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A Resilient Energy System for a Challenging Climate:
Recommendations of Environmental Defense Fund
November, 2012

Hurricane Sandy has shown us that our energy system is not up to the challenges of the present day. We must make our traditional systems more resistant to damage through "hardening." But we must also begin building a 21st century system that will keep us safe and secure for decades to come. An energy system that will meet the needs of New Yorkers in a changing world requires not only strength, but also the flexibility and diversity that together make for true resilience.

An electric system too reliant on centralized generation and transmission and fuel availability will be far more vulnerable to shocks than it needs to be. Just as diversity gives ecosystems the ability to resist or recover from disturbance by providing more coping options, an energy system with greater resource diversity will have more options for responding to both natural and manmade disasters. A mix of large and small resources, of renewables, clean co-generation, and demand side resources, will not only be capable of powering communities in times of stress, but also create economic opportunities for the growing number of New York-based enterprises developing smart grid and customer technologies and services, and help tackle the underlying cause of these mounting disasters: climate change. In addition, a resilient system will have brains as well as brawn: the system intelligence needed to cordon off damage, reroute power, pinpoint outages and integrate distributed and intermittent resources.

While natural gas service weathered Hurricane Sandy better than electric utilities, systematic insufficient maintenance of the pipeline network threatens to undermine that record and disrupt a critical backup energy supply system. New York State's pipeline infrastructure is old, especially in New York City, and composed in significant part of leak-prone cast iron and unprotected steel, which have high emissions factors. When these pipes have leaks, they are more susceptible to corrosion from water infiltration, especially during storm conditions. Some of the leaks may be individually too small to be corrected under New York State's current leak repair schedule, but storm-related corrosion could increase leak rates, leading to life-threatening hazards like those seen in the San Bruno, CA, disaster of 2010 and the Allentown, PA disaster of 2011. More broadly, when natural gas leaks out of the pipeline network, the methane released into the atmosphere acts as an extremely powerful greenhouse gas in the short term, at least twenty-five times more potent than carbon dioxide. To that end, minimizing natural gas leaks from the transmission and distribution system is not just a priority for public safety, service reliability and reducing resource loss, but it also has a significant impact on New York State's climate footprint.

Decisions made today will shape our state's infrastructure for two generations or more. Therefore, as the PSC and New York's utility companies consider the options for building tomorrow's energy system, the cost/benefit analysis needs to reflect not only the upfront cost to build but also future costs: from climate change and public health impacts, fuel price volatility, obsolete assets – and a sophisticated benefits calculation that properly considers such values as resiliency and hedging against future fuel prices. Many residents and businesses are already making substantial investments to ride out the next storm, typically in polluting fossil-fueled generators that will only add to fuel supply vulnerabilities, and exacerbate public health damage and climate change.

We have therefore a unique and urgent opportunity – and responsibility – to leverage those private investments through public policies to increase our energy security and reliance on New York's own cleaner, lower-carbon resources.

Key Recommendations

1. **Require New York's utilities to build a smarter grid.** As is being done in other states, New York policymakers should require all utilities to develop infrastructure modernization plans and demonstrate how all investments will contribute to resiliency – and to New York's other policy goals, including the RPS and New York's commitment to reduce greenhouse emissions to 80% below 1990 levels by 2050. Investments should only be approved as "prudent" if they will contribute to grid resiliency over the long term.
    - Expand metrics to annually assess utility performance on improving the reliability and resiliency of its own system and enabling customers to be self-reliant in an emergency.
    - Require utility companies to develop maximally flexible and interoperable platforms to accommodate the broadest diversity of resources, market participants, technologies and services, including allowing empowered consumers to play significant new roles.[1]
    - Require utilities to facilitate private financing for these new technologies and services, expanding on-bill repayment to reach private financing.
2. **Enable owners of clean supply resources to provide energy services to the grid, or for their own use, as needed.** This allows private investments designed primarily for clean energy and efficiency to serve an additional function by providing service continuity during an outage, and can render less sustainable backup generation resources unnecessary for some customers.
    - Reduce barriers to homes' and businesses' use of distributed generation for limited stand-alone self-supply during grid outages.

[1] Smart Grid initiatives have been spurred in some other states by a combination of legislative action and state Commission action. For information on the development of a smart grid in California, see, e.g. Senate Bill 17 (Padilla), a CPUC analysis of SB17, an EDF "Report Card", the CPUC 2011 annual report to governor and legislature on smart grid, and a summary of recent CPUC decisions/dockets for more on the development of a smart grid in California. For information on the development of a smart grid in Illinois, see, e.g., and Section 16-108.6 of the Illinois Energy Infrastructure Modernization Act section (220 ILCS 5/16-108.6), as well as the *List of Operational Tracking Measures Included in the Revised ComEd Smart Grid AMI Plan, available on page 9 of the CUB/ELPC brief, available as a link here*. In the New York context, pages 88-89 of the *Energy Highway Blueprint* recommend that the PSC adopt a more premeditated, comprehensive framework for utility smart grid expenditures. For a comprehensive look at the status of smart grid legislative and regulatory parties, state-by-state, as of late December 2011, see the U.S. Energy Information Administration's *Smart Grid Legislative and Regulatory Policies and Case Studies*.

        - A committee at the Institute of Electrical and Electronics Engineers (IEEE), with help from Oak Ridge National Labs, the Electric Power Research Institutes and other experts, is working to revise its interconnection standard, IEEE Standard 1547 (which currently requires the automatic shut-down of solar panels in the event of a grid outage), to broaden self-supply capability. We recommend that the State of New York voice support for these efforts as a component of a more robust and reliable electric grid.
        - NYSERDA's Technology and Market Development program should tackle, on an accelerated timetable, the market maturity barriers, including an absence of consumer information and off-the-shelf options. According to PSC staff, a rooftop PV system could be put into service during a grid outage through use of a transfer switch to take the entire building (including the PV) off the grid. This option, however, has simply not penetrated into the marketplace.
        - The PSC should promptly address local utility policies and practices that hinder the development of clean distributed resources. An example of such a policy would be the fault current-related constraints imposed on customers by Con Edison in Manhattan. Combined heat and power (CHP) allows building owners to achieve high levels of fuel efficiency and reduce congestion locally, and can have the ancillary benefit of keeping a building or buildings operating during a system outage.[2] Where a proposed CHP project risks putting more energy onto the system than the current utility substation can handle, Con Edison does not spread the costs among customers, but instead requires the "last" applicant to foot the entire bill.[3] This policy treats comparable projects in a radically non-comparable manner, and kills otherwise promising projects. Similarly, the PSC should modify its practice of holding incremental customers financially liable for the full cost of some gas line extensions, which seriously constrains CHP development in Manhattan.
    - Develop rate structures that fully compensate energy customers for energy and other services they provide to the grid and to other customers. Today, owners of small distributed generation resources are compensated, if at all, through net metering, with the total net metering opportunity capped at a paltry 1% of a utility's load.
        - The PSC should immediately begin a proceeding to replace net metering with a compensation mechanism that rewards distributed generation resources for the full value of the energy and other services provided. Such values will include, for example,
            - the time value of peak solar production,
            - the fast response provided by demand and storage resources (for ancillary services),

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[2] For examples of CHP providing service continuity during Hurricane Sandy, see here.

[3] *See, e.g.,* NYSERDA, *New York Presbyterian Hospital Combined Heat and Power Project Commutating Current Limited Electric Power Transmission and Distribution (EPTD) Program*, February 2010 (on file with EDF and attached to the transmittal email).

- the locational value of easing congestion (particularly at peak) and thus avoiding the need for new investment in distribution infrastructure,
- the value of being available in an emergency,
- the value of avoided emissions for meeting policy goals, and
- the value of reducing climate change and the continued threats it poses to New York. [4]

These rate structures should be designed to permit customers to supply far higher shares of the required energy, capacity and ancillary resources, including through demand reductions and load shifting. It should simultaneously ensure that all customers, including those selling services to the system, pay a fair share of the cost of the distribution system itself. This transition requires transforming not only rates but also technology, since more sophisticated compensation will require replacing obsolete utility meters with advanced smart meters capable of measuring and communicating near real-time usage and price information.

3. **Clarify the legal framework for microgrids, to enable community scale deployment and sharing of distributed resources.** As NYSERDA has recommended,[5] the term "microgrid" should be formalized as a type of legal entity, ideally defined by statute, within which electric and thermal resources and loads can be shared among previously unaffiliated utility customers.
   - The PSC should begin work immediately to use its existing statutory authority to remove regulatory and, where appropriate, economic impediments to microgrids.[6]
   - *Energy sanctuaries:* New York should, as part of its comprehensive emergency planning process under Article 2-B of the NYS Executive Law, designate critical facilities such as schools, hospitals and municipal buildings that can serve as safe havens during storms and facilitate (through subsidies and other mechanisms) deployment of clean on-site generation at those facilities capable of operating when the grid goes down. Private facilities, such as big box stores and shopping malls, willing to commit to serve as such sanctuaries, should receive expedited permitting and support (including marketing support) for providing that availability. [7]

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[4] The full value of distributed solar resources has been explored in various locations. For a study focusing on a region proximate to New York, see, e.g., Mid-Atlantic Solar Energy Industries Association (MSEIA), *The Value of Distributed Solar Electric Generation to New Jersey and Pennsylvania*, available here.

[5] See NYSERDA, *Microgrids: An Assessment of the Value, Opportunities, and Barriers to Deployment in New York State*, September 2010, available here.

[6] Some of the most compelling success stories of Sandy resilience involve microgrids, but mostly in the campus setting, where current law is more conducive to microgrid development. For example, a CHP-based microgrid system kept the 60,000 residents of Co-Op City comfortable while the utility system failed around them. For more information, *see* the New York Times' DotEarth blog and Forbes for relevant pieces published shortly after the storm. Similarly, in the city of Sendai, Japan, a microgrid powered by natural gas generators and solar panels kept the lights on at a university and hospital during the blackout caused by the 2011 tsunami. *See* a description of research by Alexis Kwasinski here. Microgrids are also increasingly regarded as essential to electric reliability on military bases; see here. *See also* the DNV KEMA study on "Microgrid Strategies and Solutions"

[7] See, e.g., Connecticut legislation establishing some dedicated funding for distributed generation at critical facilities, available here.

- New York State should also develop a fleet of clean portable generators – including solar PV coupled with batteries and fuel cells – for temporary emergency dispatch.

4. **Require appropriate changes in oversight of the natural gas system to ensure storm-hardening as well as dramatically decreasing methane emissions.** To that end, New York should take the following specific steps:
   - Require natural gas operators to submit annual storm plans, as electricity utilities must already do.[8]
   - Require that natural gas operation and maintenance plans (16 NYCRR § 255.605) and emergency plans (16 NYCRR § 255.615) consider the risks of flooding and water damage and develop protocols both to mitigate the likelihood of damage in advance and to respond with repairs to both hazardous and non-hazardous leaks following a storm.
   - Shorten the allowable repair time for each class of leaks, establish a quantitative, prompt repair time for type 3 leaks (16 NYCRR § 255.817),[9] and decrease the 4% gas-in-air threshold of non-reportable leaks (16 NYCRR § 255.821).
   - Many factors point toward more frequent and thorough system-wide surveys. Up to 99% of all distribution network leaks are detected not by leak-detection technology, but by on-the-ground personnel and the public.[10] Inspections now conducted annually should be conducted more frequently, perhaps biannually or quarterly, with sufficient staffing to do so. Further, natural gas operators should make full use of emerging technologies, perhaps partnering with NYSERDA to develop advanced new technologies in leak detection.
   - Accelerate cast iron replacement program considerably (New York's program currently is projected to complete by 2090).[11]
   - Existing performance standards for new and replacement pipelines should be revised to consider pipeline emissions factor,[12] specifically, adding the clause "new and replacement pipes and components must be rated to the lowest possible emissions factor" to 16 NYCRR § 255.53.
5. **New York should ensure that the development of resiliency improves, and does not worsen, the underlying cause of climate change.** As contemplated by Article 2-B of the Executive Law, measures to *prevent* disasters in the first place are a key part of comprehensive emergency planning. As the relationship between emissions from electric generation and climate change is well understood, the state should prioritize **clean** demand side and generation resources in providing power continuity, and ensure that natural gas supply infrastructure resists not only storm damage but also methane leakage. Indeed, if we are serious about securing New Yorkers' safety for generations to come, the state should use this moment, when we have no choice but to pause and reconsider our energy system, as the time to solidify its commitment to a low-carbon future – for example, by developing and implementing a roadmap for achieving its 2050

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[8] See NY CLS Pub Ser § 66(21).

[9] For example, in Florida, above-ground class 3 leaks must be repaired within 90 days (FAC 25-12.040(2)(c), compared to no stated repair time in New York.

[10] Shaw, D., Phillips, M., & Baker, R. (2012). *Leak Detection Study – DTPH56-11-D-000001*, available here.

[11] Pipeline Safety Awareness, PHMSA, available here.

[12] Greenhouse Gas Emissions Reporting from the Petroleum and Natural Gas Industry, Background Technical Support Document, EPA, available here, at 132

greenhouse gas goal,[13] and leveraging tools ranging from government-based (e.g., commitments to dramatically increase the deployment of renewable resources[14]) to market tools (e.g., a meaningful price on carbon).

[13] The needed reductions are unlikely to be achieved by accident, but there are many possible pathways. For examples of roadmaps adopted in other jurisdictions, see here (California), and here (Denmark), or information about Europe's roadmap available here.

[14] For an example of how such a commitment was adopted California, see this press release.