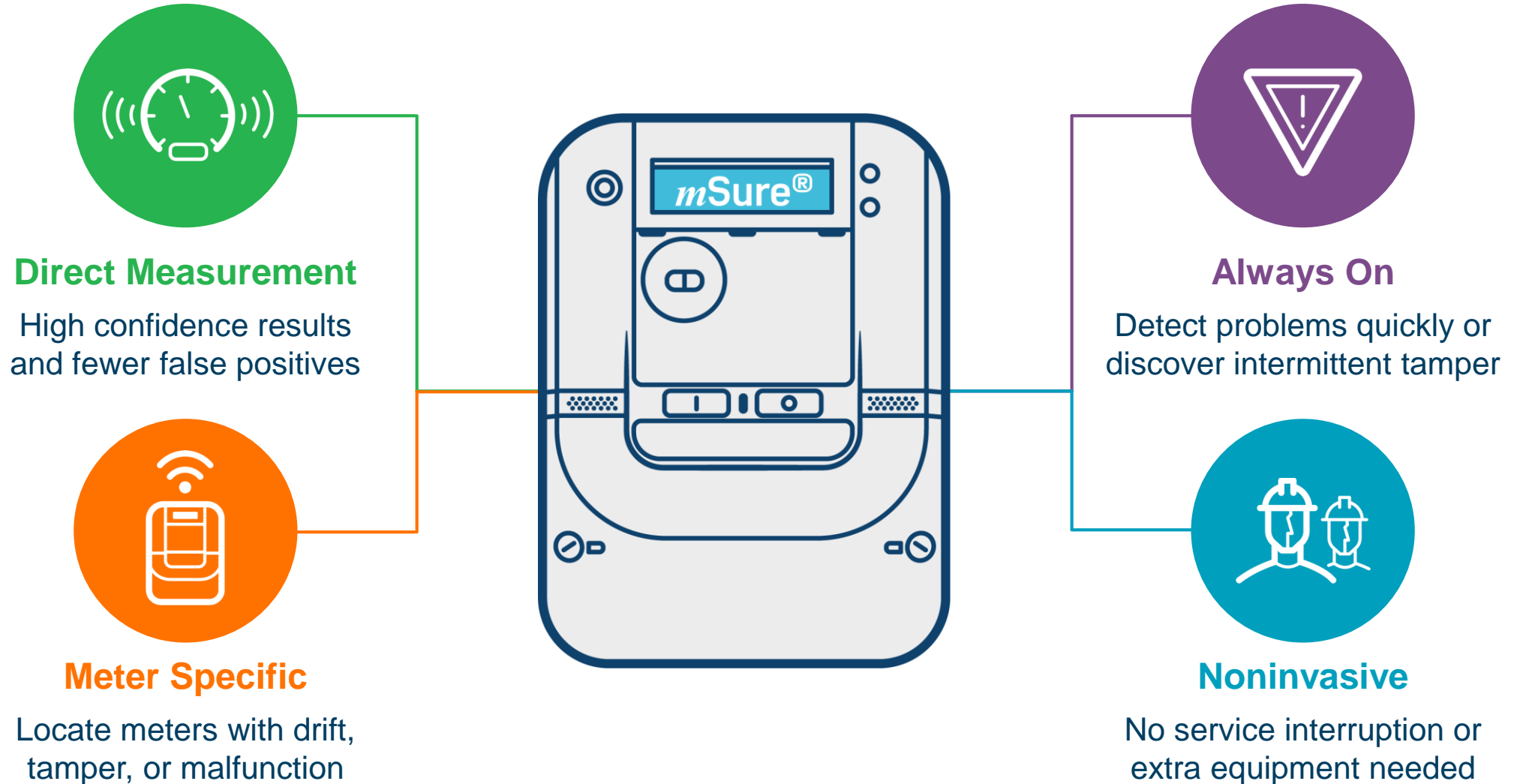
Identifier	Accuracy	Out of Spec	Tamper	Failure
Meter 1	-1.41%	Alert	Ok	Ok
Meter 2	Open	Alert	Ok	Alert
Meter 3	0.06%	Ok	Ok	Ok
Meter 4	0.02%	Ok	Ok	Ok
...	...			
Meter X	-0.04%	Ok	Ok	Ok

Bypass Tamper



Identifier	Accuracy	Out of Spec	Tamper	Failure
Meter 1	-1.41%	Alert	Ok	Ok
Meter 2	Open	Alert	Ok	Alert
Meter 3	1.62%	Alert	Ok	Ok
Meter 4	0.02%	Ok	Ok	Ok
...	...			
Meter X	-0.04%	Ok	Ok	Ok

mSure Advantages



Actionable Insights

Analog Devices Edge-to-Cloud Utility Meter Analytics

Meter Accuracy over Lifetime and Meter Malfunction



Meter Health Analytics Module



Advanced Tamper Detection



Advanced Revenue Protection Analytics Module



Return on Investment

Optimized Field Resources

- ▶ Faster faulty meter detection
- ▶ Efficient crew dispatch
- ▶ No service disruption for testing

Reduced Equipment Cost

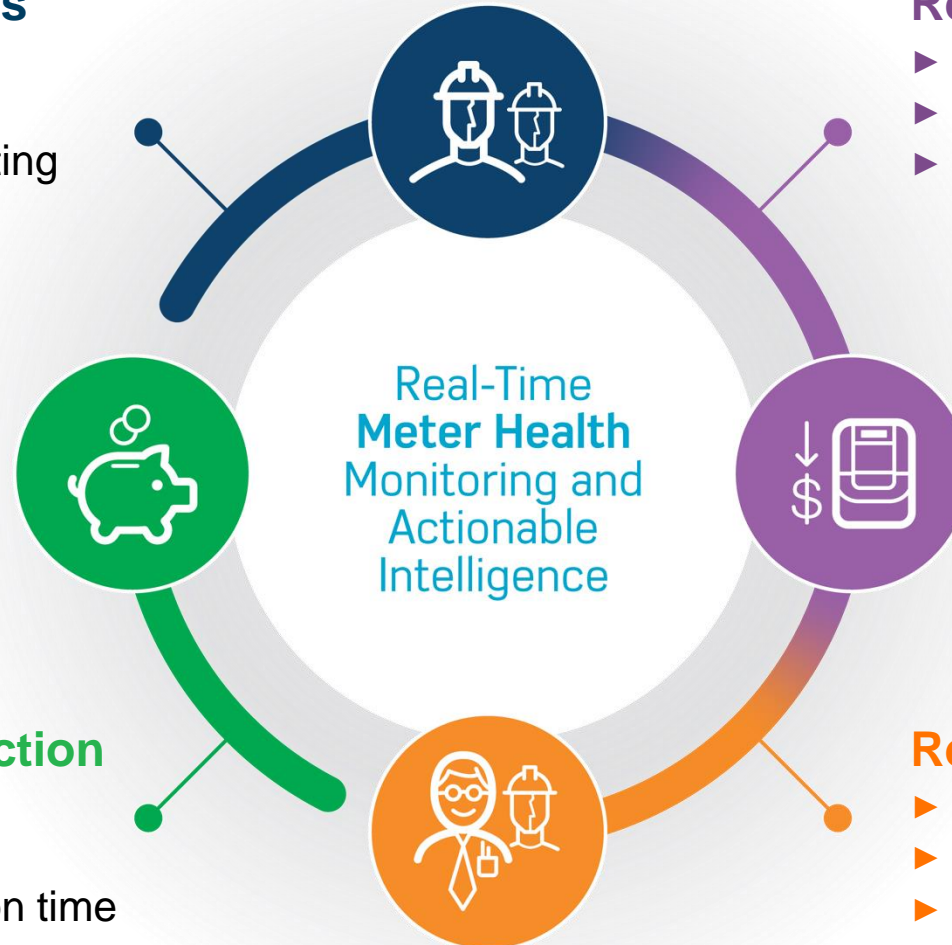
- ▶ Extended meter lifetime
- ▶ Prioritized replacement
- ▶ Ongoing quality assurance

Advanced Revenue Protection

- ▶ Estimated amount of tamper
- ▶ More tamper types identified
- ▶ Reduced tamper investigation time

Reduced Risk

- ▶ Regulatory compliance
- ▶ Identify and prevent system failures
- ▶ Customer satisfaction—no overbilling



Next Steps with *mSure*®

Visit analog.com/mSure for more resources

The screenshot shows the Analog Devices website at the URL www.analog.com/en/products/analog-to-digital-converters/integrated-special-purpose-converters/energy-metering-ics.html. The page features the Analog Devices logo and tagline "AHEAD OF WHAT'S POSSIBLE™" at the top left. A search bar is located to the right of the logo. Below the logo, there is a navigation bar with links for MY HISTORY, PARAMETRIC SEARCH, PRODUCTS (which is highlighted), APPLICATIONS, DESIGN CENTER, COMMUNITY, EDUCATION, and SUPPORT. A secondary navigation bar shows the breadcrumb trail: Home > RadioVerse > Energy Metering ICs, along with icons for Print and My Analog. The main content area is titled "Energy Metering ICs" and contains a paragraph describing the ADE energy measurement ICs. Below this, there is a "Product Selection Table" section with a link to "All Energy Metering ICs". At the bottom of the table, there are buttons for "Apply Filters to this Table" and "Reset Table", and a note that says "Hold Shift Key for secondary sorting".

www.analog.com/en/products/analog-to-digital-converters/integrated-special-purpose-converters/energy-metering-ics.html

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RadioVerse > **Energy Metering ICs** Print My Analog

Energy Metering ICs

Analog Devices' ADE energy measurement ICs address the challenges of next-generation smart meter architectures and are ideal for measuring active energy (kWh), apparent energy (kVA), reactive energy (kVAR), rms, and power quality with the highest accuracy in single phase and polyphase revenue meters, industrial instruments, and energy monitoring applications. ADI's ADE energy measurement ICs combine analog-to-digital converters with fixed-function digital signal processors to perform critical measurements, while providing unparalleled functionality and ease of use.

Product Selection Table

[All Energy Metering ICs](#)

Apply Filters to this Table Reset Table Hold Shift Key for secondary sorting

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