Energy & Store
Development Conference

E+SD 2015

The Impact of Technology on Energy Markets and the Supply Demand Equation

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Energy & Store Development Conference E+SD 2015

Agenda

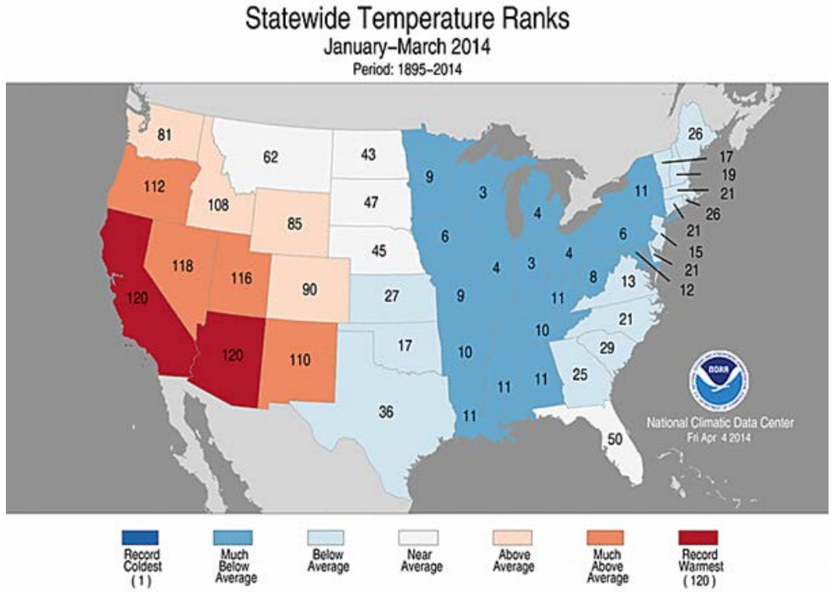
- Energy Market Overview
- Current and Pending Legislation
- Evolution of Energy Supply Management
- The Changing Nature of the Demand Side
- Future Threats and Opportunities

What is the role of Technology in Energy?

Energy Markets Overview

Natural Gas and Power Prices are Driven by Many Factors…

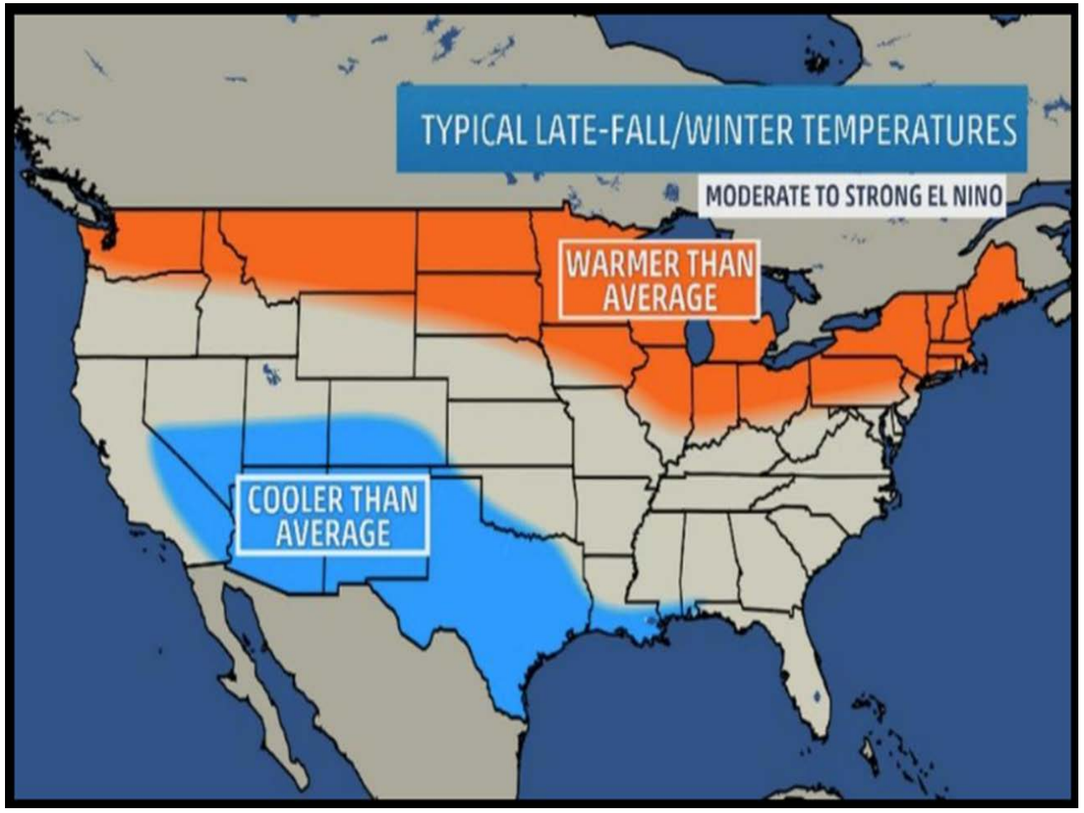
- Short Term – Weather
- Short Term – Natural Gas Production / Storage
- Medium Term – Residential, Commercial, Industrial Demand
- Medium Term – Imports and Exports
- Long Term – Regulatory Environment
- Long Term – Geopolitical Instability

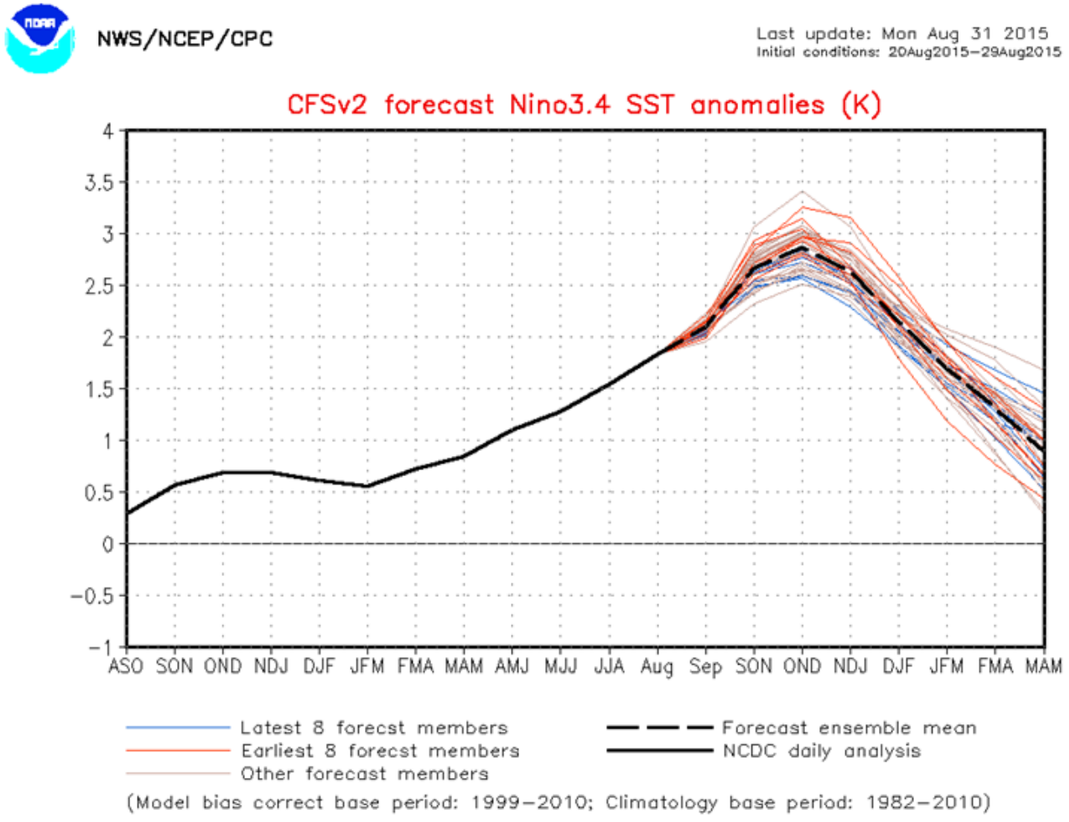


Current Themes in the Energy Markets Today…

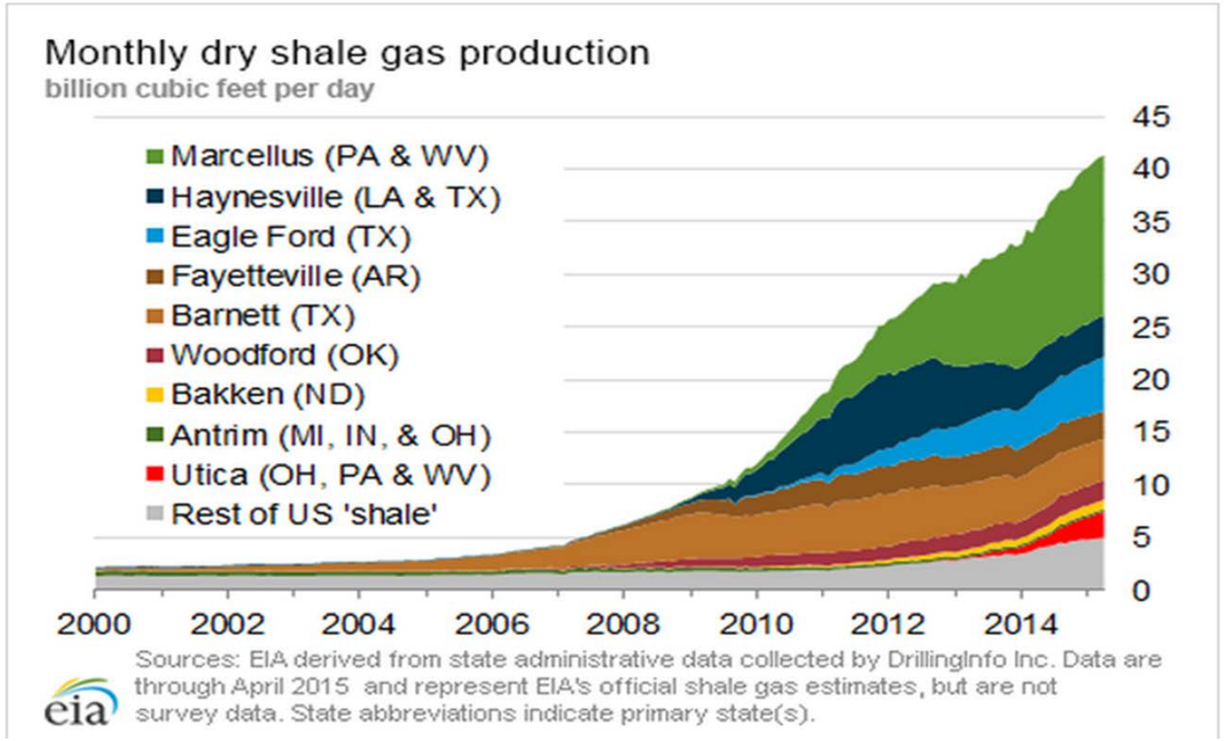
- Natural Gas Storage versus El Nino?
- Will U.S. Gas Production Grow or Remain Stable?
- Will Demand Catch Up to Supply?
- Coal and Nuclear generation retirements due to low price gas
- Grid Stability with Introduction of Distributed Renewable Generation
- Lower Risk Premiums in Out Years (‘16-’21) Driven by Natural Gas
- Black Swan? – Potential Coal Price Increases, EPA Regulations

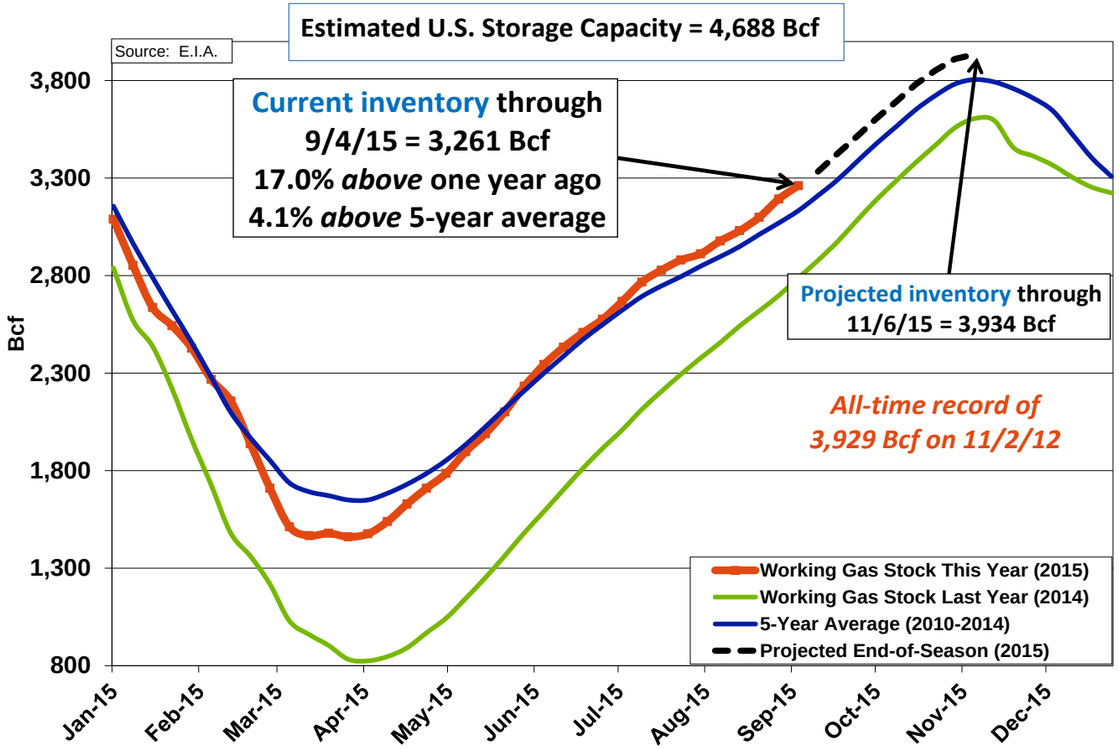
Projected Weather Impacts of a Strong El Nino



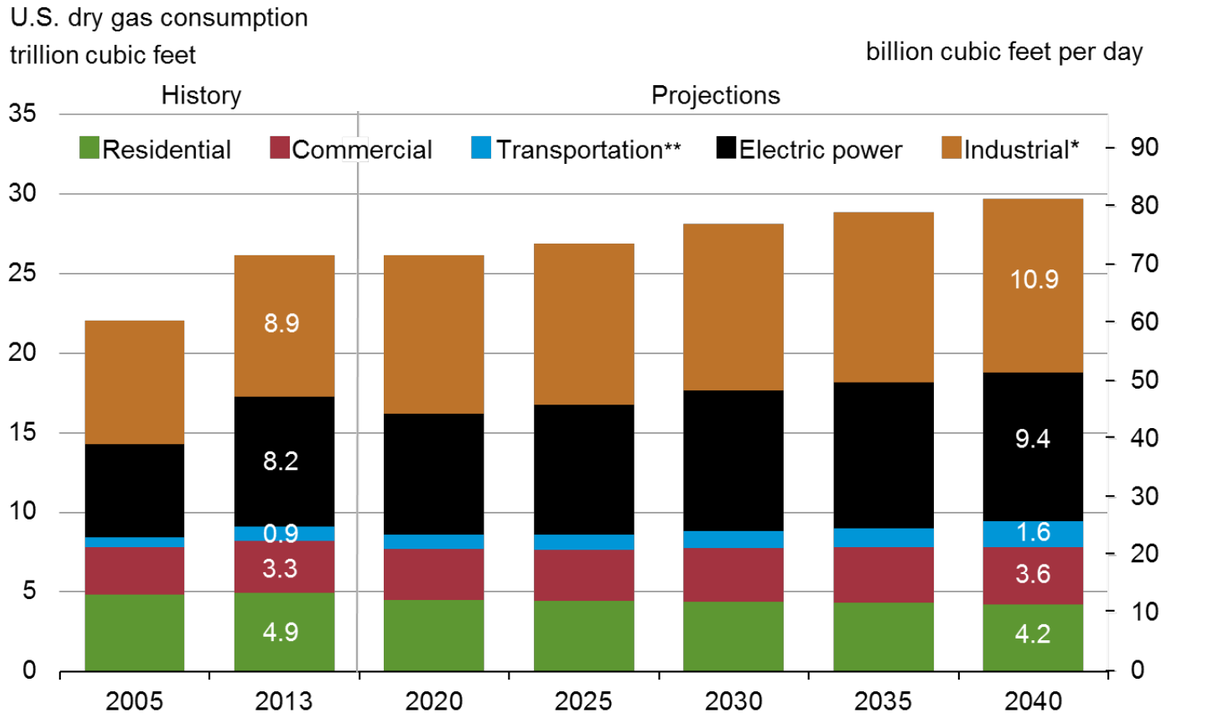


Prolific Shale Gas Production and Natural Gas Storage Inventory –





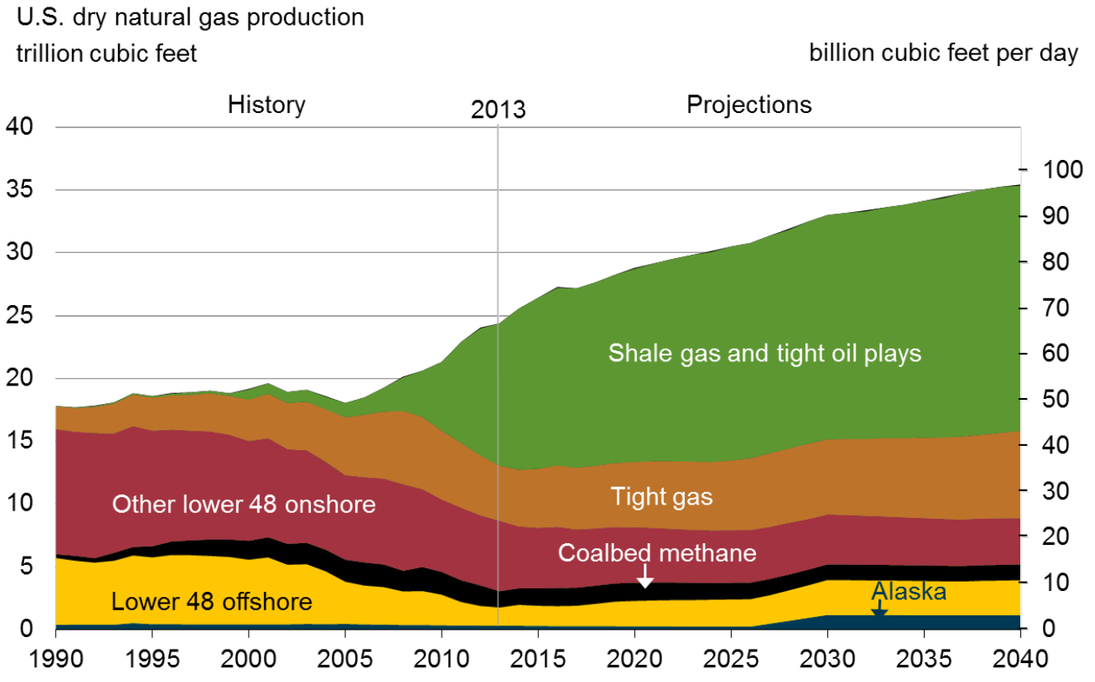
Impact of Demand Growth in Natural Gas…



*Includes combined heat-and-power and lease and plant fuel
**Includes pipeline fuel

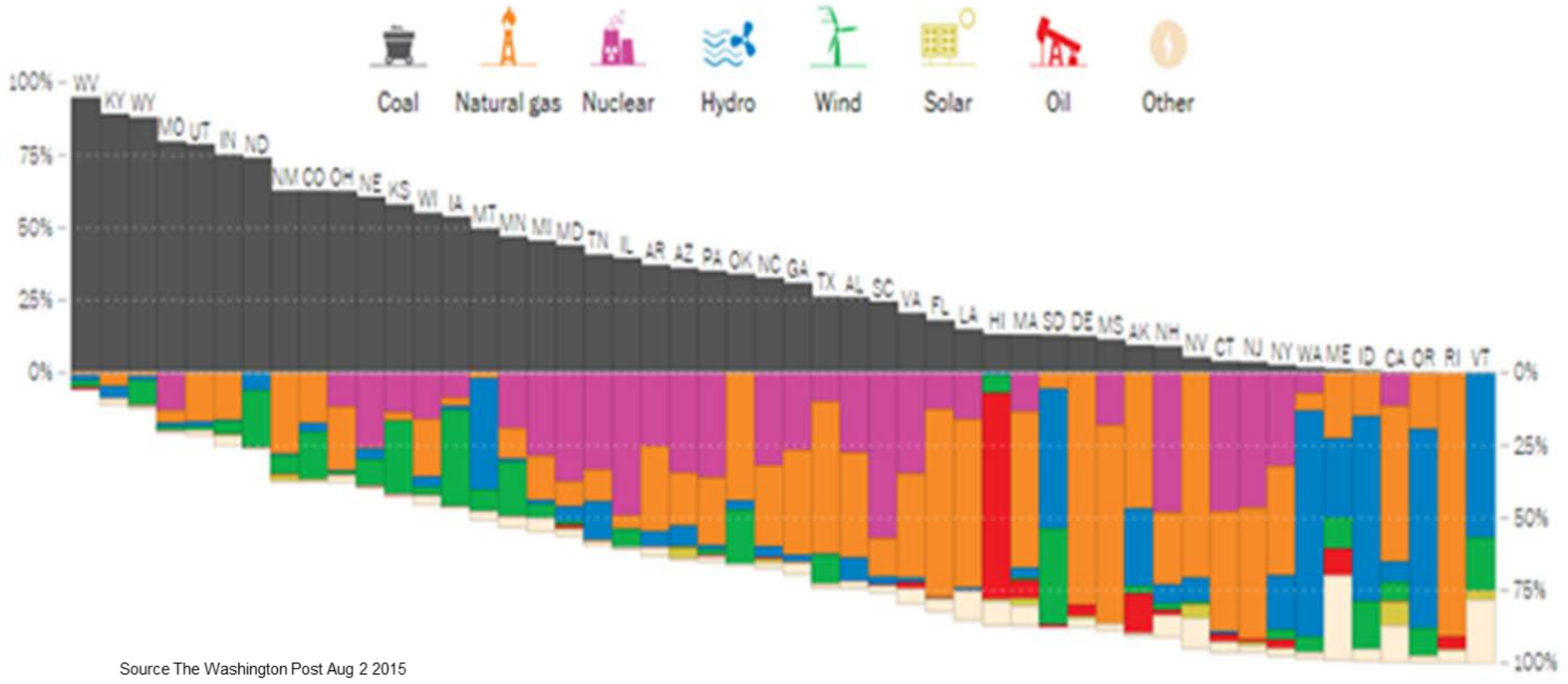
Source: EIA, Annual Energy Outlook 2015 Reference case

Offset by Continued Growth in Shale Plays



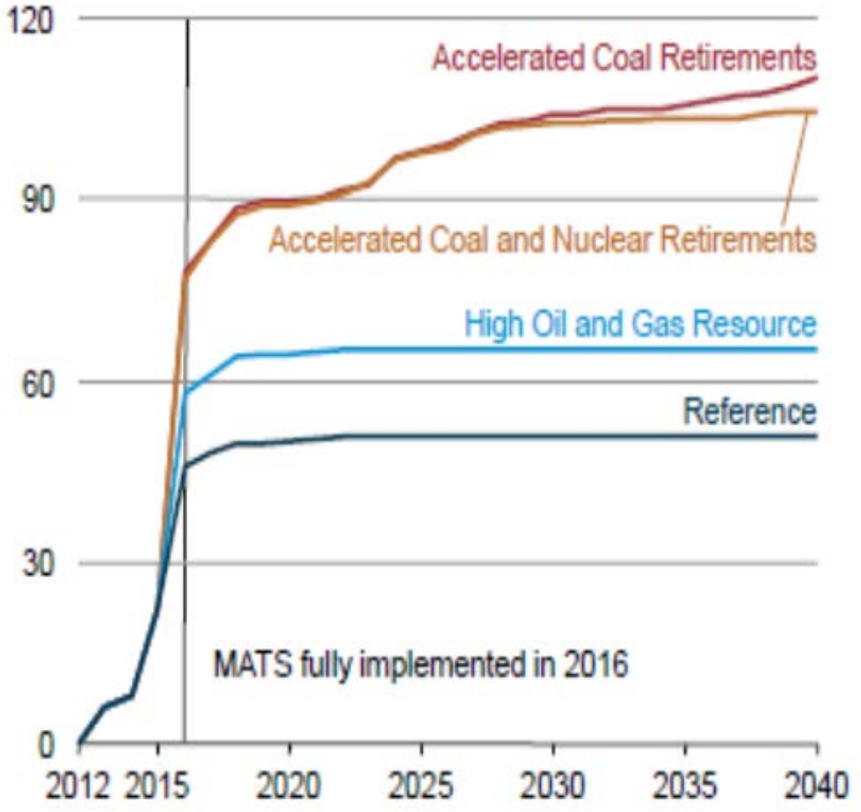
Source: EIA, Annual Energy Outlook 2015 Reference case

Potential of 110 GW of Coal and Nuclear Retirements by 2040…



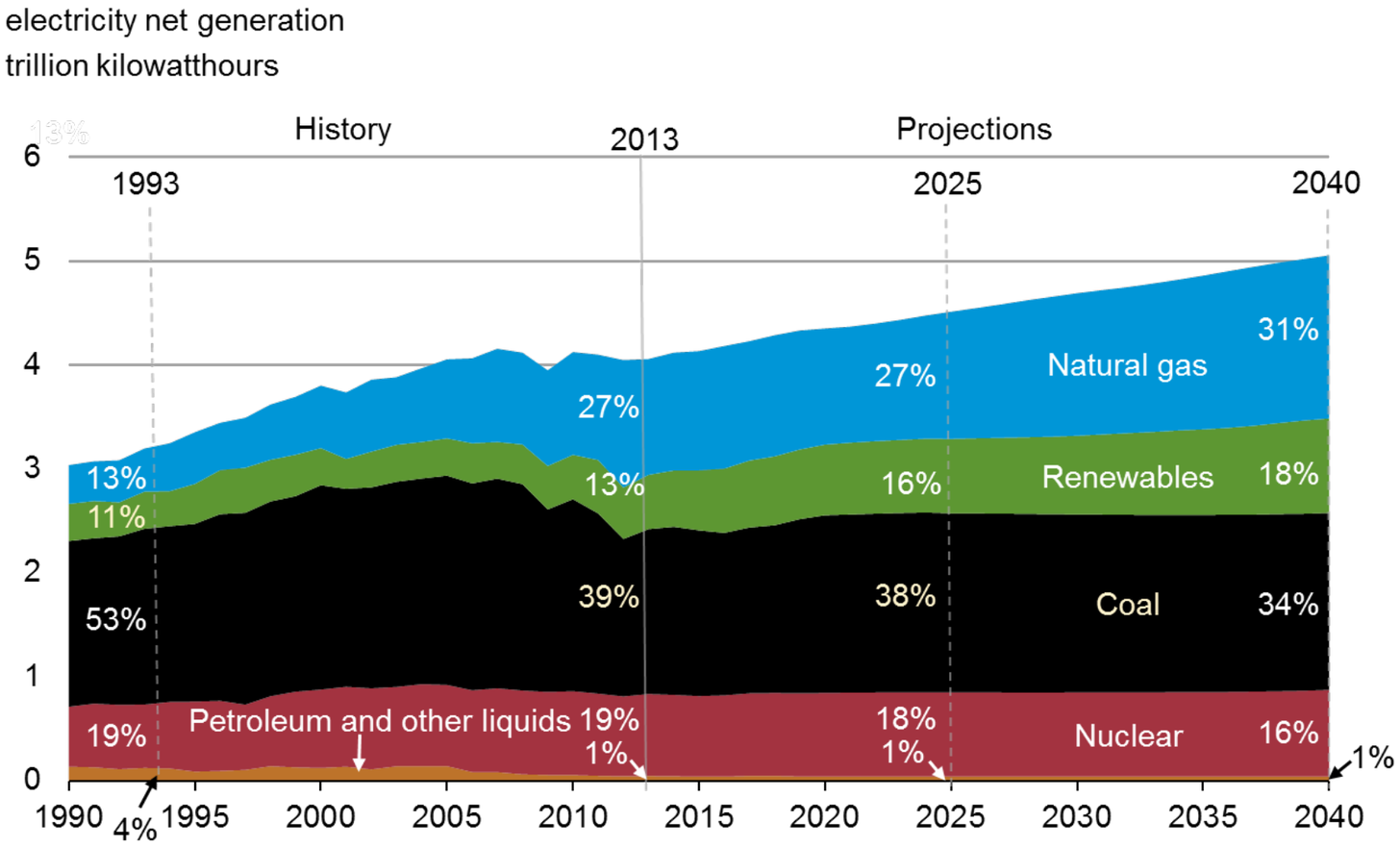
Source The Washington Post Aug 2 2015

Represents ~30% of All Capacity at Risk…



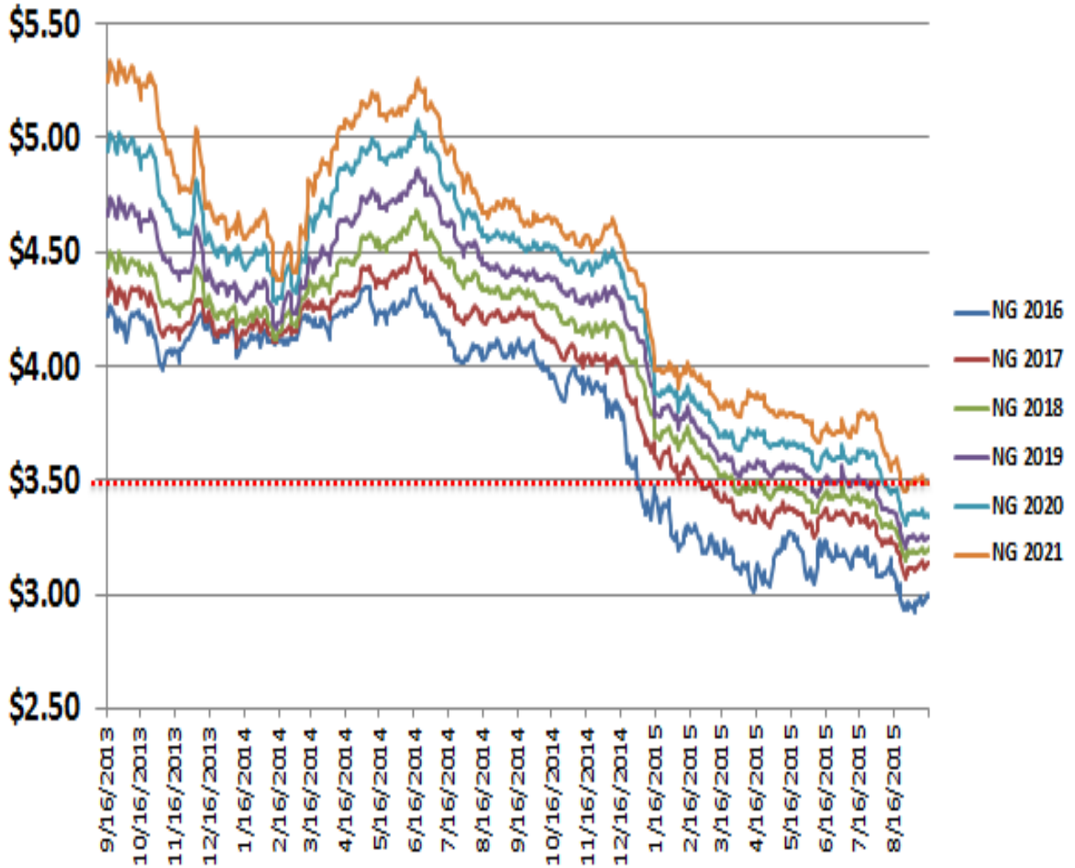
Source: EIA, Annual Energy Outlook 2015 Reference case

Will Grid Stability be Impacted by Shift to Renewables?



Source: EIA, Annual Energy Outlook 2015 Reference case

Lower Risk Premium in Out Years ('16-'21)…



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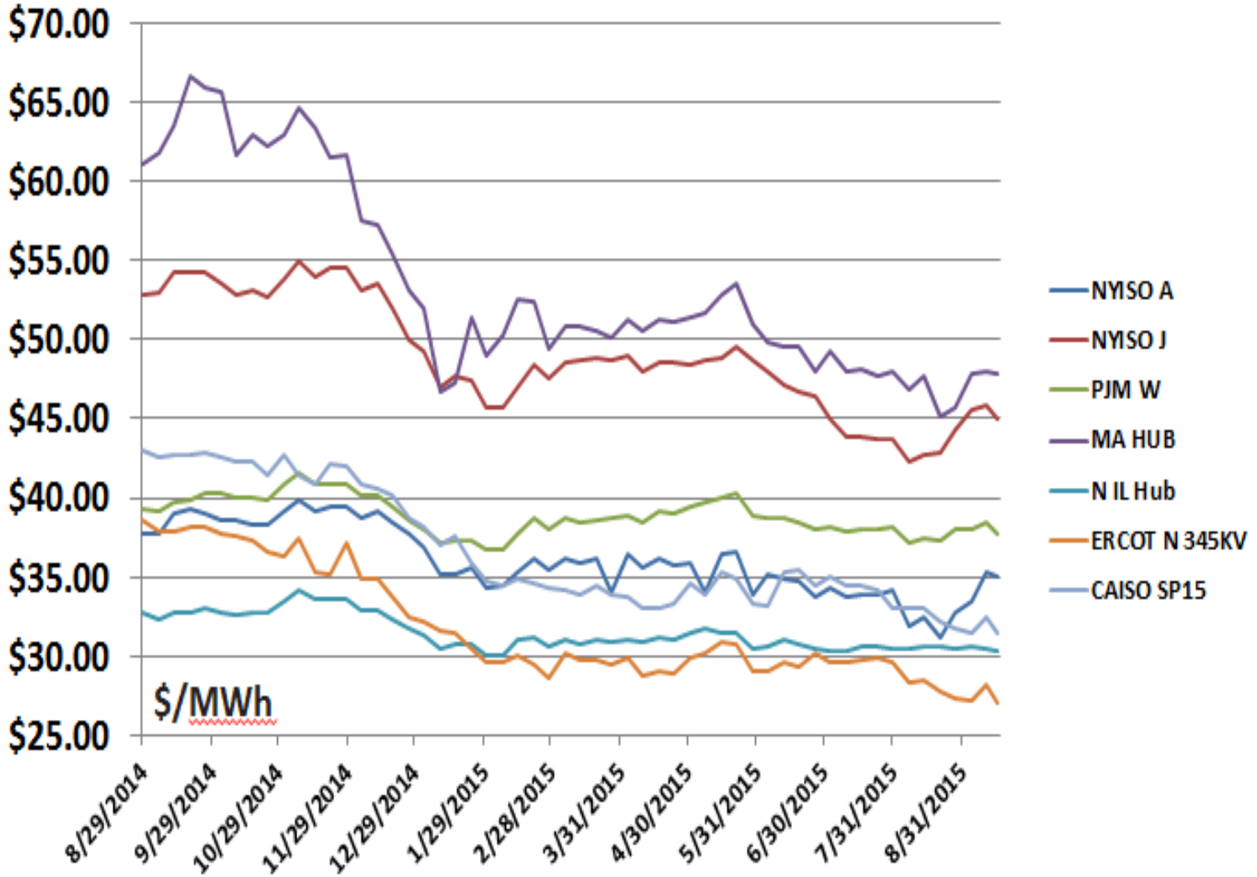
But Power Prices Vary Widely by Region



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Energy Market Summary:

- **Winter is Coming...**
- **Prolific Shale Gas Production**
- **The EPA is Coming…**
- **The End of Fossil Fuel Era**

Regulatory Overview-
Current and Pending Legislation

West Coast - Getting Greener Even with the Drought…

- Governor Brown's goal to significantly increase California's commitment to reducing GHG emissions – Senate Bill 350 has been introduced that proposes the following by 2030:
  - 50% reduction in petroleum use;
  - 50% power coming from renewable energy by 2030;
  - 50% increase in energy efficiency in existing building

- SB 350 is on track for passage this year, but must pass the California Legislature by middle of September

- The renewable energy requirement increase begins post 2020 – Current law already requires 33% renewable by 2020

Expansion of Customer Choice… Hurry Up and Wait!

- Senate Bill 286 would expand ***Direct Access*** in California by 8 GWHs, but it would require that all new, incremental direct access meet a 100% renewable requirement

- The earliest this legislation could become effective is 2017 while legislative discussions continue to try and make SB 286 more manageable by lowering the renewable requirement

Regulators Take a Break in ERCOT

- Regulatory activity is slow as regulators don't want to invite attention from the Legislature and this year was no different
- As a result, regulatory activity this year has been slow – Next legislative session is 2017
- Good for customers because little activity means regulatory certainty for the next 12-18 months

Who Needs Resource Adequacy when Reserve Margins are Strong?

- Resource Adequacy (i.e. the level of reserves) was a contentious debate at the PUC after extreme weather of 2011 stressed the ERCOT system, but ended in early 2014 when the ERCOT energy-only market was chosen and implementation of a capacity market was rejected.
- In the ERCOT energy-only market, high prices in real-time energy market are highly correlated with scarcity in reserves and the real-time energy price cap in ERCOT now is $9,000/MWh
- ERCOT reserve margins appear robust for the next several years, but wildcard in the future is potential impact of EPA regulations on reserve margins

Polar Vortex Hangover (Capacity) and DR at the Supreme Court

- Impact of the new capacity performance product/model driven by the events around the Polar Vortex of 2014 is the number one concern for customers and suppliers at this point in time. Increased cost should equal increased reliability.

- Raising the energy cap from $1,000/MWh to a more appropriate level is a big stakeholder focus at this point. Some suppliers support raising the cap with proper market monitoring oversight as it will likely reduce up-lift and provide better price signals because locational marginal prices (LMPs) will more accurately reflect the true cost of generation.

- Implementation of Demand Response after the Supreme Court order remains a concern both in how the Supreme Court rules on it (whether it is, in fact, appropriately treated as a wholesale product subject to FERC jurisdiction) and what impact the outcome will have on retail customers and prices in the PJM marketplace

Reforming the Energy Vision – Revving' Up in New York

- Reliability Must Run rules for generators that announce retirement but then are needed for reliability reasons are being developed in NY. It is unclear yet how these costs will be developed and allocated to customers.
- Demand Response and better incorporation of behind the meter generation into the NYISO model of primary concern for customers and generators
- Reforming the Energy Vision (REV) rules are being developed by the NYPSC and are likely to have an impact on wholesale and retail markets in the areas of renewables, distributed generation, energy efficiency, and energy management products and technologies

NYISO

New England's Clam Chowder of Energy Issues…

- Competing filings at FERC on proposed ISO winter reliability program for 2015/2016. Important issue for customers as costs of the program go to load.

- Multiple NE states considering two major interventions in energy markets: (1) entering into long-term contracts for Canadian hydro, and (2) requiring utilities to acquire long-term gas pipeline capacity to help finance incremental capacity.

- Mass Governor Charlie Baker filed a bill that would eliminate the cap on net energy metering for renewables, but create a new payment standard for projects above the 1600 MW goal for total solar capacity. Legislative activity on solar and other energy issues is expected to extend into 2016.

ISO new england

Canada, Eh!

- Considerable regulatory uncertainty with newly elected Alberta government possibly accelerating phase-out of coal by 2020
    - Coal currently provides ~50% of baseload power
- New Alberta government announced the carbon tax on larger emitters will be increasing from $15/ton today to $20/ton Jan 1, 2016 and $30/ton Jan 1, 2017
    - Equates to an increase of $4/MWh spread across current supply stack)
- Ontario is weighing the applicability of moving towards a capacity power market by 2017
- Ontario is the first jurisdiction to implement Canada's version of Dodd-Frank on July 1, 2015 requiring that all financial swap transactions must be reported to regulators. Alberta reporting will start in Q1 2016.

Canada

Obama's Clean, Green Regime…

- On August 3rd, EPA recently released a rule - 111(d) requiring States to reduce CO2 emissions or emission rates—measured in lbs of CO2 emissions per MWh of electricity generation from existing fossil fuel electricity generating units.
- EPA estimates that in 2030, the CPP will result in CO2 emission levels from the electric power sector that are 32% below 2005 levels
- EPA set emission reduction goals with State choice on how to meet the goals and States that refuse are subject to Federal plan – options proposed August 3rd
- State plans filed or an extension filed by Sept 6, 2016 with final plans due no later than Sept. 6, 2018 with 15 years for full implementation showing demonstrable progress through incremental steps
- EPA is creating incentives to award investment in low income demand side efficiency, wind and solar and discourage a rush to natural gas. Nuclear under construction counts, but existing nuke plants are no longer part of the plan

FERC
FEDERAL ENERGY REGULATORY COMMISSION

The Clean Power Plan – It's a State of Mind…

- Rate-based or mass-based plans
  - **Rate based**: power fleet adheres to an average amount of carbon per unit of power produced
  - **Mass based**: cap total tons of carbon the power sector emits each year

- Emission standards or State Measures plans
  - **Emissions**: assigns standards to generators
  - **State**: include limits and additional programs to offset such as renewables or efficiency standards
  - Both can include trading inside/outside the state

- **Reliability**: States must demonstrate in their plan

- Challenge to EPA's jurisdiction to set targets across the power sector

- EPA jurisdiction in light of a 1990 amendment which could be interpreted to bar from crafting new rules for a pollutant already regulated (i.e. carbon is regulated in the Clean Air act)

FERC
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Evolution of the Energy Supply Equation

Supply Side Timeline

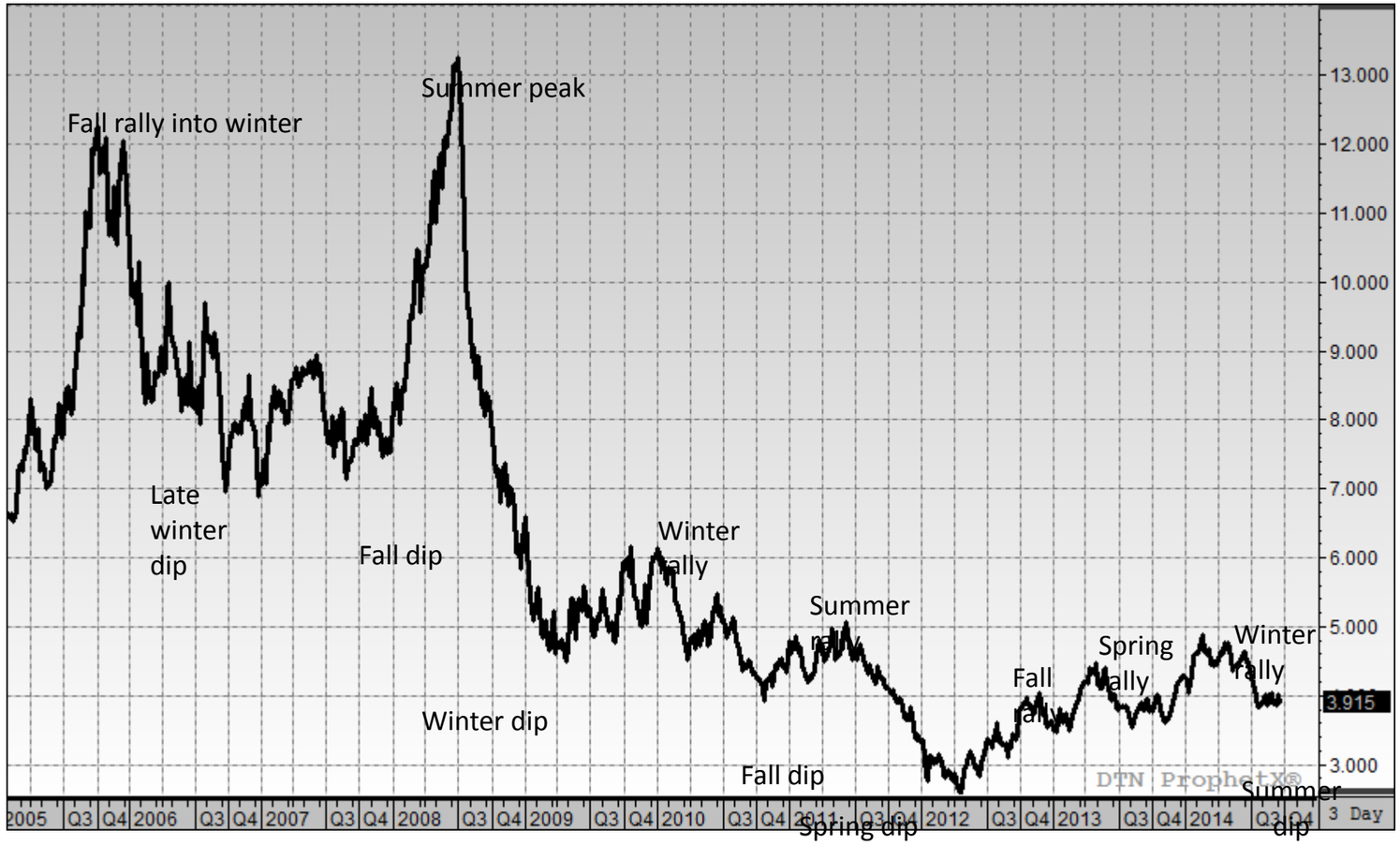
Utility Tariff Management	Customer Choice	Risk Management	Focus on Sustainability	Distributed Generation
1980's – 1990's	Late 1990's	Mid 2000's	Late 2000's	2010's - Today
• No Retail Supply Options • Work with Utility Account Rep to audit bills • Utility focus on grid reliability; recovery of stranded costs	• Limited Supply Options • Work with Supplier Rep on Simple Product Options • Grid reliability moves from utility to RTO/ISO	• Many Supplier Options • Complex products to manage risk • Development of DA/RT price signals • Emergence brokers / consultants	• New Entrants join Established Retail Energy Suppliers • Integration of Renewables into Supply Strategies • Disconnect with Commodity Supply	• More New Entrants and Exit of Utility Affiliates • Supply "projects" enabled by tech / based economics • Customer use DG for own reliability

When is the Right Time to Buy?

- Fall Dip before Cold Winter?
- Summer Dip after Spring Rally?
- Winter Dip due to Mild Weather?
- Spring Dip before Summer Rally?

There is no "Right Time" to Buy...

- NYMEX natural gas curve illustrates there are no consistent trends



Know your business, know the market, and have a platform to execute…

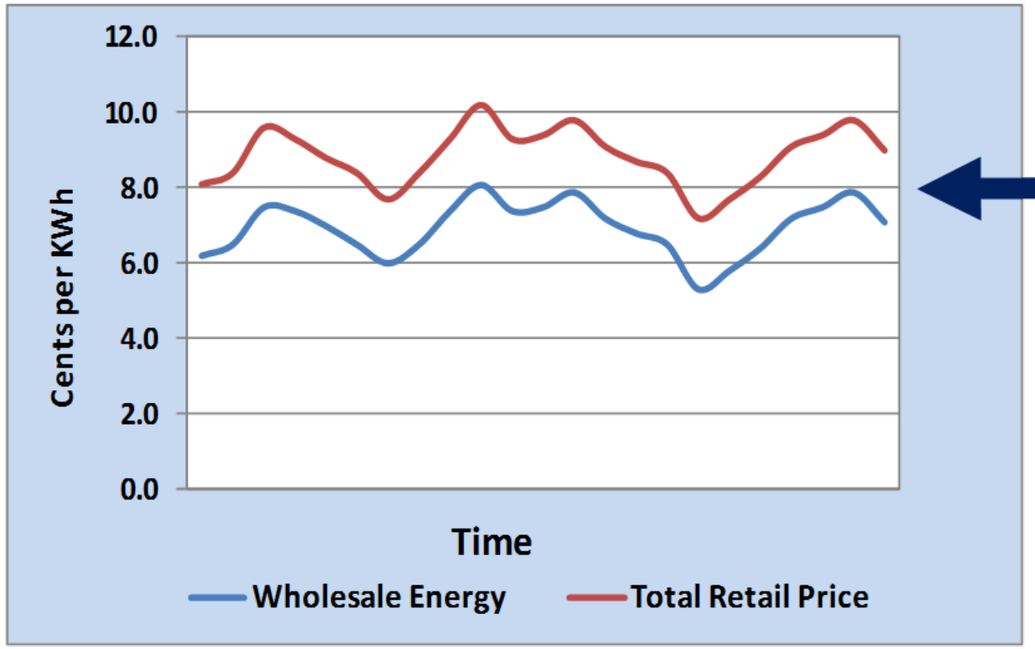
Electricity Product Risk Profile

	Index	Fixed	Managed
Risk Spectrum	High	Moderate	Low
Exploring Product Risk	• Complete exposure to market volatility • No limit to upside risk • Pricing uncertainty can increase Op Ex	• Price certainty, but only have one chance to "time" the market • No optionality to buy if market drops • Fully exposed to market upside while waiting	• Risk is spread over multiple layers • Can layer in defensive buys based on market movements • Access to Energy Advisor to help navigate the market

Reminder - There is no product structure that fully removes market exposure & risk

Retail Adders are an Important and Growing Part of Overall Supply Cost

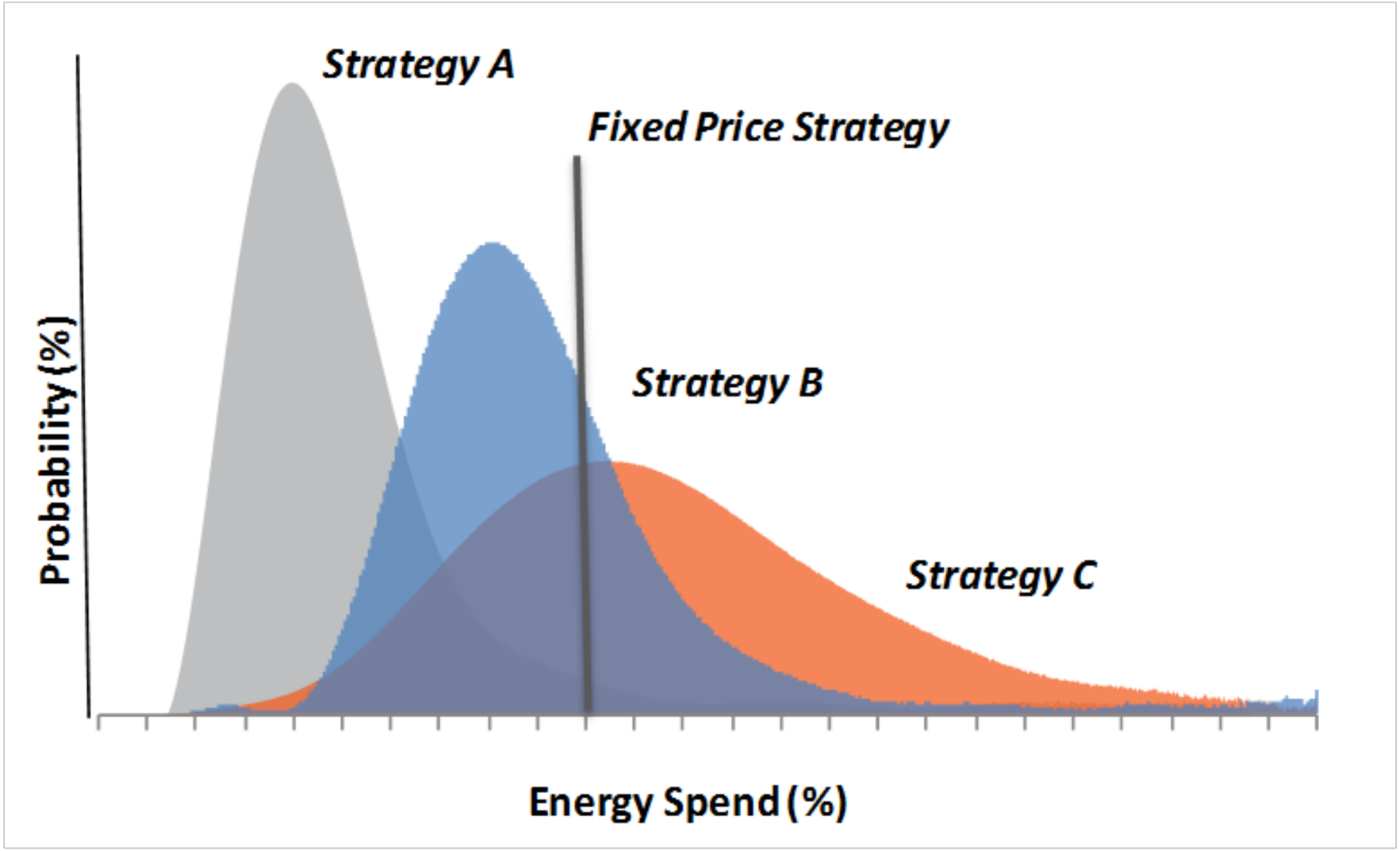
- Wholesale energy is both the most volatile and the largest portion of total spend
- Demand-based components are the most significant costs in the retail adders
  - Future rate is dependent on managing the capacity and transmission peak load contribution (PLC) values
  - Capacity is an especially Hot Topic right now (PJM, NY, NE)
- Renewables will become a bigger part of the cost build-up in the future



- Retail Adders:
  - Ancillaries
  - ***Capacity****
  - Losses
  - ***Renewables****
  - ***Transmission****
  - Management Fee

Fixed Price vs Managed Hedging Strategies

- Range of expected energy spend outcomes based on conservative, moderate or aggressive hedging scenarios
- Fixed price results in highest probability, but also potentially higher spend
- Market fundamentals and price trend analysis of managed approach can yield high probability and lower price



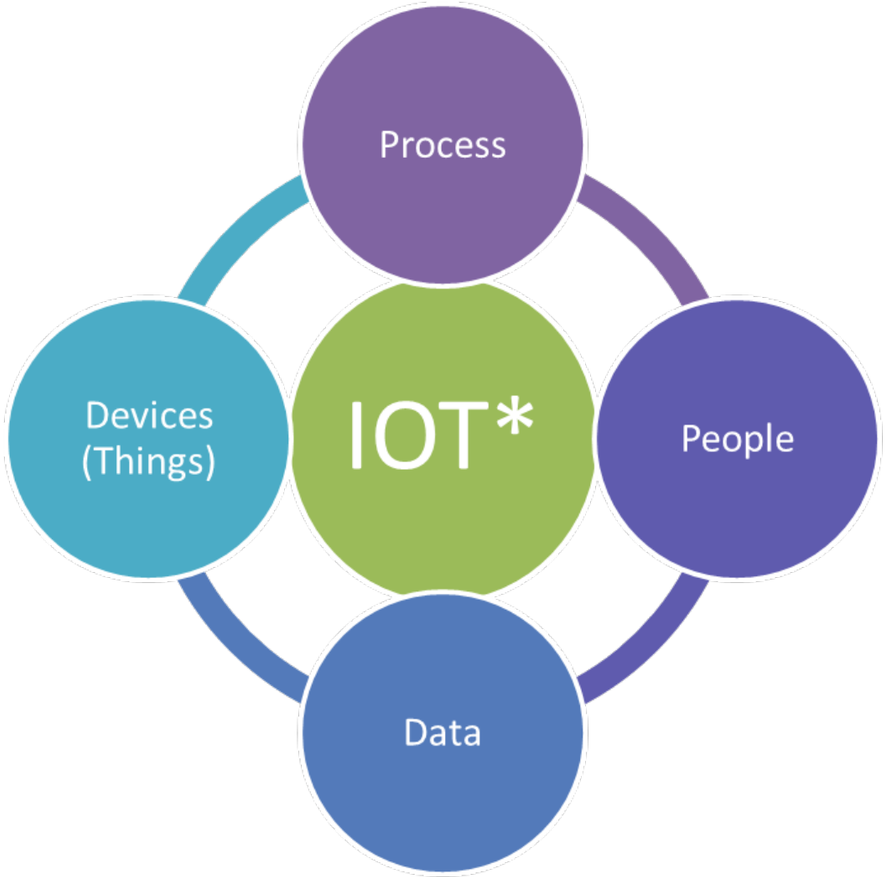
The Changing Nature of the Demand Side Equation

Demand Side Timeline

1970's – 1980's	Late 80's – 90's	2000's	Late 2000's	2010's - Today
• Demand Side Management (DSM) coined after 70's energy crises • Early state-level energy efficiency / conserve programs developed (CA, WI)	• EPA – Greenlights Program Introduced • VFD's, Controls and Occupancy Sensors • Building automation and controls introduced	• EPA Energy Star Top 25% supermarkets introduced 2001 • ISO/Utility based DR programs developed • Advanced / automation control	• More Granular Management of energy data • Sophisticated controls for large customers • Fiscal crisis / high energy prices	• Rise in integrated / connected controls and automation • Death of the ISO DR programs? • Technology rapidly changing economics of DSM

New Business Models are being Developed based upon Actionable Insights…

- Possible based on connectivity with Internet
- Increasingly executed via use of mobile devices and apps
- Increase ROI and shorten payback period



* Internet of Things (IOT)

Improved Operations
- Prevent equipment performance drift
- Monitor and drive users behavior change
- Benchmark devices to find inefficiencies

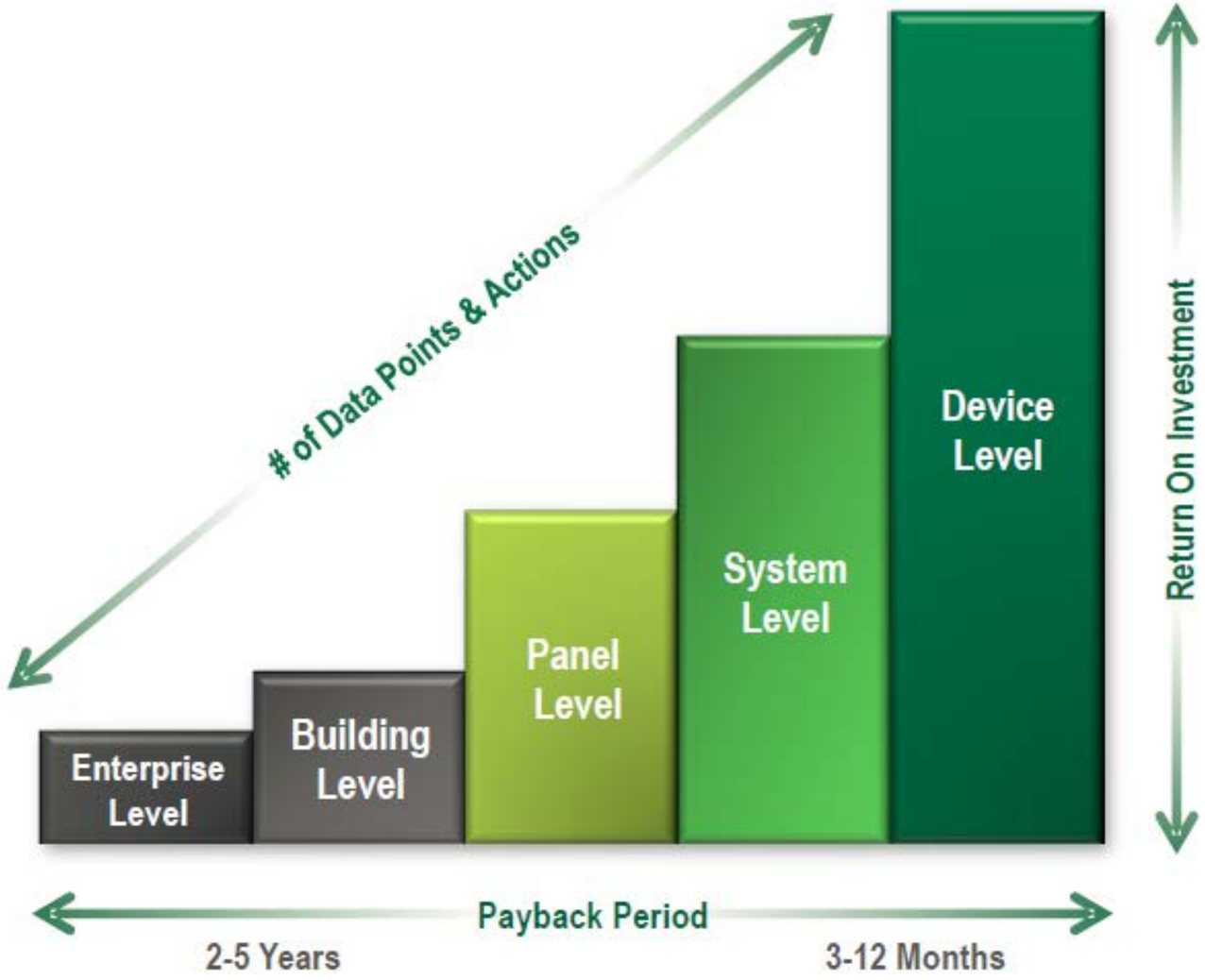
Energy Optimization & Cost Savings
- Real-time energy waste alerts
- Lower peak demand
- Ensure proper operation of BMS

Predictive Maintenance
- In advance failure detection
- Monitor technicians' corrective actions
- Prioritize maintenance visits

Source: Panoramic Power

Maximizing Return on Energy Investment (ROEI) by measurement shift from Enterprise Level to the Device Level…

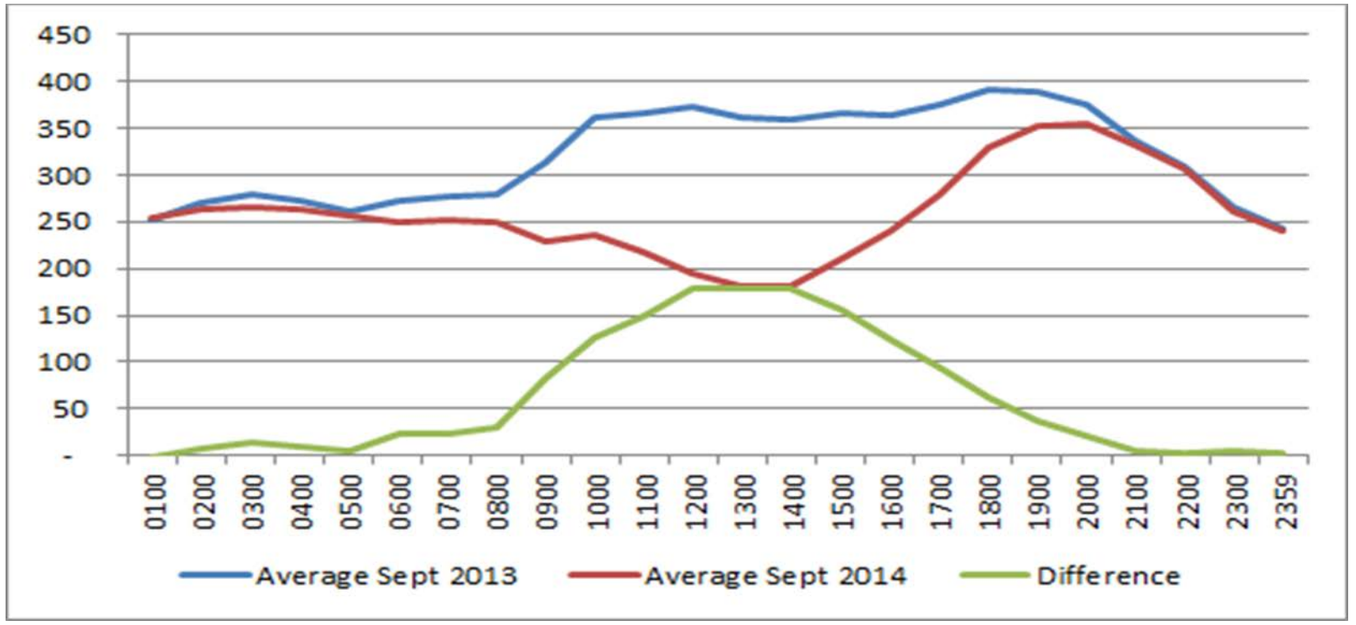
- Operational Efficiency
- Energy Efficiency
- Interrelated Systems Performance
- Advanced Failure Detection
- Peak Load Reduction Strategies
- Energy Modeling
- Efficiency Benchmarking & Comparisons
- Behavioral Recommendations



Source: Panoramic Power

The Impact of Solar on Big Box Grocery Demand…

- PV solar installation on large box / grocery customer in New Jersey
- 17 year PPA with zero escalator, coincident with end of lease
- 20% reduction in usage results in 22% savings in demand side charges
- Additional savings on non-bypassable distribution charges (not quantified)



USAGE SAVINGS

	Wtd Avg LMP	Usage	Spend
Sep-13	23.75	231,545	$5,500
Sep-14	23.11	185,940	$4,297
Savings	0.64	45,604	$1,203
Reduction		20%	

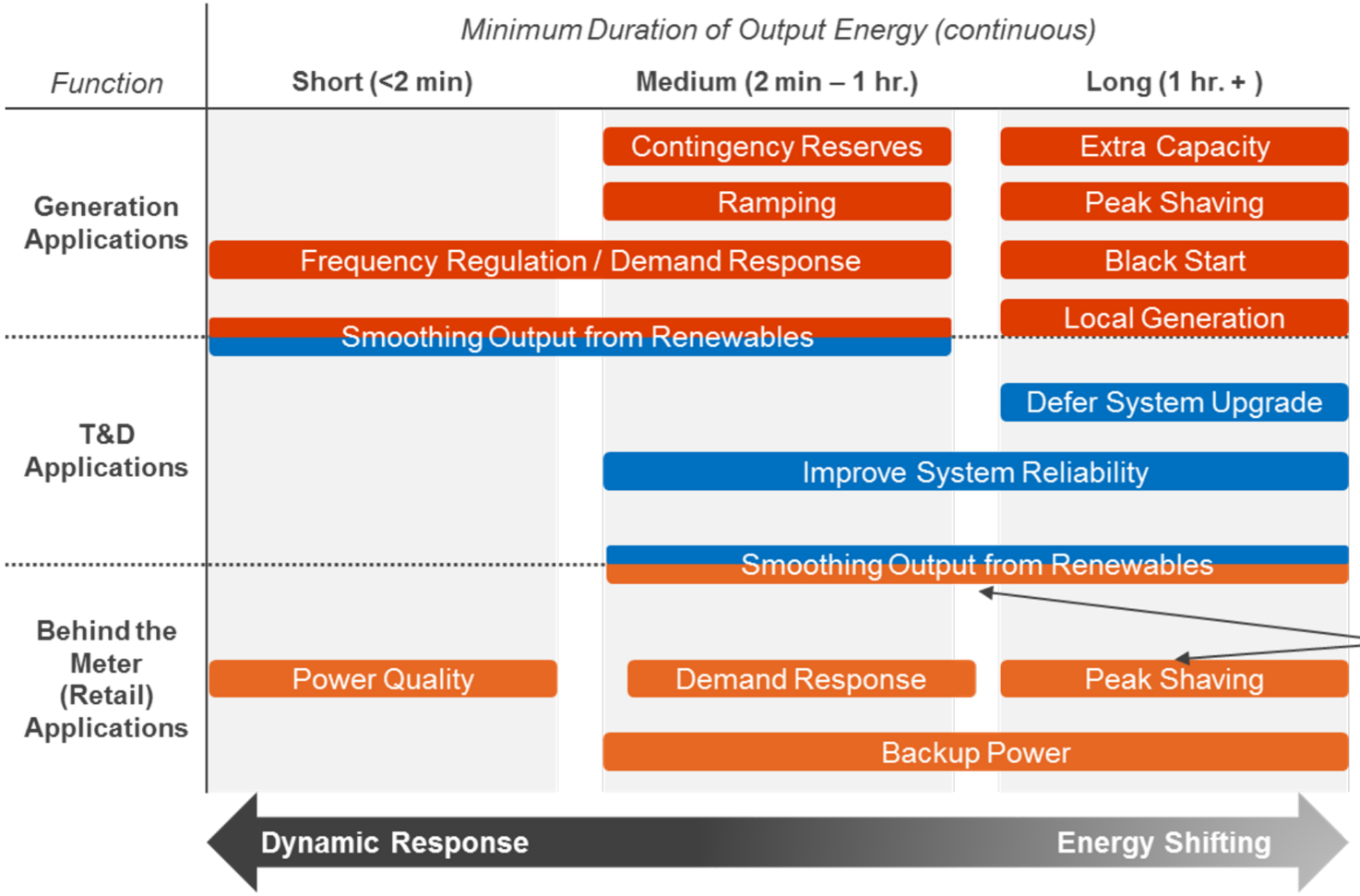
DEMAND SAVINGS

	Cap Tag	Trans Tag
Pre-Solar	616.61	558.75
Post-Solar	399.66	377.69
Savings	$1,085	$905
Reduction	35%	32%

*Savings assumes $5/kW-month rate

Impact of Battery Storage on Demand

Where Does Storage Fit on the Energy Value Chain?



62.5% of customer or 3rd party owned storage is used to **support renewables or reduce demand charges by shifting load**

*California Energy Storage Procurement Webinar 6 Nov 2013; See Appendix for Glossary of Terms

Example: Food Distribution Center - DSM Savings

Managed Supply Approach

- Vehicle to facilitate total energy Management (TEM)
- Able to take layering approach when hedging. Dollar cost averaging
- Incorporated Efficiency to lower hedge price

Demand Response

- Using Demand Response payments to reduce tax liability
- 3MW Available Demand Response

Energy Efficiency

- DR payments used to pay for Energy Efficiency Project
- 20.4% kWh (usage) reduced from total Utility invoice
- 14.7% Demand Reduction

TOTAL COMBINED SAVINGS: $1MM+

Example: Regional Grocer – Locations in Regulated and Deregulated Markets

Managed Supply

- 203 locations
- 360,000 Annual MWhs
  - Weekly Strategy Calls
  - Quarterly Energy Reviews

Demand Response

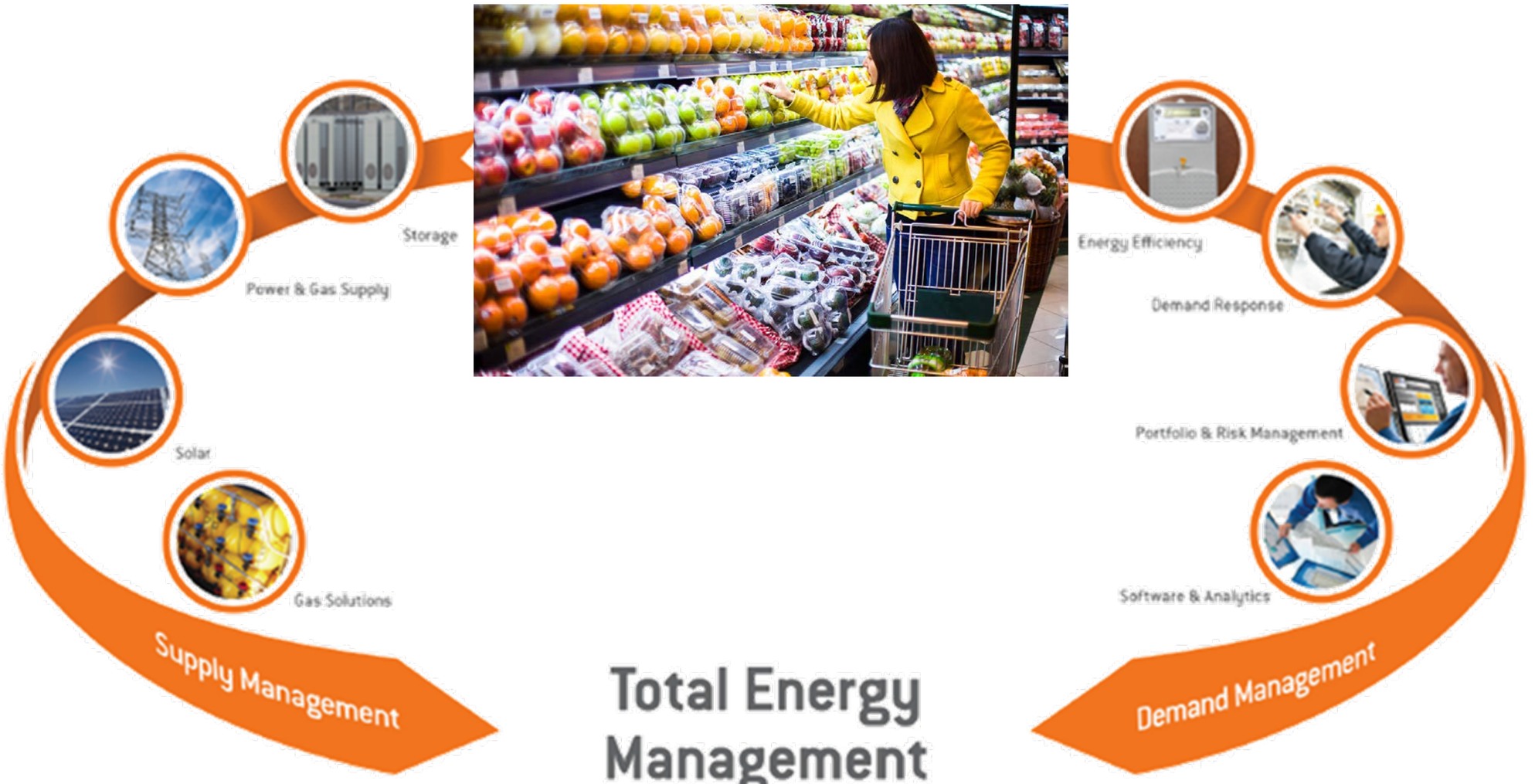
- 14.5 MW Available for DR
  - Creative solution to activate backup generation, 15 total generators
  - Serve 137 stores in both regulated and deregulated markets

Solar

- Rooftop PV
- Mix of Cash and PPA Finance
- 23 Grocery Stores ~6.6 MW
  - Regulated Market
- 4 Distribution Centers ~6.4 MW
  - Deregulated Markets

One Stop Shop – Total Energy Management

Future Threats and Opportunities


Storage
Power & Gas Supply
Solar
Gas Solutions
Supply Management
Energy Efficiency
Demand Response
Portfolio & Risk Management
Software & Analytics
Demand Management
Total Energy Management

We recently surveyed a number of grocery energy managers and here's what they had to say…

Reliability of energy supply and a growing reliance on distributed generation for self-sufficiency due to the inertia of the utility industry to keep up with increasingly rapid changes in technology…