With energy, the future is always uncertain...
But, in the next few years, prices will rise.
To understand what to do next, we first need to understand the 4 key factors contributing to the increase.
FACTOR #1
POWER PLANT RETIREMENT AND CAPACITY COSTS
You pay capacity charges on your electric bill to fund power plant upgrades and new plant construction, so that there is always enough energy to meet local demand.

THE PROBLEM IS...
NEW ENGLAND POWER PLANTS ARE OLD
4200 MWs of generating power have retired or plan to retire in the next few years.
ANOTHER 4,100 MW ARE AT RISK FOR RETIREMENT
1,600 MW of new generation has come online in the last few years, and 6,700 MW of new resources have qualified for the next auction.
CAPACITY | Planned New Generation

Fuel Type
- Blue: Dual NG/FO
- Orange: NG
- Green: Offshore Wind
- Red: Wind

Net MW
- 510
- 800
- 1,000
- 1,200
- 1,400
- 1,895
Note, graphic is an estimate meant to illustrate trends in supply rates, not actual rates (costs would vary significantly from client to client)
FACTOR #2

PIPELINES

& THE IMPACT OF WINTER WEATHER
New England isn’t just running short on generation facilities, it’s also in need of greater pipeline capacity for natural gas.
Where does NE electricity come from?

Almost 50% of electricity in New England is generated from Natural Gas.

2015 Annual Fuel Mix:
- 48.5% Natural Gas
- 29.6% Nuclear

Cumulative New Generating Capacity in New England:
- Natural Gas
- Oil
- Biomass
- Fuel Cell
- Hydro
- Solar
- Wind
- Nuclear Uprate
CURRENT PIPELINE CAPACITY IS 2 TO 3 BCF

ON A COLD WINTER DAY...

HEATING AND INDUSTRIAL PROCESS DEMANDS............4.5Bcf

ELECTRIC GENERATION DEMAND.........................+0.5 to 1.5 Bcf

TOTAL DEMAND FOR NATURAL GAS......................5.0 to 6.0 Bcf

SHORTFALL IS 2 TO 3 BCF
A tale of two seasons

When the region's gas-fired generators have unconstrained access to natural gas, wholesale electricity prices are competitive nationally. Compare New England's average summer (June-August 2015) and winter (December 2014-February 2015) prices for real-time wholesale electricity with those in the Midwest.

- **Midcontinent ISO**
  - Summer: $28.78/MWh
  - Winter: $29.31/MWh
  - (at Chicago City Gate)

- **ISO New England**
  - Summer: $26.86/MWh
  - Winter: $76.64/MWh
  - (at Algonquin City Gate)

- **Midcontinent ISO**
  - (at Chicago City Gate)
FACTOR #3
TRANSMISSION TROUBLES
In the past, transmission charges have always been relatively low, but extensive system upgrades are on the horizon.
New generation is only worthwhile if you can deliver it to the places that need it the most.
Transmission Upgrades

Representative Projects and Concept Proposals

<table>
<thead>
<tr>
<th></th>
<th>Project Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Northern Pass</td>
</tr>
<tr>
<td></td>
<td>Hydro Quebec/Northeast Utilities</td>
</tr>
<tr>
<td>b</td>
<td>Northeast Energy Link</td>
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<tr>
<td></td>
<td>Bangor Hydro/National Grid</td>
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<tr>
<td>c</td>
<td>Green Line</td>
</tr>
<tr>
<td></td>
<td>New England ITC</td>
</tr>
<tr>
<td>d</td>
<td>Bay State Offshore Wind Transmission System</td>
</tr>
<tr>
<td></td>
<td>Anbaric Transmission</td>
</tr>
<tr>
<td>e</td>
<td>Northeast Energy Corridor</td>
</tr>
<tr>
<td></td>
<td>Maine/New Brunswick</td>
</tr>
<tr>
<td>f</td>
<td>Muskrat Falls/Lower Churchill</td>
</tr>
<tr>
<td></td>
<td>Newfoundland and Labrador (Nalcor) and Nova Scotia (Emera)</td>
</tr>
<tr>
<td>g</td>
<td>Maine Yankee–Greater Boston</td>
</tr>
<tr>
<td>h</td>
<td>Maine–Greater Boston</td>
</tr>
<tr>
<td>i</td>
<td>Northern Maine–New England</td>
</tr>
<tr>
<td>j</td>
<td>Plattsburgh, NY–New Haven, VT</td>
</tr>
</tbody>
</table>
FACTOR #4
A NEW FOCUS ON RENEWABLES
You pay a renewable energy charge to support sustainable generation in your state. As goals to reduce fossil fuel reliance increase, so does this charge.
STATE POLICY | RPS Forcing Renewables Development

RENEWABLE PORTFOLIO STANDARD

A Minimum Quantity of Renewable Energy Set by State Law That Applies To All Consumers

http://www.iso-ne.com/about/key-stats/resource-mix
RPS costs increasing depending on state renewable energy targets
Est. RPS Costs per kWh by State

- MA
- CT
- NH
- RI
- ME
SOME GOOD NEWS
SHIFT AWAY FROM COAL & OIL WILL CONTINUE

NATURAL GAS & WIND Dominate The ISO-NE Inter-Connection Queue

By Type
- 64% Natural gas* (9,029 MW)
- 30% Wind (4,228 MW)
- 4% Solar (542 MW)
- 1% Battery storage (94 MW)
- 1% Pumped-storage hydro (66 MW)
- 0.3% Biomass (40 MW)
- 0.2% Hydro (31 MW)
- 0.01% Landfill gas (2 MW)

* Some natural gas projects include dual-fuel units (oil).

By State
- 31% Massachusetts (4,283 MW)
- 29% Maine (4,072 MW)
- 24% Connecticut (3,387 MW)
- 10% Rhode Island (1,409 MW)
- 6% New Hampshire (792 MW)
- 1% Vermont (87 MW)

Source: ISO Generator Interconnection Queue (April 2016) FERC jurisdictional Proposals Only
NATURAL GAS FROM SHALE...

Billion cubic feet per day

Number of rigs online

Output per rig up 11-fold 2007-16

Rig count down 8-fold 2007-16

Michael Liebrieich: BNEF-Summit-Keynote-2016
WHOLESALE ELECTRICITY PRICES HAVE FALLEN

- Cheap natural gas
- Renewables
  - Declining cost
  - Zero marginal cost of generation
  - Supportive State & Federal Policies
- Low prices are forcing coal, oil and nuclear offline

ISO New England Electricity Forwards: Rolling 12-month Strip
All Hours, On-Peak/Off-Peak Average Strip
LOWER CO2e EMISSIONS

- CO2e per MWh is declining about 2% per year
- Nuclear shutdowns partially offsetting renewables and coal retirements
HOW DO YOU ADAPT?
Those with the ability to control peak consumption will be best suited to control costs.
THERE IS NO ONE SOLUTION

- **ENERGY EFFICIENCY & RENEWABLE ENERGY CHARGES**
  - You pay regardless, get the benefit
  - Get utility incentives for retrofits
  - Participate in Solar Net Metering

- **PROCUREMENT STRATEGY**
  - Understand the pros and cons of hedging capacity or just energy
  - Communicate price impacts of capacity early

- **OPERATIONS**
  - Programmatically reduce load on peak summer afternoons
  - On-site Generation – Solar PV and/or Co-Gen
  - Demand Management / Conservation
    - Focus on summer kw demand (not just kwh energy) savings
  - Try to “time” the peak hour
THERE IS NO SINGLE SOLUTION

- SOLAR
- RECs
- DEMAND
- PROPANE
- NATURAL GAS
- OIL
THANK YOU!

CHARLIE AGNEW
Account Management
Competitive Energy Services
207.576.3490
cagnew@competitive-energy.com
SOLAR
Figure 15: US historical adoption curves for new technologies

Source: W. Michael Cox, Founding Director, O'Neil Center for Global Markets and Freedom; US Census Bureau
**Why Solar Makes Sense**

**How Cheap Can Solar Get?**

- **2015:** Solar is 1% of global electricity demand.

**When solar reaches 2% of 2015 global electricity demand:**

- Assumes 16% cost reduction of new solar electricity per doubling of scale.
- Solar costs unsubsidized.
- Natural gas prices do not include carbon pollution externalities.

**Price of New Solar Electricity:** $/kWh

- **New Natural Gas Electricity Price**
- **Average Solar - Medium Sunlight Locations**
- **Lowest Cost Solar - Sunniest Locations**

**Cumulative Worldwide GW of Solar Deployed**

- **2020?**
- **2028?**
- **2035?**

- 5 Doublings, from 200GW in 2015 to 6,400 GW at a future point.
- 20 years? Difficult to Estimate.

Graph by Ramez Naam, rameznaam.com/tag/solar/
Historical Cost of Solar

Source: Earth Policy Institute/Bloomberg
SOLAR | Solar PV Costs on the Decline

$77.00 per WATT in 1977

$0.74 per WATT in 2013

PRICE OF CRYSTALLINE SILICON 1977-2013

SOLAR INSTALLATION COSTS BY SECTOR 2011-2013
SOLAR  |  Solar PV Options

PURCHASE, OWN & OPERATE

Upfront capital costs for large systems: $2,500,000+ per MW

Significant SREC price risk

Owner (customer) can claim GREEN power if you retain the Solar Renewable Energy Credit

POWER PURCHASE AGREEMENT (PPA)

Price risk (opportunity) associated with long term price commitment

GREEN claim depends on the deal structure

NET EXCESS GENERATION CREDIT (NMC)

Two Options
  - Onsite but in front of utility meter (Using owners land)
  - Offsite via virtual Net Excess Generation

Least risk. Contracts can be structured so that owner can only benefit financially. Only risk is opportunity risk.

CANNOT claim GREEN power in your portfolio or offset Global Greenhouse Gas emissions
Conventional vs. Virtual Net Metering

**Virtual Net Metering (VNM)**
1. Solar system not attached to load (or much greater than on-site load)
2. Energy from the solar installation goes directly to the grid
3. Metered solar output is converted to a $ amount based on a formula
4. Dollar value of solar output credited to purchaser’s utility bill

**Conventional Net Metering (N/A)**
1. Solar system located on-site
2. Generated energy is used by site
3. Meter “spins backward” when on-site production exceeds consumption
4. Excess energy from your solar installation goes back to the grid
SOLAR | Net Excess Generation Flow Chart

1 SOLAR DEVELOPER
Electricity is provided to the Utility (GMP)

2 UTILITY
Payments for electricity, in form of Net Metering Credit, are issued by the Utility to Host

3 HOST
HOST reimburses Developer for the NMC less discount
RENEWABLE ENERGY CREDITS (RECs)
An intangible record that is created at the same moment as physical electricity

Can be sold separately or together

One REC for every 1 MWh

Since every electron, once it reaches the grid, is the same no matter how it was generated, RECs give incentives to create renewable energy
The costs of various green options range from insignificant to very expensive – understanding the costs is essential for informed decision making.

**IMPACT:**
Confusing, Few Rules

**OPPORTUNITY:**
Flexibility, Choice, Economic Efficiency
DEMAND MANAGEMENT
The FCM holds auctions to set payment rates.
End-users are charged the following on a monthly basis:

\[
\text{CAPACITY CHARGE} = \text{PAYMENT SETTLEMENT RATE \times RESERVE MARGIN \times CAPACITY TAG}
\]

FCM costs are set to double in the ‘17 – ’18 power year
Colleges can reduce the impact of the rising payment rate through demand management during the annual peak hour event
### Historical Peaks

<table>
<thead>
<tr>
<th>YEAR</th>
<th>MONTH</th>
<th>DATE</th>
<th>DAY</th>
<th>SYSTEM PEAK (MW)</th>
<th>HOUR</th>
<th>TEMP</th>
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<tbody>
<tr>
<td>2002</td>
<td>AUG</td>
<td>14</td>
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<td>25,103</td>
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<td>2003</td>
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<td>AUG</td>
<td>30</td>
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<tr>
<td>2007</td>
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<td>3</td>
<td>FRI</td>
<td>25,773</td>
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<td>2008</td>
<td>JUN</td>
<td>10</td>
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<td>25,691</td>
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<td>89.1</td>
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<td>2009</td>
<td>AUG</td>
<td>18</td>
<td>TUE</td>
<td>24,708</td>
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<td>90.1</td>
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<td>2010</td>
<td>JUL</td>
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<td>TUE</td>
<td>26,701</td>
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<tr>
<td>2011</td>
<td>JUL</td>
<td>22</td>
<td>FRI</td>
<td>27,312</td>
<td>2-3pm</td>
<td><strong>98.6</strong></td>
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<td>2012</td>
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<td>17</td>
<td>TUE</td>
<td>25,543</td>
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<td>93.1</td>
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<tr>
<td>2013</td>
<td>JUL</td>
<td>19</td>
<td>FRI</td>
<td>26,911</td>
<td>4-5pm</td>
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<td>2014</td>
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<td>2015</td>
<td>JUL</td>
<td>29</td>
<td>WED</td>
<td>24,039</td>
<td>4-5pm</td>
<td>88.5</td>
</tr>
<tr>
<td><strong>AVERAGE</strong></td>
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<td></td>
<td><strong>25,610</strong></td>
<td></td>
<td><strong>91.6</strong></td>
</tr>
</tbody>
</table>
DEMAND MANAGEMENT | Results

Actual- North East University Cost Reduction (2008 - 2012)

- Total Capacity Tag (KW)
- Annual Capacity Costs ($)

2008: $485,452
2009: $475,334
2010: $341,227
2011: $250,742
2012 (Est.): $230,084

Legend:
- Steam Plant Cap Tag (KW)
- Sub Station Cap Tag (KW)
- Annual Capacity Costs ($)
TO CES VALUED CUSTOMERS:

Today - Friday, July 29, 2016 - 9:30 AM

This week was a busy week, as temperatures were in the 90’s across much of New England. As a result, each day brought loads to within striking distance of the peak load set a week ago today at 24,305 MW. Beginning Monday through yesterday, peak loads reported by ISO-NE were 23,641 MW, 23,839 MW, 23,620 MW and 23,738 MW, respectively. It looks like we are in for more moderate weather, and therefore more moderate loads beginning today for the next week ... but we do live in New England, where weather changes very quickly ... and we do have all of August ahead of us.

We will keep an eye on load forecasts and issue advisories if we think loads could approach 24,000 MWs.

If you have any questions, please call your CES Account Executive or us at corporate at (866) 408-4591.
PROPANE
**PROPANE | Prices**

**Mt. Belvieu Rolling 12-Month Strip**

**Price ($/gal)**

<table>
<thead>
<tr>
<th>Month</th>
<th>Price ($/gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr-15</td>
<td>$0.65</td>
</tr>
<tr>
<td>Oct-15</td>
<td>$0.55</td>
</tr>
<tr>
<td>Apr-16</td>
<td>$0.60</td>
</tr>
<tr>
<td>Oct-16</td>
<td>$0.65</td>
</tr>
</tbody>
</table>

**THIS WEEK** $0.562  **LAST WEEK** $0.587  **PERCENT CHANGE** -4%
U.S. propane stocks
million barrels

Source: U.S. Energy Information Administration

THIS WEEK 100.567
LAST WEEK 102.682
PERCENT CHANGE -2%
U.S. Propane and Propylene Exports

THIS WEEK 981  LAST WEEK 685  PERCENT CHANGE 43%
NATURAL GAS | Short-term Commodity Futures

NATURAL GAS, ROLLING 12-MONTH NYMEX STRIP

$/MMBtu

4/25/16 5/9/16 5/23/16 6/6/16 6/20/16 7/4/16 7/18/16 8/1/16 8/15/16 8/29/16 9/12/16 9/26/16 10/10/16 10/24/16
NATURAL GAS | Mid-term Commodity Futures

Winter 16-17 Strip  24-mo Strip  12-mo Strip  Oct16
NATURAL GAS | BASIS
NATURAL GAS | Impact Of Winter Weather

NATURAL GAS: DAILY SPOT PRICES AT ALGONQUIN

Winter 12/13: Warm winter, natural gas revolution spikes demand for natural gas

Winter 13/14: Capacity problems cause record spot price spikes

Winter 14/15: Warm start to winter, LNG to help contain spot prices. February record cold causes price spikes

Winter 15/16: El Niño effect: a record warm winter kept gas prices low

$34/MMBtu

$30/MMBtu

$7/MMBtu

$79/MMBtu
- Pipeline expansion and construction stagnant for the last decade
- New influx of shale gas into the U.S. market
- Many new projects now in process or in development in the Northeast
SPECTRA ENERGY - Algonquin
- AIM (2016): 340,000 MMBtu
  - FERC approved
- Atlantic Bridge (2017): 133,000 MMBtu
- Access Northeast (2018): 900,000 MMBtu (new storage & generation)

TRANSCANADA – PNGTS (3 stages)
- Up to 500,000 MMBtu/day
- C2C (2017): 100,000 MMBtu – added compression
- 2018 PNGTS Capacity Offer – tied to Atlantic Bridge
- 2019 PNGTS Capacity Offer – Incremental Build-to-Suit capacity for generation load in response in NE

KINDER MORGAN - Tennessee Gas Pipeline
- Northeast Energy Direct (2018): Up to 1,300,000 MMBtu/day
- Cancelled as of 4/20/16
NATURAL GAS | Short-term NE Basis Futures

$1.20
$0.70
$0.20
$0.30
$0.80
$1.30
$1.80
$2.30
$2.80
$3.30
$3.80
$4.30
$4.80
$5.30

$/MMBtu

AGT Winter 16-17 Strip
TZ6 Winter 16-17 Strip
AGT 12-mo Strip
TZ6 12-mo Strip
AGT 24-mo Strip
TZ6 24-mo Strip
AGT Nov16
TZ6 Nov16
NATURAL GAS | Long-term NE Basis Futures

$0.70 $0.75 $0.80 $0.85 $0.90 $0.95 $1.00 $1.05 $1.10 $1.15 $1.20 $1.25 $1.30

$/MMBtu

AGT 2018 Strip
AGT 2019 Strip
AGT 2020 Strip
TZ6 2018 Strip
TZ6 2019 Strip
Kinder Morgan Announcement
MA Court Decision

BACK TO BOARD
OIL MARKETS
OIL MARKETS | Lowest in 7 Years

CRUDE OIL: PROMPT MONTH DAILY SETTLEMENTS

$/barrel

Brent Prompt Month
WTI Prompt Month
Global supply glut expected to pare down in 2016

- Global production expected to increase 2016 through 2017

Demand growth from emerging markets
- China & India

U.S. Production
- Low crude oil prices has slowed production, rigs pulled
- EIA projects declining production for late-2016 through 2017
WTI jumped to $50-52 since OPEC “Algiers deal” Sept. 28
  - Up from $45-46
  - Reached 15-month high for prompt month

EIA storage report:
  - US stocks fell ▼ 5.25M bbls
    - Increase was projected
  - Rigs trending up for four months

OPEC meeting Nov 30
  - Iran, Russia in question
U.S. HEATING OIL STOCKS & PRICING

Stocks (Million Barrels)

NYMEX ($/Gallon)

5 Year Range

2015-2016 Stocks

12 Month Strip Price

BACK TO BOARD