October 19, 2008

VIA ELECTRONIC MAIL

Paul A. DeCotis
Deputy Secretary for Energy
Chairman, Energy Planning Board
Executive Chamber
State Capitol, Room 245
Albany, NY 12224

RE: Comments of Anbaric Holding, LLC to the 2009 New York State Energy Plan ("2009 NYS Energy Plan" or "the Plan").

Secretary DeCotis:

Please accept the enclosed comments of Anbaric Holding, LLC ("Anbaric") to the above referenced Plan. Anbaric is an independent, privately-owned electrical transmission development company that specializes in the development of innovative transmission projects that fall outside the traditional scope of investor owned utilities. Anbaric requests that all further correspondence, communications and other documents relating to this matter be served upon the following individual as follows:

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At the outset, Anbaric commends the efforts of the Energy Coordinating Working Group in advancing prudent energy policy in New York. Please find attached a copy of Anbaric's whitepaper, *Smart Energy City, Smart Energy State: Suggestions on Projects to Integrate Renewable Energy, Smart Demand Response, and Controllable Transmission in New York City and New York State,* which we are incorporating into our formal comments. Anbaric has devoted considerable thought and analysis on how to best maximize New York's energy resources in a manner that furthers the region's economic, environmental and social policies.

A. **New Electric Transmission will be Needed to Connect Renewable Energy that will help New York State Meet its Clean Energy Policy Goals**.

By our analysis there is an emerging and substantial gap in New York's compliance with its renewable energy goals. NYSERDA reported a gap of roughly 11 GWh at the end of 2008.[1] As discussed in greater detail on pages 6-8 in *Smart Energy City, Smart Energy State*, if LIPA and NYPA also intend to meet the state's renewable energy goals, new renewable projects and the transmission to deliver that energy will be needed.[2] We applaud the State's effort to reduce electric consumption 15% by 2015 through a variety of efficiency improvements and policy changes. We also support the state's efforts to develop renewable energy resources and achieve efficient distribution of clean electricity. In order to further these development goals, and recognizing that older less-efficient resources in the state will approach retirement soon, we urge the state to support reliability upgrades where existing infrastructure will need improvements to accommodate dispatch of new renewable resources or increase reliance on newer, more efficient generation.

B. **The Average Time to Interconnect New Energy Resources should be Quantifiable and Predictable so as to Better Enable Market Development.**

The State should work with NYISO to create a better process than that which currently exists for electric infrastructure to interconnect with the grid. The draft plan states as follows:

> "The NYISO has noted that the interconnection process in this state has been taking anywhere from 27 to 52 months with the average taking over three years. Part of the cause for the delays is because developers sometimes are not able to submit their study funding and/ or input data when needed to be included in the NYISO's class year studies, which means they must wait for the following class year studies."[3]

The "Class Year" approach for new additions is inefficient and causes developers to lose valuable time and money at a crucial stage in the development process. A 27 to 52 month waiting period for interconnection is also unnecessarily delayed. Such a delay is enough to detract any investor or developer who may have interest in the region. The lost opportunities strongly affect the economy of New York, as projects that are abandoned or avoided also cost valuable jobs, tax benefits, and direct payments to New York residents.

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1 NYSERDA, *New York Renewable Portfolio Standard Program Evaluation Report, 2009 Review*, page 4.

2 Krapels, et al, "*Smart Energy City, Smart Energy State – Suggestions on Projects to Integrate Renewable Energy, Smart Demand Response, and Controllable Transmission in New York City and New York State", August 2009.*

3 New York State Energy Plan 2009, *Energy Infrastructure Issue Brief, August 2009*, page 10.

As a result of the lengthy process required to interconnect new electric projects, the electric grid - and customers too – suffer from constrained pathways that prevent electrons from flowing freely to the places they are most needed. Market inefficiencies continue and new, clean generation is stymied from the outset. This problem must be ameliorated to set New York on track to meet renewable energy goals.

C. New York and Neighboring States should Replicate the Cooperation Demonstrated by the Inter-ISO/RTO Regional Transmission Planning Processes to Streamline Siting and Permitting Policies for New Energy Resources so as to Expedite Development and Keep States on Track with their Renewable Energy Targets.

Recognizing the importance of planning toward a future electric grid that integrates renewable energy sources and reduces carbon emissions, regions have come together to coordinate planning in such a way that most effectively delivers these results. States too could benefit from adopting policies to site and permit construction of new energy infrastructure in a cooperative manner that moves power from where it is created to where it is used. All northeastern states have set ambitious renewable energy targets for the next ten years and aspire to increase generation from renewable sources further beyond that date. In order to achieve such targets a concerted effort must be deployed to move beyond the 'business as usual' approach and expedite administrative processes so construction can begin. States can enable their preferred future by addressing current challenges developers face and creating a more direct path for the next one.

D. **New York will Need New Generation and Transmission Resources to Serve Electric Load as a Result of Increasing Generation Retirement**.

As New York's generation fleet grows older, units will no longer be able to comply with environmental policy requirements. The New York ISO 2009 Comprehensive Reliability Plan describes constraints on generation from increasing regulation of NOx emissions, CO2 emissions, and the Clean Air Interstate Rule. These constraints are further discussed on page 5 in *Smart Energy City, Smart Energy State*. Even without accounting for the impact of increasingly strict environmental codes, New York will need to acquire new generation and transmission to address the aging generator population. With 32% of generation over 40 years old, and 63% more than 30 years old, the state needs to plan for loss of this generation and the impact on the system. Inroads can be laid now to further development of clean generation and adequate transmission to prepare for closure of some of the state's oldest and dirtiest emitters. The report issued by Charles River Associates did not assess the impact of aged generation on the system. This reality will contribute significantly to the electric generation landscape over the next ten years, contrary to CRA's assessment that no new capacity or transmission will be needed.

E. **The State should Act Swiftly to Integrate New Electric Transmission from Upstate New York and Neighboring Regions (including offshore), in order to Meet the Growing Electric Demand and Appetite for Renewable Energy in New York City**.

Transmission solutions can better help the city meet its energy appetite and will also provide economic benefits to regions where energy resources can be developed. New York has ample access to renewable energy. Transmission solutions to integrate the state's renewable resources are discussed on pages 7-9 of *Smart Energy City, Smart Energy State.* Since 80% of the state's load is in the city, much of the delivered energy will have to come from renewable sources if the state is going to meet its target to use 30% renewable energy by 2020. Without increased transfer capacity into the city the State cannot meet its renewable energy goals. The state should welcome projects from developers who want to improve the City's access to that clean energy.

We encourage the Energy Coordinating Working Group to recognize the ability independent transmission projects to support renewable projects in New York and provide significant consumer and developer benefits by promoting effective competition. Independent transmission providers could ultimately lower the cost of assets and allow new entrants to bring innovative solutions and funding to the marketplace. Independent transmission projects are distinguished from traditional public utilities in that the developers of independent projects are under many circumstances able to assume all of the market risk of a project in part because they have no captive pool of customers from which to recoup the cost of the project. Without burdening captive ratepayers, independent projects enable greater transparency of cost and greater incentive on the part of the developer to contain overall capital costs. Independent transmission arrangements not only provide valuable price certainty and a healthy competitive procurement process, but also facilitate innovative commercial structures that would help New York realize its renewable energy goals.

Other areas of the country have benefited from forward thinking transmission investments that unlock otherwise captive renewable resources by providing the basic logistics to move the "products" to market. Regulators and policy makers recognize that well intentioned regulations to increase amounts of renewable energy are meaningless without a more substantial framework to enable transmission infrastructure investment and development. Accordingly, Commission policy has shifted to enable commercial structures that look beyond today's resources and anticipate and encourage future development. Notably, in an order issued on February 19, 2009, FERC approved a structure for two merchant transmission projects in the mid-west (Chinook Power Transmission and Zephyr Power Transmission) that represented a creative departure from prior precedent.[4] FERC permitted the proponents to pre-subscribe a substantial portion

[4] FERC Docket ER09-432-000 and ER09-433-000, February 19, 2009.

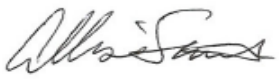
of the project capacity to anchor customers before holding open season auctions to allocate the remaining capacity because the projects were deemed necessary to help deliver energy from wind power projects to the Southwest electric markets. The Chinook and Zephyr orders provide a valuable framework for transmission investment that seeks to tap additional new renewable resources in areas that can support their development, but that are not located near load centers. The Energy Coordinating Working Group should use this template to propose a transmission infrastructure system that anticipates future project development.

F. **New York's Ability to Increase Renewable Generation in the State will Depend on Transmission Development and Market Policy Evolution that Further Integrates New York's Resources with the Broader Market for Renewable Energy**.

The amount of available renewable energy capacity in New York is very large. With over 8,000 MW of wind projects in the generator interconnection queue, New York is well positioned to be the leading renewable energy state in the Northeast, perhaps the entire east coast. It will benefit the state to create policies that encourage and enable the development of renewable resources. New York has already succeeded in adding tremendous capacity in a short period of time with its unique approach to acquiring renewable energy. Providing resources to developers has encouraged new projects to this point, but as those resources are exhausted, the policies need to evolve in such a way that wind developers can compete in a broader regional market to sell attributes of their clean energy. Creating a Renewable Energy Credit tracking and trading system could enable that transition to a more market-based approach to supporting renewable energy growth in the region.

Anbaric appreciates the opportunity to present these comments to the Plan. We welcome the opportunity to provide any further information upon request.

Sincerely,



Allison W. Smith
Anbaric Holdings, LLC

Enclosure (1)

Smart Energy City
Smart Energy State

Suggestions on Projects to Integrate Renewable Energy, Smart Demand Response, and Controllable Transmission in New York City and New York State

Coastal cities and states like New York aspire to materially reduce their green house gas emissions by means of (1) buying more renewable energy from on and offshore intermittent resources, (2) installing appropriate and smart transmission lines, (3) installing Smart Grid devices, and (4) enhancing the operational controls of the local utility and distribution companies. Anbaric Transmission respectfully offers this White Paper as documentation of a potential path for both New York State and New York City to accomplish these goals.

Edward N. Krapels, Christopher Sherman, Allison Smith
Anbaric Transmission LLC
August 2009

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Executive Summary

To combat climate change, New York State and New York City leaders have pledged to reduce the supply of high-carbon emitting electricity resources and increase the supply of low-carbon, sustainable resources. This Paper reviews progress made towards meeting these pledges. The good news is, New York has seen the development of enough renewables to meet its goals, so far, and a great deal of additional renewable development(mostly wind) has been proposed. New York has successfully developed a competitive procurement process for stimulating renewable development. As usual, with competition comes innovation, not only in the development of renewable generation but, ultimately, also in the transmission needed to bring it to market.

The bad news is that, looking forward, the "low hanging fruit" has been picked. The successful development of the next wave of renewables needed to comply with existing targets will be more challenging. To comply with the targets it has set for itself, the State needs to continue to increase the supply from renewable sources, which, as we explain in this White Paper, requires an intelligent expansion of the transmission system to account for the fact that renewable energy sources tend to be located where people are not.

For New York, the most promising and affordable wind resources are in the Northern and Western parts of the state, and in the neighboring electric market known as "PJM." These resources will need to be tapped first. Then, the next wave of wind development will begin offshore.

Achieving this state commitment to cleaner energy should require a united state effort. This is particularly challenging because New York has a history of not acting as a state in electricity matters. The allocation of costs to build transmission in New York State has always been difficult, and allocation of cost for renewables-enabling transmission will be no different.

This White Paper provides a review of the various State and City energy and environmental policies and renewables initiatives, with a focus on the Renewable Portfolio Standard program to increase the percentage of renewable electric energy sold to New York consumers to at least 25% by 2013. We conclude that New York can meet its renewables targets -- more than enough affordable renewables can be developed in New York and PJM. But, given how long it takes to make major changes in the electric system, the time to act is now.

We propose a series of practical steps and projects – some already announced -- whereby New York can meet its environmental goals through development of "smart transmission" (defined as intelligently sited and developed transmission and wind resources) and enhanced controls over electricity demand. Some of these changes come under the fashionable new rubric called "Smart Grid." If these steps are taken, we believe New York can have both renewable electricity development, acceptable transmission infrastructure, and the economic development that goes with them.

The Context: the Power Grid of a Large Coastal City

A state with a large metropolitan area like New York City naturally has a complicated power system. Over time, it becomes more and more difficult and expensive to locate all of the elements of power generation and delivery systems in the City. If one freezes the picture at one point in time – 2009 -- it is far from easy to determine what the future holds. The City has been seriously affected by the recession, yet it still has ambitions to transform its power Grid from its historic dependence on in-City generation to a new era of cleaner and less intrusive sources of electricity. Given the economic realities of the day, there is little, if any, merchant investment in the system, and if material changes in the *status quo* are wanted, they will require the allocation of Power Purchase Agreements from the state's utilities and Authorities to developers of substantial new transmission and generation resources.

In some quarters, it is expected that the City's load will – barring major surprises – grow much more slowly than it has in the past. The load outlook, however, is torn between the expected effects of new efficiency and demand response initiatives on the one hand, and the potential for more electrification (primarily in the transportation sector) on the other hand. The slow growth approach indicates there will be no need for new capacity until 2019; the potential that plug-in hybrids may actually emerge and require powering (even in the offpeak) reminds us that all forecasts of load are subject to major surprises, and that demand may grow much faster and stronger than conventional wisdom now indicates.

With that as a background, New York City and New York State have in recent months and years issued a series of important messages about their energy futures.

- On Earth Day (April 22, 2007), Mayor Bloomberg issued his seminal "PLANYC", a comprehensive plan for the City, including its energy systems. One of the 14 points for energy was to "Facilitate the construction of 2,000 to 3,000 MW of supply capacity by repowering old plants, constructing new ones, and building dedicated transmission lines."[1] In addition, the City commissioned a study to begin the development of a "Master Electrical Plan" for New York City.[2]

- Albany has also been working on a state energy plan. In 2009, Governor David A. Paterson called for 45 percent of the State's electricity needs to be met through improved energy efficiency and clean renewable energy by the year 2015. The "45 by 15" plan expands upon the important work undertaken in response to earlier statewide programs and goals.[3] "Those programs include the 2004 Renewable Portfolio Standard (see discussion below) and the State's electricity reduction goal adopted in 2007. The goals of these programs have been combined into a single clean electricity program goal which will maximize the use of efficiency resources and expand significantly the amount of electricity that will be provided by wind, hydro, solar, fuel cells, and biomass and delivered to customers by 2015."[4]

- The New York ISO conducts its own assessments in the form of annual *Comprehensive Reliability Plans* that provide year to year updates on load forecasts and generation adequacy. The 2009 edition "did not identify any reliability needs. Therefore no solutions are necessary over the ten-

year planning horizon 2009 - 2018… [as a result of] "a) a reduction in peak load forecast due to both slower economic growth and projected energy efficiency gains; b) an increase in generation additions and Special Case Resource (SCR) participation; and c) fewer planned retirements."[5]

The 2009 version of the New York ISO's *Comprehensive Reliability Plan* cautioned, however, that this conclusion could be undermined by three existing environmental issues:

1. "NOx Emissions – [With I]mplementation of new programs to control nitrogen oxides (NOx) emissions from fossil fueled generators … up to 3,125 MW of capacity may no longer be available to meet peak load conditions. If such conditions arise, and without any replacement resources, the resource adequacy criterion would be violated for all years from 2009 through 2018.[6]"

2. "CO2 Emissions - With respect to the Regional Greenhouse Gas Initiative (RGGI) program, higher carbon allowance prices – combined with a reduced fuel price spread and other environmental program compliance costs – will place significant strain on whether, and the degree to which, fossil fueled units, particularly coal units, will be able to continue to operate.[7]"

3. "Clean Air Interstate Rule (CAIR) – There is significant uncertainty about the long term impacts of CAIR on fossil generating units, largely resulting from legal challenges to the framework of the program. While the near term impacts are not expected to degrade reliability, the Environmental Protection Agency has informed the Court that development and finalization of a replacement rule is about two years away. The necessary design changes that have been required of electrical generation equipment in adjoining regions in order to become compliant with CAIR regulations have altered the combustion dynamics of those units and have restricted their ability to adapt to the transient nature of the supply in the global fuels markets. Accordingly, New York should be cognizant of the additional burdens placed upon certain units and the corresponding benefits of increased fuel diversity." [8]

NYSERDA and the Renewable Portfolio Mandate

Perhaps the most important of New York's environmental aspirations, however, was embedded in the 2004 decision by the Public Service Commission requiring the development of renewable energy, and entrusting the implementation of its mandate to NYSERDA (New York State Energy Research and Development Authority).[9] This program has been in force since 2004, and NYSERDA provides an annual review and report of its progress towards meeting its goal of having at least 25% of the electric energy sold to New York consumers be renewable by 2013. The 2009 NYSERDA review concluded that:

a. "As of January 2009, more than 1,164 MW (28 projects) of renewable energy capacity are now under contract as a result of three Main Tier procurements. Of this, more than 1,100 MW of capacity are installed and operating at 23 project sites. These facilities are expected to produce 2.9 million MWh annually; or the equivalent of about 29% of NYSERDA's RPS

obligation to procure 9.8 million MWh by 2013. NYSERDA has committed $509.5 million of the Main Tier budget, leaving a balance of over $110 million for use in developing additional renewable generation resources."

b. "The current central procurement structure using an RFP approach is working well to select projects that satisfy the Program's objectives of providing least-cost renewable energy while promoting economic development in the State. NYSERDA as the administrator of the RPS is well-positioned (being a state entity) to take into consideration the economic benefits of new renewable projects in the award selection process. Given that renewable energy development is costly and lengthy, the central procurement approach also likely saves developers time and money by avoiding multiple competitive markets and customized requirements under a load-serving entity approach."

In the Northeastern United States, New York's renewable development program is far and away the most successful. While almost every state has embraced some form of RPS, only New York has managed to promote the development of more than 1000MW of wind capacity.

NYSERDA also admits, however, that,

> "To the extent renewable resources' ability to serve load is limited by the physical limitations of the transmission system, policy goals will not be satisfied. In order to accommodate increased renewable generation, the State should consider alternatives for increasing transmission capability."[10]

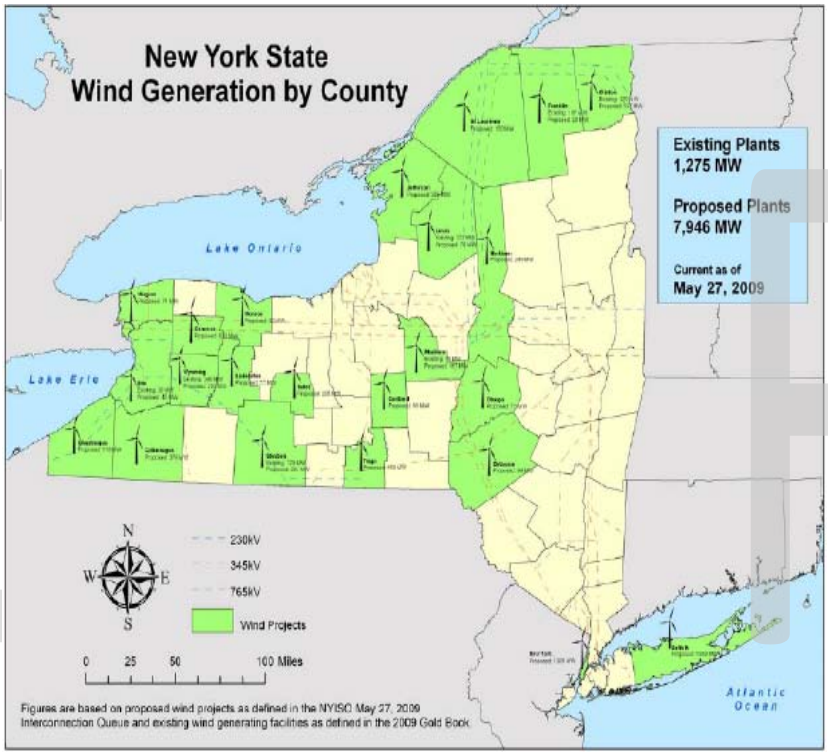
New York State's Renewable Supply-Demand Outlook

How serious are the transmission hurdles impeding the next wave of development of New York renewables? The question is difficult to answer precisely because the RPS requirement does not fall on all of New York's electricity consumers – for example, customers of the Long Island Power Authority and the New York Power Authority are not under the obligation. But, in the interest of keeping this analysis relatively simple, we assume that the state's aspiration will ultimately be applied to all. With that, we can review in more detail how large the renewables gap really is, and how it can be closed.

As NYSERDA noted in the 2009 Review of the program, "At full achievement of the 25% RPS goal, roughly 4,600 MW of new renewable nameplate capacity would enter service and produce approximately 14 GWh annually of new renewable energy generation." As of January 2009, NYSERDA reports, New York generated about 2.9 GWh of compliant renewables, so there is a gap as of end-2008 of roughly 11 GWh.[11] The requirement would be even larger if the LIPA and NYPA loads were also added.[12]

There is, therefore, an emerging and substantial gap in New York's compliance with its RPS program. To close that gap, New York needs to develop a program for accessing some 5,000MWs of additional wind generation (or other RPS-compliant resources). There are three basic sources of supply for those 5,000MWs – upstate New York, the neighboring PJM market, and offshore:

1. As shown in the figure below[13], upstate New York has abundant wind resources, and many communities would welcome the economic growth created by the development of those clean resources. And indeed, renewable energy developers have made herculean efforts to develop resources in response to RPS policies. The amount of wind power generation in New York State grew by 300% in the past year, now totaling 1,274 MW, up from 424 MW in March 2008. Additionally, 8,017 MW of wind power project proposals have been submitted by developers to be studied by the NYISO for interconnection to the grid. At the capacity factors of those wind resources (approximately 25 percent), sixty-two percent of projects in the interconnection queue will need to be developed by 2013 to attain the 11GWh needed for RPS compliance.



Historically, only twenty percent of queued projects have become commercially operable. As NYSERDA's report indicates, the development difficulty is tied, in large part, to the absence of transmission from upstate to downstate to take the wind the market. **Therefore, upstate New York can fill some of the renewables gap, but perhaps not all of it.**

2. The second logical source of affordable wind is the neighboring PJM market, which has 3,500MW of wind already developed and under construction, and an additional **44,000 MWs of proposed wind** at various stages of development.[14] Because PJM is a different control area, accessing its wind presents a different kind of transmission challenge.
3. The third source of wind – somewhat more challenging technologically and economically, is off the coasts of New York, both on the northern end (the Great Lakes) and the southern end (the Atlantic Ocean).

Transmission for New York's Renewable Resources

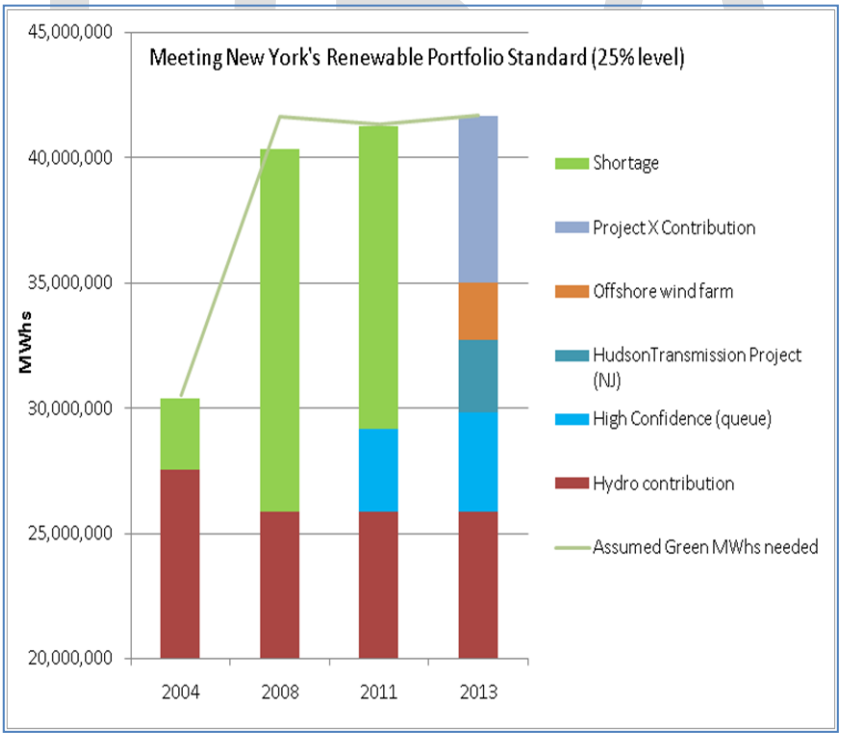
Closing the renewables gap now depends on building transmission connections between the load centers (primarily, New York City and Long Island) and the renewable resources in upstate New York and

neighboring PJM. Interestingly, this is where New York City becomes a player in the renewables game, as the customer for the renewable energy.

One important step towards developing additional renewable capacity may be taken by the New York Power Authority, if it completes a contract for transmission rights on the Hudson Transmission Project, a 660MW high voltage, Direct Current line between PJM and Manhattan scheduled for construction in 2009 and completionin late 2011. Depending on the environmental attributes of the capacity NYPA buys in PJM (all green, or part green energy), the Hudson project can inject up to 5.7 GWhs of RPS-compliant energy into the City (approximately 39% of the projected deficit in the state-wide 2013 requirement). If half of the energy flowing across Hudson were green, it could provide 16% of the State RPS requirement.[15]

A second step towards a greener New York City could be the potential development of 750MWs of wind off the coast of New York recently announced by ConEd and LIPA. If that project had a 35 percent capacity factor it could inject 2.3 GWhs of renewable energy into the City (and the State).

As shown in the chart below, even with these two new resources, however, New York State would fall short of the RPS target, whether at the original 25 percent or the Governor's 30 percent target level. To fill that gap, the state needs what we will call "Project X", which could deliver up to 7GWh of green energy into the load centers of New York City and Long Island.



As we survey the development terrain, there are three candidates for Project X:

1. A 1200MW transmission line to upstate wind and other renewable resources. At that size, New York can bring on 5.2 GWh of renewables if the line is filled with renewable energy 50% of the time.

2. An 800 MW transmission line to Quebec, if hydro-generated power from Quebec could become RPS-compliant. As baseload energy, it could close the RPS gap with 7 GWh of constant green energy delivery.[16]

3. ~2,305MWs of additional offshore wind development with high (35 percent) capacity factors.

Even though it is clear that New York needs to execute on projects like these, from a tactical perspective **it is unclear who should make the selection between the different projects (upstate, downstate, wind or hydro or other sources), and who should pay for the potentially higher cost of meeting the RPS requirements for the state as a whole.** Because the intent of RPS requirement is to advance the public good, we suspect that New York – like other jurisdictions – will ultimately find a way to spread the cost of the transmission and generation needed to bridge the RPS gap to all electricity users. There is no doubt the City of New York and Long Island will be the targets for green energy – after all, they constitute 50% percent of the state's total energy demand. What is open to question and policy deliberation is who should pay what to accomplish these societal goals.

New York's Smart Grid

Assuming New York will figure out how to develop "Project X,"it seems obvious that compliance with the State's RPS requirements will lead to a power system with a lot of intermittent energy infusions. **What are the challenges raised by this electricity and renewables profile?** Assuming the State and the City mean what they have said about wanting a transformation towards renewable energy in the state, and towards a greener profile for its iconic City, the rapid deployment of new renewable generation poses a number of readily apparent challenges:

a. Intermittency: More wind requires more sources of firming energy. Onshore and upstate wind can use existing thermal resources (albeit somewhat reconfigured away from baseload services). Offshore wind directly into the City will require use of DC cables (whose quick response time due to the undersea cable distance and power rating, is well suited to this task), and/or conversion of some thermal units from baseload to peaking services.

b. Stability: The inherent instability of intermittent resources requires additional capability to maintain a stable power supply. This goes beyond intermittency – it deals with handling the seams between the loss of wind energy and the offsetting gain of whatever takes its place (either alternative supply or responsive demand). There is a technical challenge here. The flexibility and controllability of HVDC transmission is part of the solution but responsive demand is another.

c. Voltage needs to be maintained within its strict reliability limits. Intermittent energy and responsive demand create new stresses that will have to be identified and managed. One cannot talk about voltage without also mentioning reactive power. If the City is to be served by intermittent resources and DC cables, sources of reactive power will have to be found. Potentially, if "Project X" is a DC cable, adding Voltage Source Converter technology would do a lot to address the need. In addition, some peaking units built specifically for these tasks may also be required.

In other words, a Grid with lots of renewables has to cope with intermittent energy infusions that can cause the system to become less stable for a variety of reasons (like varied wind speeds). A substantial

part of the challenge in a complex grid like that of New York is to be able to observe the state of the system in real time. This is not as trivial a task as one might first think. The system already has to deal with enormous and instantaneous changes in supply and demand as a result of its traditional structure, which was built to accommodate a relatively small number of supply disturbances. With hundreds (and potentially thousands) of wind inputs, the supply disturbances increase exponentially. At some point, the amount and variety of wind may begin to net out a less perturbed pattern (especially if there are substantial transmission ties into New York from other areas), but it is far from clear at what mix that begins to occur. Almost certainly, the first 1000MWs of wind will add to the complexity of the system.

With that added complexity, it becomes more and more important to add controllability to the system wherever possible and, of course, economical. Some resources – certain types of immediately dispatchable generation, new forms of demand management, and controllable transmission – will become much more useful to the system than they have been historically. Put another way, New York will need many more controllable resources than it has today in order to manage the "uncontrollable" or intermittent resources.

Adding much more controllable demand – ideally, demand from consumers that can be shifted or curtailed in response to intermittent supply – sounds somewhat primitive ("*Could we really manage to not use energy when the wind doesn't blow?*), but with today's modern technology, it has a completely different and new aspect. In the transmission arena, direct current (DC) transmission, and certain types of controllable AC transmission (such as the new Variable Frequency Transformer), will become more and more useful. Thus, the fact that New York has four three such projects already (the Neptune DC cable, the Cross Sound Cable, the Linden VFT project under construction between New Jersey and Staten Island, and the pending Hudson Cable) is likely to be much more valuable than originally thought.[17]

Finally, the new intermittent and controllable "tool kits" need to be efficiently deployed by those in charge of running the system (the load-serving utilities of New York and the New York ISO that binds them all). The task of reliably running a New York power grid with 30 percent renewables, in other words, will be challenging.

Controllable Demand in New York

As discussed in the preceding pages, New York – both City and State – can accomplish renewable portfolio standard objectives. New York is blessed with abundant renewable resources both in-state and "next door" (in PJM and in Canada), both of which can only be accessed if transmission is built. The intermittency is challenging, but there are both supply-side and transmission resources that can make huge contributions to managing that problem.

With that as background, we can turn to the demand side. As it happens, new developments in demand management technology can both help meet New York's efficiency objectives and provide additional support for managing intermittent supply. For the sake of convenience and clarity, we will call permanent reductions in demand "efficiency improvements," and the ability to use demand as a

resource to manage intermittent supply as "controllable demand." Both are improvements in the generic terms – "Smart Grid" and "demand response" – about which much has been written but little is clear.[18]

In the emerging dynamic smart-grid world, the demand provider will have the ability to optimize the electric power it obtains from the grid with a) what it can either produce through behind-the-meter generationor storage resources or b) what it can avoid using through control devices. Fortunately, advances in behind-the-meter generation and smart-grid technologies are quickly making this capability an economic and technical reality[19].

In the future, demand response in New York City can be coupled to intermittent resources without the intervention of the ISO. If a demand responder wishes to do so, it can tie its load dispatch with the natural variability of an intermittent resource such as wind. Depending on the size of the demand response and the size of the wind generator, this coupling effectively allows demand response to become a firming resource for the variable wind energy. New York City and Long Island – with their huge load and multiple large-use electricity customers - may be ideal partners for coupling with the offshore wind resources now under consideration by the City's utilities. Since the location of the controlled load may be sufficiently close to where the wind enters the system, the coupling effect also mitigates stresses to the system created by the variability of the renewable resource.

Finally, there is universal agreement that controlling demand provides significant value to the wholesale electric power markets. As with any other disruptive resource, the determination of how best to use and value DR will be an iterative process. What should be clear, however, is that given its value to the market and systems, the industry should focus on those changes that add to the availability and use of controlled demand as a critical energy resource. The use of DR as a dispatchable resource in the real time energy markets should be encouraged, not discouraged. We are fortunate that the smart grid technology now exists to fully exploit this valuable resource. The requirement now is to ensure that the policies and rules governing the bidding and measurement of demand response reflect these technological advancements.

Conclusion: Smart Energy City, Smart Energy State

In the long run, the essence of the Smart Energy City, as part of the Smart Energy State, is to harness its most economic renewables, which in the case of New York is likely to be nearby onshore wind and then nearby offshore wind, with controllable transmission and controllable demand.

Some will say this is a lot of trouble and expense. The long-run benefit of wind energy as a "fuel from heaven," however, is that it ultimately allows New York to escape from the tyranny of commoditized fossil fuel markets. We have seen in the last ten years the cost of the extreme fluctuations in fuels prices. Both oil and natural gas prices ratcheted up, not just by multiples of one or two from traditional price levels, but by multiples of five or six. Who can forget the summer of 2008, when oil prices reached $150/barrel, and natural gas prices reached $14/MMBTU?

Perhaps the most important reason for New York to embark on the "Smart City, Smart State" strategy, however, is the urgent need it has to comply with its own environmental regulations. Surely it was the

better angels of New York's political dynamics that persuaded the state to embark on its ambitious renewables program. There are now some who claim the State and the City should slow down, but given how long it takes to reshape the fundamental infrastructure of a system as complex as that of New York, the time to start down this road is now.

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[1] From the PLANYC website: http://www.nyc.gov/html/planyc2030/html/plan/energy.shtml; accessed May 25, 2009.

[2] Charles River Associates, *A Master Electrical Plan for New York City,* August 2009.

[3] Governor Paterson has proposed increasing the Renewable Portfolio Standard to 30 percent. He has set a goal of decreasing electricity usage by 15 percent.

[4] 2009 New York State Energy Plan, Interim Report Presented By The Energy Coordinating Working Group, March 31, 2009. http://www.nysenergyplan.com/. Accessed May 25, 2009.

[5] New York ISO, 2009 Comprehensive Reliability Plan, Comprehensive System Planning Process, FINAL REPORT, May 19, 2009. http://www.nyiso.com/public/webdocs/services/planning/reliability_assessments/CRP__FINAL_5-19-09.pdf. Accessed May 25, 2009. Meanwhile, New York transmission owners also began a study in the spring of 2009. The Statewide Transmission and Reliability Study (STARS) is a long-term, forward looking transmission planning exercise that will assess system needs 11 to 20 years from now.

[6] These restrictions include "the Ozone Transmission Commission (OTC) High Electric Demand Days (HEDD) program and Department of Environmental Conservation (DEC) new NOx Reasonably Available Control Technologies (RACT) program, could adversely impact the reliability of the electric system. Implementation of the OTC-HEDD Load Following Boilers (LFBs) and High Emitting Combustion Turbines (HECT) program could render some units unavailable and others limited to reduced output at times of peak energy needs, which would result in violations of the resource adequacy criterion in 2017 and 2018. The New York DEC is developing several proposals to lower emissions from generators in New York State."

[7] In addition, In addition to RGGI targets, Governor Paterson signed Executive Order No. 24 on August 6, 2009 stating the goal for New York was to reduce its carbon emissions to 80% below 1990 levels by 2050. The order also created the Climate Action Council which will produce a Climate Action Plan by September of 2010 to assess how all economic sectors can reduce carbon emissions and the extent to which these actions will support the Governor's goal to build a clean energy economy. Executive Order No. 24, "Establishing a Goal to Reduce Greenhouse Gas Emissions Eighty Percent by the year 2050 and Preparing a Climate Action Plan." August 6, 2009 http://www.ny.gov/governor/executive_orders/exeorders/pdf/eo_24.pdf

[8] *2009 Comprehensive Reliability Plan*, pages iv – v.

[9] New York State's Renewable Portfolio Standard (RPS) goal is to reach 25% by 2013. An RPS is a policy that seeks to increase the proportion of renewable electricity used by retail customers. Currently there are 24 states plus the District of Columbia that have RPS policies in place.

[10] NYSERDA, *New York Renewable Portfolio Standard Situation Report, 2009 Review, Draft Report,* March 31, 2009. Pages 4, 8. http://www.nyserda.org/Energy_Information/NY%20Renewable%20Portfolio%20Standard%20Program%20Evaluation%20Report%20(2009%20Review)-FINAL.pdf. Accessed May 25, 2009.

[11] NYSERDA, *New York Renewable Portfolio Standard Program Evaluation Report, 2009 Review,* page 4.

[12] To understand the respective roles of the City and the State, we have to look behind the aggregates of the RPS program. When it was enacted in 2004, the Department of Public Service (1) enacted a 25 percent target, and (b) allowed the large-scale hydro capacity that New York possesses (at Niagara Falls) to count towards that target. In that year, the existing hydroelectric generation provided 27.5 Gigawatt-hours (GWh), or 19 percent, of the total power supplied to consumers. Renewable energy acquired to meet the 25 percent by 2013 goal would be additional to the "renewable baseload" of 19 percent hydro.

[13] Source:

[14] PJM, "A Greener Grid," http://www.pjm.com/~/media/about-pjm/newsroom/downloads/greener-grid.ashx. Accessed August 24, 2009.

[15] The author is a Principal in Hudson Transmission Partners, developers of this Project.

[16] In August 2009 the New York Power Authority announced it was pursuing a project that could entail up to 2000MW of energy delivered into New York City. "NYPA Negotiating Massive Energy Project with Canadian Entities", POWERnews, August 5, 2009. (http://www.powermag.com/POWERnews/NYPA-Negotiating-Massive-Energy-Project-with-Canadian-Entities_2092.html) Accessed August 14, 2009.

[17] NYPA also has a Convertible Static Compensator (CSC) at Marcy Substation, which is a member of the FACTS family of technology and provides controllability to the transmission system. FACTS is the sister technology to HVDC. This installation provides a number of benefits, but the main one was increased capacity flowing north to south, without changing the overhead lines.

[18] The following pages are based on Audrey Zibelman and Edward N. Krapels, "Deployment of Demand Response as a Real-Time Resource in Organized Markets," *Electricity Journal,* June 2008, Vol. 21, Issue 5, pp. 51 – 56.

[19] In addition, smaller demand providers will likely require companies that can aggregate individual loads and provide the necessary two-way communication between the provider and the RTO. Larger users, such as large industrial complexes, are more likely to establish direct communication with the relevant RTO and in effect behave like a "virtual generator" on the system. For example, New York City and New York State have a number of large campuses that could reduce the amount of electricity they consume by controlling their load and utilizing distributed generation resources like traditional heat and power turbines, or solar panels, geo-thermal sources, and even hybrid cars. Internet communication devices can signal the campus to reduce its loading on the grid and monitor the changes in the campus' loads on a real time basis. Given these capabilities, the information and controls necessary to develop 24 hour, day-ahead, and real time bid strategies, the campus would appear no different than any generator or distribution utility from the perspective of the RTO.