Connecting an all-electric world

Ralf Christian,
CEO Energy Management Division, Siemens

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Decarbonization

Increasing electrification is a key lever for decarbonization

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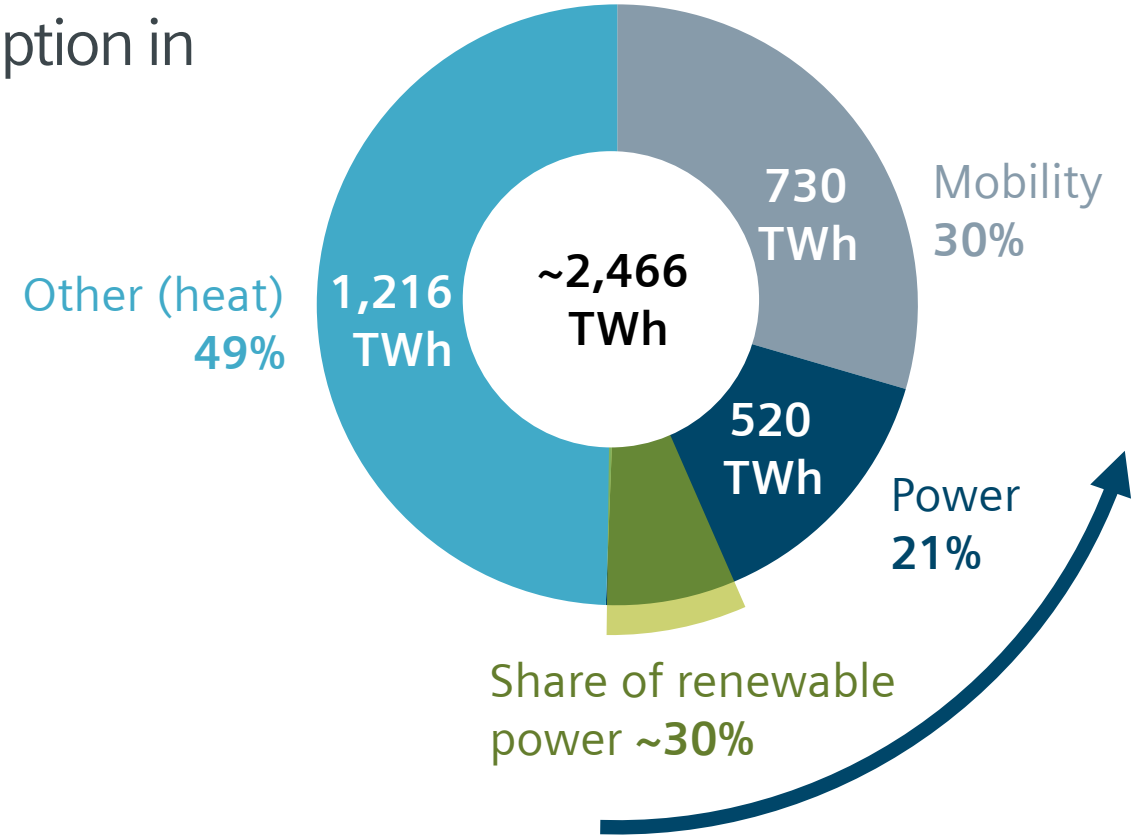
Final energy consumption in Germany 2015



Huge potential for further electrification

E-Mobility, E-Highways

Electrical heating/cooling, heat pumps etc.

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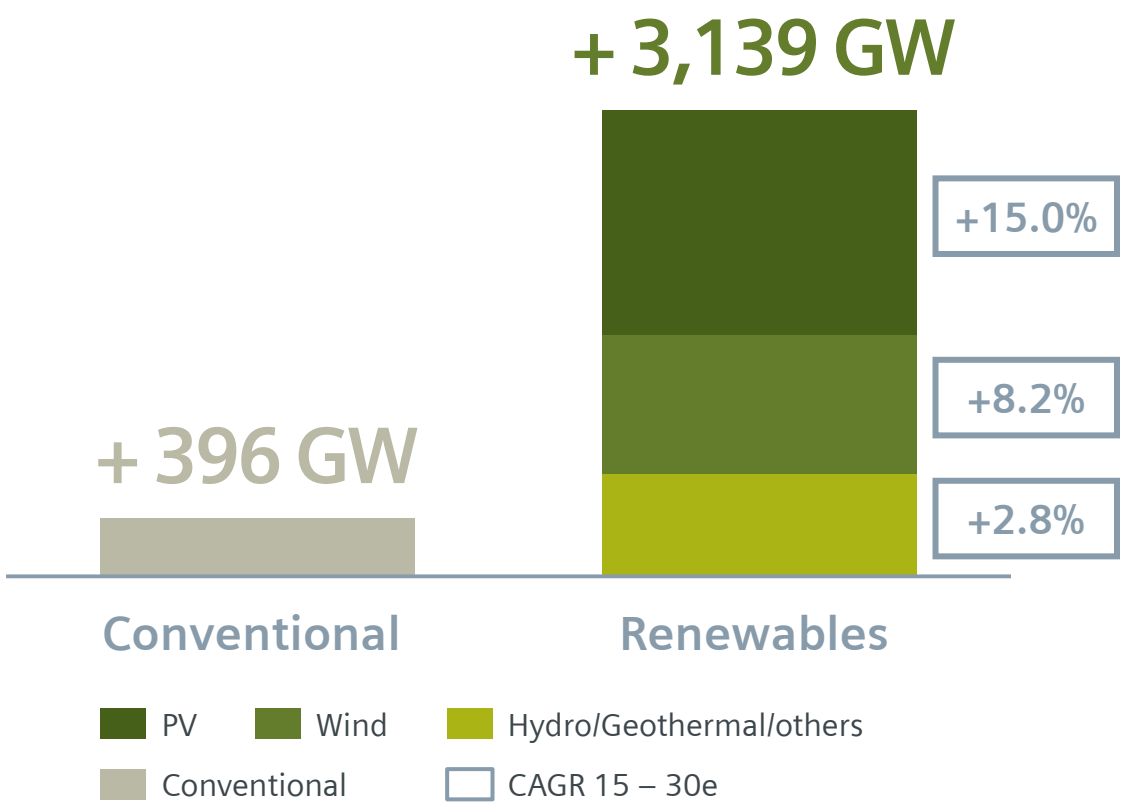
Decarbonization Decentralization

Global power generation capacity additions 2015 – 2030



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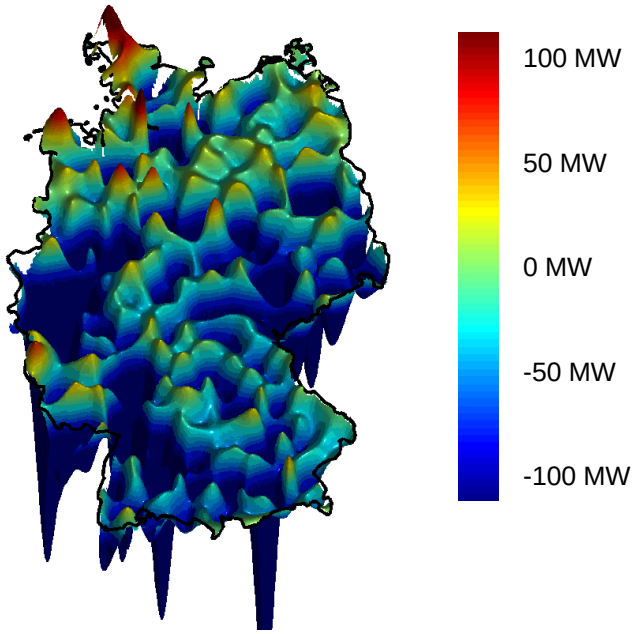
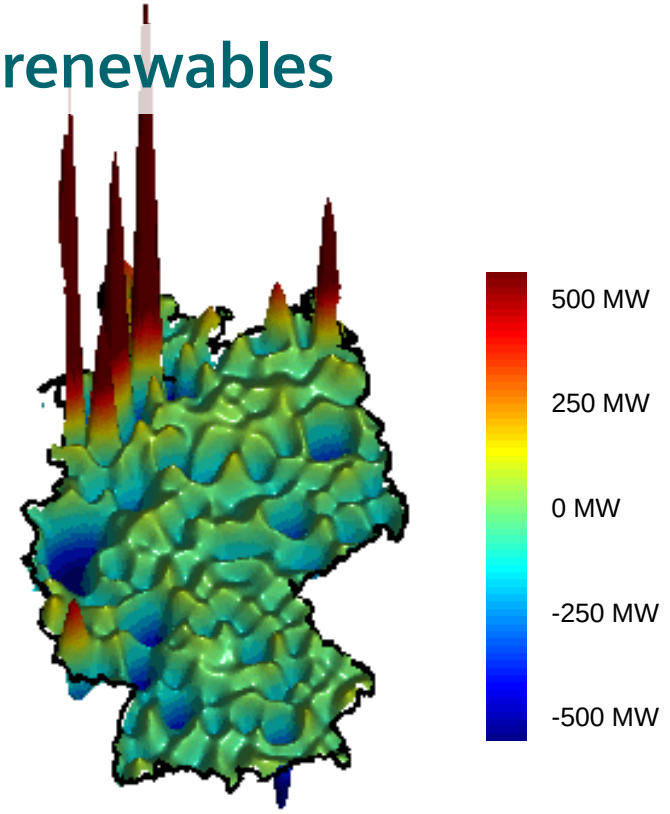
40% share of renewables

Most likely scenario for 2024



80% share of renewables

Most likely scenario for 2035+



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Decarbonization Decentralization Digitalization

Providing digital applications for an all-electric world

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Grid applications

- Digital twin and grid simulation
- Grid Control
- Substation device management
- Outage management
- Advanced device management
- Power quality analysis
- Asset performance management

Grid edge and vertical applications

- Distributed energy resource management
- Meter data management/Meter-to-Cash
- Meter data analytics
- Revenue protection
- Market transaction management
- Virtual power plant/demand response
- Connected e-mobility
- Energy efficiency
- Critical power management
- Distributed energy resources performance monitoring

EnergyIP powered by MindSphere

Providing digital applications for an all-electric world

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Grid applications

- **Digital twin and grid simulation**
- **Grid Control**
- Substation device management
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Grid edge and vertical applications

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EnergyIP powered by MindSphere

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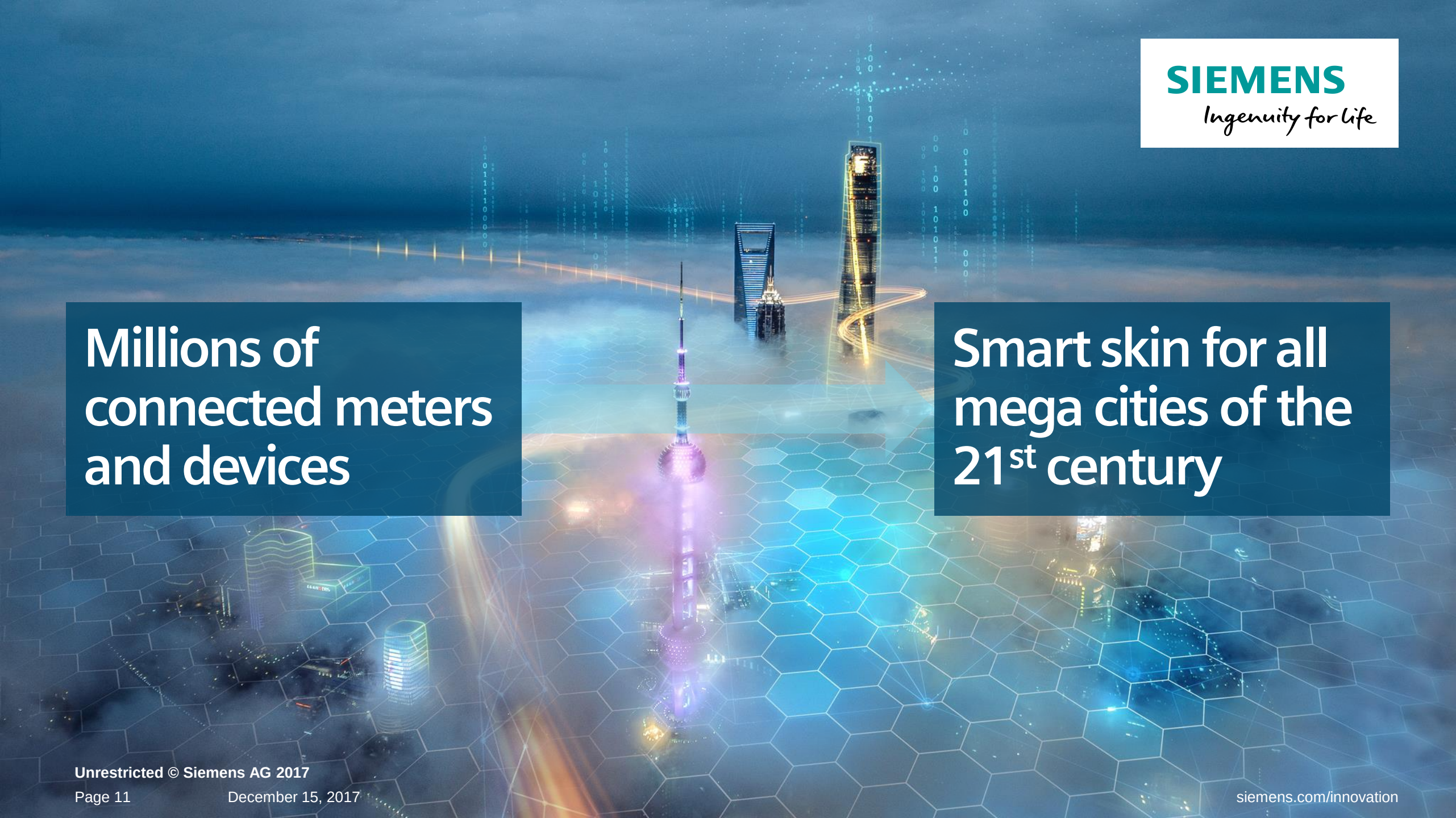
~75 million
contracted meters

~20 million
connected meters

~3.5 million
connectable automation devices



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secure

efficient

intelligent

FINGRID

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Supporting investment planning for the future grid

Jussi Jyrinsalo, Senior Vice President, Grid Services and Planning, Fingrid

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Securing reliable electricity for the Finnish society

14,600
kilometers of power lines

116
high voltage substations

935 MW
of reserve power plants

FINGRID

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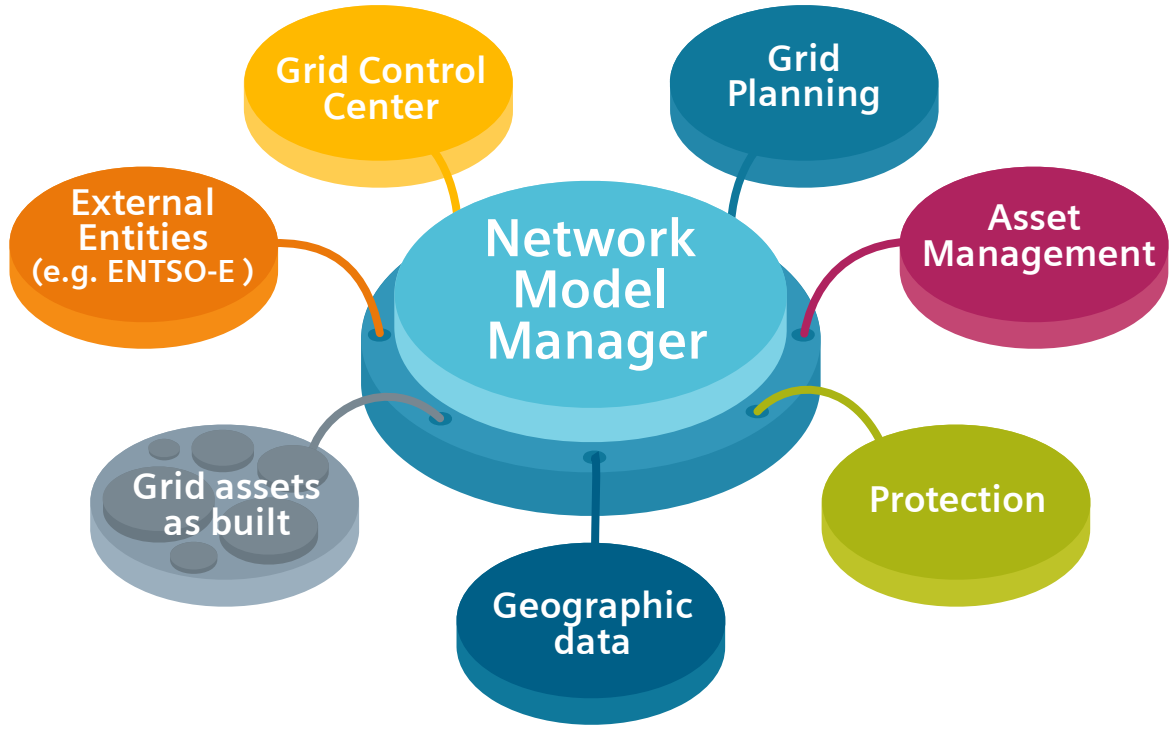
Single digital grid model

Enables systematic and consistent exchange of grid topology and asset data for improved grid planning, operations, and maintenance



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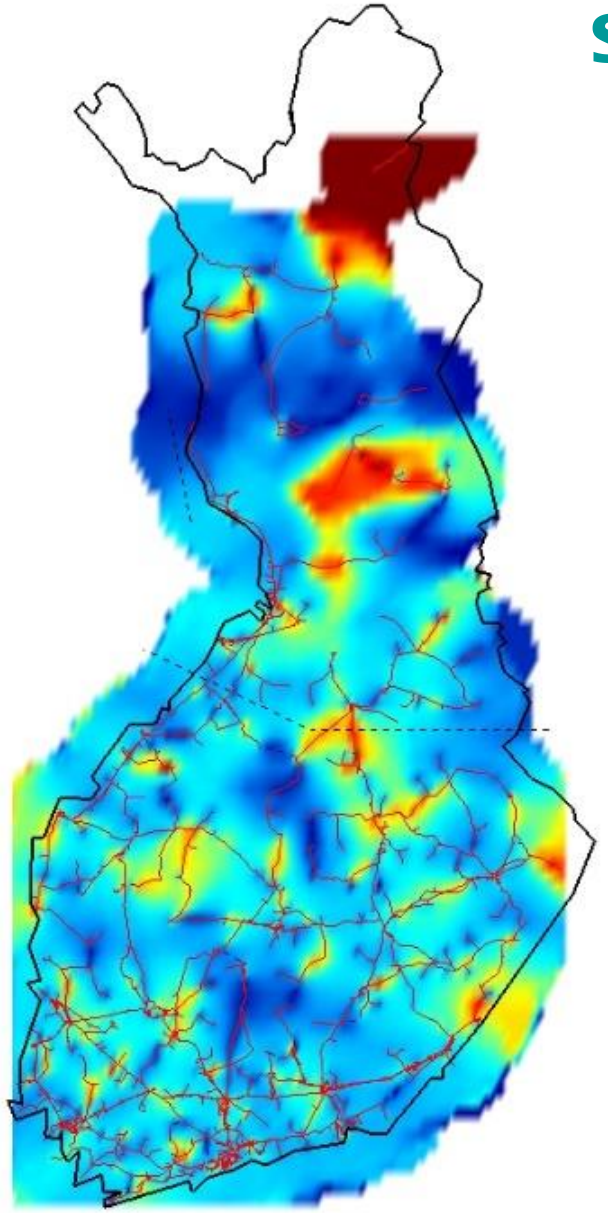
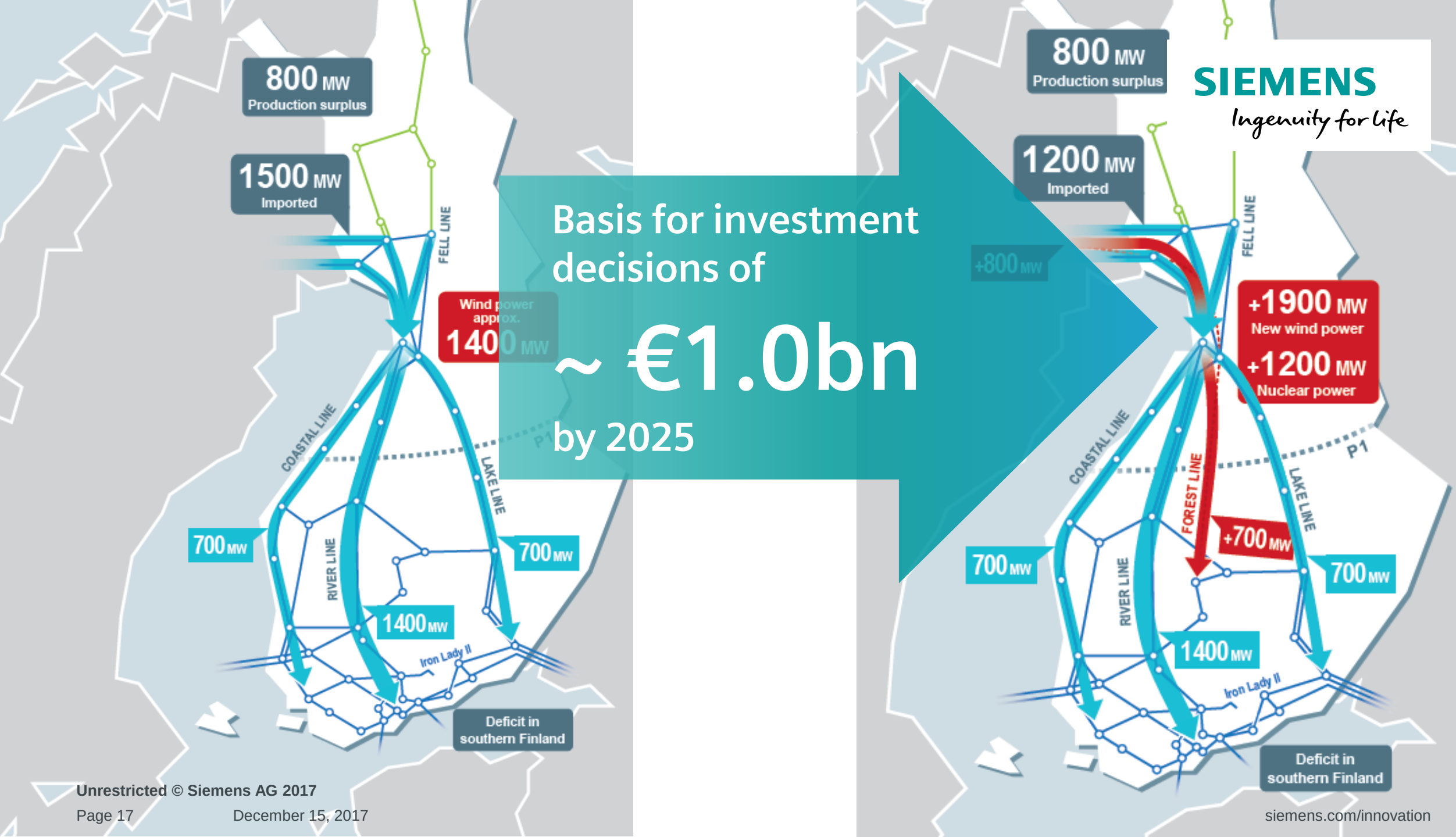
The digital twin

helps in analyzing and planning a complex electrical power system





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Reduced effort

80% data collection & verification / 20% advanced analysis turns into 20/80 %

Improved investment planning

with “single source of truth”, 25 years in the future

Integration of conventional and renewable power

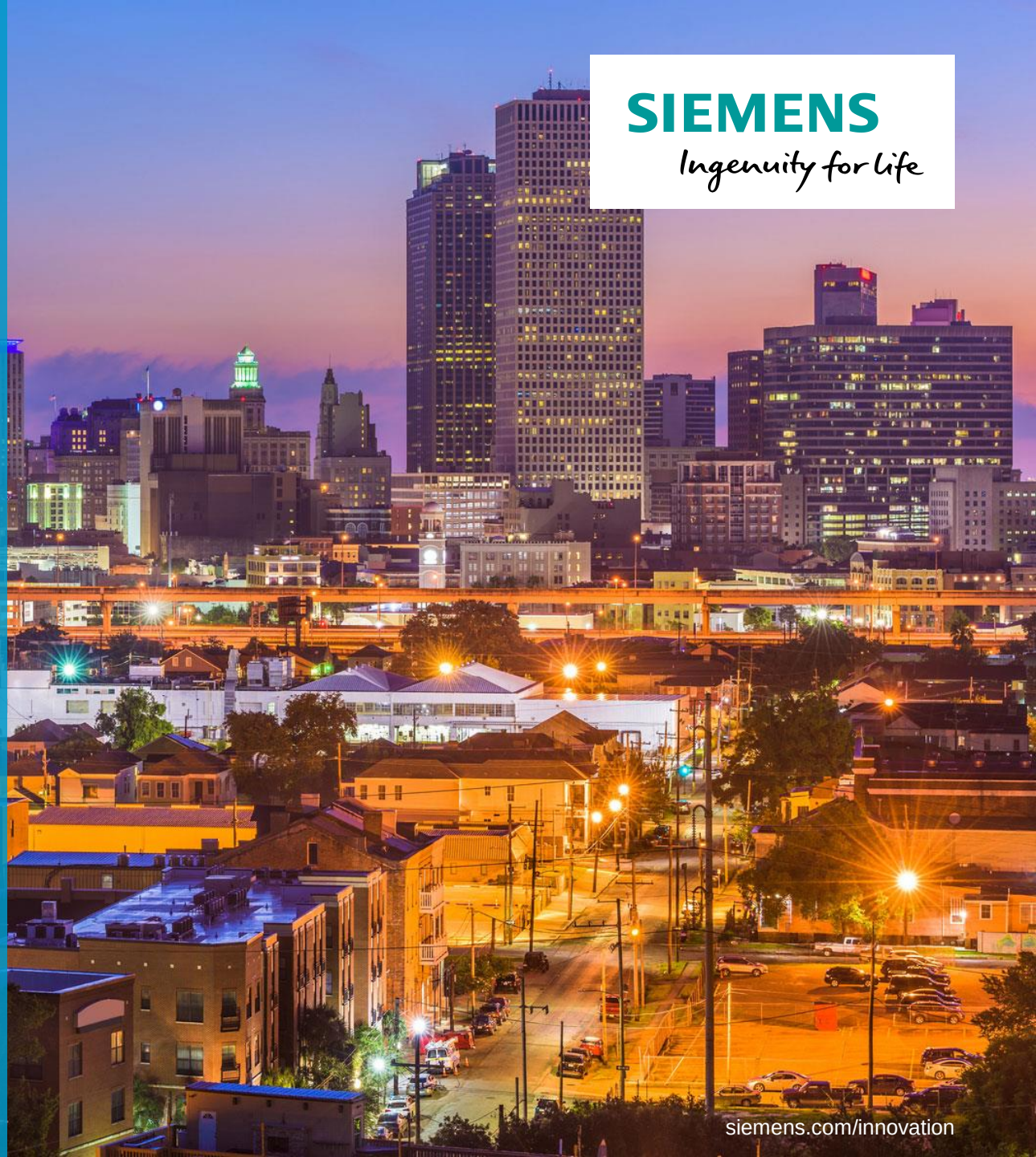
minimizing CAPEX and OPEX

Improved grid reliability

>99,9996% through cross-functional workflows & data management

Being at the forefront of customer service

Bill Abler, Vice President for Innovation and Commercial Ops, Entergy



Entergy

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Headquarter
in New Orleans

2.9 million
utility customers in Arkansas, Louisiana, Mississippi and Texas

~30,000
megawatts of electric generated capacity

~2.9 million

meters to be deployed by 2021

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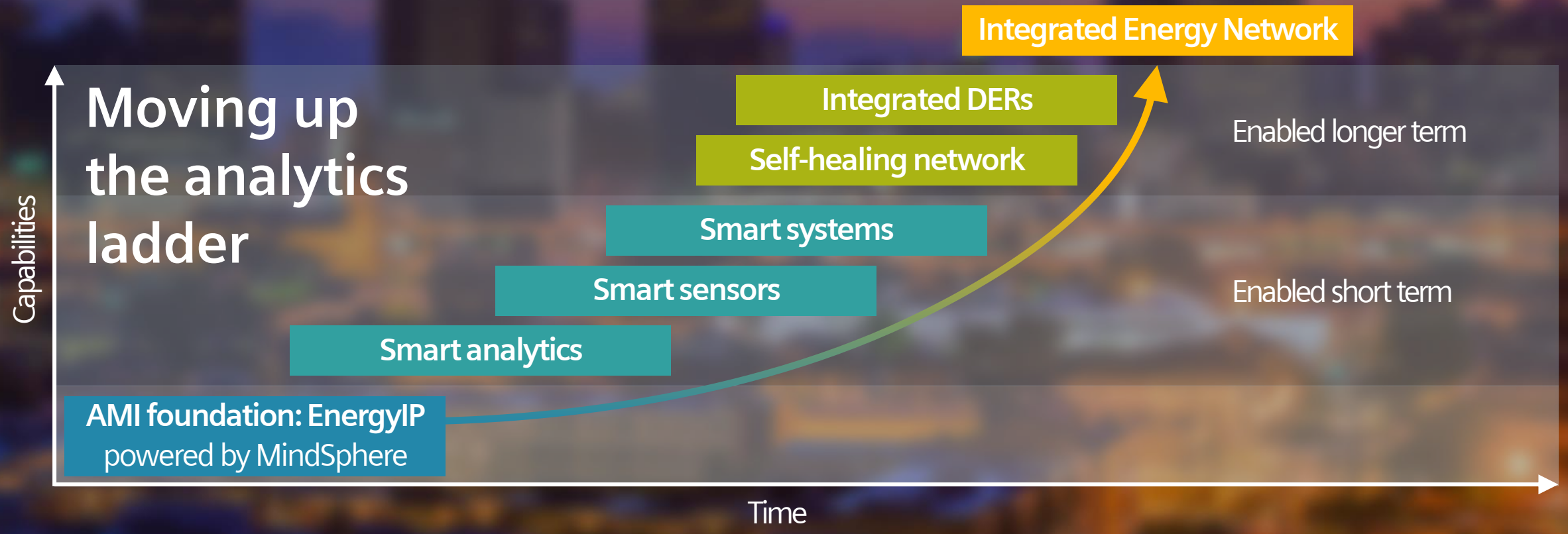
Utility digitalization

Optimization

Enabling integrated energy network

Foundation

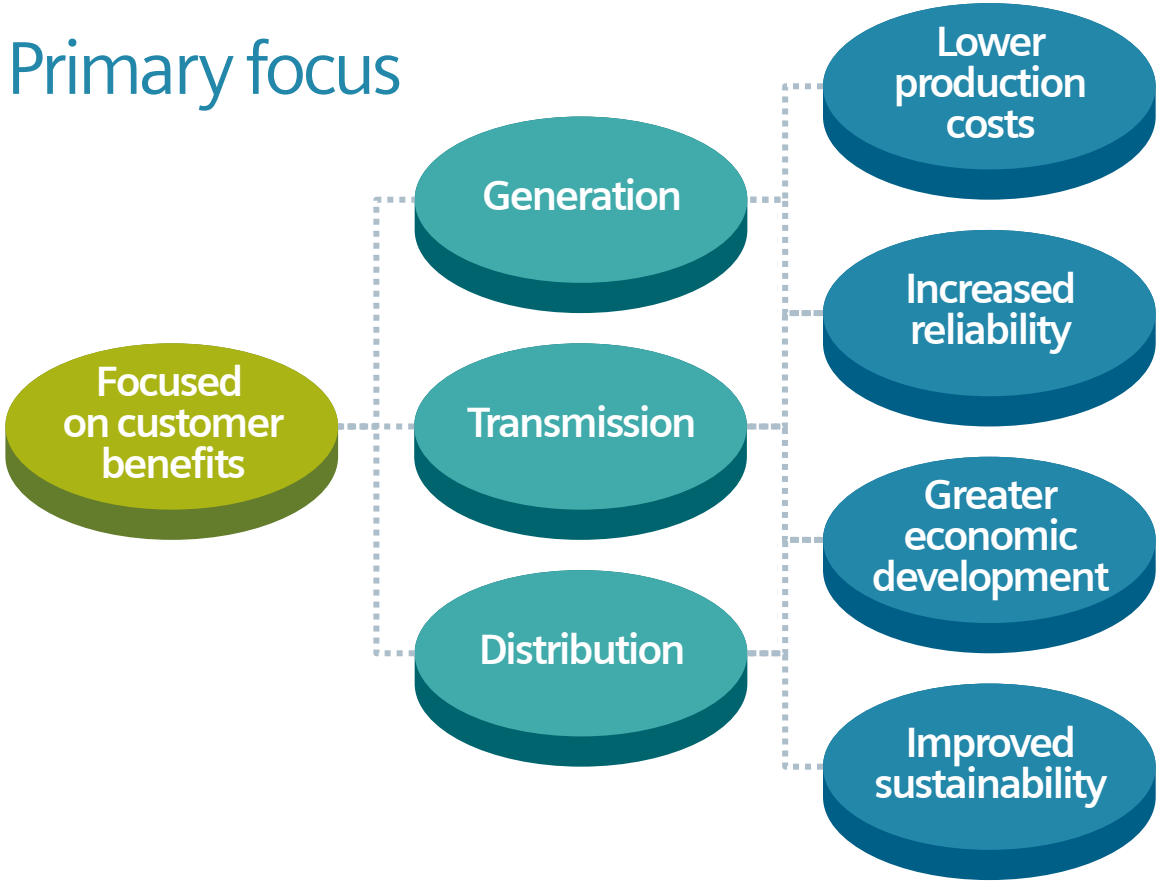
Advanced Metering Infrastructure (AMI)



Utility today

Electric system

Primary focus



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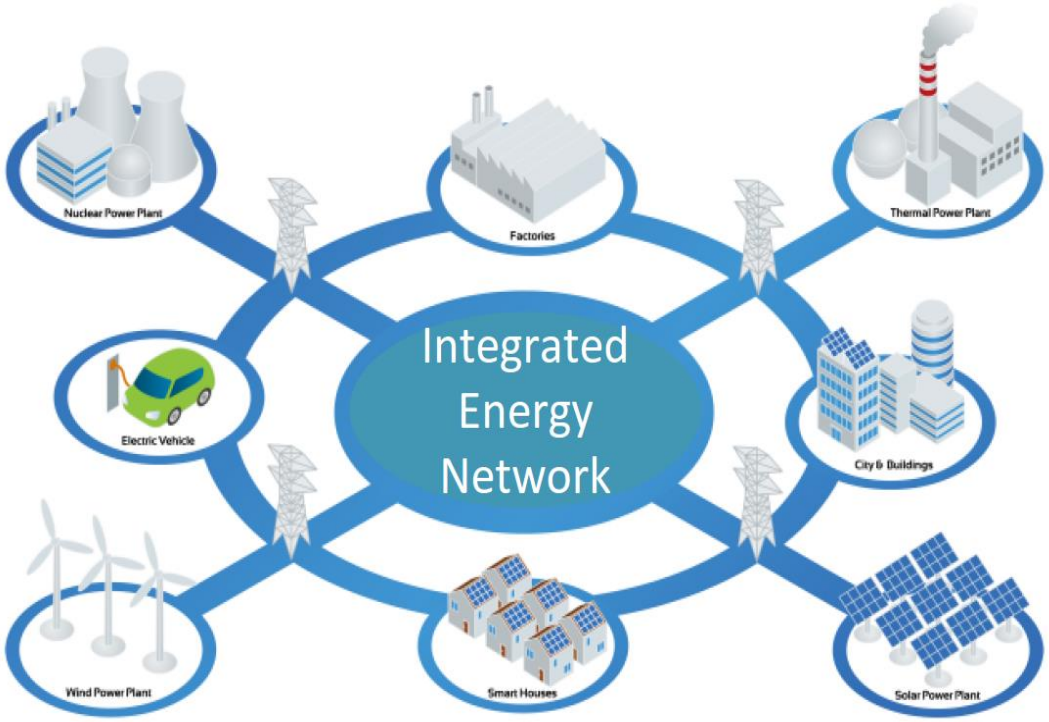
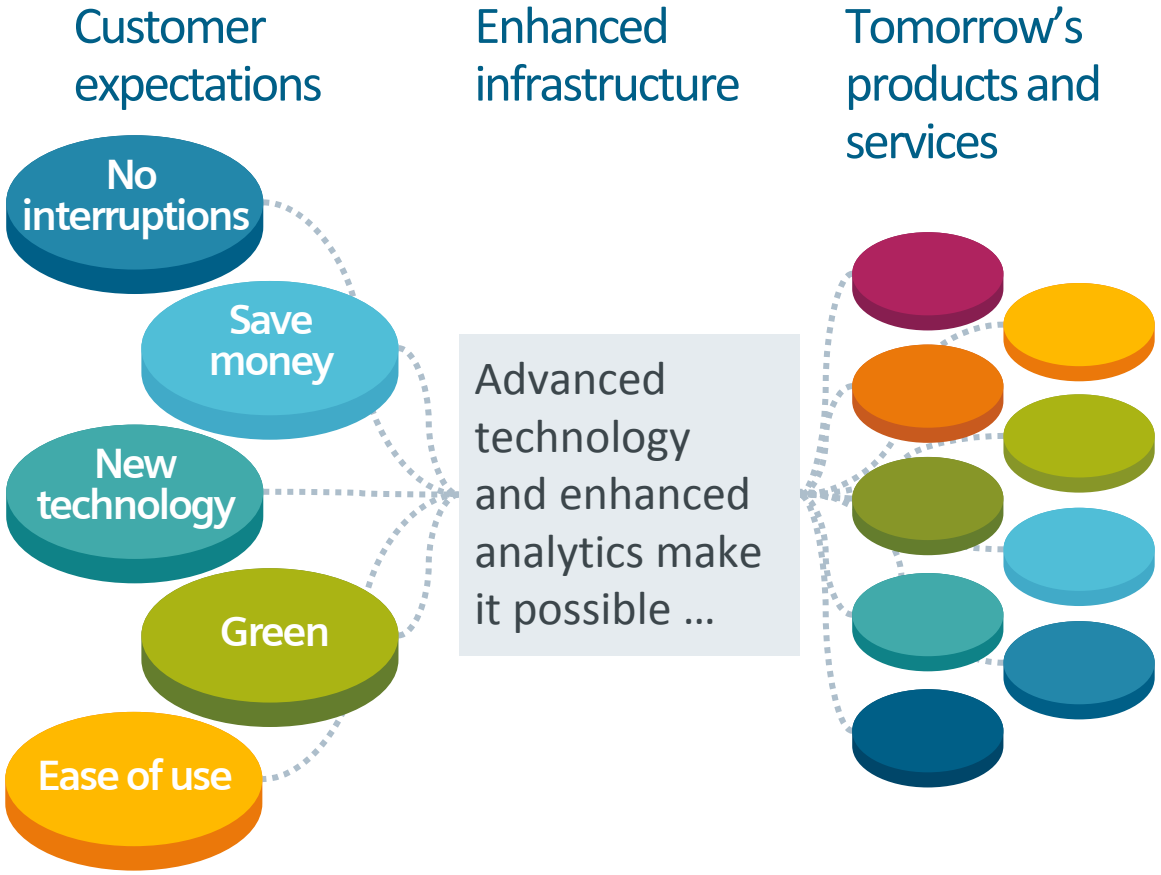
Utility tomorrow

Integrated Energy Network





NRGi

Making more out of meter data

Poul Berthelsen, Project Manager, NRGi Net

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~5,000
commercial and industry users

220,000
private users

~40%
of power consumption from renewables

6,000
renewables sources integrated

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100%

smart meter coverage
(~225,000)

100%

based on
Siemens EnergyIP

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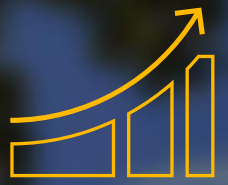
First Phase: Implementation of Smart Meters with EnergyIP billing functionality (Meter-to-Cash)

Increased billing transparency, accuracy and flexibility

Prepared for billing on 15 min price rate



Increased efficiency through automated reading of meters

Benchmark in Denmark e.g. referring outage times

~12 min/year

⌀ Europe: 18min/year

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Second Phase: Making more out of meter data with out of the box analytic applications

EnergyIP analytics = Artificial intelligence + Big data processing

>1.3bn data sets/month

Full transparency of low voltage grid

Precise planning of investments

Reduced grid losses

Increased power quality

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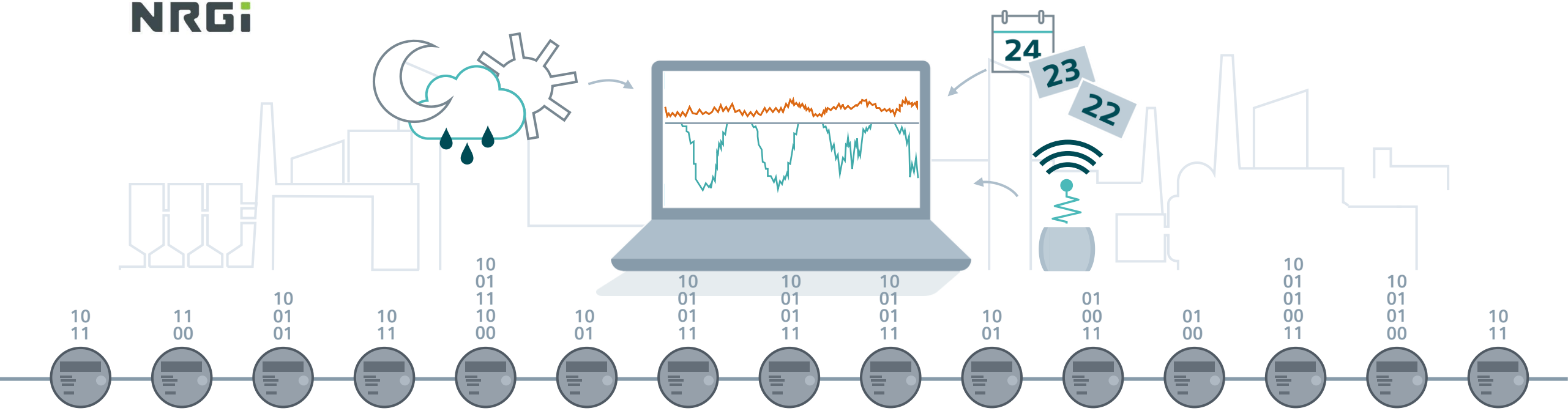


Meter Data + Weather + Calendar + Time = Load forecast

Building a future-ready grid with digitalization

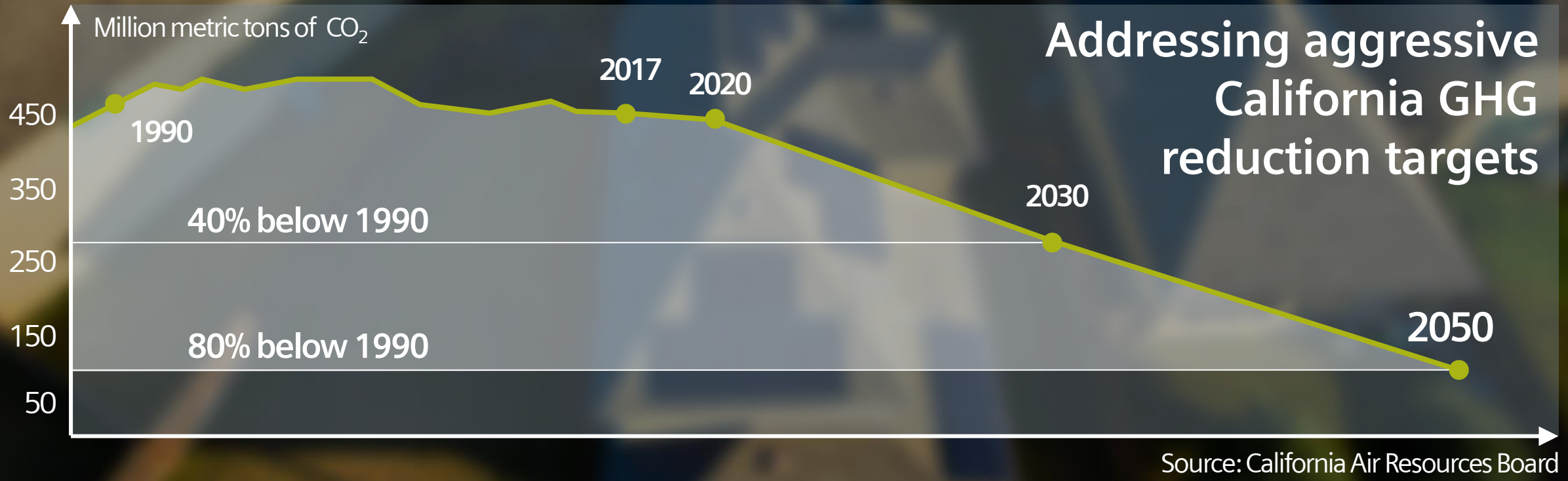
Doug Kim, Director, Technology Strategy, Edison International

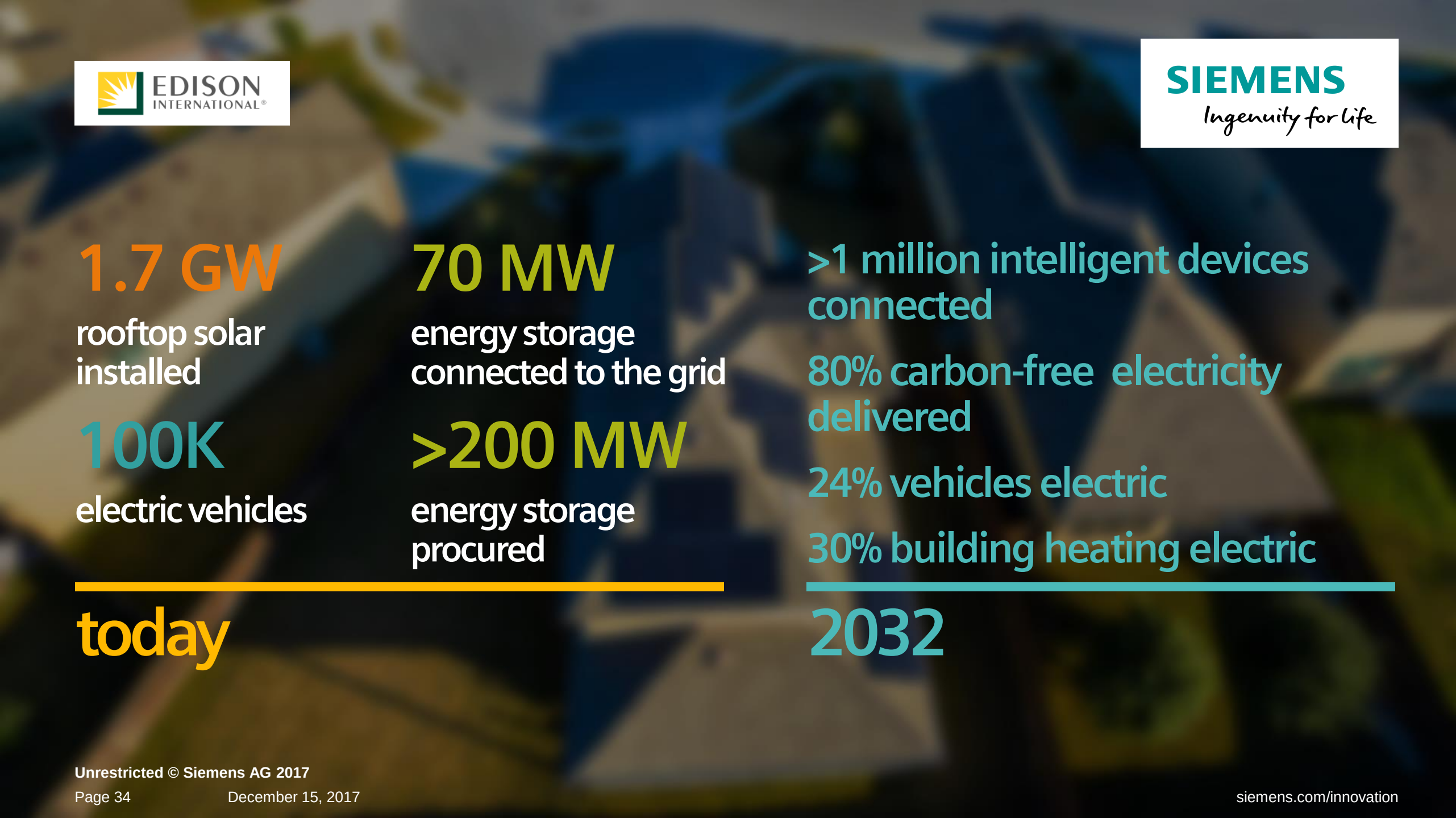
Headquarter in Rosemead, California

5.1 million
utility customers

106,000
miles of distribution lines

$51.3 bn
grid assets across 50,000 mi^2 of service territory





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Grid-wide interconnectivity establishes enhanced reliability and efficiency

More effective management of DERs

Enabling customers to become “prosumers”

Improved system reliability