Electricity in New York:

Future-proofing for building owners and facilities managers

BOMANY Lunch and Learn / May 16, 2019

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Contents

1. **Electricity Prices Today:** How did we get here?
2. **Disrupting the Electricity Industry:** What to expect
3. **Future-Proofing Your Facility:** Actions for building owners

Part I.

Electricity Prices Today: How did we get here?

How did we get here?

Events impacting the U.S. power mix over time

The “central generating plant” concept is 140 years old.

Parts of the transmission system are also over 100 years old.

1882
Pearl Street Station first commercial generating plant

Mid 1900s
Post-war per capita energy consumption begins rising >10% per year

1950s–70s
Investment in nuclear

2008
Peak coal production & natural gas boom

2018
Natural gas replaces coal as largest fuel for electrical generation

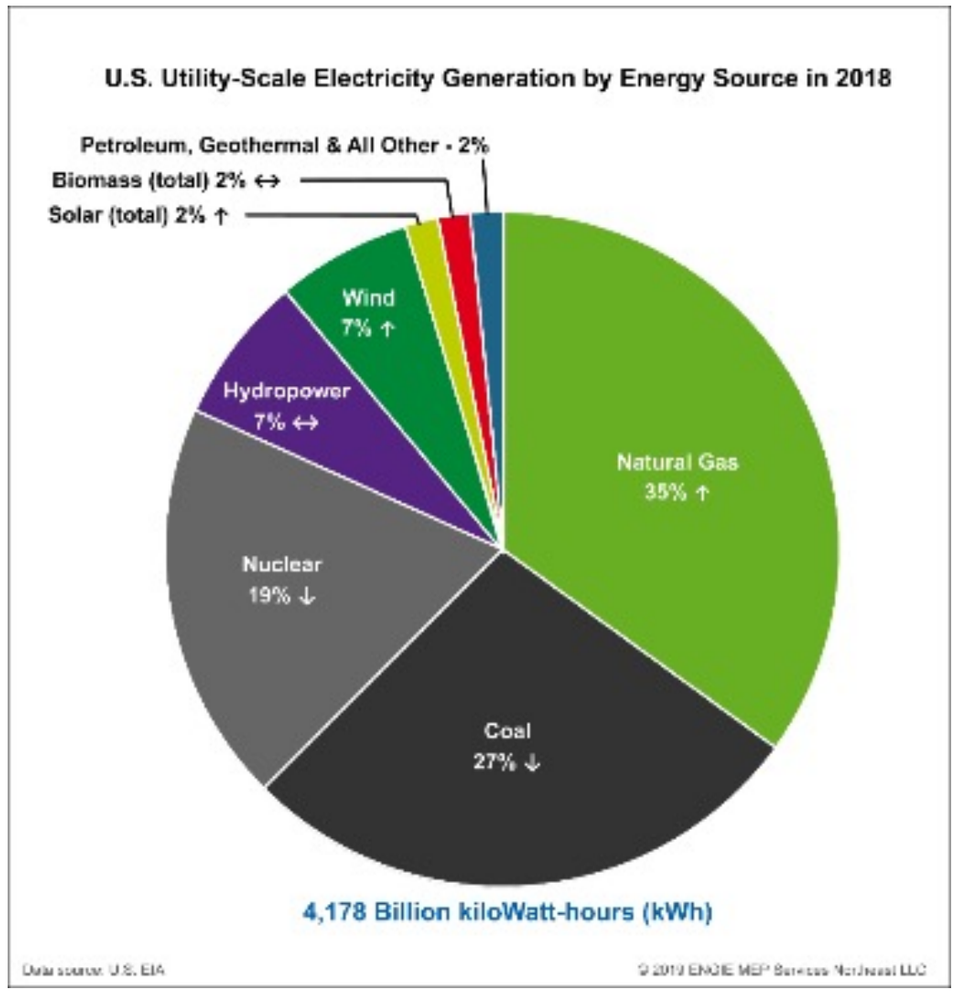
Today's Electric Grid – Bulk Power System

An aging and exposed electrical system

Future Resource Uncertainty

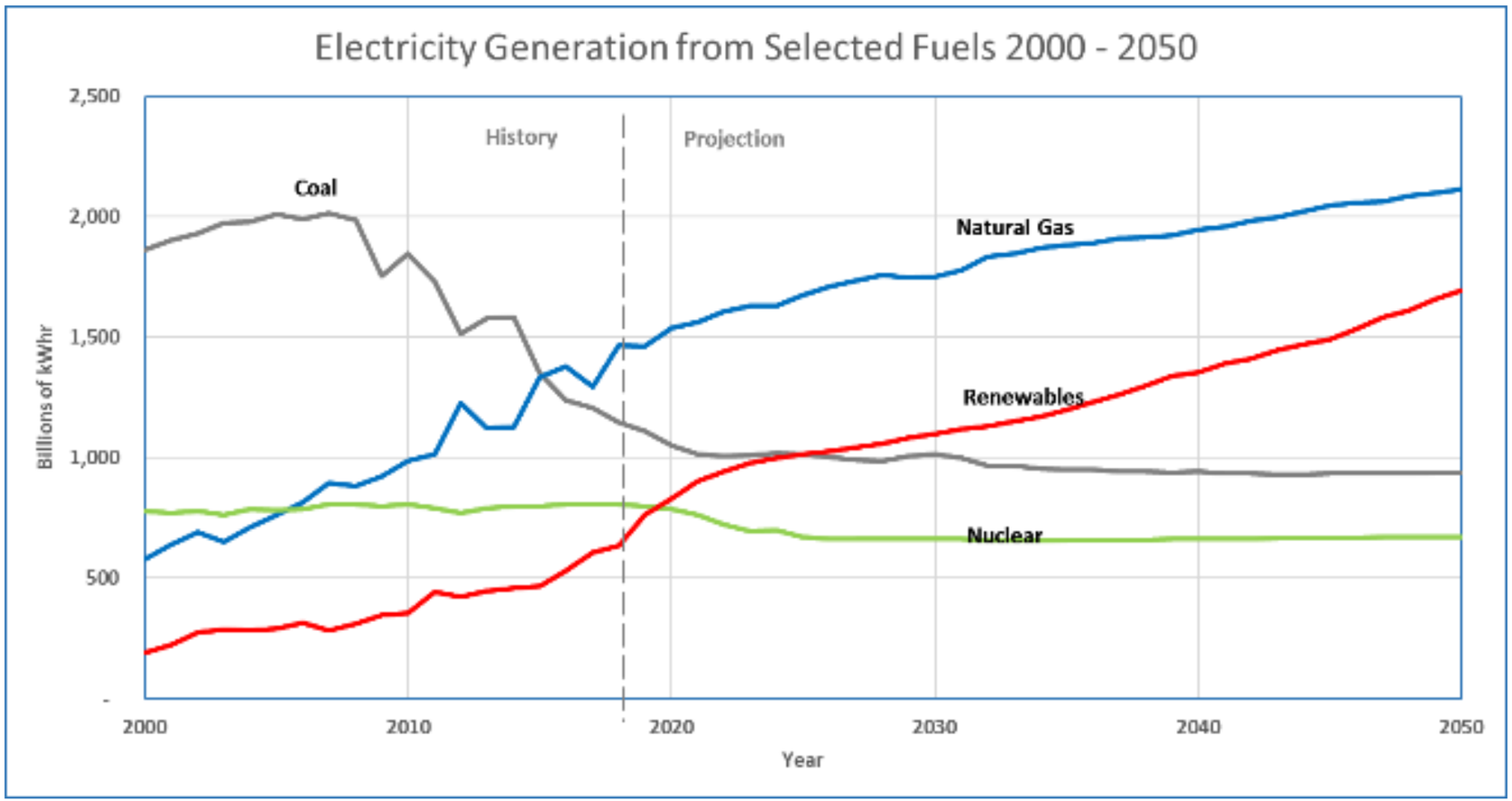
The changing energy landscape

- 46% of today's fuel options rapidly disappearing
- Replaced by what?



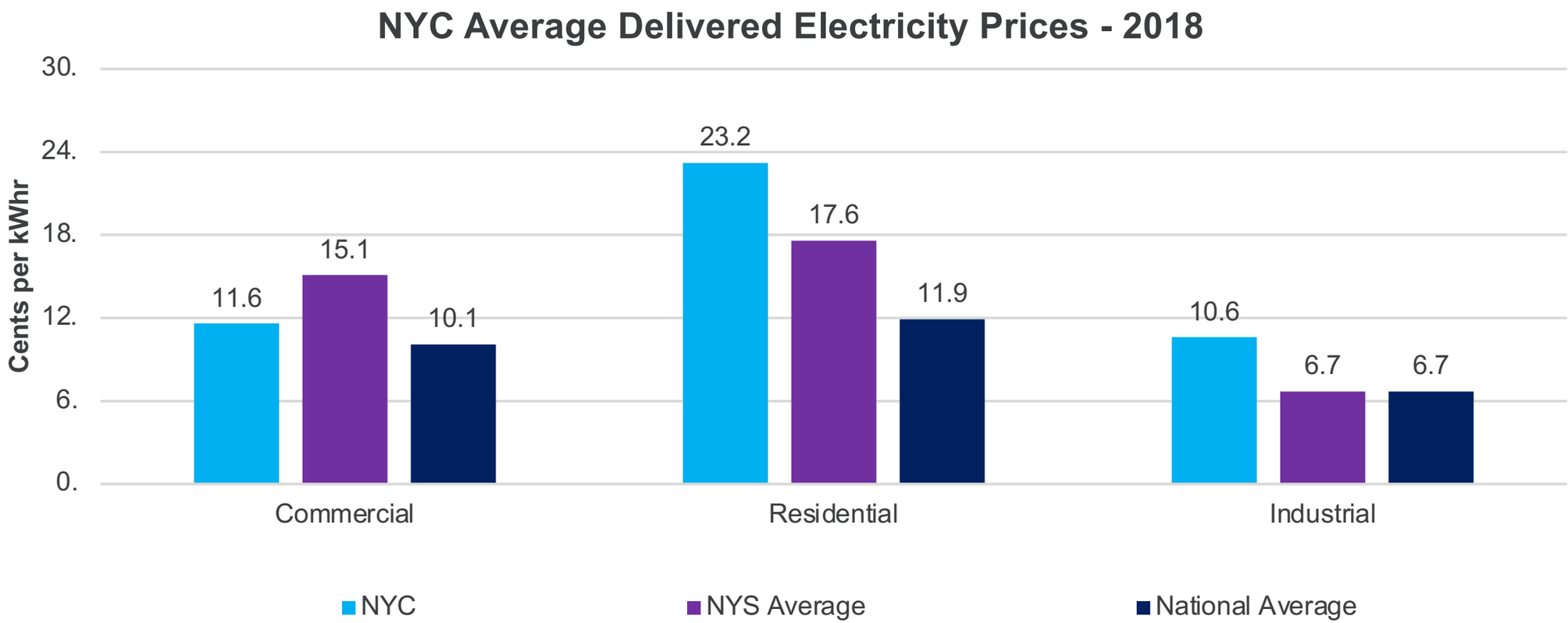
Electricity Generation Fuel Mix

Natural gas and renewables replace coal and nuclear



Today's Electricity Prices

Compared to residential rates, NYC commercial rates are fairly good…for now



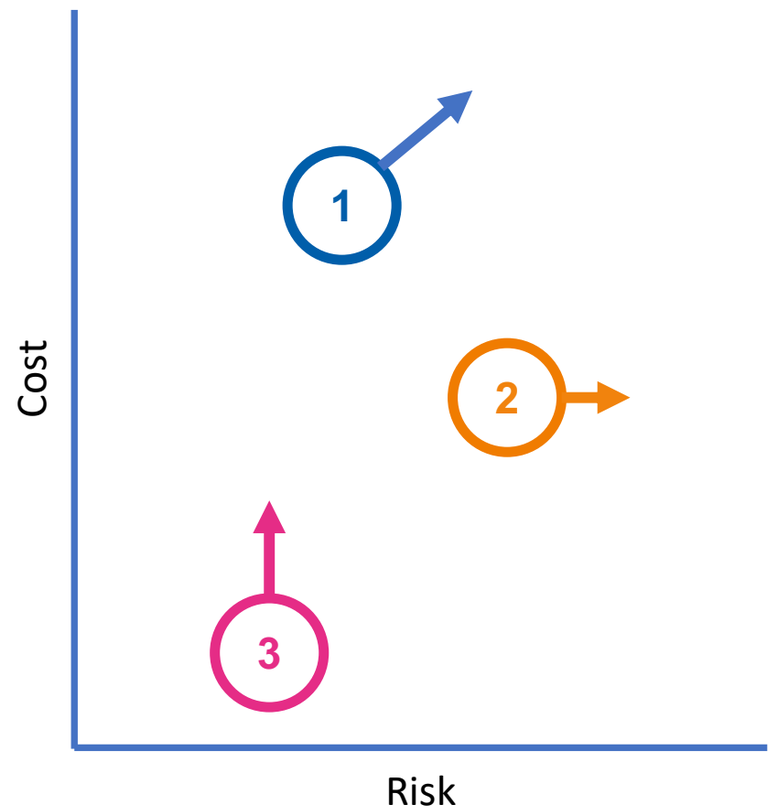
Part II.

Getting to 100%
What to expect

Increasing Risks to NYC Electricity Supply

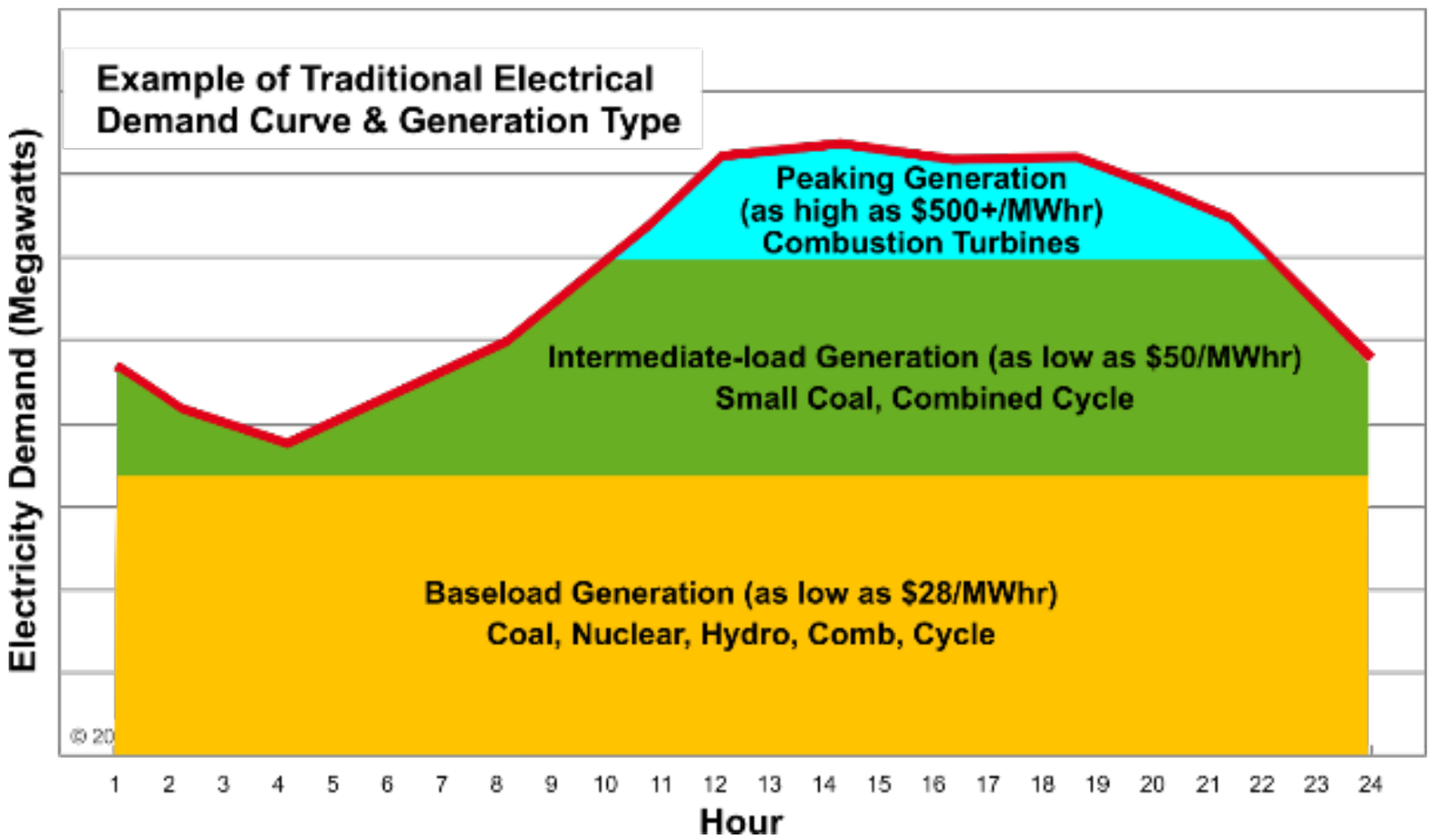
Challenges created by shift in energy sources

1. The Changing Grid
2. Quality, Reliability & Resiliency
3. Decarbonization Goals



The Changing Shape of Demand

Understanding renewables vs. peak demand

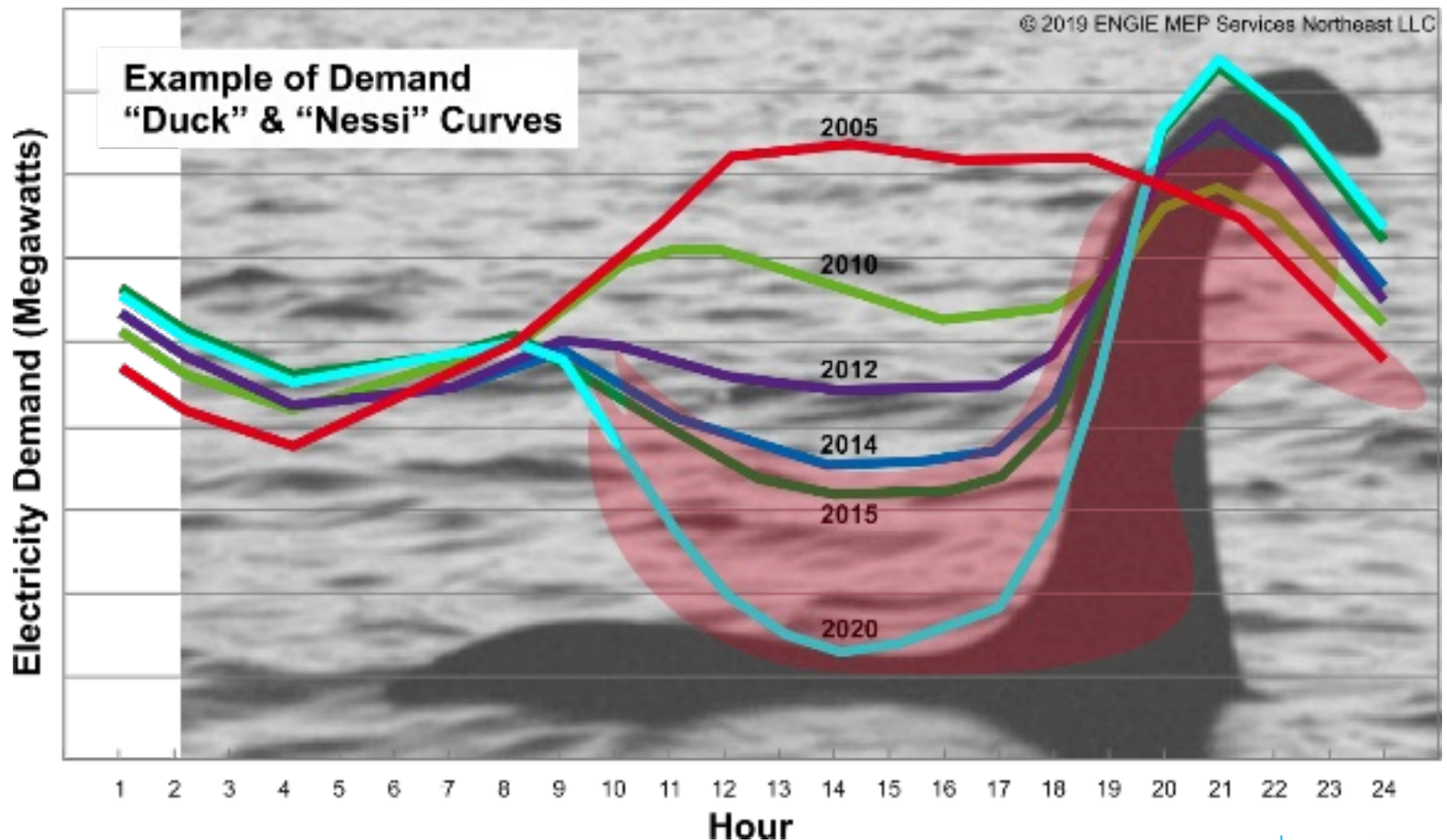


The Changing Shape of Demand

Understanding renewables vs. peak demand

Duck & Nessi Demand

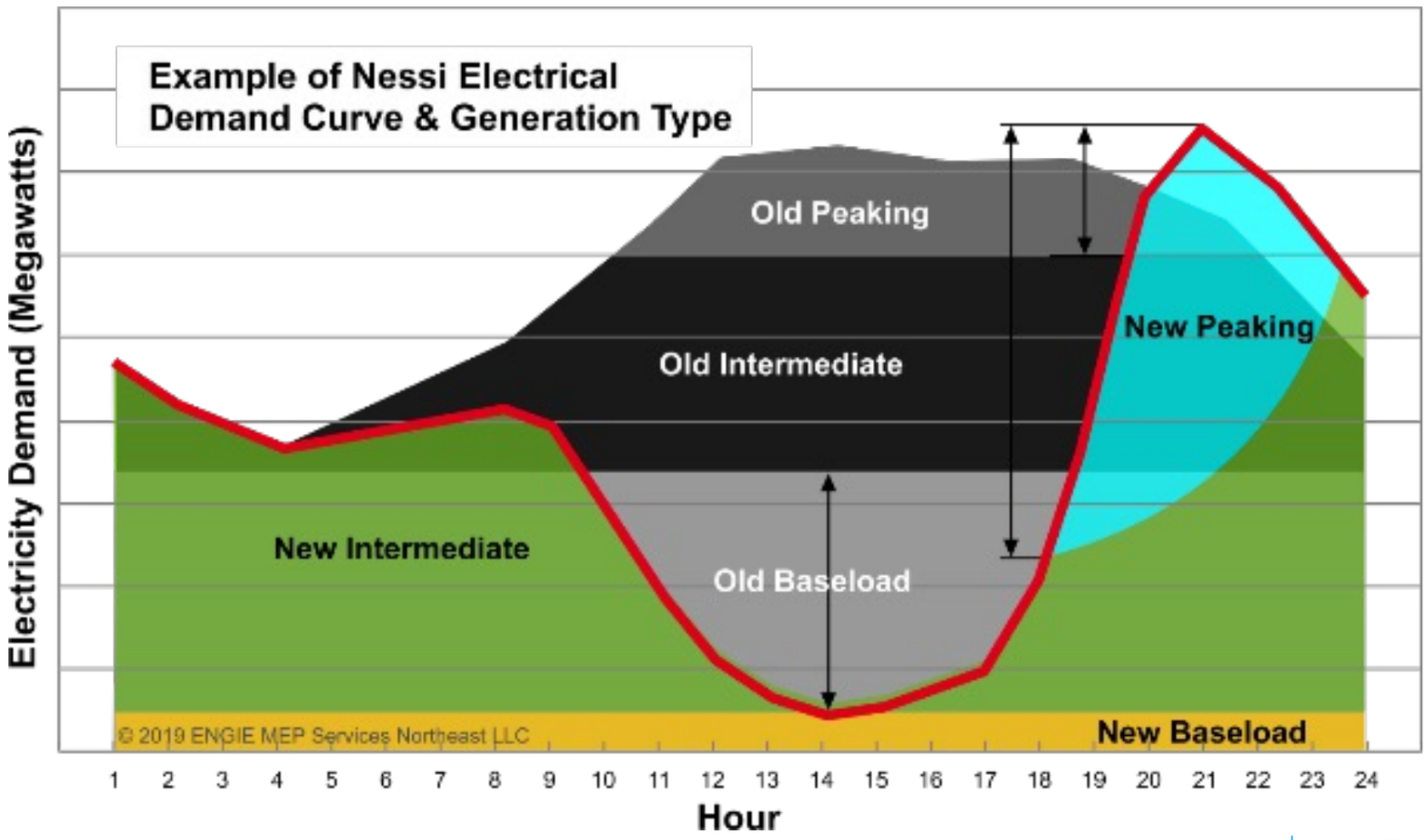
- Renewables depress daily peak… sometimes
- Makes managing peak demand much more challenging…
- …and much more expensive



The Changing Shape of Demand

Understanding renewables vs. peak demand

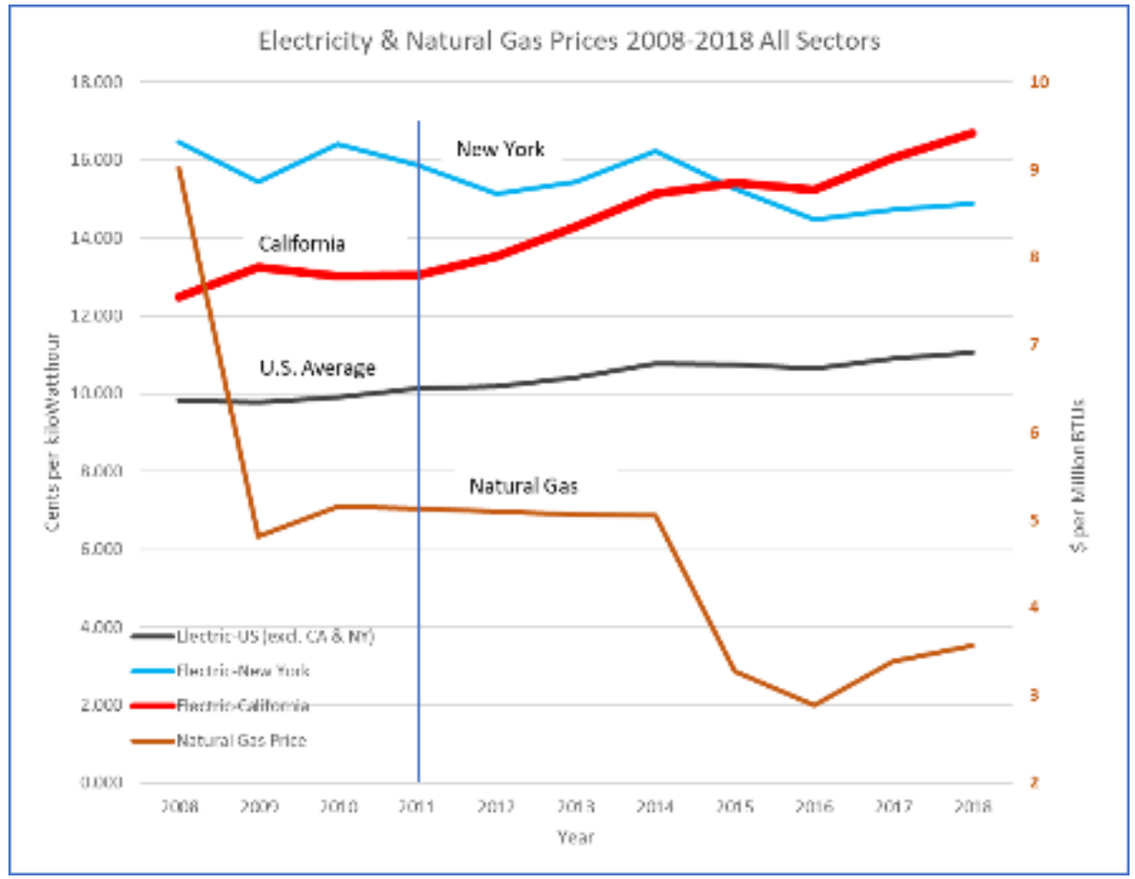
- Less baseload + more peaking = much higher electricity costs



Learning from California

Correlation between electricity price and renewables

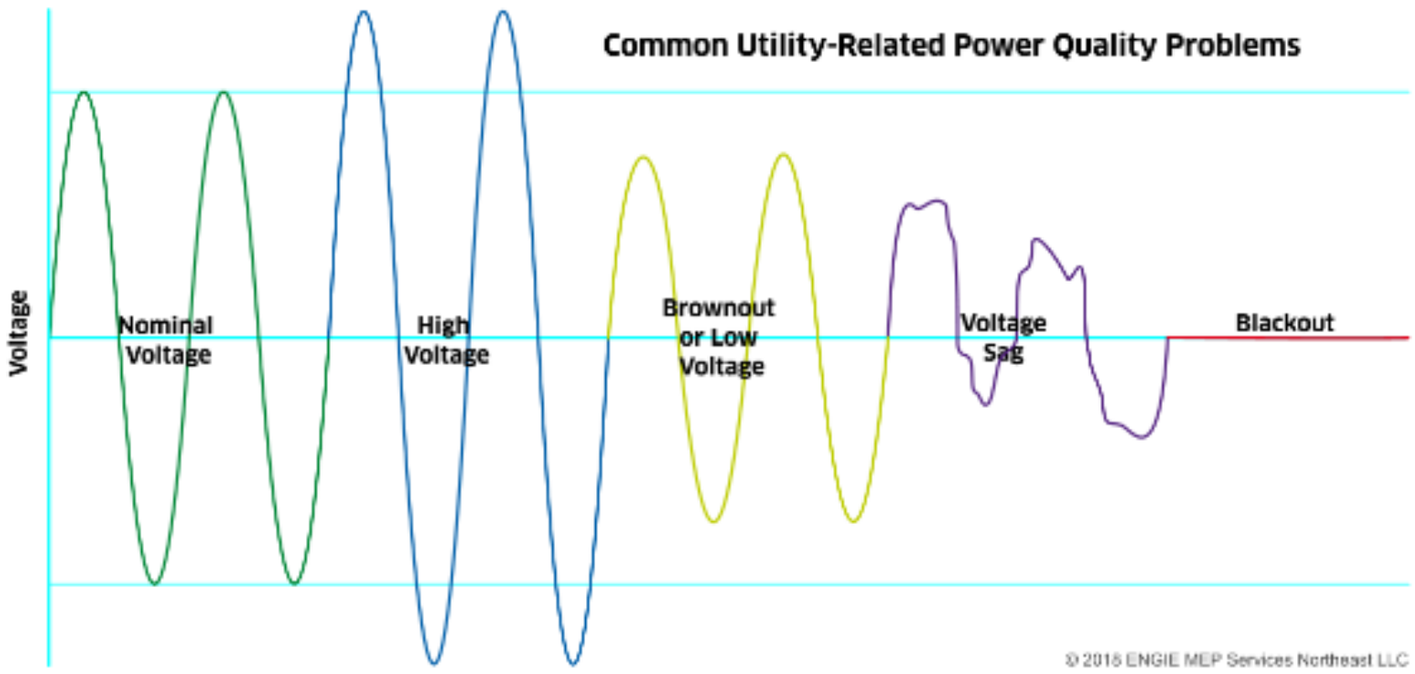
- CA now almost 30% renewables …most in U.S.
- Electricity prices increased 30% since 2011 despite drop in natural gas price
- OneNYC (NYC Green New Deal) is more ambitious than CA's plan



Effects of an Aging Transmission System

Power quality, reliability & resiliency

- Most > 35 years old
- Some > 100 years old
- Overloaded in parts
- Exposed to lightning & weather events
- Source of most power quality problems



OneNYC 2050

Power quality, reliability & resiliency

"This will require a radical shift to end our reliance on fossil fuels and ensure 100 percent clean electricity resources, and to transform the city's buildings, energy, transportation, and waste sectors to fully electrify the city."

- Cover upstate with wind & solar farms to supply the metro area…

OneNYC 2050

Power quality, reliability & resiliency

"Attaining a clean electricity future, however, is constrained by the available transmission capacity directly connected into New York City. Almost all of the renewables currently deployed in New York are located upstate, but the power lines that bring clean electricity from upstate to New York City are at capacity, so very little can reach the city."

…but,

- Need 100% more transmission capacity to cover the loss of generation in the city, and
- Need further 100+% capacity to cover electrification of everything …steam, hot water, chillers, transportation, etc.
- Resiliency → zero

Bill 1253

Decarbonization goals

"…achieving a 40 percent reduction in aggregate greenhouse gas emissions from covered buildings by calendar year 2030, relative to such emissions for the calendar year 2005."

Pertinent points:

- Penalties start in 2024
- Limits go down in 2029
- All details not yet available
- Evaluation of CHP unknown

The Future of Electricity in NYC

An interrelated set of compounding problems

Building owners will see:

DISRUPTED ELECTRIC INDUSTRY

INCREASING POWER QUALITY RISKS

RISING ELECTRICITY RATES

Part III.

Future-Proofing Your Facility Exposure: Actions for building owners

The New Energy Paradigm

Efficiency & lowest electricity price are longer enough

For new electricity reality:

- Traditional efficiency providers rarely have all the needed skills
- With manufacturers: “every problem looks like a nail”
- Non-traditional skills: optimizing all energy resources (size & operation) for variable loads, shifting energy costs and revenues

Efficiency providers:

- Electricians
- Engineers
- In-house staff
- Equipment suppliers
- ESCOs
- AEs

The New Energy Paradigm

Efficiency & lowest electricity price are longer enough

Success requires complex collaboration:

- Agnostic equipment supply network
- Energy masterplanning – all complexities of design, operation & control
- Energy construction management – energy efficiency build
- Energy operation & maintenance – guaranteeing long-term performance
- Energy Integration – integrating controls for low cost & high revenue

One Solution: Microgrids & DER

Adding value for both the building owner and the electrical grid

Places generation at the point-of-use:

- Takes load off T&D system
- Reduces need for new power plants
- Increase use of renewables
- Increases building electrical resiliency

Protects you against issues such as:

- High demand charges
- Peak time-of-use charges
- Rising electricity costs
- Blackouts & power quality problems

Risks will increase for those purchasing electricity,
Risks will decrease for those with microgrids/DER

Steps to Future-Proofing Your Facility

The Energy Integrator approach

1. Create a Strategy

- Load assessment
- Develop energy options
- Identify costs
- Project financing
- Define strategy

2. Execution

- Repairs & replacements
- Efficiency upgrades
- Building automation
- DER
- Nanogrid(s)
- Microgrid
- Add different resources

3. Maintenance & Operation

- Revenue generation optimization
- Ongoing monitoring and maintenance
- Operations & facility management

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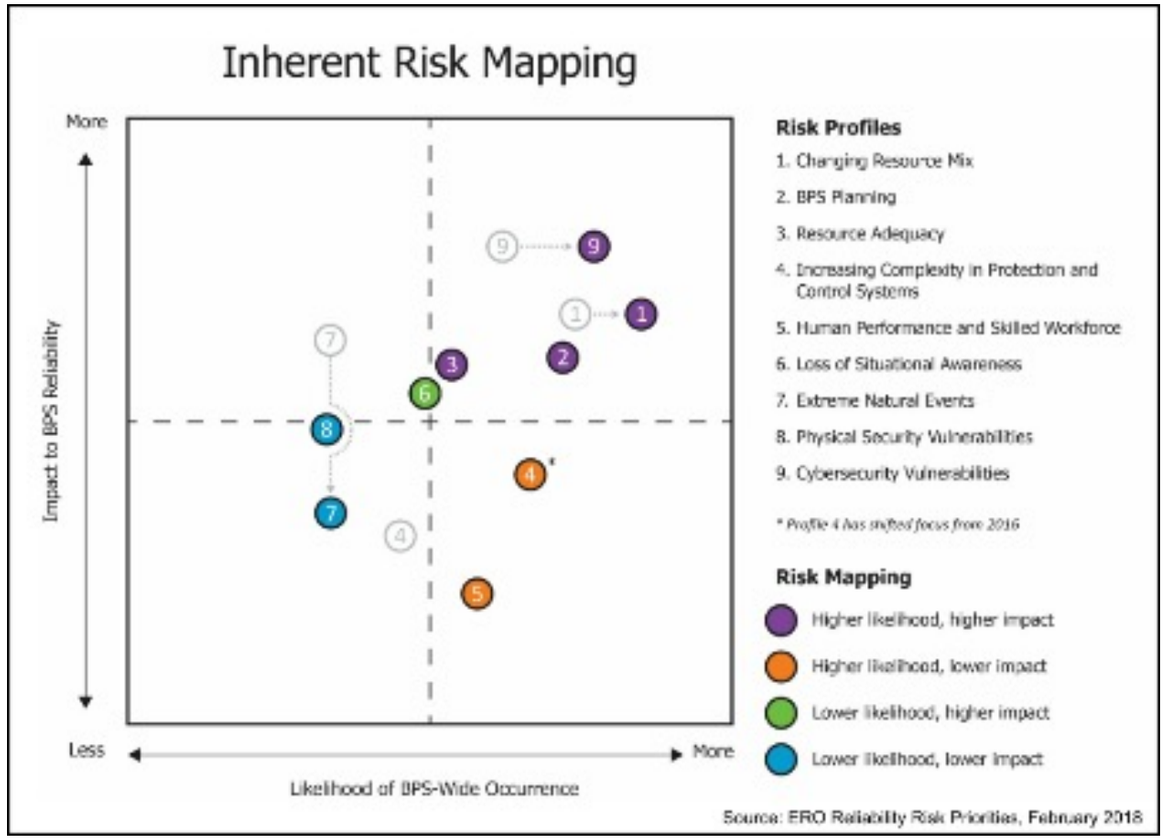
Increasing Risks to Bulk Power System

Reliability challenges created by shift in energy sources

1. Percentage of intermittent resources growing
2. Utilities have less control over generation retirements & new additions
3. Uncertainty about how new generating sources will perform in the long-term



Bulk Power System uncertain future

Utility planning grows increasingly complex as renewable capacity increases

UNKNOWN
generating capacity additions

+

RANDOM
weather effects

=

UNCERTAIN
utility forecasting

Grid reliability challenges

Aging infrastructure complicates BPS even further

Power quality problems: blackouts & interruptions, sags & surges, chronic low voltage