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Tracking Failure Curves and Considerations for AMI 2.0

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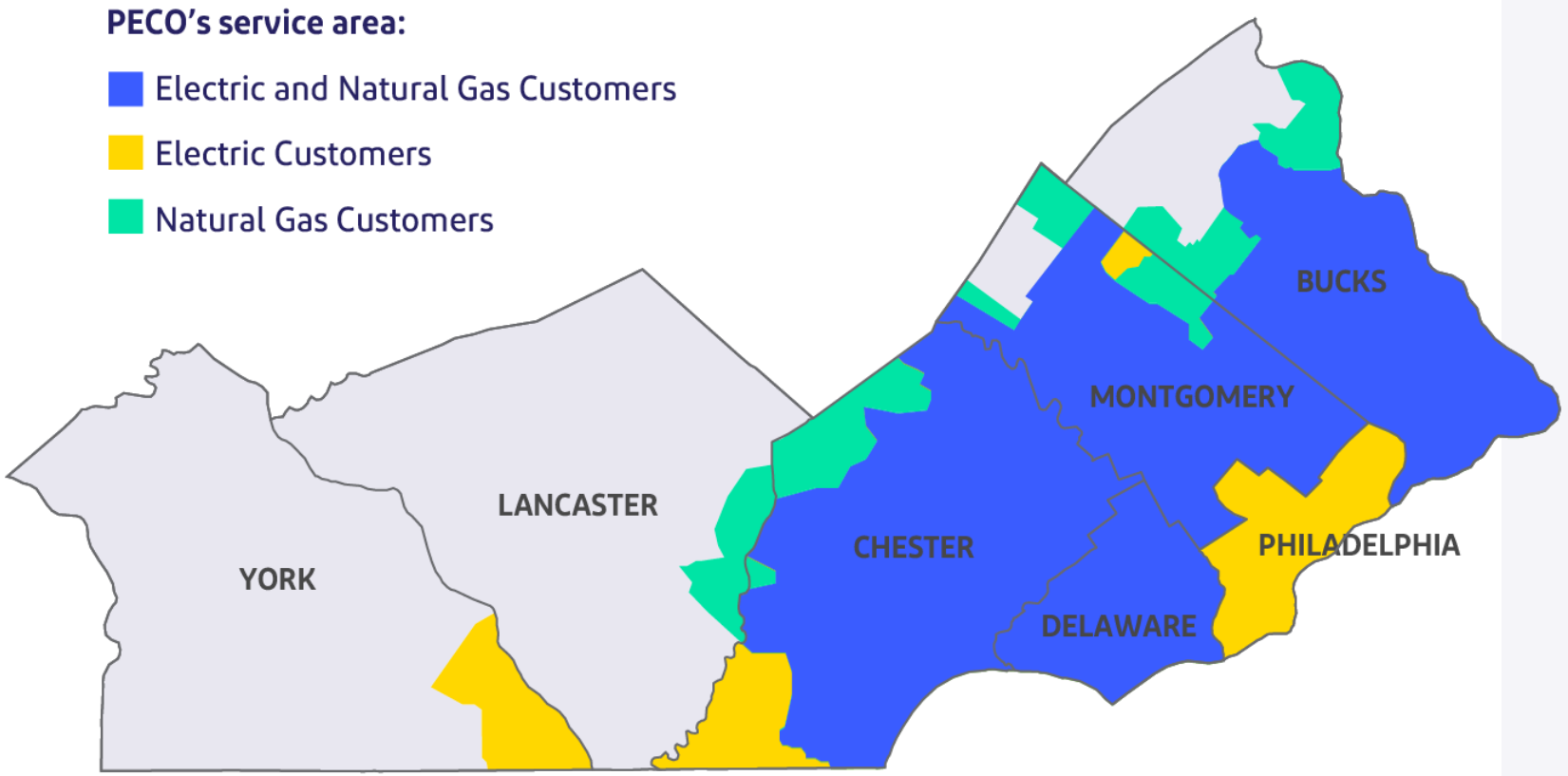
Agenda

- PECO – About Us
- PECO's Automated Metering Journey
- Current Situation/Challenge
  - Device Obsolescence / Meter Failure Bathtub Curve
  - Industry Trends
- PECO's Plan – the strategy and actions
- AMI 2.0?
- Open Discussion

Overview

Headquartered in Philadelphia, PECO is Pennsylvania's largest electric and natural gas energy delivery company, serving 1.7 million electric customers and more than 553,000 natural gas customers in southeastern Pennsylvania. PECO employs approximately 3,000 people and is a subsidiary of Exelon Corporation (NASDAQ: EXC), the largest fully regulated utility company in the nation with more than 10 million customers.

PECO



22,659
distribution miles

1.7 million
electric customers

553,000
natural gas customers

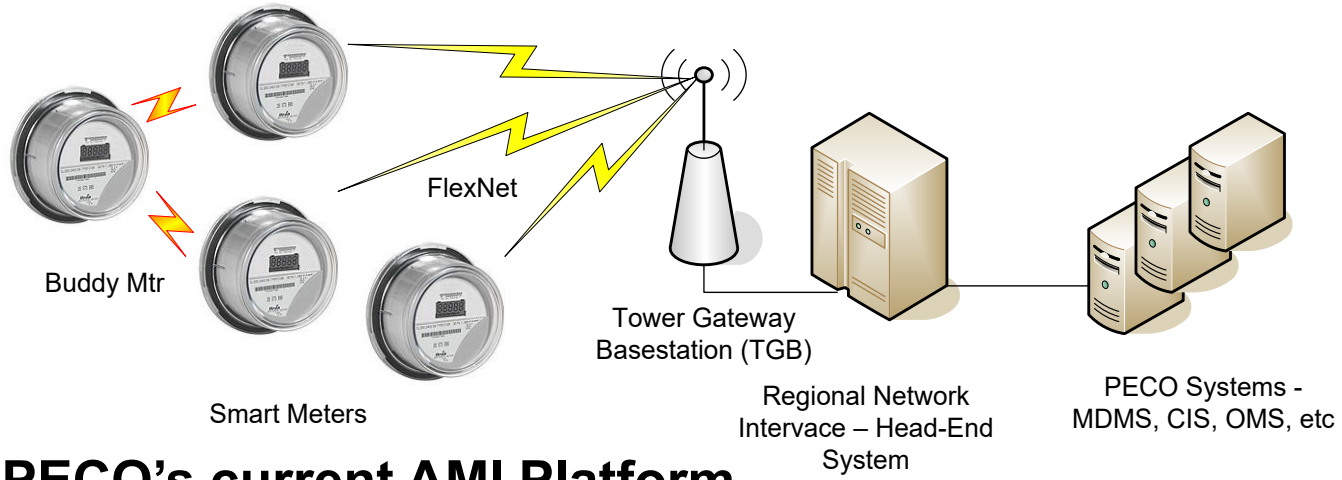
10%
commercial/industrial

90%
residential

PECO's Automated Metering Journey

Timeline

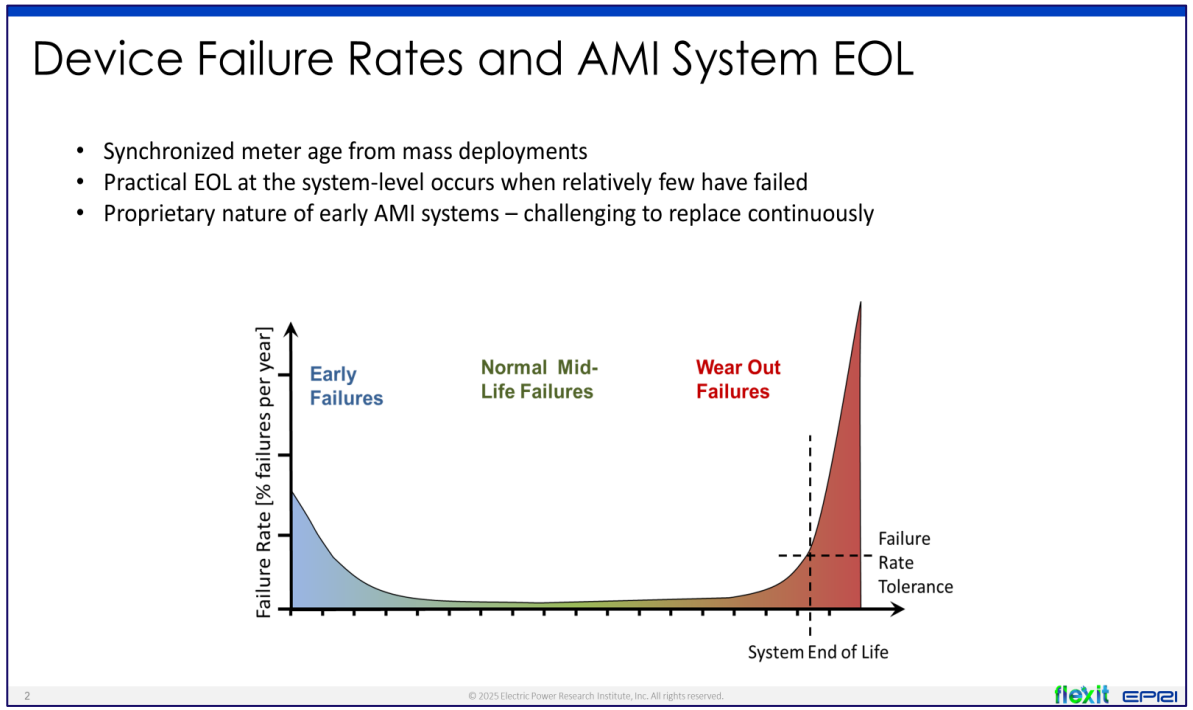
- Pre-2000 – Emetcon PLC
- 2000-2016 – Landis+Gyr/CellNet Fixed Network AMR (*Full Deployment*)
- 2008 – Pa. Act 129
- 2010 – Federal ARRA Stimulus Grant Award
- 2011–Present - Sensus FlexNet AMI, Generation 1 (*Full Deployment*)
- 2022 – Next Generation Meters and V2 Communications Protocols
- 2027 – Obsolescence Plan Starts



PECO's current AMI Platform

- PECO's network consists of a private Radio Frequency (RF) network, which operates using Tower Gateway Base Stations (TGBs), FlexNet SmartPoint modules, and the FlexNet AMI Regional Network Interface (RNI).
  - PECO licenses our radio frequencies from the FCC
- The network consists of nearly 250 TGBs
  - Individual meters interact with 3-7 TGBs on average
- Meters from Aclara, Honeywell, Landis+Gyr and Sensus are used today
- The head-end application is hosted by Sensus

Device Obsolescence and Failure Rates



- **Electric Meters have no Utility serviceable components**
- Meter **"Failure" is seen to be a binary event**, it either works as designed or it is removed from service and retired as *failed*.

Typical Meter Failure Modes

- Higher part-count/complexity – fundamental Mean Time Between Failure (MTBF) from random failures is lower
- Electrolytic (wet) capacitors dry out
- Crystal oscillators age - frequency changes. Radios don't work well.
- MOV Surge Suppressors wear out, stop protecting against overvoltage transients
- LCD displays fade, become unreadable
- Memory semiconductors are write/erase cycle limited

EEI Meter Ops Committee Survey Results

Note this is the Communication Technology

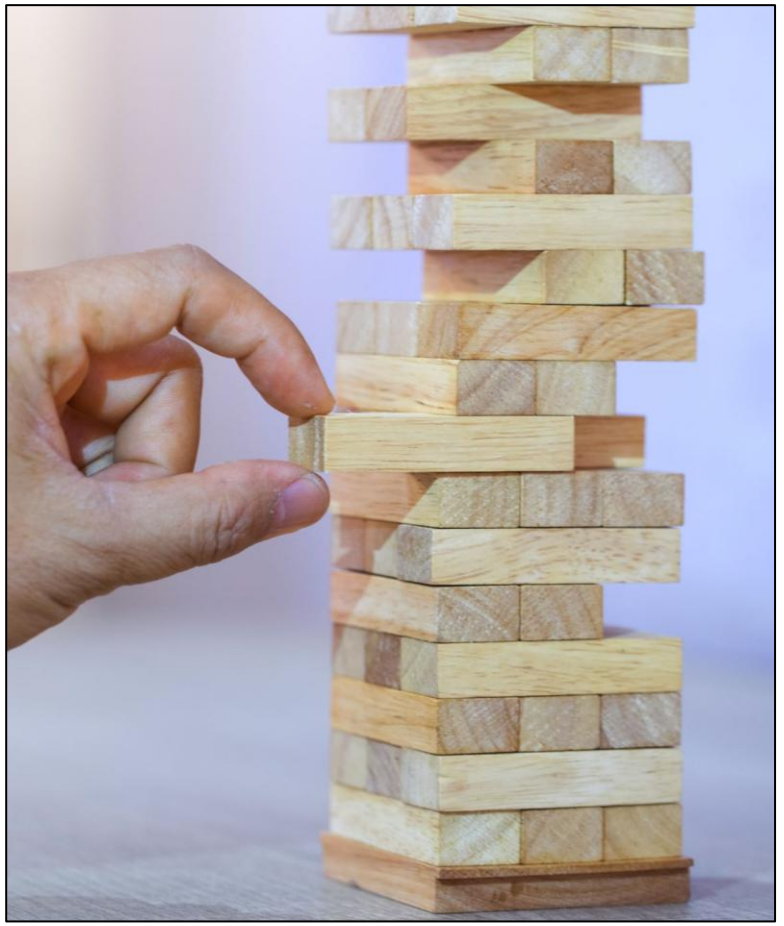
What utility do you represent?	What is a typical lifespan of your AMI meters?	AMI Tech	How many customers/meters does your Metering Engineering Department support?
Alliant Energy	We started a lifecycle program to replace meters 10+ years old.	Sensus	
Minnesota Power	We are starting AMI 2.0 at 15 years of age	Sensus	150,000
Georgia Power	Unknown	Sensus	2.8 million
AEP	10-15 years	L+G/Itron	5.6 Million
Ameren Missouri	20 years	L+G	1.25 million meters
NV Energy	Less than 20 years	Sensus	1.5 million
Xcel	We hoping 20 years	Itron	3.2 million
CenterPoint Energy	15 years	Itron	2.8 mil
PacifiCorp	na. Installed in 2017.	Itron	+2 Million
Oncor		Itron	> 4 million meters
Florida Power & Light	15 years	Itron	6,000,000
Ameren IL	Commercial meter displays start going bad around 5 years.	L+G	1.2M (IL) + 1.2M (MO)
OG&E	10-15 years	Itron	900,000+
Dominion Energy Virginia			2.5 million

Key Take-Aways

- The surveyed Utilities generally see **AMI meter service life as 15 years**, with a range of 10-20 years.
- The **service life is independent** of the meter manufacturer or AMI Communication Technology

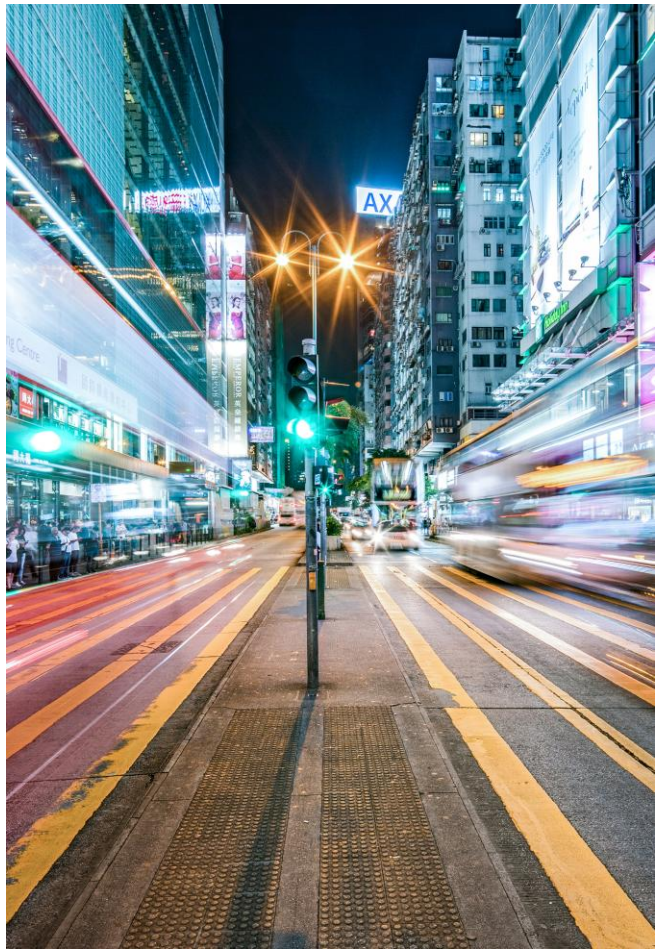
Developing Strategies

- The Industry and each Exelon OpCo has installed AMI systems across their territories
  - Initial deployments started as **early as 2008**
- All Exelon Utilities have acknowledged AMI meter life is finite and not **expected to exceed 20 years**
  - Meter Vendors have confirmed this expectation
- PECO Finance has affirmed the 15-year book life of the AMI meters
- All Exelon Opcos are developing plans that include **5% ongoing annual meter replacement**
  - Initial program deployment rates may be higher to account for the original “big bang” meter deployments, up to 10%



PECO's Obsolescence Plan

- 15-Year Replacement Plan with Continuous Meter Refresh
  - Assumes replacement of current generation PECO Electric meter population over 15-year period 2027-2041
  - Plan will continue on to address future meter generations
- Deployment Rates
  - 10% Yearly Deployment in 2027-2031 to address oldest meters
  - 5% Continuous Deployment starting in 2032
- The 10% and 5% deployment rate was selected to ensure that the current field operations and meter shop will not be overwhelmed with failing meters
  - The PECO meter is currently sized to manage 25,000 meters per year.



PECO's Obsolescence Plan

- The Plan is designed to leverage the **newest, most capable meters** throughout the deployment
  - The meters purchased in year 1, will likely not be the same as the meters purchased in year 5 or year 10
  - Initially, meters from **Sensus and Aclara** will be deployed
- If Customer or Utility needs dictate a change in AMI Communications or AMI Vendor platform, flexibility has been designed into the plan to account for shifting needs and/or strategies

Program Staffing (*final plan is under development*)

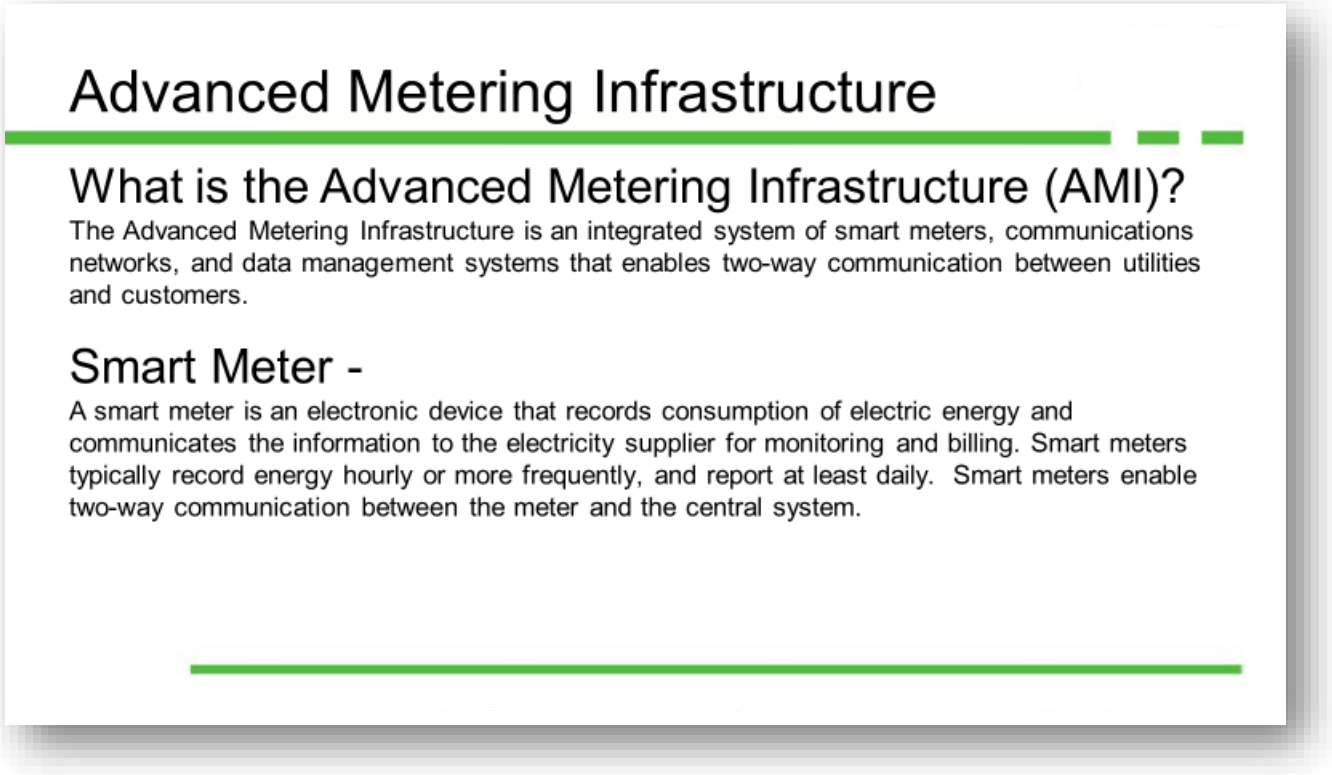
- Back Office team of 10 FTEs: 1 Manager, 2 E03s, 7 E02s
  - Supervisors, Analysts, Customer Care, Billers, Schedulers, Supply Chain Specialists, Etc.
- Field team of 15 meter technicians
- Contract Installers to fill in the remaining installer needs

AMI 2.0

AMI 2.0 is a system upgrade that results in increased network reliability and more reliable exchanges of data

The functions build upon AMI 1.0, which set the foundation for the future

"Many of the end user/customer advantages promised by AMI 1.0 did not materialize."



More Data & New Functions

- Increased Sample Rates
  - 60-, 15-, 5- & 1-minute samples are possible
- Multiple Recording Channels
  - Some vendors are claiming up to 32 independent channels are available
- Distributed Intelligence and Decision Making local to the meter

Question – *Has the Network and Head-End kept pace with the new meter capabilities?*

New Functions

- On-Board Decision Making
  - EV Management
  - Voltage Regulation
- Analytics
  - Non-intrusive load monitoring & Load Disaggregation
- New Communications Methods for FAN and HAN
  - PLTE Based Communications
  - WiFi Enabled Meters
  - Matter Protocol for in home device integration

Next Generation Meters at PECO

- What is a ***Next Generation Meter***?
  - Functionality – More recording channels, Grid Edge Intelligence
  - V2 Protocol – Increased bandwidth, better RF management
- Why Now? What Changed?
  - Covid parts shortages
  - New meter designs
- Meter Exchanges
  - Focus on Capitalizing work, reducing Expense spending
  - Early NextGen Meter Deployments
    - >75,000 NextGen meters deployed today

New Meter Functionality

- While the Plan is not designed to introduce new meter functionality, the meters will be able to foundationally support new features* and programs such as:
  - Distributed Intelligence and Grid Edge Functionality
  - Enhanced Power Quality and Voltage Monitoring
  - Loss of Neutral Detection
  - Enhanced Hot Socket Detection and Safety Measures including Auto-Shut Off Functionality

** New functionality requires additional IT integration and business process changes*

- PECO is separately in the process of introducing Over The Air (OTA) meter programming which is expected to reduce meter configuration issues and speed customer addition of DER products (meter exchanges and site visits will not longer be required)
  - This functionality is expected to be available to coincide with the Obsolescence Program initiation in 2027

Summary and Open Discussion

- PECO is changing its meter deployment strategy from an orchestrated “big bang” deployment to a continuous replacement program.
  - As meters near their 20-year service life, they will be replaced.

- PECO is has committed to delivering the most capable meters to our business and our customers to support their evolving needs.

Course Feedback

Please Take a Few Minutes To Provide Feeback About The Course & Instructor

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Thank you

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