The Missing Energy Crisis & What it Tells Us About the Energy System of the Future

Acadia Center
Advancing the Clean Energy Future

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Part III: Figuring Out the Solutions

Our energy system is evolving and will look very different in years to come from what we have today. Electricity produced by solar, wind, and other renewable technologies will power our cars and provide efficient heating. Homeowners and businesses will anchor an integrated grid with power flowing between consumers and among smart appliances and batteries within energy-sipping buildings.

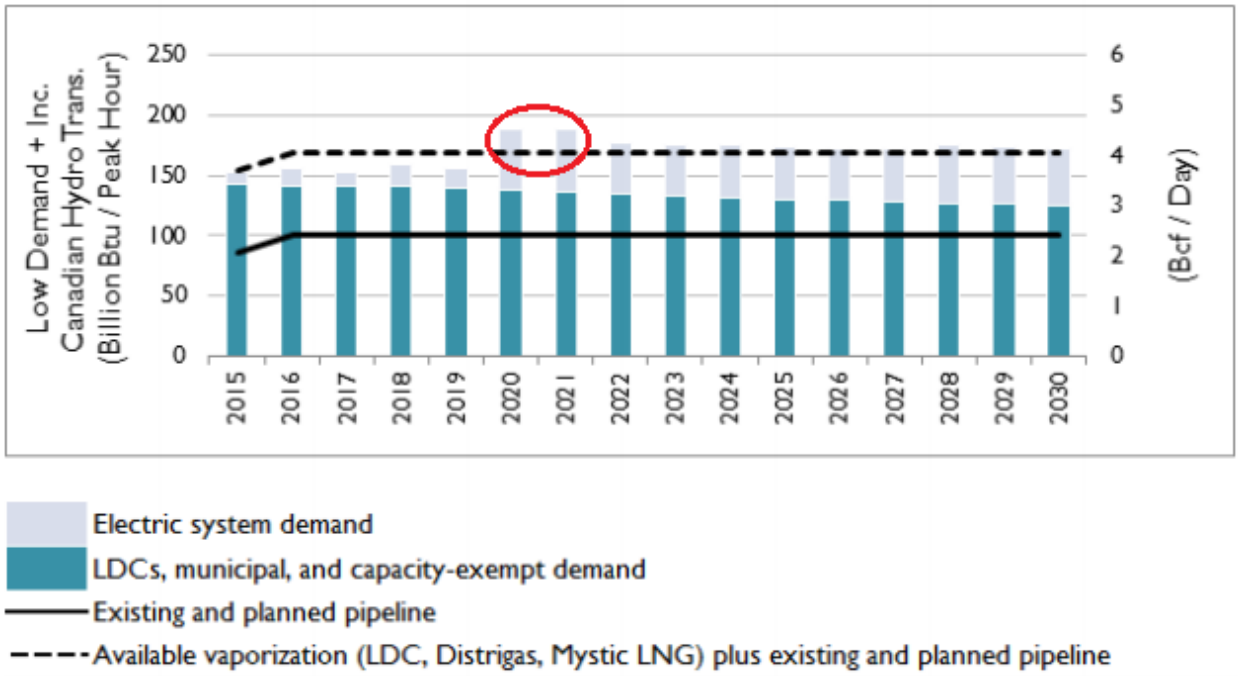
The transition is underway. In 2013 more renewables came online than coal, oil, and natural gas generation combined, and financial analysts think there is no going back. Sales are booming for heat pumps capable of pumping out hot air in the depths of New England winters and efficiently cooling buildings in the summer. Electric vehicle maker Tesla is the first US auto company to go public since Ford Motors in 1956, and the company just rolled out a home energy storage system that some think could be even more valuable than the celebrated electric vehicle line. Business heavyweights ranging from Google to Comcast are focusing on the growing home energy management market to optimize how our appliances, heating systems, and electric vehicles interact with each other and the power grid.

However, technological trends and consumer preferences are running up against regulations designed for an outdated model where centralized, fossil fuel-burning power plants send power one way to passive consumers who do not store or generate energy or manage usage. The rules written for this old model prioritize over-building the system so that it can meet infrequent peak demands – often without accounting for cheaper and smarter solutions that reduce energy demand and avoid the need for excess infrastructure. Part III of this series describes how the rules governing our energy system need to change, and how these changes could help address the energy challenges that face the region.

Determining the True Energy Need

Part I of this series described the challenges the northeast is facing due to over-reliance on natural gas and pending retirement of outdated power plants, and went on to detail the role that market reforms, lower fuel prices, and clean energy played in bolstering the grid's performance during record cold this past winter. Part II explored states' efforts to increase energy supplies though subsidies for natural gas pipelines and procurements of renewable energy, hydroelectricity and related transmission. In conjunction, expenditures on supply infrastructure and long-term contracts could total $20 billion to $30 billion – even before fully accounting for the cost of natural gas and electricity that would flow through these pipes and wires. With a price tag in the neighborhood of the Big Dig, ratepayers who would end up covering these costs need assurances that potentially cheaper alternatives have been exhausted and that proposed expenditures align with consumer interests. On both fronts more work is needed.

Efforts to identify solutions to the region's energy needs have largely failed to account for the energy sector's transition toward distributed solutions like efficiency and distributed generation, and have not addressed how expenditures on long-lived infrastructure align with states' climate commitments. Unsurprisingly, this has resulted in the promotion of large gas pipelines and transmission lines, a lack of adequate consideration for demand-side solutions, and no discussion of how states plan to expand reliance on natural gas and still meet statutory greenhouse gas (GHG) reduction requirements. An example of this overly narrow approach is a 2013 analysis commissioned by New England states that found potential benefits of either expanding pipelines or importing hydropower. The study additionally found that lowering demand through expanded energy efficiency, distributed generation and renewable heating technologies could avoid the need for new infrastructure, but the cost of achieving this "Low Demand Scenario" was not determined. Responding to pressure for full evaluation of gas pipeline alternatives, Massachusetts commissioned an additional study to determine whether a "Low Demand Scenario" could avoid the need for more pipeline capacity. Despite its limitations – including failing to account for demand side solutions outside of Massachusetts, and using now-outdated prices for oil and liquefied natural gas (which can both displace the need for pipeline gas before more renewables come online) – the study identified only two years (2020 and 2021) during which demand meaningfully outstripped supply (see figure below from p. 5 of the report). Gas demand is then scaled back in 2022 when new hydroelectric imports reduce the need for gas generation.



With energy resources in Massachusetts alone able to reduce the region's gas pipeline needs to only two years, it is clear that the effort to identify solutions needs to be expanded to the region as a whole. Capturing cost-effective energy savings from customers outside of Massachusetts may avoid the need for new pipelines. Holding back on a deeper addiction to natural gas could also keep states within reach of achieving climate targets – something that the Massachusetts analysis finds is impossible with new gas pipeline capacity. Updated analysis is further needed to account for improved coordination of gas and electric markets, as well as new lower LNG and oil prices, which upend the economics of natural gas pipelines, and make all prior analyses outdated.

Pursuing a balanced mix of demand- and supply-side solutions may be more complex than going all-in on large projects. Relying on coordinated state-level efforts to improve energy efficiency, promote distributed generation, and develop incentives for renewable heating may seem daunting. But there is precedent for aligning states' policies to achieve shared outcomes: from the creation of the regional transmission grid, to pollution reductions achieved through the Regional Greenhouse Gas Initiative, to recent coordination on pipelines and transmission lines themselves.

And we should not kid ourselves, we will need to spend billions of dollars updating an energy grid that has been given a D+ grade by the American Society of Civil Engineers. But expenditures that we make in the energy system need to facilitate the transition to clean energy, and promote the

interests of consumers and society at large. In order to make progress on this needed transition to a clean energy system, we need further reforms of utility regulations.

Why Financial Regulatory Reform Matters

The bias favoring regional infrastructure projects over distributed solutions is rooted in a regulatory structure that has evolved over time to make infrastructure projects the most lucrative expenditures for utilities. In the 1990s, the New England electric market was 'restructured' to promote competition in electric generation. This was achieved by splitting vertically integrated power companies into separate entities owning generation, transmission, and distribution networks. In most of the northeast, utilities now own geographic sections of the grid, and buy power for their customers through competitive markets. Many of the region's utilities then went through 'decoupling' in order to remove the incentive to maximize sales and better align utility incentives with promoting energy efficiency. Now that utilities no longer own power plants and decoupling removes their ability to increase profits by maximizing sales, one of the few means for utilities to increase profits is building an ever-larger grid. Even when utilities are given incentives for achieving energy savings targets, the incentives are far lower than returns on infrastructure expenditures. For example, Massachusetts utilities get a 5% incentive for achieving energy savings, compared with returns of over 10.5% for spending on transmission.

This misalignment of incentives leads to overvaluing expensive, traditional infrastructure and undervaluing energy efficiency, one of the most effective tools we have to meet our energy needs. Every unit of electricity and natural gas saved across the region reduces energy prices and strain on the system during peaks. In order to quantify the benefits of energy efficiency, Acadia Center calculated electric demand reductions achieved by New England states since 2000, and found 2,164 MW of reductions in demand, equivalent to the combined capacity of coal and oil-fired Brayton Point (1,557 MW) and Pilgrim Nuclear (680 MW) power plants. Without these demand reductions, during the "polar vortex" winter of 2013/2014:

- Demand would have been 14% higher
- The price of wholesale electricity would have been 24% higher
- Overall costs for electricity would have been $1.5 billion higher

Saving electricity though measures such as LED lighting, building weatherization and incentives for efficient appliances costs about $0.04/kilowatt hour (kWh) – a quarter of the regional average wholesale price of $0.16/kWh during the winter of 2014.

Aligning Financial Incentives with the Public Interest

Determining the best mix of solutions to meet our energy needs will remain difficult until skewed utility incentives are realigned with the public interest. As long as investments in energy efficiency programs and other demand reduction measures are less lucrative than expenditures on supply infrastructure, utilities will face a fundamental conflict between the public's interest (reducing costs and GHG emissions) and their own commercial interest (maximizing profitability).

The good news is that financial incentives can be changed, and some states and utilities are already preparing for these changes. State and federal regulators have direct control over returns that utilities are allowed to earn on different types of expenditures. New York regulators are undertaking ambitious reforms to base utility revenue on a combination of factors, including creation of competitive markets to serve customers' energy needs and new performance-based outcomes ranging from integration of renewables to maintenance of reliability. With arguably the most complex and expensive electric network in the nation, Con Edison – which serves Manhattan, Queens, and Brooklyn – has been testing the use of energy efficiency to postpone costly infrastructure upgrades since 2003. Building on early successes, the utility has recently proposed to invest $200 million in alternative customer-side and utility-side investments in order to delay a $1 billion expenditure on traditional infrastructure upgrades. Significantly, Con Ed has asked its regulators to consider financial treatment of this project that would "make the Company indifferent to whether it invests in traditional or non-traditional solutions." While New York is seeking comprehensive and ambitious changes, utility managers across the country increasingly recognize the need to revise how they operate. In a recent survey of 200 US utility executives, "business model transformation" was the top priority."

The bad news is that until incentives are realigned and utilities become agnostic to the types of investments needed to meet consumers' needs, commercial pressures will motivate utilities to try to build as much infrastructure as possible. If utilities can convince policymakers and their regulators that infrastructure is necessary, they will generally be guaranteed profits on new pipes, poles, and wires, even if we do not end up needing them (because demand-side resources cause peaks to shrink) or wanting them (because cleaner, cheaper options become available). In the near term, we can account for this conflict of interest by applying appropriate skepticism to utilities' recent calls for massive infrastructure expenditures.

What Comes Next

Facilitating the transition to a decentralized, clean, consumer-centric energy system will require bold reforms in five areas described in Acadia Center's recently-released UtilityVision:

1) Empower the modern consumer by considering customer-sited solutions integral resources for efficient operation of the grid
2) Focus grid planning on consumers by allowing new technologies and energy management strategies to compete with traditional infrastructure expenditures
3) Align utility incentives with consumer and environmental goals through performance-based regulation and equal cost-recovery for non-traditional expenditures
4) Charge consumers for their true costs of using the grid to ensure the upkeep of the system and create incentives to reduce usage during peak demand periods
5) Pay consumers for the full value of the energy and energy services they provide by accounting for the unique benefits of distributed generation and customer-sited demand reductions

Absent these reforms we are headed for continuing over-build of the energy system which, in turn, will lead to escalating costs. Higher costs and lower overall consumption will increase rates and the motivation for customers with solar-compatible roofs or deep pockets to reduce energy usage or go off-grid. This will leave fewer customers to pay for the grid, resulting in still higher costs for remaining customers, and increasing public pressure on utilities. This is not a distant prospect. Analysis by RMI finds that customers in areas with high energy prices or lots of sun could economically pair solar and storage to defect from the grid within the next decade. Solar City seemingly validated this prediction in announcing that it will offer customers in Hawaii no-money-down solar-plus-storage systems next year, and plans to integrate storage with all solar offerings within five to ten years.

The other option is for utilities to truly reform their business models and focus on providing customers with energy services – the comfortable homes, cold drinks and hot showers that we care about – rather than energy itself. This will allow utilities to use their engineering expertise to keep the system operating efficiently and make it financially attractive for empowered customers to stay on the grid.

The future energy system is already taking shape. The question is whether we cling to outdated rules and behaviors that divide us into energy 'have's' and 'have-nots,' or whether we adapt to new technologies that can give us a cleaner, smarter, and more inclusive energy system in the future.

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 Installments in this analysis series are also available at: http://acadiacenter.org/document/the-missing-energy-crisis/