FOR THE RECORD

THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
SCOTT M. STRINGER

TESTIMONY OF NEW YORK CITY COMPTROLLER
SCOTT M. STRINGER

IN SUPPORT OF INT 0378-2014

A LOCAL LAW TO AMEND THE ADMINISTRATIVE CODE OF THE CITY OF NEW YORK, IN RELATION TO REDUCING GREENHOUSE GASES BY EIGHTY PERCENT BY TWO THOUSAND FIFTY

BEFORE MEMBERS OF THE
COMMITTEE ON ENVIRONMENTAL PROTECTION
OF THE NEW YORK CITY COUNCIL

OCTOBER 23, 2014

Thank you Chair Richards and the members of the City Council Committee on the Environmental Protection for proposing this pioneering bill. Committing to an 80 percent reduction in carbon and greenhouse gas emissions by the year 2050 is an ambitious and necessary goal which will make New York City a leader in showcasing how cities across the country and around the world can do their part to fight climate change.

The consequences of climate change are already being acutely felt, from the five boroughs to big cities and small towns around the world. As a City with 538 miles of coastline, many of our citizens—including the nearly 3 million living in flood zones—are on the front lines of this fight, threatened by rising tides and more frequent storms.

In addition to the incalculable human toll caused by climate change, a changing environment also poses risks to our economy and our way of life.

- According to a Rutgers University study, future weather events related to climate change will cost the City over $10 billion a year by 2050. When Superstorm Sandy struck, the doors of the New York Stock Exchange had to be barricaded with sand-bags.

- By 2050, New York will experience hotter and longer summers, with the average number of days over 95 degrees rising from 2.6 days per year to as many as 16 days by 2050. This will severely tax our energy grid and could lead to higher prices for consumers and rolling blackouts.[1]

- In addition, extreme rain events may increase by 300-400 percent by the end of the 21st century, further overwhelming our City's antiquated sewer infrastructure and leading to more discharge into our waterways and flooding in our streets.[2]

Curbing emissions is not only compatible with economic growth, it is essential to our future prosperity. New York has witnessed this first-hand as a founding member of the Regional Greenhouse Gas Initiative (RGGI). With eight of our neighboring states, we have seen emissions fall by 18 percent since 2009, while our shared regional economy has grown by 9.2 percent, outpacing the rest of the county.[3]

RGGI has already invested over $500 million in programs that reduce greenhouse gas emissions, promote energy efficiency and renewable energy, and protect public health and the environment. These investments are working to fuel a burgeoning green industry, providing jobs and opportunity for New York City residents.

While RGGI will continue to provide significant benefits to the region's environment and economy, we must explore every policy option if we are to meet the ambitious goal laid out in this legislation.

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[1] http://riskybusiness.org/report/overview/regions/northeast.
[2] http://www.ag.ny.gov/pdfs/Extreme_Precipitation_Report%209%202%2014.pdf.
[3] http://www.nytimes.com/2014/06/06/upshot/best-of-both-worlds-northeast-cut-emissions-and-enjoyed-growth.html?abt=0002&abg=0.

For instance, New York should take a hard look at British Columbia and Boulder, Colorado, where a broader carbon pricing system is using market forces to limit greenhouse gas emissions and require companies to address the true effects of their pollution.

In addition, we must boost investment in green projects that not only make New York more resilient in the face of climate change, but can also act to reduce its effects. That is why I recently proposed the creation of a New York City Green Bond program, which could both expand our investor base and over time drive down borrowing costs, while also focusing our capital program on environmentally beneficial projects.

Reaching the goal of "80 by 50" will require advances in green energy generation and energy efficiency, better engineering and increased public transport, business buy-in and community involvement, as well as our City's ongoing commitment and determination. For making these changes, we will be rewarded with a cleaner, healthier, and more prosperous City.

Combating climate change is the global challenge of our time and it will require us to work together, across countries and continents, to ensure that the world we bestow to our children and their grandchildren is healthy, stable, and green.

It will also require us to do our part on the local level and to take the lead, as New York City always has, in charting a path toward a more prosperous future, for our environment and our economy.

Citizens' Environmental Coalition

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October 21, 2014 **FOR THE RECORD**

Chairman Donovan Richards
& Members of the Environmental Protection Committee
NYC Council
New York, NY

Re: Comments in Support of Intro 378

Citizens' Environmental Coalition applauds the efforts of Chairman Richards, the Environmental Protection Committee and Council sponsors of this bill for their efforts to address the serious threats posed by global warming. Thank you for your leadership. However, we urge that the word "TOTAL" be added to greenhouse gas emissions in this bill .

As you are aware we need to act immediately to dramatically cut greenhouse gas emissions in the next 15 years if we hope to stabilize the climate. The International Panel on Climate Change also elevated the importance of methane this year in addressing global warming. Over a twenty year period methane has a GWP of 86-105 times the warming potential of CO2.

At the state level there are two major problems—we never completed a Climate Action Plan and secondly we have a state greenhouse gas inventory that has focused primarily on carbon dioxide and severely undercounts methane emissions in the state. At the same time the state is expanding natural gas infrastructure projects – methane storage, pipelines, compressor stations – in preparation for possible approval of horizontal hydraulic fracturing. All of this will mean dramatic increases in methane leaks—when we must do the opposite to cut GHG emissions by 80%.

The official state public policy goal was first established by Governor Paterson by Executive Order and renewed by Governor Cuomo. It requires cutting TOTAL greenhouse gas emissions 80% by 2050 from 1990 levels. An 80% reduction is difficult, but it is impossible if we are simultaneously expanding natural gas/ methane emissions.

Governor of California, Jerry Brown, just signed a bill requiring the state to come up with a comprehensive plan to control methane emissions. The article reports that Wall

Street is joining environmental groups in calling for action on methane with NYC Comptroller Scott Stringer calling on the EPA administrator to tackle methane. http://www.newsobserver.com/2014/10/20/4251013_california-looks-to-curb-methane.html?rh=1#storylink=cpy

The US Department of Energy just joined EPA and the Department of Interior in saying the US must act on Methane emissions. http://fuelfix.com/blog/2014/10/20/energy-department-u-s-must-act-now-on-methane-emissions/

Our Recommendations:

1. NYC should match the same goal as the state – calling for an 80% reduction in TOTAL greenhouse gases by 2050 from 1990 levels.
   An 80% goal is ambitious but we fully support moving quickly to achieve the goal-- especially given the $10 Billion annual damage costs of climate change to the state cited in the Draft Energy Plan 2014.

2. Intro 378 should also set in motion plans for development of an accurate NYC greenhouse gas inventory that includes methane emissions. We need an accurate starting point to plan for reductions. This effort will also prove fruitful for protecting the safety of NYC residents from explosions and fire associated with pipeline leaks in NYC's aging pipeline infrastructure (70% are over 100 years old). Con Ed adopted the national average estimate for pipeline leaks of 2.2%, which equates to 2.67 million metric tons of carbon dioxide equivalents per year or MMTCO2e. This is likely a gross undercount as Con Ed has 2600 miles of pipe that is most likely to be leaking. A study by Gas Safety, Inc. in 2013 found the emissions of methane for Manhattan alone (1/3 of Con Ed territory) to be greater than Con Ed's estimate --3.48 MMTCO2e.

3. We also recommend that the City Council support the adoption of a comprehensive pipeline replacement program as recommended by PHMSA, the US Dept. of Transportation Pipeline and Hazardous Materials Safety Administration.

Thank you for your attention.

Respectfully,

Barbara J. Warren

Barbara J. Warren, RN, MS
Executive Director

FOR THE RECORD

New York Climate Action Group

716 East 11th Street #2P, New York, New York 10009

October 21, 2014

RE: File # Intro 0378-2014

To the Members of the City Council of the City of New York:

The New York Climate Action Group commends the City Council sponsor and co-sponsors of this Intro for crafting a bill that would mandate, rather than sugges, the reduction of our city's greenhouse gas emissions by 80 percent by the year 2050.

We have some strong concerns and suggestions to amend this legislation:

First, as we are an organization that has studied climate issues, especially those related to, generated by, and/or affecting New York City, we request that you exclude the use of natural gas to accomplish this mandate. We know that, according to the research of Professor Robert Howarth of Cornell University, methane is a much more potent greenhouse gas than carbon dioxide, at about seventy to eighty times the level of emissions over a twenty year period. If this bill were to allow the previous administration's insistence on encouraging the switch of boilers to natural gas, then from the year 2015 until the year 2035 we would strongly intensify the steamroller of catastrophic climate change, already so dire a threat. Also, as members of this group and as residents of this city, we are aware of the significant leakage of methane from gas pipelines under our city's streets. We also reject the use of nuclear energy as a corrective measure to carbon emissions, as this city is perilously located very close to an aging nuclear power plant, as the construction and maintenance of these plants rely on fossil fuels, and as the nuclear waste is not safely disposable. Finally on this point, we ask that energy from hydroelectric dams NOT be included as an option, because of the devastation these dams cause to their ecosystems, which always include carbon sinks (forests).

On the subject of solutions and remedies of which we do approve, we recognize (and request that the City Council do the same) that the best route to lowering emissions is through energy efficiency measures and conservation of energy. We suggest such technologies as low-wattage lighting wherever possible and motion-sensors to turn on lights only when needed. We suggest that renewable forms of energy are put forth, especially those that favor the ownership and control of the public, so that distributed energy is supported.

Finally, we do not see any language in this bill about instruments to enforce carrying out the mandate. We request that such language be inserted and that periodic reviews of the progress of this reduction of emissions, open to and including input by the general public, on an annual basis.

Thank you for your time and efforts.

Sincerely,

Judith K. Canepa, Co-Founding Member
New York Climate Action Group

FOR THE RECORD

HEARING TESTIMONY FROM
BUILDING OWNERS & MANAGERS ASSOCIATION OF GREATER NEW YORK
Thomas L. Hill, RPA, President
Roberta M. McGowan, CAE, Executive Director

INT. NO. 378, A LOCAL LAW TO AMEND THE ADMINISTRATIVE CODE OF NEW YORK, IN RELATION TO REDUCING GREENHOUSE GAS EMISSIONS BY EIGHTY PERCENT BY 2050

Good afternoon Chairman Richards and the esteemed members of the Committee on Environmental Protection. I thank you all for affording me the opportunity to offer testimony from the Building Owners and Managers Association of Greater New York (BOMA/NY) on Intro Number 378, a proposed local law to reduce greenhouse gas emissions by eighty percent by 2050. BOMA/NY has a long track record of working with the city on laws and policies that involve the buildings sector, and we appreciate being invited here today to continue in that role.

First, a little background on BOMA/NY and the real estate industry. BOMA/NY represents more than 750 owners, property managers, and building professionals who either own or manage 400 million square feet of commercial space. We are responsible for the safety of over 3 million tenants, generate more than $1.5 billion in tax revenue, and oversee annual budgets of more than $4 billion. BOMA/NY is the largest Association in the BOMA International Federation, the world's largest trade organization.

The commercial real estate industry is a significant contributor to the Nation's and, in particular, the City's economic engine. Our industry employs over 228,000 New Yorkers and contributes over $14 billion to the Gross State Product.

As for the proposed legislation, we support both its goal to cut citywide emissions deeply over time, and the process it sets out to do so. The bill would establish an iterative planning process through every-four-year revisions to PlaNYC that would allow the private and public efforts to reduce emissions to evolve over time as new best practices and technologies come about.

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That said, we must proceed carefully if we are to achieve emissions reductions in an efficient and cost-effective way. The goal envisioned in this legislation is truly lofty, and meeting it will require considerable planning and effort. To do so, BOMA/NY and others in the buildings and real estate sectors must be consulted at every step and their expertise heeded. We of course look forward to working with the City Council and the Administration moving forward with these efforts.

Thank you once again for allowing BOMA/NY to testify on this important legislation.

Enterprise®

FOR THE RECORD

October 23, 2014
Honorable Donovan Richards, Chair
Committee on Environmental Protection
New York City Council
City Hall
New York, NY 10007

Re: Comments in support of Int 378 – A Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by two thousand fifty

Dear Chair Richards,

On behalf of Enterprise Community Partners, Inc., I submit this letter of support for the proposed intro to reduce New York City's greenhouse gas emissions by 80 percent by 2050.

At Enterprise, we have worked with the city and community-based organizations for nearly 30 years to create opportunity for low- and moderate-income people through safe and healthy affordable housing. In that time, we have created or preserved 44,000 affordable homes for 114,000 New Yorkers and invested $2.5 billion in equity, grants, and loans to community development projects. Ten years ago we created the Enterprise Green Communities Initiative to bring the health, environmental, and economic benefits of green building to low-income communities. We work closely with the Department of Housing Preservation and Development to implement their Green Policy. This incorporates the Enterprise Green Communities Criteria, the nationally recognized standard for green and healthy affordable housing, into new and substantially rehabilitated homes.

We do this work because we firmly believe that climate change is an equity issue. Low-income and vulnerable populations are disproportionately impacted by climate change and have the fewest resources to recover from its effects. As an example, 55 percent of people impacted by Sandy were low-income renters. One year after Sandy, half of those renters were still living with storm damage to their homes, compared to one-third of people with higher incomes. Protecting these low-income residents and their homes requires a commitment to climate change action and investments in our affordable housing infrastructure. The proposed 80 by 50 legislation lays the groundwork for a more sustainable city.

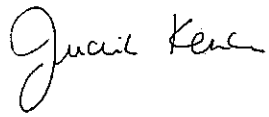
New York has been a leader in climate change action. PlaNYC has helped the city reduce greenhouse gas emissions by 19 percent since 2005 and led to the cleanest air in

50 years. But as the New York City Council has recognized, there is much more work to be done. Three quarters of the city's greenhouse gases come from buildings, and multifamily residential buildings present the greatest energy-saving opportunity. Therefore, achieving the bold greenhouse gas reduction goal will require reinvestment and efficient operations for these buildings. Sustainability and equity must be a core component of the city's overall development strategy. Enterprise stands ready to work with the Council, city agencies, and our affordable housing partners to help reach the 80 by 50 goal.

We applaud the New York City Council's leadership in creating a Comprehensive Platform to Combat Climate Change, and urge the passage of the 80 by 50 legislation as the cornerstone of that work.

Thank you for the opportunity to submit these comments strongly in favor of Int 378.

Sincerely,



Judith Kende
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TESTIMONY FOR NYC COUNCIL COMMITTEE ON ENVIRONMENTAL PROTECTION REGARDING INTRO 378 AS IT RELATES TO GHG EMISSIONS AS GIVEN BY THE SENIOR ADVISOR TO THE MAYOR ON RECOVERY, RESILIENCY AND INFRASTRUCTURE AND THE ACTING DIRECTOR OF THE OFFICE OF LONG-TERM PLANNING AND SUSTAINABILITY

Thursday, October 23, 2014

Introduction

Good afternoon Chairman Richards and members of the Committee on Environmental Protection. My name is Bill Goldstein and I am the Sr. Advisor to the Mayor on Recovery, Resiliency, and Infrastructure. Joining me is Daniel Zarrilli in his capacity as Acting Director of the Office of Long-Term Planning and Sustainability (OLTPS), Emily Dean, the Director of Energy Programs and Strategy and Ozgem Ornektekin, Deputy Commissioner of Energy Management for the Department of Citywide Administrative Services (or DCAS).

We are here today to discuss our commitment and leadership in dealing with the causes of climate change. Before I begin, I want to thank you Chairman Richards and members of this committee for calling this hearing today to discuss this important issue. I'd also like to thank you, the Speaker and the Council Members who have kept this a priority and the many public stakeholders and advocates who continue to keep this issue at the forefront. Last month many of us participated in the march for climate change and the world's eye was placed on our city. We demonstrated the type of vision and resolve that makes New York City the best city in the world.

Fighting climate change is a fundamental priority

Protecting citizens from the impacts of climate change – including rising sea levels, heat waves,

and extreme storms – is a fundamental public safety issue and a core function of government at every level. Since taking office, Mayor de Blasio has already established a track record for leading the fight against climate change. This Spring, he announced the most sweeping update to New York City's Air Pollution Control Code since 1975 and I'd like to acknowledge Chairman Richards for his leadership as we hope to codify this into law with the NYC Clean Air Act. This Administration has increased municipal organics recycling, significantly scaled up investments in green infrastructure, and is on pace to expand bike lanes by 58 miles citywide. We also made environmental sustainability a key component of *Housing New York*, the City's ten-year affordable housing plan.

And of course, during climate week, the Mayor announced our commitment to reducing citywide greenhouse gas (or GHG) emissions by 80% from 2005 levels by 2050, or "80 by 50." This makes New York City the largest city in the world to make such a public commitment, because nothing short of such an ambitious effort will be effective in the fight against climate change. Aligned with this goal, the Mayor also announced our commitment to chart a long-term path for a total transition from fossil fuels and invest in renewable sources of energy.

We all must work together on this issue because identifying the pathways to reach 80 by 50 will be exceptionally difficult and will require the complete transformation of many areas of work and life in New York City. For this reason, we put forward a plan of action, *One City: Built to Last*, an unprecedented and detailed plan to address the largest source of GHG emissions in New York City: our buildings. Nearly three quarters of New York City's GHG emissions come from the energy used to heat, cool, and power buildings and our plan is a roadmap that outlines how

we will make dramatic investments in our public buildings and make them more efficient and sustainable, drive a thriving private market of building efficiency and renewable energy, craft forward-thinking green codes and legislation together with the City Council, and ultimately make New York the global hub of clean energy, technology and innovation.

As you may have read, earlier today the Administration announced $13 million in energy efficiency upgrades across City agencies as part of *One City: Built to Last.* This represents one third of the initial $39 million in energy efficiency investments, which are underway as part of the Accelerated Conservation and Efficiency (ACE) program. ACE is a competitive funding program managed by DCAS to fast track shovel-ready energy capital projects and guarantee optimal GHG reductions and cost savings. Collectively, these projects will result in an annual reduction of 13,800 MT of carbon emissions and yield avoided energy costs of $5.06 million a year.

I am now going to turn the testimony over to Dan Zarrilli to provide more detail on this plan. After his portion of the remarks we will answer questions the Council has for us regarding this topic.

The risks of climate change

Thank you Bill, and thank you Chairman Richards and the members of the council for holding this important hearing today. New York City is vulnerable to the impacts of severe weather and climate change and these risks are expected to grow. During Hurricane Sandy, we saw how exposed we are to the type of damage and loss of life that can happen in extreme weather events.

Tragically, 44 lives were lost in New York City and we incurred $19 billion in damages and lost economic activity. Mayor de Blasio established the Office of Recovery and Resiliency (or ORR) in order to accelerate the city's recovery from Sandy and make investments to prepare for the future risks of climate change more broadly. I have worked closely with many of you in my capacity as Director of the Office of Recovery and Resiliency (or ORR) and I know you understand how real this risk is. ORR is tasked with implementing the city's climate adaptation and resiliency plan, which includes strengthening coastal defenses, upgrading buildings, protecting City infrastructure and making neighborhoods safer and more vibrant. We have made significant progress over the last year in implementing this plan:

- we have placed more than 4 million cubic yards of sand on beaches citywide and 26,000;
- inear feet of dunes
- we have advanced flood insurance reform to better address the impacts of insurance rates and guidelines;
- we secured millions in funds for NYCHA; and
- we have completed much more activity as we plan and secure funds for the next round of investments.

The policy and programs being implemented at OLTPS and ORR to reduce the causes of climate change and adapt to its impact are driven by the best available science. Prior to Hurricane Sandy, the New York City Panel on Climate Change (or NPCC) was created with partnership from Council leadership. It is comprised of the region's pre-eminent climate scientists and was established to make sure that NYC would always have updated, accurate local climate risk information. The NPCC released initial recommendations in 2009 and was reconvened after

Sandy to provide the best-available projections, which paint a vivid picture of the risks we can expect into the middle of the century and even out to 2100. For example, high-end estimates put sea level rise at 2.5 feet by the 2050s and as high as 6.25 feet by 2100.

To put things into focus, within forty years, the population of New Yorkers living in the 100-year floodplain is expected to double from almost 400,000 to almost 800,000 people. And we have to consider an entire range of climate risks beyond coastal storms including intense precipitation and heat waves. By the 2050s, high-end projections show the number of days over 90 degrees to go from an average of 18 days per year to almost 60, akin to Birmingham, Alabama. Furthermore, it is our most vulnerable – senior citizens, the medically infirm, and low- and middle- income families – who feel these impacts the hardest.

In addition to gaining a better understanding of the city's vulnerability, we have invested a lot of effort to better understand the causes of climate change specific to New York City. The City of New York releases its Greenhouse Gas Inventory annually and we just released the most recent inventory based on data from 2013. It reveals that we have seen a 19% reduction in citywide GHG emissions since the 2005 benchmark to 2012, but then flat-lined at 19% from 2012 to 2013. There are external factors at play, including weather events like the polar vortex of last winter, but this is a strong indication that while we have main strong initial gains we have much work to do if we hope to overcome the normal occurrence of weather. Not only that, but much of these gains came about through a one-time switch in the power generation transition from coal and oil to natural gas. That can't be replicated, which is why we need to be more aggressive.

One City: Built to Last

One City: Built to Last is comprehensive plan to fight climate change by reducing greenhouse gas (GHG) emissions produced by our buildings with a package of policies and programs announced by Mayor de Blasio during climate week. It calls for direct investments to increase the efficiency of the City's public buildings, including schools and public housing and to spur private building owners to invest in efficiency upgrades that can reduce GHG emissions that contribute to climate change and poor air quality, protect New Yorkers from rising utility bills, and stimulate demand for retrofitting and renewable energy jobs.

In the interest of time I will provide a brief summary this afternoon, but you can review the plan in full at www.nyc.gov/builttolast.

While *One City: Built to Last* has long-term vision, it is based on a ten-year first phase that accelerates the City beyond the previous 30 by 30 goal, which is necessary if we hope to achieve 80 by 50. By 2025, this plan will reduce City government GHG emissions by 35% and buildings citywide by 30% and in so doing, establish the aggressive pathway needed to bring overall GHG emissions down by 80% before 2050. Last year, the City produced a report "New York City's Pathways to Deep Carbon Reductions" that indicated that as difficult as 80 by 50 will be to achieve, such interim goals as 35% City GHG reduction and 30% citywide GHG reduction by 2025 will put on us on the correct course.

There are four key strategies guiding this plan.

First, the City of New York will lead by example and make public buildings models for sustainability. We will invest in high value efficiency upgrades in approximately 150-200 City buildings per year for the next ten years, including schools, firehouses, hospitals, police precincts, libraries and homeless shelters. This will be accomplished through a competitive citywide process that identifies the most effective reduction measures across the public building portfolio. We will upgrade every City-owned building with significant energy use by 2030. We will perform energy upgrades in 450 schools over the next five years – including 325 comprehensive lighting upgrades and 125 boiler replacements to improve energy efficiency and improve indoor air quality (PCB remediation). We will increase solar and renewable energy deployment on City assets, beginning with 24 schools – and install solar on more than 300 city buildings, generating 100 MW of energy over the next decade. We will pilot cutting-edge energy technology from local clean tech start-ups in City buildings. The City will hire additional operations & maintenance staff and expand training programs for the City's building operators to upgrade skills and ensure equipment is operated efficiently. Finally, we'll partner with HUD to reform the Energy Performance Contract (EPC) program to unlock the potential for undertaking large-scale energy efficiency measures at NYCHA that will free up dollars for other critical needs and improve quality of life for residents.

Second, the plan seeks to create a thriving private market for energy efficiency and renewable energy. We will require buildings over 25,000 sq. ft. to measure and disclose energy use annually, conduct energy assessments, and upgrade lighting. We will catalyze the retrofitting of about 20,000 private buildings, through a "retrofit accelerator" program, making up 15% of citywide built square footage. This program will align building owners with the technical know-

how, the incentives and the financing to make these investments. Two-thirds of this are multifamily buildings, and roughly 40% are government-assisted affordable or rent-stabilized. We will connect New York workers with new jobs and opportunities in energy efficiency and renewable energy with integrated workforce development focus throughout each initiative. We will create a green grant program for affordable housing that will fund efficiency upgrades in exchange for regulatory agreements to preserve affordability. We'll incorporate efficiency measures into all HPD moderate rehabilitation programs by requiring that all buildings undergo an energy audit as part of the capital needs assessment process. We will organize communities to spur efficiency retrofits, starting with about 900 buildings in Brownsville and East New York, Brooklyn. We will challenge the City's largest institutions to commit to deep carbon reductions of 30-50% over ten years and fund trainings in energy efficiency best practices for building staff to save energy and promote skills upgrading. We'll spur the development of more than 250 MW of private solar generation across the City in the next decade – a dramatic eightfold increase over current levels.

This program will be entirely voluntary at first, because we know that these investments make sound economic sense. But if we don't see the needed effort, we may need to consider mandatory action once we better understand the right means to hold ourselves accountable to these goals.

Third, with the leadership of NYC Council, we will develop world-class green building and energy codes. By working together with the industry leaders and City Council, the City will continue to improve standards for energy performance and sustainable building practices in new

construction. Standards will be implemented that raise the bar towards better construction practices, higher efficiency equipment, and improved operations and maintenance to improve the quality of our building stock and lower energy costs for residents. Energy performance standards need strong enforcement and education to ensure existing and new standards are met, which is why we are allocating resources to the Department of Buildings to ensure that these requirements are fulfilled in both the design phase and during construction.

Finally, we will promote New York City as a global hub for clean energy technology and innovation. We will explore innovative technology for buildings and support clean tech businesses seeking to expand in New York City in energy efficiency, energy storage, or renewable energy generation. For example, the Urban Future Lab in Downtown Brooklyn boasts 10,000 square feet of incubator, educational, and demonstration space. It hosts 17 companies who are not only pushing the edge of innovation in sustainable and resilient urban technology, but cultivating economic development for our emerging "Tech Triangle" in Brooklyn.

It is important to reiterate that while this plan has a long-term perspective, this works begins now and the impacts will begin immediately and for all New Yorkers. These impacts will be felt environmentally, in terms of public health, economically, and in terms of green jobs. Specifically the proposed plan will reduce GHG emissions by 3.4 million metric tons/year inside of 10 years, or by 2025. That's a 10% reduction in building-based emissions – equivalent to taking 715,000 vehicles off the road or decommissioning an entire coal-fired plant. The plan will also generate cost-savings of more than $1.4 billion annually by 2025 for public and private sectors, leading to $8.5 billion in cumulative energy cost-savings over 10 years. The plan will also create nearly

3,500 new jobs in construction and energy services and train 7,800 workers to upgrade their skills.

Already the City has taken action to install solar panels, securing $28 million to fund 24 installations on City schools as part of *One City: Built to Last*, tripling the amount of solar currently planned on City-owned buildings.

Furthermore, by developing a comprehensive plan to address building efficiency we are building out an 80 by 50 framework that we can apply to other sectors, like transportation, energy and solid waste. Planning for the 2015 PlaNYC update is already underway.

I will end my remarks by reinforcing the tone that Bill had in the beginning of his remarks: this is a crisis of the century and nothing short of the full cooperation of every New Yorker from every walk of life will be needed to fight the effects of climate change. In that spirit, we will closely with New York City's world class real estate industry, architects, engineers, labor unions, affordable housing experts, environmental justice leaders, and academics to carry out *One City: Built to Last* as collaboratively as possible, but make no mistake – we are serious about this goal and the transformation needed to complete it. We have no illusions that New York City alone can solve this crisis. What we can do is show how cities can take action to reduce the effects of climate change while at the same time continuing to pursue an aggressive resiliency plan to address the vulnerabilities we face.

I am confident that, just as New Yorkers have responded to every crisis put in front of them with

strength and vision, they will address this great crisis of climate change before us. It is imperative that, with the Council's continued cooperation, we provide the direction and leadership necessary for them to do so. Thank you for your time. We will now address questions that the Council has.

FOR THE RECORD

My name is Ellen Osuna, I've lived in New York City for most of my life. I chose to leave this city six years ago and have recently returned. With each visit back I became more sure that NYC is my home, and I would like to get more involved in helping shape a sustainable course for this amazing and influential place. I've been involved in the environmental movement, from food issues to advocating renewable energy over fracking, including issues of oil refineries California and coal / oil trains in Oregon, for over 10 years. Along the way one of the things I've learned is the insidious influence of the dirty energy industry on government, advertising, academia, and public opinion. When industry fronts for fracked gas, which releases methane, a potent greenhouse gas, as well as volatile organic compounds and a host of other toxins into the environment, can masquerade under names like the American Clean Skies Foundation and the Groundwater Protection Council, there is a problem.

Becoming more involved in the movements for sustainable energy in NYC, I've met some amazing, brilliant, pragmatic people who have tremendous knowledge about the viability of renewables – and efficiency – and the harms to health and climate which result from extreme energy sources such as hydrofracking and nuclear power. Some of these people have submitted testimony which I hope you seriously consider. I also ask you to look closely at research by Theo Colburn into chemicals used in "natural" gas operations http://endocrinedisruption.org/ , research done and compiled by Physicians, Scientists, and Engineers for a Healthy Energy http://www.psehealthyenergy.org/ , and Breast Cancer Action http://www.bcaction.org/ , to truly understand why a path to a truly sustainable NYC will not invest one dollar nor one hour of energy into fracked gas, and will take a stand against any new fossil fuel infrastructure. NYC should be adamantly opposed to any hydrofracking in NY State, not only concerned about our watershed. Still, a basic understanding of how wells leak, how natural fissures underground lead water towards water, leads to the conclusion that "buffer zones" between the gas wells and our watershed are nearly meaningless. Please also review research by Arnie Gunderson, nuclear scientist who explains clearly and scientifically why nuclear energy is a mess of problems that should by no means get away with labeling itself "clean", and understand that Indian Point needs to be closed. http://www.fairewinds.org/

We aren't only against things, we are for a renewable future, which needs to begin in the present with sincere effort, not a diluted "all of the above" which takes one step forward and two steps back. Please look to The Solutions Project for guidance from scientists & engineers about paths to 100% renewable energy for all purposes. http://thesolutionsproject.org/

I thank you for taking this step to make NYC an example for the world in sustainability. However I urge you to walk this talk as thoroughly as possible. Council Intro 378 needs clear enforcement, clear paths to becoming 100% renewable, and clear paths away from ***all*** fossil fuels & nuclear. PlaNYC mentions carbon emissions in many places where it fails to mention methane emissions. One can reduce carbon emissions by using more fracked gas, yet be doing nothing better for the climate and be contributing to a host of

environmental and health problems which will plague future – as well as current – generations. I do appreciate that the language of Intro 378 mentions greenhouse gases rather than only carbon. Please continue to do so and work to change PlaNYC to reflect that understanding as well.

While we can drown in mental facts about the dangers of fracking and oil and nuclear and on and on .... Of course we need to understand this science – the science independent of industry funding and influence - and base any sound decisions upon it. But beyond that, we all know in our hearts and souls that our task is to create a future that does not include fossil fuels and nuclear, at all ... well, besides the damage which will forever remain from the eras when they have been used. We need a new direction, to go completely renewable. Even five years ago I would not have been able to say this and feel confident in the viability of becoming 100% renewable, for all purposes. Now, because of the planetary imperative, enough research has been done, enough technology is available including for the times the wind doesn't blow and the sun doesn't shine, and there are many ways to incorporate more efficient buildings, and less energy use in general. TheSolutionsProject.org - It is possible. Let's have NYC lead the way.

Sincerely,
Ellen Osuna
73-63 260th St
Glen Oaks, NY 11004-1121

TESTIMONY ON COUNCIL INTRO 378
BY ROBERT ALPERN

My name is Robert Alpern. I've been active in the development of City and State environmental policy for some 40 years, among other things, in government, as Senior Advisor to the NYC Commissioner of Environmental Protection and public member of the NYS Water Resources Planning Council.

For me at least, Intro 378 presents these problems:

- It leaves in place a definition of "greenhouse gas emissions" that includes only carbon dioxide, methane and nitrous oxide (there are others).

- It doesn't clearly identify the agency responsible for City energy policy (the presumed intention is the Mayor's Office of Long-Term Planning & Sustainability).

- It gives no guidance on preferred policies, programs and actions to achieve the 80 by 50 goal (leaving open the possibility of reliance on nuclear energy and natural gas).

- It establishes no dates, criteria, or review processes for the responsible agency's finding that the 80 by 50 goal is or is not "feasible".

At a minimum, the proposal should be amended:

- to require that the policies, programs and actions proposed to meet the 80 by 50 goal should not include use of nuclear power or natural gas, either long-term or as a "bridge fuel," and should not rely on Canadian hydropower;

- to require that the agencies responsible for proposing and managing those policies, programs and actions be clearly identified and be advised by an appropriate advisory committee of citizens and scientists; and

- to require the Mayor's Office to report each year on the "feasibility" of the 80 by 50 goal, following a public hearing on its preliminary determination.

In addition, the Council should consider preparing its own report to the public -- and ultimately hold public hearings -- on the City's current and projected capacity for energy policy-making, including the arrangements for staffing and consultation of all relevant City agencies -- the Mayor's Office included.

Finally, the Council should ask responsible City officials to explain why only three greenhouse gases are currently covered in the emissions inventory -- carbon dioxide, methane and nitrous oxide -- and why other greenhouse gases should not be covered by the 80 by 50 program.

Robert Alpern
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ORAL TESTIMONY REGARDING INT. 378, A LOCAL LAW TO AMEND THE ADMINISTRATIVE CODE OF THE CITY OF NEW YORK, IN RELATION TO REDUCING GREENHOUSE GASES BY EIGHTY PERCENT BY TWO THOUSAND FIFTY

Prepared by Moisha Blechman and R. Frank Eadie

for the New York City Group of the Sierra Club

October 23, 2014

The New York City Group of the Sierra Club includes approximately 14,000 members who are deeply concerned about the environment of the City--the human, the other fauna and flora and the built environment. In particular, we have a long history of involvement with global warming/climate change so we very much appreciate the opportunity to comment on this critical piece of legislation.

We are most grateful for your initiative in taking this step at this time. There are, however, several steps that we believe are necessary to prevent the planet's spinning off into unpredictable, intollerable weather patterns that will make current conflicts and instability look like a quiet day in the park. Most scientists agree that If we brought greenhouse gas emissions to zero, today, it would be at least 2050 before the climate begins to stabilize. Unfortunately, their predictions have almost always been unrealistically conservative, so we should take these warnings very seriously.

Given this, and many other arguments, we strongly urge that you revise the proposed reductions from 30% by 2030 to be 50% by 2030 and 80% by 2050 should and can be 100% since 2005 levels. Even at these levels, emissions will be well above what may provide a "safe" level of 350 parts-per-billion of carbon dioxide in the atmosphere.

We know that under the Bloomberg Administration renewable energy in NYC has begun to play a significant role in the City's energy mix--increasing in an exponential manor over the last several years. Most New Yorkers have a serious concern and information regarding climate change. Even the real estate developers and owners are indicating real concern.

Please, then reconsider the numbers--we can do much better than 80%. Let's be a real leader for the rest of the planet!

Other issues: Int. 378 could and should insure that "renewables" really are renewable. Nuclear, natural gas, and large scale hydro are not! It does not give priority to the development of well distributed energy production. It does not refer to any of the greenhouse gases other than CO^2, nitrous oxide, and methane. It doesn't clarify enforcement or reporting frequencies by specific city agencies.

INTRO NUMBER 378
TESTIMONY BY THE SALLAN FOUNDATION
NEW YORK CITY COUNCIL, ENVIRONMENTAL PROTECTION COMMITTEE
OCTOBER 22, 2014

My name is Nancy Anderson, Executive Director of the Sallan Foundation. Sallan is a New York City-based, independent, non-partisan, non-profit organization dedicated to advancing useful knowledge for greener cities. I am pleased to testify here and to offer strong support for Intro. Number 378, a bill that builds on and extends the goal of the City's Climate Protection Act, Local Law 22 of 2008.

It is clear that we must do more and we can do more, starting today, to be climate action leaders. It is also clear that much of this real hands-on innovation will arise at the urban scale. We are up to the task.

In order to act in the best interests of the City to provide for an increase in future reductions in citywide greenhouse gas emissions, I offer 5 recommendations for City Council action:

1. Companion legislation should be drafted to establish binding intermediary greenhouse gas reductions. Intermediary targets would foster and guide future City Council oversight hearings on the progress being made toward meeting the 80x50 goal and would also inform the Council's budget proposals and approvals.
2. Legislation should also require the Mayor's Office to produce an annual progress report on how the City is advancing in its efforts to meet the 80x50 goal.
3. The Council must ensure that the staffing needed for detailed 80x50 policymaking, implementation, relevant permit reviews and enforcement is made possible by adequate annual funding. This should start with the FY 16 City budget.
4. Everyone wants to be a winner. The Council should establish an Energy Reduction Race and use annual energy benchmarking data (required by Local Law 84) to award buildings that make the biggest cuts in their energy consumption. This Energy Reduction Race would be a great way to spotlight the importance of City's Benchmarking Law and elevate it above just "more paperwork". Philadelphia is doing this. New York should too.
5. The Council should facilitate creation of special 80x30 districts. These pioneers will need the commitment and capacity for nimbly taking advantage of City and State energy efficiency and clean energy programs to cut greenhouse gas emissions by improving the energy performance of their buildings and taking bold steps to decarbonize their heat and power supplies. Replicable energy efficiency projects and "test-bed", community-scale GHG-reducing heat and power systems like microgrids or renewable installations like solar power are the tools we must plug in now. By volunteering to lead the way, 80x30 districts will show all New Yorkers how to do it.

Thank you for holding this hearing and for the opportunity to speak.

I'm Ken Gale, and since 2002, the host and producer of the environmental radio show Eco-Logic on WBAI-FM here in New York City and founder of the New York City Safe Energy Coalition, NYCSEC.

I absolutely support reducing greenhouse gas emissions by 80%, the sooner the better. I also thank you for saying greenhouse gas emissions instead of carbon, since replacing one fossil fuel with another is foolhardy.

And don't let anyone in the nuclear industry make you believe that nuclear power doesn't have a fossil fuel footprint. It's so dangerous that the pumps, relays, safety equipment and cooling systems must use fossil fuels or outside electricity. The environmental racism and fossil fuel footprint of the uranium mining and milling ALONE should keep nuclear power from being considered. AND the increased cancer rates of the people living near nukes who get exposed to routine emissions of radiation every day. That's the benign name they have: "routine emissions." Look up www.radiation.org

But NYCSEC was created not just to shut down Indian Point, but to help with energy solutions, with accent on our buildings as the cause of most of our greenhouse gases. Other *sources* of energy such as rooftop solar, ground source heat pumps and tidal are important and need to be promoted, but I especially want to emphasize efficiency. Using less energy means we won't burn as much fossil fuel or radiate anyone.

Buildings are built to code and no better, so our building codes must take energy use into account. Just as many people buy cars with the mileage in mind, choosing energy efficient cars, so too should buildings be made and bought with their efficiency in mind.

Passive House techniques have been around since the '70s and been perfected to use less than 1/10 the energy of what is usually called a conventional building. New York City architect Chris Benedict has shown they don't have to cost one cent more to build, either.

The easiest, fastest and cheapest solutions are better windows, better window frames and better or more insulation. Most of our buildings were not built with efficiency in mind, so they must be retrofitted. It will pay for itself in a few years, much less time than the life of the building. This benefits landlords, tenants and homeowners. I suggest loans, not grants.

The New York Green Bank won't help homeowners, being geared toward large projects. Con Ed won't participate in on-bill financing, so the City must help homeowners who want to lower their monthly energy costs connect with financial institutions who understand the low risk of such loans. With lower monthly energy bills, the borrower will find it easier paying for efficiency loans than probably any other type of home improvement. Solar installers tell me there are still a lot of banks that don't recognize efficiency or solar as good investments, despite their amazing track record. Solar panels increase property values, sometimes by more than the cost of the panels, so no solar installer should ever have financing problems. Solar panels, insulation and better windows cannot be installed from overseas. They mean local jobs. Let's stop burning our money or sending it to Texas and the mid-east and spend it at home.

When the air or water are clean, thank an environmentalist. If not, become one. 'Nuff Said! Thank you.

Ken Gale nuffsaid@riseup.net

Ways to Go Green

New York Solar Energy Society
5270 Sycamore Avenue
Bronx, NY 10471-2838
917-974-4606 • NYSES.org

Food

Shop closer to home and support your local economy.

Join a "CSA" (Community Sustainable Agriculture) for fresh local food.

Eat what's in season.

Bring your own bags to the grocery store.

Buy in bulk. Look for stores with foods like honey, peanut butter, and oil in bulk and bring your own jar to refill. Weigh it first. A little flour sack can be refilled with grains.

Buy Fair Trade Products.

Use loose tea in tea balls.

Eat veggies, grain and beans. Livestock accounts for 20% of CO^2 gas.

Organic foods save the soil and are full of trace minerals.

Avoid GMOs (genetically modified foods). They breed super weeds and may cause allergies. Super weeds need toxic super weed killers.

In the Kitchen

Use cloth napkins and towels, instead of paper.

Wear an apron.

Filter your drinking water, if necessary, instead of buying it in plastic bottles.

Run dishwasher when full. Pre-wash dishes only if necessary.

Skip the dry cycle and open the dishwasher door instead.

Bake multiple dishes in the same oven or one right after the other.

Use glass jars and old style glass storage containers to store food in the refrigerator and glass can & freeze jars for the freezer.

Keep the freezer full but the refrigerator with air space.

Keep refrigerator coils clean.

In the Bathroom

Take short showers.

Turn off the water while shaving, brushing teeth, gargling.

Use organic, chemical free cosmetics and shampoos.

In the Laundry

Use a clothesline with closes pins or a drying rack.

Concentrated soaps use less packaging.

Keep diapers white (and baby bottoms rash free) by washing in hot water with bleach substitute followed by a second rinse with ¾ cup white vinegar.

Cleaning Choices

Go toxin-free at home.

Clean with baking soda, 10% vinegar in water and citrus products. Slow down on bleach and ammonia.

Find a local organic cleaners. Drop off and pick up with a garment bag.

In the Home/Office

Use plants to purify air.

Check out the new, very low energy appliances.

Investigate the new LED lamps.

Turn lights off when leaving a room.

Turn heat down or off when leaving for several hours.

Install dimmers and motion sensors.

Warm little black boxes are using electricity.

Remember plugs, cables, extension cords all lose electricity.

Get a library card. Use online reservation service.

Call the 800 number on junk mail and ask to be deleted from mailing lists.

Print on two sides of the paper.

Bring unused items to a thrift shop.

Look for swap meets.

Buy things that will last.

Try products made from fast-growing, renewable bamboo: sheets, towels, cutting boards, flooring.

Install ceiling fans. There are corner fans to move air from warmer rooms to cooler rooms.

Fluorescent bulbs save money and energy.

Use power strips for easy on-off. There are whole-room and whole-house easy on-off switches. Cut off all those ceiling fans as you leave.

Fix leaky faucets and toilets.

Caulk drafty leaks.

Choose reusable instead of disposable.

Use solar-powered battery rechargers.

Build a solar cooker/oven.

Carefully recycle old cell phones and computers.

Install awnings to keep the sun from hitting the windows.

Explore alternative heating and cooling. Solar-heated hot water is free.

Give solar panels for birthdays, wedding presents, good grades and for graduations.

Invest in environmentally friendly mutual funds.

On the Go

Take public transportation (and read a book).

Unload your car to lighten the load and use less gas.

Get a tire pressure gauge to keep tires properly inflated.

Don't leave your car idling.

Ride share and carpool.

Get car alignment checked and keep engine well tuned.

Drive a hybrid or diesel.

Ride a bike.

Skip the hotel plastic mini-bottles of shampoo.

Skip the escalator and elevator and take the stairs.

Carry a nice plastic knife, fork and spoon you can wash and use again.

Use a great thermos and refillable water bottles.

Coffee shops will refill your own coffee mug.

Pack a smaller stuff sack for library books and unexpected shopping.

Put a handkerchief or bandana in your pocket or purse.

"Hold the plastic!"

Explore ECO Tourism.

In the Yard & Garden

Learn to "square foot" garden.

Compost leaves, greens and soil together. Lightly water and turn the pile once in a while.

Use hand tools instead of power tools when possible, like a hand mower, hedge clipper, edger and rake.

Direct downspouts into a rainwater barrel for watering and washing tools.

Shrink your lawn; use compost lawn food; buy better seed.

In the Community

Let your town know you want to save energy.

Shield outdoor lights to point light down.

Volunteer at your local park or waterfront and make it the best place to visit.

Plant a community garden.

Remodel older homes rather than building new.

Energy touches everything and everyone and you are a part of the sustainable discussion.

Testimony of Patrick Almonrode (member, 350NYC) on Intro 378

(to amend the NYC Administrative Code in relation to reducing greenhouse gas emissions by 80% by 2050)

Chairman Richards, members of the committee, and Ms. Swanston, good afternoon. My name is Pat Almonrode, and I'm here today as a member of 350NYC.

As most of you know, my organization is the local affiliate of 350.org, an international grassroots organization fighting climate change, and I'd like to begin by commending this committee, its chair, and its counsel for the extraordinary work you've all done to help in that fight. It is, I think, a great *and hopeful* time to be a New Yorker, and a large part of that is due to your work.

Intro 378 is another example of that important work. I'm very happy that you see the need to set a goal for the reduction of citywide emissions of greenhouse gases *more ambitious* than was originally set in PlaNYC. The reduction of greenhouse gases and the stabilization of the atmosphere is the most important and the most urgent challenge that humanity has ever faced. New York City has already made significant reductions, but we must do more. In fact, we must do more *even than this amendment proposes*.

I urge that this amendment be re-written so that it requires an 80% reduction *not* by 2050, but by 2030, and further, so that it requires a 100% reduction – that is, an *emission-free New York* – by 2050. As Professor Mark Jacobson and others have shown, these goals *are achievable* – and, importantly, such ambitious goals would jump-start our local economy and create thousands of good jobs, and would do so faster than the current proposal.

I also urge that the amendment add language to the Code specifying that these emissions reductions must be achieved through conservation and efficiency measures, and through increased reliance on renewable energy sources. Huge reductions can be achieved through the retro-fitting of existing buildings, and by requiring that new construction be green. The same is true of conservation – for instance, maybe it's time for a law against keeping empty office buildings lit up all night long.

As for renewables, we have not even begun to seriously tap the potential of solar, wind, and tidal energy for the City. If we've already achieved significant reductions, just think about how much further we could reduce our emissions, *and* how many jobs would be created, if we were to seriously invest in rooftop solar, offshore wind, and tidal-energy projects.

The proposed amendment should require such investment, and just as importantly, the amendment should specify that reductions are *not* to be achieved by increased reliance on natural gas and/or nuclear energy, both of which would be exactly the wrong way to go.

Mr. Chairman, I know that you're aware of just how wrong it would be to increase our reliance on natural gas. You recently toured the fracking fields of Pennsylvania, and saw that devastation first-hand. As you well know, nowadays, natural gas *is* fracked gas. Reducing New York's emissions by increasing our use of natural gas would not only increase the pressure to bring fracking's devastation to *our* state.

Moreover, numerous studies have shown that while natural gas may burn cleaner than other fossil fuels, it has a *greater* climate impact than those other fuels when the whole extraction-to-combustion cycle is considered.

Mr. Chairman, given the strong words of your recent op-ed in the Daily News, we expect you to be particularly vigilant in making sure that emission-reduction plans don't become a backdoor to fracking and to increased reliance on natural gas. The same for nuclear, which is too costly, too dangerous, too polluting, and which would take far too long to build, to be part of any serious emission-reduction plan.

Again, on behalf of 350NYC, I commend you for your work so far, and I urge you to make that work even stronger by setting more ambitious goals, and by requiring that those goals be met through efficiency, conservation, and renewables, and *not* through natural gas or nuclear. 350NYC stands ready to work with you to make New York a world leader in the fight against climate change. Thank you.

Testimony for 10/23 City Council Hearing on Intro. 378

Good afternoon, my name is Edie Kantrowitz, I am affiliated with United for Action, NYC Friends of Clearwater, and the Coalition Against the Rockaway Pipeline. I would like first of all to thank both the City Council and the Mayor's Office for the tremendous leadership they have shown in recent months towards our shared goals of reducing emissions and addressing climate change. 400,000 people marched in the streets of Manhattan in September to demand a sustainable future, and this bill, Intro. 378, is a beautiful start towards making NYC a leader in climate progress. However, it does not go far enough.

The bill *must* make explicit that shale gas, nuclear power, and large scale hydroelectric dams are not the power sources we must turn to in order to reduce emissions. Too many times, and in too many ways, we have heard that methane will save us from Co2 emissions. But methane, aside from all the public health, economic, and environmental harms caused by fracking, is 86 times more potent than Co2 as a greenhouse gas over the twenty year period; and a recent study has shown that 40% of U.S. carbon emission reductions since 2007 can be attributed to renewables, while only 30% can be attributed to the growth of shale gas. So even looking simply at the standard of effectiveness, we see that shale gas should have no place in our energy future.

Nuclear power is simply cancer waiting to happen, and large hydroelectric dams are ecosystem disrupters. We will not support Intro. 378 unless it makes clear that our emission reduction goals are to be met only by power sources that are truly clean, green and sustainable, such as solar, wind, geothermal, tidal power, and small scale hydroelectric.

Conservation and efficiency must also be given a much larger role in meeting our emission reduction goals. This is a low hanging fruit that we must not ignore. Americans waste a tremendous amount of energy, and NYC can, and should, set a positive example by becoming a leader in implementing energy saving attitudes and technologies.

Additionally, the plan needs strong enforcement measures, which it currently lacks; and it needs to have more clearly delineated policies and procedures for meeting the 80 percent by 2050 goal, including annual targets, and reportbacks on whether those targets are being met. The agencies responsible for managing new programs should be clearly identified, and there should be mechanisms in place for establishing an advisory committee of citizens and scientists to allow for continuing public input.

Beyond that, let's ask ourselves: why only 80% by 2050? Why not reduce emissions 80% by 2030? Even better, can we not challenge ourselves to reduce emissions 100% by 2030, and be completely sustainable? We need to do this, and we can do this. For the sake of future generations, we cannot afford to do any less.

Edie Kantrowitz
333 McDonald Avenue - #5D
Brooklyn, NY 11218

Contact:
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New York League of Conservation Voters
212-361-6350 x203
yliu@nylcv.org

Statement of Ya-Ting Liu
Director, New York City Sustainability Program
New York League of Conservation Voters
before the
New York City Council Committee on Environmental Protection
concerning

Intro 378-2014

October 23, 2014

Good morning. My name is Ya-Ting Liu, and I am Director of the New York City Sustainability Program at the New York League of Conservation Voters (NYLCV). NYLCV represents over 25,000 members in New York City and we are committed to advancing a sustainability agenda that will make our people, our neighborhoods, and our economy healthier and more resilient.

NYLCV enthusiastically supports Intro. 378 which sets ambitious goals for reducing greenhouse gas ["GHG"] emissions 80% by 2050 in New York City. Thank you to Chair Richards and members of the Environmental Protection committee for holding this hearing. Climate change is among the most important environmental problems facing US cities today. Potential impacts of climate change on New York City have been well documented and increasingly devastating in recent years.

Intro 378 builds on the existing goal of reducing NYC greenhouse gas emissions 30% by 2030, which the city is already two-thirds of the way towards meeting. This bill sets the bar even higher. While this bold action is desperately needed, we face a long and costly journey towards achievement of these significant reductions, which require interdisciplinary collaborations between multiple agencies and committees. It will require future mayors and councils to continue to make substantial progress.

In order to help set the table for this ambitious plan and help future councils in evaluating the progress towards the 80 by 50 plan, NYLCV offers the following suggestions to make the bill stronger so that its goals become a reality:

1. In order to provide guidance to this and future administrations, the bill could be improved by creating intermediate goals for greenhouse gas reductions. NYLCV suggests intervals of five to ten years so that future Councils can monitor the progress towards those milestones and ensure that programs are on-target and projects to achieve these goals are

working well.

2. Both the *Mayor's Management Report* and the *PlaNYC Inventory of New York City Greenhouse Gas Emissions* provide progress reports on GHG emissions and have proven to be useful tools to evaluate the City's efforts. In order to meet the more ambitious reductions in GHG emission goals in this bill, we suggest that the legislation require an expanded annual progress report. Building from the *Inventory,* this report should break down GHG emissions by industry sector, building type, geographic region (such zip codes), transportation sectors, and more. The Council would then be able to evaluate the success or failure of programs designed by energy consumer.

NYLCV applauds the work of the members of the environmental protection committee. We are committed to working with our advocacy partners, members of the City Council and the administration to continue striving towards a sustainable future and improved quality of life for all New Yorkers.

Philip H. Kahn, PhD
Co-Leader, Manhattan Chapter
Citizens' Climate Lobby

Testimony to the New York City Council
Committee on Environmental Protection

October 23, 2014

Dear Committee Members:

Thank you for giving me an opportunity to speak on behalf of my organization, the Citizens' Climate Lobby (CCL), in support of Local Law 0378-2014.

CCL wholeheartedly supports passage of Local Law 0378. This law will put New York City in the vanguard of actions to save our city, nation and our planet from the worst effects of climate change brought about by greenhouse gas pollution.

CCL's primary policy goal is a national price on carbon emissions that will allow businesses and consumers to choose their own methods of de-carbonization and we fully recognize the value of setting ambitious goals such as those in Local Law 0378 and the Mayor's recent proposals for mitigating the effects of climate change on New York City. We applaud the leadership that New York City is showing on this extremely important issue, but also wish to highlight that without a national price on carbon pollution, the chief way New York City will be able to significantly reduce emissions is through regulation, mainly through strengthening and enforcement of its building codes.

I want to briefly summarize the CCL policy proposal and tell you how it can help assure we meet the 80% reduction goal by 2050 in both New York City and in our nation.

Citizens Climate Lobby (CCL) is a grassroots organization dedicated to national action that will ***lessen climate change through market forces rather than regulation***. Our main efforts involve engaging Congress to enact a revenue neutral fee on the carbon content of fossil fuels as they enter the national economy. This fee would start at a modest level of $15 per ton of CO2 emissions and steadily rise by $10 per ton of emissions per year. This proposal would refund all proceeds collected to the American people on an equal basis, and has provisions to help American businesses compete with firms in countries without such carbon fees.

A recent study of the impact on the U.S. economy of a proposal similar to ours was performed by Regional Economic Modeling Inc. (REMI). The study modeled the greenhouse gas emissions, employment, and economic activity through 2035 compared to baseline prediction of those parameters without a tax policy. Key results compared to the baseline case with no carbon fee are:

- . After only 10 years, CO2 emissions decline by 33% , and by 52% after 20 years

- 13,000 lives are saved annually after 10 years (primarily from reduced burning of coal), with a cumulative 227,000 American lives saved over 20 years
- 2.1 million jobs are gained in the first 10 years, rising to 2.8 million in 20 years.
-
- By 2020, annual GDP increases $70-$85 billion , with a cumulative increase in national GDP due to revenue neutral carbon tax of $1.375 trillion

A **national** price on carbon pollution with the proceeds equally returned to the citizens will especially benefit New York as we have the lowest per capita carbon emissions of any large American city, resulting in more funds being refunded to New Yorkers than they pay in carbon fees. Thus it would help finance the investments required to meet the goals of Local Law 0378.

Further information on Citizens Climate Lobby may be found at http://www.citizensclimatelobby.org and information on the Regional Economic Modeling Inc. report on the effect of revenue neutral carbon tax may be found at http://citizensclimatelobby.org/remi-report/.

Thank you for inviting our testimony on this most important matter.

NEW YORK ENVIRONMENTAL LAW AND JUSTICE PROJECT

11 Park Place, Suite 701, New York, NY10007 office@nyenvirolaw.org 212 334 5551

Outline for Comments - New York City Council Intro. 378

- 80% GHG reduction by 2050 - goal is possible
- all GHG should be included
- can exceed this target and timeframe - public education campaigns needed
- how will implementation be administered through relevant City Agencies
- no enforcement in Intro. will NYCDEP provide enforcement
- feasibility of Task Force as coordinating role
- Mayor's Office of Long Term Planning and Sustainability
- reporting - revision - PLANYC is 4 year cycle
  (annual or bi-annual review with public hearings and input)
- http://www.nyc.gov/html/planyc/downloads/pdf/publications/NYC_GHG_Inventory_2013.pdf
- need study of subsidies and barriers to distributed renewable energy
- advocacy by City at State and National levels i.e. NYSPSC REV
- modeling scenarios to include:
- energy efficiency
- energy conservation
- transportation sector
- reduction and/or no consumption of animal products
  (51% GHG worldwide)
- NYC municipal utility
- NYC municipal owned transmission systems
- economic and health impacts
- alleviation economic inequality within vulnerable populations
- no "transitional" fuel supply i.e. nuclear, fossil fuels, Canadian hydrodams
  (explain pending 750 mw contract - Blackstone CHPE - Queens)
- no false solutions i.e. pollution trading or offsets
  (most RGGI reductions due to fuel switch to gas)

Oct. 23, 2014 - submitted by Annie Wilson, Senior Energy Policy Advisor

October 23, 2014

Chairman Donovan Richards

New York City Council Environmental Protection Committee

My name is Ling Tsou. I'm a co-founder of United for Action, an anti-fracking pro-renewables grassroots group in New York City.

We commend the City Council for this bill Int. 378. While this bill sets out the goal for reducing greenhouse gases, it does not specify how the city plans to achieve this goal. We wish to see New York City achieve its greenhouse gas reduction goal through energy efficiency, conservation and investment and building of renewable energy infrastructure like solar, wind and geothermal and not through increased usage of natural gas or nuclear energy.

Natural gas is not a green energy nor is it a "transitional" fuel. Under the Bloomberg administration the city was building or converting coal fired power plants to natural gas fuelled plants. This is not sound policy which should be discontinued. While burning natural gas maybe cleaner than burning coal, this does not take into account of the methane leakage in the extraction, production and pipeline transportation of natural gas. Methane is a potent greenhouse gas. According to data from IPCC on global warming potentials, methane is 85 times more potent than carbon dioxide when measured over a 20-year time frame. Bloomberg's administration was also aggressively pushing for the conversion of boilers in New York City buildings from number 6 heating oil to natural gas. While we agree that number 6 heating oil is very dirty, conversion to natural gas is not the answer. We call on the city to advocate for more boiler efficiency and conversion of number 6 heating oil to low-sulfur Number 2 heating oil, which creates less particulate matter than natural gas, or biodiesel, which creates near zero particulate matter. These alternatives are less costly to convert and will result in better air impacts and higher efficiency. Increased natural gas usage and expansion of natural gas and liquefied natural gas (LNG) infrastructure will lead to more fracking and greenhouse gas emissions and exacerbate climate change. Nuclear energy is not clean with its radioactive and toxic wastes. With energy efficiency and conservation, New York City does not need the Indian Point Nuclear Plant which should be shut down immediately.

This bill does not specify how the city plans to monitor and report the reduction of the greenhouse gas emissions nor does it specify how the city plans to enforce rules to achieve these reductions. Without regular monitoring and reporting procedure, especially without legally binding enforcement measures with substantial fines for non-compliance, these reduction goals will just be words written on a piece of paper without meaning and substance.

Climate change is the most critical issue of our generation. We need to take bold actions before it's too late. New York City can be the leader and set an example for this country and the whole world. Thank you.

Sincerely,

Ling Tsou

80 Beekman Street (#5K), New York, NY 10038

Ruth Hardinger
October 23, 2014 Public Hearing at NYC Council

Thank you for your new, important and bold initiatives to address climate change. I'm going to list some things that could reduce City emissions and also present new information on time frames for the short-lived climate forcing gases.

New buildings are being constructed all over the five boroughs. Many of these buildings have been recently finished and many new ones are well in progress and many others are in the floor plan stage. How many of these are using renewable energy? Very few, although LEED certification is happening which is helpful. This is a perfect time to have buildings under construction convert to renewable energy. Perhaps one way to encourage this would be make coop and condo tax abatements – such as were used for J-51 in the 1980 or 1990 or after 911 in the financial district.

This seems to be the NYC "time to upgrade" (in parenthesis) as water pipelines and gas lines are being replaced and expanded all over town. That's not good news for reducing emissions short and long term because these constructions are causing more dust, asphalt odors and particulates, plus the crusty, rusty old pipelines replacements are adding more GHG because the pipelines valves are turned off and then the remaining gas (natural gas) in the line is emitted to the air. This has not been addressed or measured, but it definitely adds to methane's climate contributions. This infrastructure development is supporting use of more fossil fuel, natural gas. In the DCS fugitive emissions report of 2013, at least 5% of the gas distributed in NYC is leaked from pipelines ... 8.6 billion cubit feet per year, or about 2.86% of the 300 billion cubic feet of gas handled in the entire ConEd system each year.

It is important to understand that the promoting natural gas as "clean" is based **only** on its having ½ the emissions of oil or coal when burning, yet that does not have a positive affect on reducing its greenhouse gas. The fine particulate emissions are either not accounted for or are deliberately ignored. Though particulate emissions are about 10% of those produced by coal power, the U.S. Environmental Protection Agency estimates that 77% of particulates from natural gas plants are dangerously small. These fine particulates have the greatest impact on human health because they by-pass

our bodies' natural respiratory filters and end up deep in the lungs. In fact, many studies have found no safe limit for exposure to these substances. "Ambient PM2.5 (the Particulate Matter measured in the ambient air) derives from combustion activities such as motor vehicles, fossil-fueled power plants, wood burning, and certain industrial processes.

Natural gas emissions participate in ground-level ozone (commonly called smog) and have been linked to a range of respiratory illnesses. More recently, ground-level ozone has been linked to the development of childhood asthma, the "most common chronic disease" among children.

What are our real carbon levels? CO2, the well-known carbon dioxide, is the strongest greenhouse gas contributor on the 100-year time frame, and now CO2 levels are approximately 400 ppm. Yet, there are other sources of greenhouse gases that participate in escalating climate change that raise the GHG levels much higher. The Intergovernmental Panel for Climate Change (IPCC) in 2014 says: "The Fifth Assessment Report (AR5) of the IPCC provides the latest comprehensive evaluation of the factors driving climate change. What this means is that methane and aerosols levels are higher now than last year.

This report then changes the name of these radiative forces from SLCP short-lived climate pollutants to NTCF Near-Term Climate Forcers because the chemistry and degradation of these gases vary depending on their concentration, chemical activity and the time frame you are considering. The IPCC states that it is not appropriate to compare CO2 to these Near Term Climate Forcer and IPCC discourages the use of CO2 equivalence because these gases have an array of life cycles. That being said, the NTCF have strong impacts up front, therefore these are the gases that we should focus on stopping now. This is an important reason, (along with the numerous other reasons) why natural gas is escalating climate change, is not a benefit to the environment and NYC should stop the build out of gas infrastructure...push the pause button on more gas infrastructure and emphasize conservation, efficiency and renewable energy.

My understanding of our current GHG levels is that we are probably way close to the tipping point, as was stated by Bryce Payne, PhD on September 20. We may well be at 450 – 480 PPM if these near-term climate forcers are added to the CO2 levels. Most scientists agree that 500 PPM is the point of no

return. We have 5 or 10 years to turn off the fossil fuel spigot.... not 25 years. I urge that this information effects your decisions for actions to update how PlaNYC is implemented.

I suggest that you have meetings with independent specialists in pipelines and gas such as Gas Safety, Inc., and also with those who know about cutting usage through conservation, about encouraging building efficiency and renewable energy use. I want this NYC administration to make real progress soon enough, based on real facts so that we do not go to that point of no return.

Testimony of Jeff Zimmerman
Damascus Citizens for Sustainability, NYH2O, and Citizens for Water

Committee on Environmental Protection
New York City Council
October 23, 2014

Thank you for the opportunity to present testimony to the committee today on reducing greenhouse gas emissions by 80% by 2050. Currently, the Mayor's office is continuing to implement PlaNYC to reach a 30% reduction in carbon emissions by 2030. Recently it was reported that we have achieved a 19 % emissions reduction and should reach the 30% goal by 2017. The cornerstone of the PlaNYC emissions reduction strategy has been replacing No. 6 and No. 4 fuel oil with natural gas or No. 2 fuel oil. By far and away, the new fuel of choice has been natural gas, due in large measure to aggressive incentive programs by the gas distribution companies, ConEd of New York and National Grid, with support from the Mayor's office and other government participants such as NYSERDA.

Unfortunately, the expansion of natural gas usage in new buildings and in conversions of existing buildings has only substituted one fossil fuel for another and, in the process, increased the emissions of methane, a far more potent contributor than CO2 to increased greenhouse gas levels. It was reported last month by the U.N. World Meteorological Organization that atmospheric levels of CO2 have reached 400 parts per million and continue to increase, especially from the more potent compounds such as methane. Rather than contributing more methane on this road to ultimate ruin, it is time for New York City to hit the "pause" button and rethink our strategy for reducing emissions of greenhouse gases.

In June 2013, President Obama announced a Climate Action Plan to reduce carbon pollution and directed his administration to develop a comprehensive strategy to cut methane emissions. The President stated that curbing methane emission is "critical to our efforts to address global climate change." Earlier this year, the White House released its Strategy to Cut Methane Emissions. Among the projects included in this Strategy is action by the EPA to cut methane emissions from oil and gas. If EPA decides to issue new regulations, the Strategy requires EPA to complete these new rules by the end of 2016.

In June 2014, New York Attorney General Eric Schneiderman and the attorney generals of six other states submitted extensive and detailed comments on five methane white papers released by the White House. In these comments, the AGs noted that EPA has classified methane as one of six greenhouse gases endangering public health and the environment. They identified four segments of natural gas utilization – production, processing, transmission and distribution -- during which methane (which constitutes over 90% of natural gas) is either leaked or

intentionally released into the environment, and noted that EPA had already acknowledged its authority under the Clean Air Act to regulate emissions from each of these segments. The AGs' comments criticized the white papers for excluding the distribution segment from the white papers. The AGs stated that, "We must act to ensure that the global warming benefits of switching from coal to natural gas are not diminished because of the release of methane throughout the natural gas system." They went on to state, "It is the States position that not only is targeting methane emissions a necessary component of a successful strategy to address global warming, it is required under the Clean Air Act."

On September 16, 2014, the seven attorney generals sent a letter to EPA requesting that the agency propose methane emissions standards and guidelines for all segments of the natural gas system, "including covering leaks from the distribution of natural gas." This letter noted that leaks from distribution constitute 20% of total methane emissions from natural gas utilization and that the EPA Inspector General had recently released a report calling on EPA to improve efforts to control methane emissions from gas distribution pipelines.

It is clear that, if nothing is done by EPA to reduce methane emissions from gas distribution systems, the seven attorney generals will most likely file suit to compel EPA to take action. As you have heard today, Damascus Citizens for Sustainability has already documented that there are significant methane leaks throughout Manhattan and the amount of this leakage will only go up as more natural gas is sent through the distribution pipelines to supply gas to all of the buildings throughout the City that have converted to or will be built to use natural gas. It is obvious to us that emissions controls will be placed on all significant sources of methane leakage including the distribution lines and the buildings using natural gas.

The prudent course of action, which we urge the City Council to take, is to halt the conversion of more buildings to natural gas and the use of natural gas in new buildings until the issues related to the regulation of methane emissions from distribution leakage are clarified. This should occur over the next year or two. Moreover, PlaNYC did not take these developments related to methane emissions from increased distribution and use of natural gas into account. As we go forward, we need to focus much more attention and effort on replacing natural gas with renewable energy sources for both new construction and retrofitting existing buildings and infrastructure. We support your efforts to reduce greenhouse gas emissions by 80% by 2050 and urge you to emphasize greater use of renewable energy as the cornerstone of the new plan.

Thank you for this opportunity to provide our thoughts on this most important matter.

NYC City Council Comments
10/23/2014

Buck Moorhead, AIA
New York Passive House / Board of Directors
Damascus Citizens for Sustainability and NYH2O / Board of Directors

RE: Int. 378, A Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by two thousand fifty.

Some advice from Buckminster Fuller

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."
R. Buckminster Fuller

We applaud Local Law 378. Imbedded in its language is the capacity to begin to "build a new model that makes the existing model obsolete".

Our existing model is a fossil-fuel based economy, or as Al Appleton calls it, the "black" economy. The new model most recognize that we need, the new paradigm, is the green economy.

PLANYC 2030, introduced in 2007, promotes excellent strategies., to a substantial degree. For all the excellent strategies, it does not change the model because, in encouraging increased use of natural gas, it fails to make the fossil-fuel model obsolete. The current and proposed expansion of our natural gas infrastructure further exacerbates the issues because natural gas is really hydro-fracked shale gas, with its plethora of attendant problems.

Mayor DeBlasio' ONE CITY: BUILT TO LAST plan, and 378 Local Law to amend the administrative code, are strong steps toward a new paradigm.

To mitigate climate change, we must leave much of our accessible, known fossil fuel reserves where they are, in the ground. Some scientists say we should leave 80% of known reserves in the ground.

In NYC, 75% of our energy use is in our buildings. Nationally, 40% of energy use in buildings.

Reducing the use of fossil fuels in buildings, through energy conservation, can therefore substantially mitigate climate change impacts.

I am an architect and a certified Passive House designer. Passive House, developed in Germany in the1990's, leads to buildings that use 80 - 90% less energy for heating & cooling. 30,000 buildings have been built in Europe since 1990.

It is encouraging that Passive House is referenced in One City: Built to Last
"Implement leading edge performance standards for new construction that cost- effectively achieve highly efficient buildings, looking to Passive House, carbon neutral, or "zero net energy"

strategies to inform the standards."

It should be understood that Passive House standards are applicable to the retrofit of existing buildings, as well, not only new construction as referenced in the quote above.

Existing buildings are our challenge.

In thirty years, 85% of existing buildings will still be here. Bringing new construction to Passive House or equivalent standards is the "low hanging fruit" Retrofitting the existing buildings is the challenge. We need to incentivize this retrofit process for occupied multi-family rental and coop buildings, and commercial buildings

Passive House is a global movement.

These low energy buildings are schools, prisons, 1600 unit apartments complexes, offices, court buildings, fire stations

In the European Union, by 2020, all new buildings are to be near zero or net zero. And any residual energy they may require has to be generated on its own site. This is in 5 1/2 years!!!

Luxembourg has adopted regulations that will all new buildings will be built to Passive House standards, as of 2017

Starting in less than three months, January 1, 2015, all new buildings in Brussels must meet the Passive House standard, meaning they will all use 80-90% less energy for heating & cooling, and there is a strict standard for source energy use on a per square foot basis.

Brussels, while a smaller city, is a good model for NYC to look to for lessons learned

There is no mystery or magic to this. These good efforts are happening around the world and in our own City. There are numerous completed Passive House projects and others in the planning and construction phases. There is a 40-unit market rate Passive House rental building in the planning stages for a Manhattan site considering electric heat for the units, because its heating demand will be so low.

One City Built to Last is the genesis of a master plan for our energy future that will ween us off fossil fuels, off fracked shale gas. It is not "natural" We do not need an expanded gas infrastructure.

It will be a master plan that is not determined by companies that will benefit financially by that plan but rather an energy master plan determined by us, and by you, our representatives.

It will be a master plan that looks comprehensively at our energy sources, the public health, and global environmental risks.

NYC can lead the way in our country. This City Council can push our City forward, thoughtfully and intelligently.

Quotes from One City: Built to Last

Nothing short of a dramatic transformation in the way energy is used in buildings is necessary to achieve 80 by 50. By 2050, our buildings will need to become high-performance structures powered by low-carbon energy sources. Walls and windows must be insulated, building equipment must become more efficient and intelligent, and building systems must be made ready for renewable energy sources to eventually replace fossil fuels for heating, hot water, and cooking. Residents would need to conscientiously conserve energy and water, and building operators will need to become skilled in the latest energy efficiency technologies. Moreover, achieving 80 by 50 would require the deployment of new and promising—but largely unproven— technologies and strategies. (Built to Last page 12)

That statement above in red is not accurate. Passive House has been tested, data collection, over 20 years

"Implement leading edge performance standards for new construction that cost- effectively achieve highly efficient buildings, looking to Passive House, carbon neutral, or "zero net energy" strategies to inform the standards." (Built to Last page 12)

"Develop interim energy performance targets for existing buildings to be met through both voluntary reductions and new regulations, such as performance standards and measure-based mandates, which would be triggered if adequate reductions are not achieved."
(Built to Last page 12)

Can and should retrofit to Passive House standards, as well

Buck Moorhead, AIA

New York Passive House / Board of Directors
Damascus Citizens for Sustainability and NYH2O/ Board of Directors

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I am speaking today for Barbara Arrindell, Director of Damascus Citizens for Sustainability.

Thank you for taking my comment into consideration in relation to Local Law, Intro 378.

I would like to urge several items be taken into account in the mandating of an eighty percent reduction in citywide greenhouse gas emissions relative to such emissions for the base year by calendar year 2050;

First point: that the build out of gas infrastructure currently ongoing be paused as quickly as possible. Gas usage actually increases greenhouse emissions - it has been shown that natural gas creates considerably more greenhouse gas emissions along the full path of its production, processing, transport and distribution than is saved, compared to coal or oil, at the singular point of its combustion. Gas is over 90% methane, which in the near term is more than 85 times as potent a greenhouse gas than CO2. Simply put, the less methane released the better off we are globally. Additionally to gas being a very much a fossil fuel, with profound impacts, it may very well see radical hikes in price. This is a new administration with better information and it should chart a new path rather than carry the burden of the failing Bloomberg policies promoting gas usage. so stop the buildout is the first point.

Second point; relates to the first - The planned build out of gas infrastructure in NYC has a tremendous cost - even just looking at the hardware. This cost will be paid for by New York City residents either directly or indirectly (...these projects are not "free"!). If even only the cost of the parts of the build out not yet built are repurposed to conservation and efficiency work, and bringing online more renewable energy sources, then NYC will be in a better longterm position as it achieves its emissions goals.

Third point: All decisions based on some quantitative number should...must...have these numbers be arrived at by actual measuring, not by guesstamates arrived at by modeling (which are ways of guessing) using estimates based on other estimates, that come from maybe a few measurements, made with outdated equipment - years ago. For example, measuring methane, to show gas leaks, is easily possible today by relatively new, but thoroughly tested and vetted instrumentation that is durable, reasonable in price, scientifically robust, easily available and mobile. This same instrumentation, Cavity Ring Down Spectroscopy or CRDS, can be also be used to measure CO2 as well as methane, and also carbon monoxide - down to parts per billion and on a mobile platform. Actual measurements can be then incorporated in a clear enforcement scheme. Without actual measurements we are fooling ourselves.

Thank you,
B. Arrindell
Damascus Citizens for Sustainability

STATEMENT ON COUNCIL INTRO 378

My name is Alice Slater. I work with Shut Down Indian Point Now and am a member of the newly formed NYC Safe Energy Coalition. For the past 25 years, I have worked in various networks and organizations for a sustainable energy future including with the UN's Commission on Sustainable Development which established an International Renewable Energy Agency in 2009.

In the course of my work to phase out nuclear power, fossil fuels, industrial biomass and large scale dam produced hydropower, I have learned that there are so many solutions available to us to make the transition to a clean, safe, planet powered only by our sun, wind, water and geothermal heat abundant and free to all of us on earth. Numerous studies from the UN Panel on Climate Change , World Wild Life Fund,[i] Institute for Energy and Research Evaluation, Rocky Mountain Institute, and Stanford University's Solution Project[ii] demonstrate that we can power our whole planet with 100% clean safe energy by 2050, some even suggest as early as 2030. For these reasons I urge the City Council to legislate, not merely for an 80% reduction of noxious fuels in our city, which should specifically be named in this pending legislation as nuclear, fossil, big dam hydropower, and industrial biomass, but to call for New York to be using 100% sustainable energy by 2050 through a combination of clean energy sources and efficiency. Let us capture the imagination of the people. Just as President Kennedy called for putting a man on the moon in 10 years, this NYC Council should call for 100% of our energy needs to be met by the sun, wind, tides, and geothermal energy coupled with efficiency and conservation by 2050. 80% just doesn't cut it!

We greatly appreciate that many of our Council members were with us at the world's largest climate march in history whose 400,000 people included not only environmentalists and international visitors, but labor contingents, social justice and anti-poverty coalitions, the peace movement, indigenous people, religious leaders, scientists, all calling for a new energy paradigm to avoid the catastrophic consequences of global climate change. We New Yorkers are well aware of the threat to Mother Earth after suffering the devastation of hurricane Sandy and are still restoring our hard hit and impoverished neighborhoods on the Atlantic shore. Yet we have research from Mark Jacobson of the Solutions Project from Stanford, for example, that windmills off the coast of Queens and Brooklyn, could actually slow down the tides, and avoid future Sandys by acting as a natural barrier, while providing enough wind to power up our city. [iii] Our own CUNY has done a solar rooftop study that shows we can provide 50% of our peak energy in the summer by paneling all our roofs with solar. [iv] Even painting the rooftops white would help us meet our goal by deflecting the heat of the sun on our black tar roofs. Geothermal pumps can deliver free heat from the earth to warm our buildings. Today there are rotors under the East River bringing tidal electricity to a supermarket and garage on Roosevelt Island.

There are numerous studies, including one from Cornell University, about the tens of thousands of green jobs we could create, jump-starting our economy and putting people back to work with local jobs that can't be shipped abroad. [v] We urge you to also consider the possibility of

returning NYC to public power. Last year, the City of Boulder Colorado took back its local utility which was slowing down progress by foisting fossil and nuclear energy on the city rather than making the transition to solar and wind. Recent articles show that large utilities are blocking the implementation of sustainable energy programs. This legislation should provide for a review of ConEd policies and call for an examination of the advantages of public power and distributed energy. We are aware of the corporate lobbies that are blocking progress. [vi]

To make sure we reach our goal of 100% by 2050, the legislation must clearly identify the agencies responsible for proposing and managing these clean energy policies, and should require an Advisory Board of Citizens and Experts to oversee the project. Provision should be added in the new legislation that the Mayor's office should report each year to the Council on the progress and feasibility of the project with public hearings for comments on the Mayor's preliminary and ongoing reports.

Alice Slater
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We may now care for each Earthian individual at a sustainable billionaire's level of affluence while living exclusively on less than 1 percent of our planet's daily energy income from our cosmically designed nuclear reactor, the Sun, optimally located 92 million safe miles away from us. Buckminster Fuller

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[i] http://www.worldwildlife.org/climate/energy-report.html

[iii] http://www.stanford.edu/group/efmh/jacobson/Articles/I/Offshore/offshore.html
[iv] http://www.ilsr.org/new-york-city-should-meet-half-its-peak-demand-rooftop-solar-pv/
[v] V.
http://www.brookings.edu/~/media/research/files/reports/2011/7/13%20clean%20economy/0713_clean_economy.pdfv http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf, 2009:
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http://www.stanford.edu/group/efmh/jacobson/Articles/I/susenergy2030.html
[vi] vi http://www.commoncause.org/site/pp.asp?c=dkLNK1MQIwG&b=8667133

Council Member Donovan Richards, Chair, Environmental Committee of the City Council of New York

Comments Respectfully Submitted by Kim Fraczek, Sane Energy Project, Regarding: Int. No. 378

By Council Members Constantinides, Chin, Cumbo, Mendez, Rodriguez, Rose, Rosenthal, Deutsch, Treyger, Kallos, Williams, Miller, Palma, Richards, Espinal, King, Garodnick, Johnson, Levin, Torres, Lancman, Levine, Weprin, Koslowitz, Dromm, Gentile, Koo, Menchaca, Reynoso, Crowley, Cornegy, Vacca, Cohen, Eugene, Vallone, Ferreras, Van Bramer and the Public Advocate (Ms. James)

A Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by two thousand fifty.

Thankfully, many members of the council already understand that New York City's actions have a much wider impact. The proposed ban on fracking waste and road brine is an encouraging step, and we want to thank Council Members Levin and Johnson for taking the lead on that effort. As a thriving urban center and a major consumer of energy, the consumption choices we make affect the entire region.

This also applies to the council's clean air plans: While we stand in solidarity with urban families who suffer health impacts from heavy fuel oils used in older, inefficient boilers, we also stand in solidarity with rural families who suffer the health impacts of drill sites, pipelines, compressor stations, storage facilities, waste dumping, and the related harms of fracking.

We hope that the council will realize that gas boiler conversions are harmful to both urban and rural families for several reasons:

• Fracking threatens our water, air quality and foodshed, statewide.

• Costly gas boiler conversions burden rent regulated tenants who can be charged an MCI (Major Capitol Improvement) rent increase to pay for conversion costs that are often hundreds of thousands of dollars. in the Mayor's climate plan, he notes that: "Increasing utility costs are one of the primary contributors to the growing share of New Yorkers who are becoming rent-burdened."

• Costly gas boiler conversions may put financial strain on building owners when fuel prices rise due to the planned export of shale gas and quickly dwindling reserves, estimated to run their course as soon as 2020 (see attached).

• According to the City's own "Clean Heat" experts, gas boilers create more particulate matter (the cause of asthma) than even number 2 fuel oil, and far more PM than biodiesel.

• Boilers run on biodiesel results in 0% sulfur emmissions, and a 55% reduction in Particulate Matter compared to diesel fuel oils. (see attached chart)

• Biodiesel results in approximately a 60% reduction of Lifescycle GHG over diesel fuel oil.

• Solar thermal installations could greatly reduce the need for boilers to heat hot water, especially during summer months.

More and more families are supporting conversion to biodiesel, and it is our hope that the Council will encourage and help facilitate these efforts.

We are excited to be working with such a progressive Council and we look forward to continued conversations with the Council over the next few years. Thank you.

Council Member Donovan Richards, Chair, Environmental Committee of the City Council of New York

Comments Respectfully Submitted by Patrick Robbins, Sane Energy Project, Regarding: Int. No. 378

By Council Members Constantinides, Chin, Cumbo, Mendez, Rodriguez, Rose, Rosenthal, Deutsch, Treyger, Kallos, Williams, Miller, Palma, Richards, Espinal, King, Garodnick, Johnson, Levin, Torres, Lancman, Levine, Weprin, Koslowitz, Dromm, Gentile, Koo, Menchaca, Reynoso, Crowley, Cornegy, Vacca, Cohen, Eugene, Vallone, Ferreras, Van Bramer and the Public Advocate (Ms. James)

A Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by two thousand fifty.

Sane Energy Project is happy to see the City Council taking this important step toward meeting New York City's climate change responsibilities. We want to begin by applauding the council for targeting a reduction of ALL greenhouse gases, which must include methane, not just carbon dioxide. We understand that the 80% reduction target is a bold step toward climate action.

That said, we remain committed to a New York City that is powered entirely by renewable energy, and we know that this vision of New York is not only possible but within our grasp. Stanford Engineering Professor Mark Jacobson has outlined how we can get there from here, and what his work shows us is that we have to make a choice. We must actively choose a renewable future, or have the choice made for us, and remain locked into an energy system that endangers our health, our security and our climate.

We can begin making this choice through some of the steps that the council has identified. There are important gains to be made via efficiency and retrofits, and we applaud that the council is prioritizing investment in environmental justice communities and the creation of green jobs. Further steps can be taken to streamline the permitting process for renewables and encourage the deployment and development of renewable energy technology, which enjoys wide support from the people of New York City.

Projects such as the two offshore wind farms proposed off Long Island are a neccesary step towards a fully renewable New York. According to the Jacobson plan, to become 100% renewable, New York State must supply 40% of its energy from offshore wind.

So we must also speak loudly and clearly when there is an obvious choice between renewables and fossil fuels. Right now, off the coast of the Rockaways, in the same location where a wind farm has been proposed, there is also a proposal for an LNG (Liquefied Natural Gas) port. This project, called Port Ambrose, would present a terrorism risk near the busiest harbor on the East Coast and close to Kennedy Airport. It would increase the burden of energy costs on working families by facilitating exports and driving prices up. In an area still reeling from Hurricane Sandy and threatened by sea level rise, LNG releases 40% more GHGs than even domestic shale gas. This project would further destroy ecosystems and worsen our climate by encouraging the growth of fracking and shale gas infrastructure across the region.

As New Yorkers, we have a responsibility to oppose projects such as Port Ambrose wherever they spring up. This is why we encourage the city council to support a resolution against Port Ambrose, and against ALL new fossil fuel infrastructure.

My name is Stephanie Low. I am a volunteer with Sierra Club, working for the last 2 years focused on the Trans-Pacific Partnership or TPP trade agreement as Chair of both the Chapter and NYC TPP Task Forces. For the 4 years preceding that I worked as a member of the Gas Drilling Task Force, which focuses on fracking. Currently I also volunteer with OWS Environmental Sustainability Work Group, NY Chapter of Progressive Democrats of America, and NYC Safe Energy Coalition.

Thank you to Chairman Richards and members of the Environmental Protection Committee as well all the sponsors of this important bill for this opportunity to present my concerns and suggestions regarding Intro #378.

Here are my concerns about the text I see in Intro #378 entitled "A local law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by 80% by 2050."

1) The bill does not exclude natgas, nuclear or hydro dams as energy sources.

2) The plan should promote conservation and efficiency as a primary means to achieve the 80% emissions reduction.

3) The plan should include a study on the feasibility of public power and distributed energy and a follow-up focus on initiatives revealed by such a study.

4) The bill does not present a clear structure of responsibility for implementation and enforcement. A public hearing on the bill's feasibility should furnish a preliminary report on incremental and long-term goals of the bill's myriad parts, to be followed at 6- or 12-month intervals with updated progress reports from each separate initiative the bill includes, open to the public.

5) In addition, I would propose a monthly exchange of information among offices assigned to monitor the many aspects of emissions reduction, including laws already proposed or on the books, such as:

- The lights of municipal and business offices as well as storefronts to be turned off when those venues are closed for the day.
- Waiting vehicles such as school buses, repair and delivery trucks required to turn off their motors after their immediate purpose is addressed and turned on only when ready to move on.
- Metropolitan buses required to employ air conditioning only when outside temperatures reach a level such that the inside temperature would reasonably discomfit the majority of passengers, say, somewhere between 70-75 degrees Fahrenheit.
- Street lights to be regulated at half power from a specific nighttime hour, say 2 AM, till daylight.

- Bike lanes should be expanded throughout most city streets, with sufficient protection from vehicular traffic, with biking rules posted online and enforced by fines and/or court charges depending on the severity of any accident.
- Create a Reduce-Your-Carbon-Footprint website so residents can check whatever rules they're expected to follow.

Additionally, there are initiatives outside the purview of the City Council that could nevertheless be supported by the Council, such as:

- a "Take a Car Off the Road" campaign set up both on- and off-line to encourage and track share-a-ride commuting, with monthly prizes for most rides logged.
- a monthly public contest for the family that, say, reduces its electric bill the most in each borough, with prizes such as energy-saving appliances.
- a grade school Science Class competition for the best suggestion to Lower NYC's Carbon Footprint. This could also be proposed to NYC's colleges and universities.

The possibilities are endless. Adoption of several initiatives under a general title such as "Save Our Species: Lower NYC's Carbon Footprint" might engender huge public support, given the 400,000 New Yorkers who demonstrated their concern for the climate by marching together last month. Harnessing that concern by putting effective solutions for global warming on the community radar screen will bypass the too-common response that it's just too big to deal with, and generate positive enthusiasm for whatever needs to be done. It could also unite the community in unforeseen ways to benefit other aspects of our lives together -- economic, social, and spiritual.

Re: Intro 378

10/23/14

To the Members of the NY City Council:

My name is Wendy Scher, and as a NYC resident of the last 11 years, having lived in four of the five boroughs, I have a great investment in the future of this city. Activism means fighting for tangible, positive change, which is why this Intro. 378, to reduce greenhouse gases 80% by 2050, is so encouraging. NYC can and has set the standard for the rest of the nation. However, for this to be implemented effectively, it needs some more detail, and more teeth. Specifically:

Using PlaNYC alone as a guide for renewable energy is far from adequate. For instance, Milestone #15 of the 2014 Report calls to "Encourage conversion from highly polluting fuels by increasing natural gas transmission and distribution capacity and improving reliability." The obvious problem is, natural gas IS a highly polluting fuel – both in extraction (increasingly, using hydrofracking wells), burning, and leakage – particularly as methane, the primary component of natural gas, is 75 times more powerful as a greenhouse gas than CO2, over a 20 year period. Bottom line is, fossil fuel reliance will NOT lead us to a more stable and livable climate. Instead, to heat our buildings and water, we can use biodiesel heating oil sourced from waste oil (from which there are many suppliers now), or we can install new solar thermal heating systems directly on building rooftops. These two methods can be used in tandem as well. We can also invest in newer technologies, such as the adsorption chiller, that uses evaporative cooling to utilize the energy from hot water (from either solar thermal collectors, or from waste heat sources) for air conditioning and refrigeration systems. We cannot use the same old systems to get off greenhouse gases... we need to change the infrastructure.

Second, NYC needs to encourage the use of distributed generation – that is, property owners feeding electricity to the grid, using their own installed solar, wind, or geothermal systems. This is the only way to make renewable energy installations both affordable to the property owner, and accessible to use on a citywide basis. NYC is overdue for "feed-in tariff" legislation, and other policies to ensure that renewable energy can achieve price parity with oil, gas, and nuclear sources.

And most importantly, any widespread use of renewable energy sources has to work in tandem with huge increases in energy efficiency. This city is a massive over-consumer of energy – from our buildings' climate control systems over-heating and over-cooling, to the massive video billboards in midtown, to all manner of interior and exterior lights, all running 24/7. Thermostats, timers, and motion sensors are pretty simple options to reduce these kinds of waste. Upgrading to more efficient LED lighting is another way to get more out of less wattage.

Finally, this policy needs to be fully enforceable, to the same degree as our laws on worker's rights and public safety – that is, a permanent part of the governance system. This means expanding from the current Sustainability Committee to our own city department devoted to policy enforcement and review, fully accountable to the public. This is too important for anything less!

All in all, I am thrilled to see this legislation being championed by the Mayor and so many members of the City Council. But it needs some essential tweaking to make sure it really works as intended. We can set the example for NYC to really make sure that our future generations survive in this world. To do that, we need to encourage real renewable energy – not methane or nuclear; get really serious about energy efficiency and consuming less resources; and enforce this like our life depends on it. Because it does.

Sincerely,

Wendy Scher
15 Thames St #2
Brooklyn, NY 11206
wendy@gjae.org

Denise Katzman
EnviroHancement (Climate Science Analytic)
THURS 10.23.14 Public Hearing Int. No. 378

Good Afternoon:

80% GHG emissions reduction by 2050 minus critical enforcement – will push us in the wrong direction. There are no benchmarks for enforcement. There must be thresholds for all relevant parties to met on a biyearly basis @ minimum & accomplish goals. PG 2 states "If the office determines...". no specific office is stated.

Enforcement in NYC is chronically lacking on a myriad of platforms. Which is why EP is moving in the right direction by utilizing enforcement.

How to do the Enforcement Thing: the Idling Law will be a major player in scaling up clean air. We are surround by Methane via idling vehicles to fugitive emissions. EP is totally aware that our atmospheric air is carcinogenic per the WHO and indoor air quality ain't much better. I understand that Chair Richards wants edification in the direction of clean energy jobs. Which is a tremendous opportunity for NYC. The Chair's platform will create a fabulous duet with the City investing in clean energy while creating jobs per sector. The ROI (return on investment) will benefit shareholders and allow NYC to be a vibrantly clean metropolis. Let's bounce back to 2030 America Can Nearly Quadruple Its Renewable Electricity By 2030 10.19.14 A recent Union of Concerned Scientists (USC) study found that America can nearly quadruple its renewable electricity in the next 15 years, reaching 23% by 2030. This comes in response to the Environmental Protection Agency's proposal that America set a modest goal of 12% renewable energy by 2030. EPA's goal.. a fraction above "business as usual." Let's give a shout out to Johannesburg city of Johannesburg - City gears up for carbon-free fuel future 10.16.14 They're doing it right now and done in the next 2 years. **https://www.cdp.net/CDPResults/CDP-SP500-leaders-report-2014.pdf** CDP 2014 S&P 500 Climate Change Report represents US$92 trillion from 767 investors that believe in clean energy investment and Climate Change risk mitigation.

RBD (Rebuild By Design) must stay on schedule to ensure that all shoreline buffers are resilient and reduce hardscape on the shoreline and throughout NYC.

Will Climate Change Denial Become a Political Liability? U.S. Treaty Envoy Thinks So | InsideClimate News 10.15.14 Todd Stern (U.S. envoy on Climate Change): "a stable, durable, rules-based climate agreement with legal force that is more ambitious than ever before, even if not ambitious enough."

NYC's needs CAT bonds aka Catastrophe bonds – it can be doable via the Comptroller and EP uniting. EP must start looking @ CCA (Community Choice Aggregation). It's now part of NYS' REV (Reforming the Energy Vision). NYC is finally getting hip to Solar & enowenergy uses solar via vehicles. It's ideal metric to power city vehicles http://www.enowenergy.com/

Science has proven that CH4 causes 21x as much heat trapping as an equal quantity of CO2 over a 100 year timeline. It only gets worse if we don't stop the Runaway Greenhouse Effect. We have all the necessary resources - we've had them for years. EP must keep on moving in the right direction.

THANK YOU

Comments on Int. No. 738-2014 by Bob Wyman, 23-Oct-2014

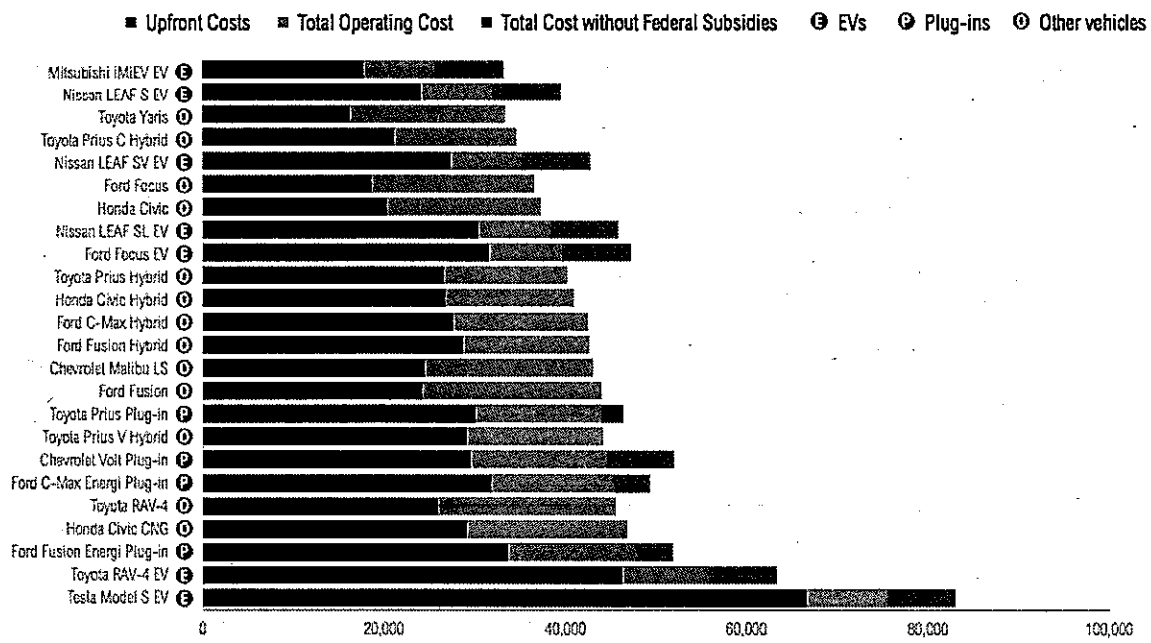
The 80x50 target is a good start, but we must consider several implications that aren't well explored in the Mayor's Plan:

1. **Cleaner systems are typically cheaper when total cost of ownership (TCOE) is considered.** Thus, 80x50 makes sense even if the climate change deniers are right and CO2 emissions aren't important. Because cleaner is cheaper, we should target 80% reduction sooner than 2050.
    1.1. Efficiency: The cleanest and cheapest energy is the energy you don't buy or use. Efficiency can often have high up-front costs but pays off through lower energy and operating costs.
    1.2. **Thermal Energy**: We focus electrical energy while ignoring thermal energy even though many buildings dump vast amounts of waste heat. We need to find ways for buildings to sell their excess thermal energy to neighboring buildings. Waste heat could be a profit center!
    1.3. **Fuel Switching**: We must replace direct-use of fossil fuels with cheaper electric systems and increase the proportion of energy delivered and consumed as electricity.
        1.3.1. 2,000,000 vehicles are registered in our city. Most burn fossil fuels and would be both cheaper and cleaner if powered by electricity. Already, total cost of ownership of some electric vehicles is lower than their internal cumbustion equivalents. Electric vehicle costs will only drop further in the future.
        1.3.2. The 1,000,000 buildings in our city are mostly heated with fossil fuels. But, Columbia University researchers estimate that as many as 80% of our buildings, mostly outside Manhattan, could be heated and cooled using often cheaper and always cleaner Ground Source Heat Pumps. **Clean heat is cheap heat.**
        1.3.3. Today, **PSC and NYSERDA policy <u>discourages</u> fuel switching!**
2. **The Second Great Electrification** of our society.
    2.1. **Electricity is the fuel of the future** even though it only accounts for one-third of the delivered energy in the US today. It is cleaner and cheaper than direct-use fossil fuels and will get even cleaner and cheaper in the future as renewable energy resources grow.
    2.2. The First Electrification focused on lighting, communications, and appliances. **The Second Great Electrification will focus on the transportation and heating/thermal applications** which consume two-thirds of delivered energy in the US today and primarily rely on direct-use of burned, dirty fossil fuels.
    2.3. While utilities seem focused on losses of market share to distributed generation, they should instead be preparing to double or triple the amount of electricity produced.
3. **A Shift from Operating Expense to Capital Expense** will require substantial support through financing programs. More money is needed than can be provided by cash subsidy programs.
    3.1. Today, you pay for energy at or near the time when you consume it. In the future, you'll pay more for "capacity" and you'll pay less or even nothing as you actually consume energy.
    3.2. Fossil fueled systems offer lower up-front costs, but their operating costs are higher. It is like giving razors away for free and then charging for the blades. Pay-As-You-Go is often more convenient than Pay-Up-Front, but it is much more expensive in the long run.
    3.3. **It takes money to save money. Today, only the relatively wealthy, with good credit, can afford the cheaper, cleaner alternatives.** This must change.
    3.4. The solar industry has proven that large amounts of private capital can be attracted to clean energy technology that delivers good yield.
    3.5. NYCEEC, NYSERDA and our Capital Markets can profitably provide the financing we need via leases, PPA's, loans, loan guarantees, bonds, securitization, etc.

Notes:

Some Electric Vehicles are already cheaper than their "same-class" alternatives. The following figure is from the World Resources Institute paper "Seeing is Believing: Creating a New Climate Economy in the United States," published October 2014 at: http://www.wri.org/sites/default/files/seeingisbelieving_working_paper.pdf

Figure 3.5 | Total Cost of Ownership of Select Vehicles in the United States



Heat Pumps are both cleaner and cheaper than fossil fueled heating/cooling systems.
Grid powered heating/cooling systems, particularly ground source heat pumps, are cleaner than fossil fueled systems and usually cheaper. This is particularly true in New York City and Upstate New York since we have some of the cleanest grid-supplied power in the country.

According to the EPA, the New York City/Westchester "sub-grid" delivers power with an average CO_2 cost of 300 grams/kWh after transmission losses are considered. Furnaces that burn No. 2 oil at average efficiencies produce thermal energy at a CO_2 cost of 324 grams/kWh_t. The CO_2 cost for propane is 275 grams/kWh_t and for natural gas it is 221 grams/kWh_t.

Thus, using "clean" New York City grid power, any heating/cooling system that is 90% efficient will produce heat more cleanly than No. 2 oil. Any system with an efficiency of at least 110% will be cleaner than propane and any system with an efficiency of 140% will be cleaner than natural gas.

The EnergyStar minimum efficiency rating for Ground Source Heat Pumps is 310% (i.e. COP=3.1). Thus, **any EnergyStar-compliant GSHP in New York City will be much cleaner than an equivalent fossil fueled system**. GSHP augments grid-power with locally harvested thermal energy for > 100% efficiency.

Given 2013 New York City power and fuel prices, a ground source heat pump system with a COP = 3.1 would have "fuel" costs of only 53% that of a No. 2 oil burner and 51% of the cost of a propane powered system. At COP=3.1, natural gas would be cheaper. However, if the heat pump ran with an efficiency of 400% (COP=4), which is more typical of current industry standards, the GSHP would be 5% cheaper than the natural gas burner. COP's will increase in the future.

Testimony of Cecil Scheib (Chief Program Officer)
and Richard Leigh (Director of Research), Urban Green Council
Before the New York City Council Committee on Environmental Protection
October 23, 2014

Good morning Chairperson Richards and members of the Committee. My name is Cecil Scheib and I am the Chief Program Officer of Urban Green Council, joined by Dr. Richard Leigh, Director of Research at Urban Green, the New York chapter of the U.S. Green Building Council. We will testify in favor of Intro 0378-2014, "A Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by twenty fifty."

Urban Green Council applauds the initiative shown by City Council. To avoid potentially catastrophic levels of climate change, the developed world must lower emissions at least 80% by 2050. A successful journey begins with picking a destination. By making an 80% reduction in New York City's carbon footprint by 2050 the official City goal, Int 378 charts an ambitious but achievable course toward a sustainable New York City. As the City recognizes, we must start with buildings, which are responsible for three-quarters of our contribution to climate change.

In support of this initiative, we offer the results of a study released by Urban Green Council in February 2013. "90 by 50: NYC Can Reduce Its Carbon Footprint 90% by 2050" established that the required reductions can be achieved using presently available technologies at a reasonable cost. Our report made a number of no-nonsense recommendations:

- Retrofit existing buildings and strengthen codes for new construction to lower building energy requirements by around 60%.
- Eliminate fossil fuel combustion in buildings, converting all building energy use to electric. The amortized cost will be comparable to the savings from eliminated fuels, and money now being spent on fossil fuel would instead fund at least 11,000 new green jobs in building air sealing, insulation, and installation of more efficient materials and equipment. This represents a 10% increase in the present construction work force.
- Eliminate fossil fuel combustion for electric energy in buildings, instead relying on carbon-free sources of energy like solar, wind, and water. Total electric consumption will not increase in comparison with annual usage today, but peak electric demand will increase, and new energy storage capacity will be required.
- Beyond buildings, the expansion of mass transit, conversion to higher efficiency vehicles, and improvement of solid waste handling will make a reduction of over 90% in total emissions feasible.

The City's recent reports ("New York City's Pathways to Deep Carbon Reductions" and "One City, Built to Last") are a bold and credible basis for further action. We urge City Council to pass this legislation and commit New York City to a truly sustainable future, leading the way for other cities worldwide. We look forward to answering any questions you may have.

Urban Green Council
U. S. Green
Building Council
New York

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Global Kids®

Hearing on Council Member Constantinides' bill to reduce carbon emissions by 80%
NYC Council Chambers, City Hall
Thursday, October 23, 2014 1:00 PM

Global Kids Testimony
Given by Kevin Murungi, Global Kids Human Rights and Foreign Policy Specialist, on behalf of the students of Global Kids

My name is Kevin Murungi; I am Director of Human Rights and Foreign Policy Programs at Global Kids, a youth development and global education non-profit working with middle and high school aged students in New York City and Washington, DC. Thank you very much for having me here today, for giving me the opportunity to represent the students of Global Kids, and testify on this important and urgent issue.

Even before Super Storm Sandy, Global Kids students in our Human Rights Activist Project chose to focus their activist energy and work on climate change and climate justice. They recognized the immediacy of the issue and wanted action taken to mitigate the effects of climate change: Action from their peers, from their schools, and from their government and governments around the world.

They have used this program as the platform to take action in the form of several climate justice related campaigns. In the past, they have called on the New York state legislature to issue a moratorium on hydraulic fracturing, or fracking, as more transparency and stricter regulation are put in place to ensure that the process is environmentally safe. They have worked on a campaign to install green roofs on New York City public school buildings that would help reduce storm water run off and reduce heating and cooling costs as well as provide green living labs for classes. Last year, with invaluable help from Council Member Constantinides, they worked on a campaign to mandate climate education in schools to make it possible for students around the city to learn more about climate science and climate solutions.

The students of Global Kids would like this chamber to know the following:

- Global Kids Leaders, representing schools in all five New York City boroughs want to see leadership on climate change and as such, enthusiastically support Council Member Constantinides' carbon emissions reduction bill

- Many Global Kids Leaders were impacted by Super Storm Sandy and know first hand the devastating impact of climate change

- Many Global Kids Leaders have roots in countries around the world that are especially vulnerable to climate change, like Haiti, Nepal, and Bangladesh, for example. This issue hits close to home for them on several different fronts.

- Global Kids Leaders, as global citizens, ultimately want to see world leaders work together to make a binding climate treaty to curb global carbon emissions, the council members bill is a step in the right direction towards achieving this

I'd like to close with a quote from a Global Kids student who tragically lost her uncle as a result of the devastation of Super Storm Sandy:

"This is the future I want: a country that is better prepared for climate and environmental disasters, and is working proactively to mitigate global warming. Just like we have fire drills in school, we need to have evacuation plans and disaster preparedness kits. We must rely less on oil and more on alternative energy, and reduce carbon emissions by any means necessary. We cannot continue to provide subsidies to oil and gas companies that are wreaking havoc on our earth. We need more preservation of natural resources and less consumption. Science matters, and we must educate the next generation on the realities of climate change so we are all working to promote a better, more sustainable future. I am more committed than ever to work to make the future I want a reality."

Global Kids students enthusiastically support the Council Member's bill as a step towards young people around the world realizing this future. This is after all the planet we leave them and we must do what is necessary to follow the lead of these remarkable young people to ensure its long-term health.

Thank you.

The New York City Council - Hearing Int. No 378 - Oct. 23, 2014

1:00 PM in the Committee Room, City Hall, New York, N.Y.

Testimony of Catherine Skopic

Thank you, City Council Member Costa Constantinides for introducing this bill to reduce greenhouse gases; and thank you to each of the 38 Council Members and the Public Advocate who have also signed. As we sit here in this committee room of the people, I thank you for your comprehensive platform to combat climate change, as it will help the people of New York City.

As we have moved from the geologic age of the Holocene to the Anthropocene, meaning "Man-Made," read reports of the IPCC - Intergovernmental Panel on Climate Change - as well as other scientific evaluations and experience climate changes around us, we recognize the urgency to do all we can to halt global warming. The main cause, as we know, is the burning of fossil fuels, putting excess CO2 and methane - greenhouse gases - into our atmosphere.

This bill serves to reduce the amount of greenhouse gases, and for this reason, is to be applauded. This bill is consistent with PlaNYC that aims to reduce emissions citywide by 30% by 2030 and goes beyond by reducing emissions 80% by 2050.

Two significant ways to reduce emissions are 1) efficiency and 2) transition to renewable energy. I'd like to speak to the second. The city has been working to expand renewables. For example, CUNY led the development of the New York City Solar Map. This map shows that as of April 15, NYC installed capacity is 39.1 MW. Log onto this map, enter your address and you can see the solar potential for your building. I did this and discovered that in the building where I live, with solar panels installed, we could have an annual savings on our electric bill of $1,633 with as much as 8.95 kw of solar. This would reduce carbon emissions by 6,026 lbs per year, or the equivalent of planting 16 trees. Lincoln Center recently installed solar. Just imagine the reduction in emissions we could have with solar panels on ALL our buildings - private, municipal, schools, universities, hospitals, museums, stores, garages, warehouses, etc.

We could also be installing generative wind turbines on our buildings, for example, like this model of a VAT - vertical axis turbine - one of many designs. With all this solar and wind electricity generation potential enabling us to reduce fossil fuel use, I wouldn't be at all surprised that if all segments of our society were to get behind this effort 100%, we were able to even far exceed the goals we have set for our GHG emissions reduction.

In addition to this monumental potential contribution to halting climate change, New York City could set the example for refusing use of natural gas, as fracked gas - methane - is many times more GHG producing than is CO2. Fracking also threatens our water and food supply and with the radon it carries, negatively impacts our health. Gas pipelines leak and have exploded. I ask the City Council to do all it can to prevent use of natural gas - fracked gas - and to continue on the path you have selected of GHG emissions reduction and installation of renewable energy.

I congratulate the New York City Council for your forward thinking, comprehensive platform of bills to address climate change and pledge all I can to work with you for their accomplishment.

Thank you. Respectfully and in PEACE, Catherine Skopic

140 West Broadway, New York, New York 10013

IMAC Steering Committee; Grassroots Alliance; PCM, 350nyc; Food & Water Watch; We Act

Lisa DiCaprio, October 23, 2014

Testimony on Int. 378, A Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by two thousand fifty.

My name is Lisa DiCaprio. I am a Clinical Associate Professor of Social Sciences at New York University where I teach courses on sustainability. I am a member of 350NYC and the Energy Committee of the Sierra Club Atlantic Chapter which advocates for policies to facilitate the transition from fossil fuels to renewable energy in New York State.

I am testifying in support of the new Local Law to achieve an 80% reduction in NYC's greenhouse gas emissions by 2050. This is one of the new environmental initiatives outlined in the City Council's Comprehensive Platform to Combat Climate Change.

The proposed law aligns NYC with the greenhouse gas reduction goals adopted by New York State, the U.S. federal government, several U.S. cities, and countries that made this pledge at the UN Climate Summit. However, the law should also specify that the 80% by 2050 reduction must be met with energy conservation, efficiency, and renewable forms of energy.[1]

Without this requirement, as with the original PlanNYC goal of a 30% reduction by 2030, the new goal of an 80% reduction by 2050 could unintentionally provide a rationale for:

- Maintaining the nuclear reactors at Indian Point, since there are no greenhouse gas emissions from nuclear power and
- Facilitating an expansion of NYC's natural gas infrastructure, as the EPA's method for calculating greenhouse gas emissions from natural gas does not take into account fugitive methane emissions throughout the entire lifecycle of hydrofracking from extraction to combustion. As scientific studies have shown, methane is 80 times more potent a greenhouse gas than carbon dioxide in the first 20 years of its emission into the atmosphere.

Currently, two-thirds of the electricity consumed in NYC is generated by natural gas plants in the outer boroughs.

Here are eight recommendations for how we can achieve the goal of reducing greenhouse gas emissions by 80% by 2050 with energy conservation, efficiency, and renewable energy:

1. Review the February 2013 Urban Green Council report, "90 by 50: NYC Can Reduce Its Carbon Footprint 90% by 2050" and the December 2013 report "PlaNYC: New York City's Pathways to Deep Carbon Reductions," which was

commissioned by the Bloomberg administration to explore ways to reduce greenhouse gas emissions by 80% by 2050.[2]

2. Mandate a schedule of five-year benchmarks with biannual public progress reports that would include information about reductions from specific sources of emissions; for example, buildings and transportation, etc.

3. Facilitate the creation of the Renewable Energy Systems Web Portal which was mandated by Local Law 12 in 2013, but is still not available to the public. The interactive web portal is to provide information about renewable energy options in NYC on the website of the NYC Department of Buildings and other appropriate NYC home pages.

4. Explore ways to implement NYC's new heating oil rules that do not provide incentives for the conversion of boilers burning No. 6 or No. 4 oil to natural gas. The new rules were announced by the Bloomberg Administration in April 2011 as an update to PlaNYC. At this time, the approximately 10,000 buildings burning these heating oils were responsible for 87% of all heating soot emissions in NYC.

In the current phase of this program, no new Certificates of Operation are issued for boilers burning No. 6 oil and all boilers burning No. 4 oil must convert to natural gas, No. 2 oil, or biodiesel by January 1, 2030.

Public education is required to inform building owners about the alternatives to natural gas boiler conversions which are expanding NYC's natural gas infrastructure and the NYC market for fracked gas from the Marcellus Shale in Pennsylvania which has an especially high Uranium and Radium content.[3]

5. To facilitate the retrofitting of privately owned buildings with less than 25,000 square feet, the proposed new threshold for mandatory energy audits, call on the New York State Legislature to grant NYC home rule for the purpose of issuing green bonds to subsidize the retrofitting of these buildings.

6. Mandate the DEP to provide information about energy conservation, efficiency, and renewable energy in the water bills that it sends to all building owners. This will ensure that all owners are informed about the fossil fuel free options for electricity and heating and cooling.

For electricity, owners may install solar photovoltaic panels, if appropriate, purchase 100% green power, or combine both options. As a result of New York State's deregulated electricity market, institutions and individuals can obtain 100% of their electricity from renewable sources. The feasibility of combining solar power with green power purchasing is described in a recent New York Times article about Lincoln Center's arrangement with Green Mountain Energy which includes a contract for green power purchasing and, most recently, the installation of solar power on one of its buildings.[4]

Heating and cooling options for displacing fossil fuels include geothermal, using 100% biodiesel as a fuel in boilers, solar thermal for heating water, or heat pumps, such as the kind manufactured by Mitsubishi that combine heating and cooling in a single unit.

7. Explore options for the City Council to support state-wide policies which will expand renewable energy in NYC.

For example, the current goal of our Renewable Portfolio Standard (RPS), which was instituted by the Public Service Commission (PSC), is 30% renewable energy in New York State by 2015. At present, 19% of the state's electricity is obtained from hydroelectricity and only 2% of our electricity is generated by solar and wind.

The Sierra Club is advocating for the PSC to meet and increase the RPS goal to 50% renewable energy by 2025. The first benchmark is 40% renewable energy by 2020.

The NY Wind Initiative launched by the Sierra Club is also key to actualizing our renewable energy potential. We are calling on Governor Cuomo to support this initiative. New York State now has 1,800 MW of installed onshore wind power and our goal is to double this amount by 2018 or 2020 for a total of 4,000 MW. We now have 0 MW of installed offshore wind power. Our goal is to achieve 1,500 MW of offshore wind by 2020.[5]

8. Finally, building on the success of the People's Climate March and City Council initiatives supporting the march, City Council members could:

- Include information about energy conservation and efficiency, and renewable energy options on their websites and in the newsletters that they send to their constituents.[6]

- Introduce a resolution of support for Earth Week 2015 along the lines of the People's Climate March resolution in which City Council members would encourage their constituents to attend an Earth Week event.

I would like to conclude with a quote from Rajendra K. Pachauri, Chairman of the UN Intergovernmental Panel on Climate Change (IPCC). Speaking at the press conference held in Berlin on April 13, 2014 to announce the report of Working Group III, which provided us with a fifteen year opportunity to assume decisive action to reduce greenhouse gas emissions, he stated:

"What comes out very clearly from this report is the fact that the high speed mitigation train would need to leave the station soon and all of global society would have to get on board if we really want to bring about a limitation of temperature increase to no more than 2 degrees Celsius."

NOTES:

[1] This revision could be made in the second to the last paragraph of the text which describes how to achieve the new reduction goal.

[2] For the "90 by 2050: NYC Can Reduce Its Carbon Footprint 90% by 2050," report, see: http://urbangreencouncil.org/sites/default/files/90_by_50_report.pdf For "PlaNYC: New York City's Pathways to Deep Carbon Reductions," Mayor's Office of Long-Term Planning and Sustainability, see: file:///C:/DOCUME~1/Lisa/LOCALS~1/Temp/NYC%2080x50%20Report%20-%20February%202014%20-%20Executive%20Summary.pdf The PlaNYC report includes several valuable recommendations even though it promotes the expansion of natural gas as a way to reduce greenhouse gas emissions. By contrast, the Urban Green Council report advocates for supplying hot water and heating with heat pumps, which would eliminate building fuel use, and for obtaining the electricity for the heat pumps from carbon-free sources.

[3] See "Boiler Conversions, Surveying the Options," a Report by RenewNEWYORK, which I wrote for RenewNEWYORK in 2012. The report may be accessed on the Sane Energy Project website: https://dl.dropboxusercontent.com/u/41163777/Boiler%20Report%20rev%20final%20copy.pdf

[4] See, James Barron, Lincoln Center Turns to Solar Power to Provide Some of Its Bright Light, New York Times, October 10, 2014 http://www.nytimes.com/2014/10/10/nyregion/lincoln-center-to-draw-some-of-its-bright-light-from-solar-power.html?module=Search&mabReward=relbias%3As%2C{%221%22%3A%22RI%3A7%22}&_r=0

[5] Currently, we have the potential for a 700 MW wind farm off the Rockaways which will reduce NYC's reliance on fossil fuels. For information about the Long Island – New York City Offshore Wind Project, see: http://www.linycoffshorewind.com/about.html

[6] The following kind of information could be included on a website until the Renewable Energy Systems Web Portal is posted on the NYC Department of Buildings website:

For information about energy audits and efficiency, contact the New York State Energy Research and Development Authority (NYSERDA) at 1-877-NY SMART or visit the NYSERDA website: http://www.nyserda.ny.gov/residential

The NYSERDA list of solar thermal installers in New York State: www.nyserda.ny.gov/Contractors/Find-a-Contractor/Solar-Thermal-Installers.aspx

NYSERDA list of solar photovoltaic installers in New York State: www.nyserda.ny.gov/Contractors/Find-a-Contractor/Photovoltaic-installers.aspx

For information about purchasing electricity from renewable energy sources, see the U.S. Department of Energy Green Power Network list of options for New York State: http://apps3.eere.energy.gov/greenpower/buying/buying_power.shtml?state=NY

Pamela Drake Gregory
Certified Paralegal
State of New York
pam2159@gmail.com

FOR THE RECORD

TO: Honorable Members of the City Council
of the City of New York

FROM: Pamela Drake Gregory

STATEMENT RE: Oversight Concerns Connected with Intro 378, a Local Law to Amend the Administrative Code of the City of New York, in relation to reduction of greenhouse gases by 80% by 2050 (the "Bill")

My concerns connected with the Bill regard not merely the content and coverage in the wording of the Bill but also the issues inherent in the Bill's oversight and implementation.

To put the Bill into effect in a manner that will carry the most impact would logically require a vast amount of oversight. It might potentially require a task force assembled for the purpose of following up with landlords, co-op and condo boards, building managers and even superintendents to assure that the procedures necessitated by the Bill are being implemented fully and effectively. To perform less than such supervisory measures after the Bill's passage would be a virtual guarantee of failure to perform the tasks necessitated by the Bill. It would be all too easy for those who must make urgently needed changes in the form and deployment of energy in their buildings to rest on their laurels. This could be minimized or eliminated entirely by supervision that would demand they build and maintain the required infrastructure by a date certain or face City penalties.

This task force, of course, could be organized under, and should be answerable to, the Department of Environmental Protection ("DEP") as the most appropriate agency to implement the Bill, with cooperation from other New York City agencies as required (the Fire Department to ensure code adherence in building modifications, for example).

It is, therefore, my opinion that the City Council of the City of New York should consider appropriate legislation following the passage of the Bill to create a 2050 Task Force, answerable to the DEP, for the direct supervision of modifications to City buildings to ensure adherence to the requirements of the Bill.

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Testimony of Daniel Gianfalla, President and Chief Operating Officer of

United Metro Energy Corporation (UMEC)

Before the New York City Council Environmental Protection Committee

October 23, 2014

Good morning Chairman Richards and members of the Environmental Protection Committee. I'm Daniel Gianfalla, President and Chief Operating Officer of United Metro Energy Corporation (UMEC). UMEC, owned by John Catsimatidis, supplies and delivers gasoline, ultra-low sulfur diesel fuel, biodiesel, bioheat, heating oil, and natural gas throughout the New York Metropolitan Area from terminals in Greenpoint, Brooklyn; Riverhead, Long Island; and Calverton, Long Island.

Since acquiring Brooklyn's Metro Terminals in 2013, UMEC is proud to have built upon build the pioneering role that Metro has played in the advancement of biofuels in New York City over the last decade.

UMEC supports the goals of Intro-378 to reduce greenhouse gases by 80% by 2050 as well as the vision laid out in Mayor De Blasio's transformative plan "One City Built to Last."

The goal of 80 percent greenhouse gas reduction by 2050 cannot be realistically accomplished in New York City without the increased use of bioheat, a blend of biodiesel and heating oil. And UMEC hopes to play a major role in further applying the clean air and environmental benefits of bioheat in New York City.

Biodiesel is a biodegradable, virtually zero-sulfur, and totally renewable energy source that is made from plant, vegetable or animal fat-based oils and is then blended with diesel for use in transportation fleets and with heating oil for use in buildings - also known as bioheat. Biodiesel reduces:

- particulate matter that causes asthma;
- carbon emissions that contribute to global warming;
- and they lower our country's dependence on foreign oil and fossil fuels.

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According to the American Energy Coalition, B12 bioheat burns cleaner than natural gas. Let me emphasize this point – at B12 blends – which means 12% biodiesel and 88% traditional heating oil – bioheat fuel can produce lower lifetime emissions than natural gas.

Last year, UMEC blended 4 million gallons of biodiesel into our heating oil and diesel products, eliminating 58 million pounds of carbon and substantially reducing pollutants in the City of New York. This carbon reduction is the equivalent of removing more than 7,000 cars from the road annually.

UMEC walks the walk. Our truck fleet of 55 vehicles uses B20 for eight months and B5 for four months in the winter. By solely using these two grades of biodiesel, United Metro is able to reduce its carbon output by 750,000 pounds annually.

UMEC has been a vocal advocate for bioheat requirements and actively supported legislation to phase-out Numbers 4 and 6 heating oil.

Only three years ago, nearly 10,000 buildings in New York City burned Nos. 4 and 6 heating oil. Through the efforts of the NYC Clean Heat Program and companies like UMEC, several thousand buildings have converted to cleaner fuels in recent years and many more are actively pursuing conversions. UMEC has offered incentives to building owners helping to accelerate conversions to the cleanest heating fuels, as well as educating building owners, real estate managers and tenants on the benefits of bioheat.

UMEC is in a period of substantial growth, positioning the company to help the City meet its energy efficiency goals. Earlier this year, UMEC acquired the expansive heating oil portfolio of Hess. This acquisition makes us the largest heating oil and biofuels provider in the New York Metropolitan Area.

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In 2015, United Biofuels, Inc., an affiliate of UMEC, will open one of the largest state-of-the-art advanced biodiesel production facilities in North America, to be based in Brooklyn and designed to produce 50 million gallons per year of biodiesel fuel. The facility, which would be the only one of its kind in New York City, will be capable of accepting multiple feedstocks including recycled restaurant grease and soy, processing it into biodiesel for distribution in the New York City region. At maximum output, our processing facility will allow for the offset of 365,000 tons of carbon, or 730 million pounds, annually.

UMEC recently opened the City's first public biodiesel marine fueling facility for waterborne vessels. The new dock is adjacent to our Greenpoint facility and will provide custom blended biodiesel and ultra-low sulfur diesel to commercial marine vessels.

UMEC is supportive of the goals outlined in Intro 378 and in the Mayor's plan to transform buildings for a low carbon future. We feel strongly that bioheat has an important role to play in the City's energy portfolio. And we are prepared to meet the biodiesel and bioheat demands of the New York Metropolitan Area.

Thank you.

Testimony of John Maniscalco
CEO of the New York Oil Heating Association
Before the New York City Council Environmental Protection Committee
Regarding Intro. 378
October 23, 2014

Good Morning Mr. Chairman and members of the Committee. My name is John Maniscalco and I am the CEO of the New York Oil Heating Association (NYOHA), a 75-year-old trade association whose members are largely family-owned heating oil distributors and terminal operators, delivering the country's cleanest heating oil to over 1.8 million housing units throughout the City of New York and employing thousands of New Yorkers directly and indirectly. Thank you for the opportunity to testify today.

NYOHA supports the goals of Intro 378 that seeks an 80% carbon emissions reduction by 2050 and we commend the Mayor on the "One City, Built to Last" report focused on improving sustainability in buildings throughout New York.

Today, I am very proud to sit before this committee and confidently assert that New York City has the cleanest heating oil in the United States. This is no accident. NYOHA and our partners and colleagues in the heating oil industry, the biodiesel industry, labor, the environmental, public health and environmental justice advocacy communities have worked very closely to reach this significant achievement.

In the last few years alone, NYOHA has proactively sought and achieved sweeping reforms in the heating oil industry including the following:

1. The mandating of the 15 parts per million (ppm) ultra low sulfur heating oil fuel standard for all #2 heating oil statewide in 2010;
2. The City Council's 50% sulfur reduction in #4 oil from 3,000 ppm to 1,500 ppm;
3. The phase-out of #6 heating oil by 2015 and #4 heating oil by 2030; and,
4. The City Council's B2 Bioheat® fuel mandate in ALL grades of heating oil which has now been in effect for two full heating seasons.

These truly monumental reforms have already had a tremendous impact on air quality, reduced dependence on fossil fuels, carbon reduction, green local job creation and job retention. NYOHA's pivotal role as an industry leader has been recognized nationally. The Bioheat® fuel mandate alone has already displaced more than 40 million gallons of petroleum since its implementation, not including voluntary shifts to higher biodiesel blends which have accounted for millions more offset gallons – and offset carbon.

Bioheat® fuel is a blended product of petroleum and 100% renewable biodiesel that reduces dependency on fossil fuels like oil and natural gas, improves air quality and reduces our carbon footprint.

NYOHA is a proud, founding member of the Mayor's Clean Heat Task Force which leverages the expertise of members like NYOHA to help buildings make smart, informed decisions about their fuel usage, encouraging the cleanest fuels to be utilized. We are proud that clean 2 oil, which has virtually no sulfur and at least 2% renewable biodiesel, is helping the City of New York reach notable benchmarks in air quality and carbon reduction.

And there is more that we can do. We have been advocating for a statewide Bioheat® fuel standard after our great success with a Bioheat® fuel standard in New York City – but in all honesty, as of late, the City Council and the Mayor's Office have been much more forward thinking than our counterparts in Albany.

I would like to make a statement that I hope resonates with you far after I deliver my testimony today. Clean 2 oil with biodiesel is as clean as natural gas from a 2.5 parts per million perspective. By NYC's own admission as indicated by the Clean Heat Program, ***"ULS 2 has close to zero soot emissions, the lowest of all conventional heating fuels."*** According to the National Biodiesel Board, when blended with approximately 18% biodiesel, we actually become cleaner than natural gas.

Many of our companies have been selling B20 Bioheat® fuel for years – voluntarily. Others sell B10, B5, while all sell B2. So far, the success and effectiveness of biodiesel blends, along with crucial State Clean Heating Fuel consumer tax credit, have enabled this robust biodiesel market to get off the ground. Once the American Society for Testing and Materials (ASTM) produces an industry-wide spec for biodiesel blends up to B20, (there is a currently only a spec up to B5), and equipment manufacturers fully endorse the higher blend products, there will be even greater investment in higher blends nationally. We expect a B20 spec within the next 18 months.

We must, however, be cautious not to over-stimulate the market. B2 was a necessary fuel standard because it allowed for biodiesel to enter the market and for EVERY building in the City of New York to gain experience with the product. It has been a very successful fuel standard so far. And while NYOHA is certainly open to discussing how to achieve higher citywide standards over time, it is important to acknowledge that what made the B2 mandate so successful was that it did not go too far too quickly. That mandate considered affordability and supply – which if not considered carefully could end up hurting homeowners, building owners and tenants.

We would actually like to see more focus on Bioheat® fuel and clean heating oil as the City Council contemplates this bill and specific ways to reach important carbon and air quality milestones over the years and decades to follow. The kind of savings we are talking about in this bill and the Mayor's report are simply not possible without clean #2 with biodiesel. Natural gas is simply not available in many parts of our city - it is also a 100% fossil fuel that is by definition less renewable than biodiesel blends. Wind and solar are great but require significant investments in infrastructure whereby biodiesel is a "drop-in" fuel that requires no infrastructure or equipment investment in most instances and moderate ones for examples where old inefficient heavy oil equipment is being

converted to equipment that burns clean 2 with biodiesel. Bioheat® fuel therefore becomes a natural tool in the City's arsenal for lower carbon emissions as well as better air quality and a lower dependence on fossil fuels.

I would like to conclude by saying that this an exciting time for the heating oil industry, which like many industries, is seeing the benefits of new developments and investments that will create a more sustainable, cleaner heating fuel. We look forward to working with this Committee and the Council to reduce emissions and increase sustainability in the years ahead.

Thank you.

REBNY®
REAL ESTATE BOARD OF NEW YORK

Testimony before the Committee on Environmental Protection
of the New York City Council
By Ryan J. S. Baxter, Senior Policy Analyst
Real Estate Board of New York
October 23, 2014

Good afternoon Chairperson Richards and members of the Committee on Environmental Protection. The Real Estate Board of New York, representing over 16,000 owners, developers, managers, and brokers of real property in New York City, thanks you for the opportunity to testify regarding the proposed changes to the Administrative Code regarding greenhouse gas reductions. We appreciate our continuing dialogue with both the Environmental Protection and Housing and Buildings Committees where many of the follow-up proposals will likely fall. We thank Chairmen Richards and Williams for their leadership and for continually going out of their way to sit down with the real estate industry.

We have been actively engaged in discussions with our membership to help ensure the proposal is not an imposition of undue costs or burdens on building operators while pursuing an aggressive reduction of greenhouse gases to help curb global climate change. We are pleased to report that we support Int. No. 378. We believe an 80% reduction in greenhouse gas emissions by 2050 to be an ambitious target that will ensure New York City continues to lead the world by example in regards to sustainability. As there are many unknowns to consider, we would like to volunteer ourselves to assist the Council in every fashion we can in order to accomplish this goal.

Thank you again for the opportunity to comment. We look forward to continuing our conversations with the Council to continue improving sustainability throughout the City for all New Yorkers.

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Testimony to the New York City Council Committee on Environmental Protection regarding Int. No. 378
October 23, 2014

Thank you for giving me the opportunity to comment on the proposed emissions reduction legislation, known as 80x50. My name is Susannah Dyen, and I'm an Organizer at ALIGN: The Alliance for a Greater New York. ALIGN is a community-labor coalition dedicated to creating good jobs, vibrant communities, and an accountable democracy for all New Yorkers. ALIGN also coodinates the Alliance for a Just Rebuilding, a community-labor alliance dedicated to ensuring post-Sandy rebuilding is done in a just and equitable way for workers and Sandy-impacted communities.

We are in support of the prposed 80x50 goal, and coupled with the interim 30x30 goal, which is already in place, this is a strong mandate for reducing New York City's contribution to global warming. Our concern is how New York City plans to actually acheive 80x50 and whether or not workers will benefit from these investments in emissions reductions.

The curent plans shared by the Mayor (One City Built to Last) and the Speaker (Comprehensive Platform to Combat Climate Change) lay out their agendas for acheving 80x50. While these plans indeed make important strides towards this shared goal, they both miss an essential element: a mandate on large building retrofits.

Buildings produce more than 70% of New York City's emissions. Large buildings over 50,000 square feet use nearly half of the city's energy but make up only 2% of the building stock. Also, 75% of these buildings are expected to be in use by 2050. Accodingly, New York City cannot shy away from a bold plan to address this problem.

New York City's current plan, Greener Greater Buildings, developed by former Mayor Bloomberg, requires large buildings to be audited for energy efficiency, to report on energy use (known as energy benchmarking) and to tune building equipment (known as retrocommissioning). There is no mandate that large buildings actually act on their audits, or reduce their energy use below curent levels. Therefore, we have seen only a fraction of buildings in the city voluntarily conduct retrofits.

On the other hand, the Clean Heat Program, which requires buildings to switch to cleaner fuel sources, has resulted in an enormous uptick in boiler retrofits and replacements since the program went into effect. Additionally, most of the emissions reductions in the building sector identified in the recent annual NYC Emissions Benchmarking Report have resulted from this mandatory clean heat program. Mandates work.

The current proposals by the Mayor and Speaker would make important contributions towards addressing climate change, but we believe that mandatory energy efficiency retrofits is the necessary ingredient to achieving 80x50. We recommend requiring large buildings to reduce their energy use 60% below current levels by 2050.

Hurricane Sandy demonstrated that we can no longer wait for those who are most responsible for climate change to act voluntarily. Sure, some buildings have taken up the Mayor's Carbon Challenge and made big improvements in their emissions. But those building owners are the exception to the rule. A mandate is essential and should be done immediately.

Thank you for your time.

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Testimony on Intro. 378 before the New York City Council Committee on Environmental Protection
October 23, 2014

Good afternoon, Chairman Richards and members of the Committee on Environmental Protection. My name is Rick Bell, and I am the Executive Director of the American Institute of Architects New York Chapter (AIANY). I am here to offer testimony on Intro. 378, a Local Law to amend the administrative code of the city of New York, in relation to reducing greenhouse gases by eighty percent by two thousand fifty.

The AIA New York Chapter was founded in 1857 and is the largest AIA chapter in the country with more than 5,000 practicing architects, allied professionals, students, and public members with interest in architecture and design. AIANY and its members are dedicated to the structural integrity and health impacts of our buildings by protecting the health, safety, and welfare of the public through design. We believe that Intro. 378 can help advance those goals. Architects will also play a key role in reducing carbon emissions 80% by 2050.

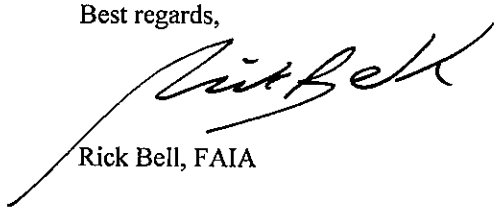
Following the UN Climate Summit and Mayor de Blasio's pledge to overhaul the energy-efficiency standards of all NYC public buildings, Architecture 2030 founder Ed Mazria, AIA, addressed a full house at the Center for Architecture on September 23, 2014. Architecture 2030's mission is to transform the built environment from the major contributor of carbon emissions to part of the solution. Over the past decade, Mazria's seminal research into the sustainability, resilience, energy consumption, and greenhouse gas emissions of the built environment has redefined the role of architecture, planning, design, and building in reshaping our world. He outlined the blueprint for a carbon-free and just built environment by 2050, and he emphasized the critical role that architects and designers must play in securing a livable future for New York City.

On August 8, 2014, at the 2014 International Union of Architects (UIA) World Congress, member organizations – representing 124 countries at over 1.3 million architects – voted unanimously to phase out CO2 and adopt the 2050 Imperative, a decision to eliminate carbon dioxide emissions in the built environment. Cities are responsible for more than seventy percent of carbon dioxide emissions worldwide, most of which are from buildings. Architects are now charged with helping to reduce fossil fuel emissions to zero.

The implementation of sustainable design, in consort with principles of resilient design, is required to effectively address both the cause and effects of climate change over the long term. AIANY believes that assiduous efforts on the part of the building community can result in a significant impact towards halting the damage of climate change. We cannot overstate the importance of implementing both mitigation policies and adaptation measures; adaptation alone cannot protect our city's residents from the anticipated effects of climate change.

AIANY commends the City Council's pledge to drastically reduce the City's greenhouse gas emissions by focusing on building design. AIANY has long advocated for local laws and code changes that support energy conservation. Upgrades to public buildings, including housing, that concentrate on renewable energy sources and innovative design solutions, will benefit all NYC residents and set a powerful example for the private sector and the rest of the world. NYC's architects stand ready to help carry out this work.

Best regards,



Rick Bell, FAIA

New York City Council Hearing on Bill # 378 – October 23, 2014

I would like to thank the New York City Council, the Environmental Committee and Counselor Samara Swanston for holding these hearings on bill #378 to reduce NYC's greenhouse gas emissions 80% by 2050. Many thanks also to Council Member Costas Constantinides for sponsoring the bill. Given the recent report issued by the Intergovernmental Panel on Climate Change (IPCC), it is imperative that the Council moves forward with this ambitious initiative.

However, *how we achieve these goals is key and it is important that we avoid the most seductive and glaring pitfalls by employing honesty, vigilance and scope in our methods.* For example, replacing one dirty fuel (i.e.: #6 oil) for an equally dirty or more potent greenhouse gas emitter (i.e.: methane or "natural" gas), as NYC's misnamed "Clean Heat Program" is currently advocating, is not a true solution, particularly when lifecycle emissions from shale gas extraction, such as through the process of hydraulic fracturing or "fracking," from which much of our methane gas is derived, are factored into the equation. The build out of gas infrastructure and dependency locks us into an outmoded dirty fuel economy for years to come, and for those of us who have been studying the grim realities of fracking, is akin to "jumping out of the frying pan into the fire!" Indeed, a 2011 Cornell University study has shown that the shale gas footprint is 20% greater than that of coal within the first 20 years and maintains its climate warming supremacy over coal up to and beyond 100 years when the cradle-to-grave process is considered.

Neither is the replacement of fossil fuels with nuclear energy a viable option, given the catastrophic 2011 nuclear disaster in Fukushima, Japan, the reactor's ongoing meltdown issues, and the unsolved problems of nuclear waste disposal, environmental destruction, human health impacts and the habitat and wildlife threats posed by nuclear energy reactors. Further, as escalating global warming continues to heat our water bodies, the use of water to cool nuclear reactors will become increasingly costly, while the growing problems of water scarcity and contamination are likely to make water use for nuclear cooling a foolhardy and dangerous enterprise.

Instead, greenhouse gas emissions reductions must be achieved through vigorous programs that promote energy efficiency retrofits for all buildings, energy conservation and energy use reduction measures, and the long-overdue shift to renewable energy sources, such as from wind, solar, geothermal and gas derived from biological sources such as algae and waste products. It is interesting to note here that the Newtown Creek Wastewater Sewage Treatment plant in Brooklyn was at one time energy self-sufficient, generating all of its operational energy needs from the methane contained in the processed waste, until a misguided change in leadership and policy reversed course and reverted the plant back to the wasteful and costly energy guzzler that it is today.

Finally, I would like to recommend that the NYC Council implement strong incentives and legally-binding guidelines to encourage and ensure that building owners take the urgently needed steps to actually reduce greenhouse gas emissions, rather than relying on good-faith or recommended initiatives that can easily be dismissed or ignored.

Once again thank you for undertaking this much-needed initiative.

Gusti Bogok, Co-Chair Sierra Club Atlantic Chapter Gas Drilling Task Force
130 W. 16th Street, #41
New York, New York 10011

October 23, 2014

NYC Council, Committee on Environmental Protection
Prop. Int. 0378-2014
Reducing greenhouse gases by 80% by 2050
Statement of Raya Salter, Senior Utility Advocate

Good morning Chairman Richardson and Members of the Committee. My name is Raya Salter, and I am a Senior Utility Advocate at the Natural Resources Defense Council (NRDC), a national nonprofit environmental organization based in New York City. Thank you for the opportunity to be here to testify in support of the City's commitment to a %30 reduction in citywide emissions by 2030, and a %80 reduction by calendar year 2050 ("80x50"). NRDC thanks and applauds the City Council for, in partnership with Mayor, courageously taking national leadership on reducing carbon emissions and addressing climate change.

80x50, recognized by the United Nations as the international standard consistent with avoiding the worst impacts of climate change, is the right goal. New York City is highly vulnerable to the adverse impacts of climate change. In 2013, the New York City Panel on Climate Change projected that by the 2050s, among other things, the City may experience up to 31 inches of sea level rise.[1] This threatens to broaden flood zones across the city.[2]

Two years after Sandy caused a tragic loss of life and property while ravaging the City's infrastructure, this is an impressive and substantial commitment to create a more stable climate for the future. The landmark legislation before you today is an affirmation that the science is in. The time to debate the reality

[1] New York City Panel on Climate Change, Climate Risk Information 2013, Observations, Climate Change Projections and Maps, June, 2013 at 4.
[2] *Id.*

of climate change has come and gone. Climate change is here and New York City is acting now.

New York City can achieve 80x50![3] In order to do so, we will need to make large gains in energy efficiency in our buildings. We will need to make clean and renewable generation, including solar and offshore wind, into an everyday reality. And we will need to electrify the transportation sector.[4]

Here is where I can begin to deliver the "good news." Taking on carbon in New York City is far more than a greenhouse gas ("GHG") reduction strategy. Tackling fossil fuels is also a way to help the City become stronger and more resilient in the face of climate change. Saying no to carbon can also make New York City a cleaner, greener city for all New Yorkers. This is a challenge, but it is also a major opportunity. The pursuit of 80x50 can make the city into a stronger, more affordable and healthier place.

In particular, addressing carbon in the buildings sector, which is responsible for %75 of City carbon emissions, can help bring the City's affordable housing plan to fruition while making our communities healthier and wealthier. Home energy costs pose a crushing burden to New York residents today. Particularly for very poor individuals and families, home energy costs threaten a households' ability to cover expenses for housing, food, medical care and other essentials. In this way, energy efficiency in buildings can make a positive difference in the health and wealth of our communities.

Further, integrated strategies to address dirty fuel oil improve the health of indoor environments, increase resiliency and promote clean and renewable power in ALL neighborhoods. This can help lower NYC's intolerable asthma rates, lower energy costs and create jobs.

This legislation, coupled with strong actions- and financial commitments- in support of the 80x50 goal will not only result in a multitude of benefits in New York City, but can also serve as a model for other cities around the country and the world. I thank you again for leadership on this issue and urge this Committee and the Council to expeditiously move forward to adopt this bill as soon as possible.

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[3] *Id.*at 6.
[4] *Id.*

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To the esteemed members of the NYC Council Committee on Environmental Protection regarding INTRO 378, a Local Law to amend the administrative code of the city of New York in relation to reducing greenhouse gases by eighty percent by 2050, I offer this testimony in support of this bill;

Tri State Biodiesel has been on the forefront of the environmental movement here in NYC for ten years operating from the conviction that implementation of "Biodiesel", the only renewable alternative fuel to achieve the designation of an "Advanced Biofuel" by the EPA (requiring 50% or more emissions reduction compared to it's fossil fuel equivalent for this designation), is the most viable and effective means we have immediately available to our community to reduce harmful emissions from diesel trucks and the heating of buildings here in NYC, which make up almost 75% of the harmful emissions which have been directly attributed to causing the highest rates of asthma among children in the whole country here in our city as well as a host of other pressing health and economic issues that accompany our unnecessary addiction to fossil fuels.

Biodiesel has a solid track record of seamless functionality in a host of legacy equipment ranging from the most complicated diesel engines powering generators and heavy duty diesel trucks and equipment, to the most basic boiler systems that heat everything from single family homes up to the largest buildings in the city. At this time the biodiesel industry has matured to the point where it is able to supply a major portion of the City's fueling needs, and in fact NYC is already the largest purchaser of biodiesel fuel in the country with the DSNY and NYC Parks Dept both wholly embracing the move to B20 and beyond at their own discretion, miles ahead of local government mandates which are already in place to bring all municipal fleets up to speed in the coming years.

Biodiesel is the safest, cleanest, cheapest, and most socially and environmentally responsible heating fuel currently available on the market, here's why;

Safer and cleaner than "Natural" Gas- When burned by the end user, natural gas burns as clean as a B11 biodiesel blend (11% biodiesel/ 89% ULSD), however this estimate does not take into account the huge amount of dangerous GHG emissions released during the extraction and delivery of natural gas, essentially reversing any emissions reductions into the negative.

This estimate also does not take into consideration the well documented irreversible damage caused to the land and communities in areas where fracking for natural gas is rampant. In stark contrast, Biodiesel is Non-HAZMAT, non-toxic, biodegradable, and most importantly does not present a public safety issue should it should leak for any reason, a risk made blatantly obvious last winter when a gas main in Harlem leaked into the building above and exploded, which ironically was owned and operated by anti fracking activists using B100 Bioheat® Heating Oil to heat the building.

NYC is already well on it's way to reversing the overall harmful emissions that result from heating our city thanks to new low sulfur rules and the 2% Bioheat mandate implemented in 2012, but to achieve these new goals more needs to be done, and increasing Biodiesel mandated volume content in all heating oil and transportation can go a long way towards helping to meet these goals. TSB has already successfully moved over 1000 homes and buildings in NYC to B100, pure biodiesel, with amazing success and dramatic emissions reductions.

Thankfully, with regards to mandate enforcement mechanisms, The NYC Mayor's Office of Long-Term Planning and Sustainability already has in place a clear structure of responsibility for implementation and enforcement in the NYC Clean Heat program which has already been very successful in reducing emissions citywide, and with your help can move forward much more aggressively were this council to consider and pass a minimum of a 20% mandated biodiesel content in all heating oil, with future benchmarks raising that percentage incrementally up the the 100% level where applicable.

TSB has already demonstrated the viability of this proposal in the field for years now with the technical support of the Brookhaven National Labs, and is happy to work with this council to see more aggressive mandates put into place as we did with the previous administration to get the original Bioheat ® mandate in place in 2010.

Respectfully,

Dehran Duckworth
Managing Member
Tri State Biodiesel

Bioheat Fact Sheet

Harvard Green Campus Initiative

What is Bioheat?

Bioheat is a blend of heating oil and biodiesel. Biodiesel is oil that is most often made from soy, palm, canola, or refined used vegetable oil. Biodiesel can be blended with any type of heating oil, including #2 for residential boilers, #6 for industrial boilers, and ultra low sulfur heating oil. The ratio of heating oil to biodiesel can vary, but it is most often combined as B5 (5% biodiesel), B10 (10% biodiesel), or B20 (20% biodiesel).

Bioheat is not a new product; it has been used in Europe for over 20 years but is just beginning to gain in popularity in the United States (one Pennsylvania company has used it in over 10,000 homes since 2005). The U.S. oil heat industry has accepted bioheat and hopes to use B5 interchangeably with standard heating oil, as there is virtually no difference in performance.

Bioheat Performance

In tests conducted by Brookhaven National Laboratory, bioheat at low blend levels showed little or no negative impact on a burner's performance while simultaneously improving the emissions, lubricity, efficiency, and cleanliness of combustion.

Boilers do not need to be converted to use blends of B20 or less. Mixes of greater than 20% can be used in existing boilers, but retrofits are needed because the pumps and seals may break down due to bioheat's high solvency. When first used, bioheat may dissolve sludge in the boiler, leading to clogging, so filters may need to be changed more often soon after the switch. The use of bioheat in boilers does not have any of the cold weather limitations associated with vehicular biodiesel.

Bioheat Standards

Bioheat is regulated by two national standards. The industry standard for biodiesel is ASTM D6751, which ensures that biodiesel is good quality, will perform consistently, and meets certain criteria (such as flash point and viscosity). BQ-9000 is a voluntary quality control program for vendors and manufacturers. It requires that all batches are tested for compliance with ASTM D6751 and includes storage, sampling, testing, blending, shipping, distribution, and fuel management best practices.

Environmental Benefits

Biodiesel is non-toxic, biodegradable, and renewable. NOx, sulfur, carbon monoxide, smoke, hydrocarbons, and particulate matter are all reduced when using bioheat (although different studies find differing reductions). B20's net life cycle CO_2 emissions are reduced by 15.66% due to carbon recycling by the plants (although, at the stack, CO_2 emissions have been found to increase by 4.7% with B20 compared to diesel). The higher CO_2 levels are from more complete combustion and the concurrent reductions in other carbon-containing stack emissions. Environmental benefits increase as greater percentages of biodiesel are used.

Emissions Reductions: B20 compared to #2 fuel oil

	NOx	SOx	CO
B20 in a commercial boiler	6% reduction	-	6% reduction
B20 in a residential boiler	6% reduction	-	9% reduction
B20 and low sulfur highway diesel: mix of boilers	20% reduction	83% reduction	No change
B20 in Rhode Island school boilers	19% reduction	18% reduction in sulfur	No change

Sources: C.R.Krishna, J. Batey, Energy Research Center, & Rhode Island Public Schools

Bioheat Costs

In Massachusetts, heating oil prices have increased by 64% over the past three years. B20 prices, on the other hand, should drop as more distributors and processing plants come online in New England, increasing the supply and competition (this was the case in Vermont after demand increased). As of November 2007, there were 165 accredited processing plants in the US and 80 under construction, up from 25 plants in 2004. Biodiesel prices should be more stable than oil, as biodiesel is not affected by global supply or political issues.

In August 2007, Mass Energy's (a discount oil provider) price of B20 bioheat was 5 cents per gallon less than #2 heating oil. The price differential is larger (about 30 cents more per gallon for bioheat) for Harvard buildings that buy wholesale #2 oil through UOS.

When MIT's biodiesel processing plant is functioning, Harvard could able to obtain free or inexpensive biodiesel generated from the University's own waste oil.

Biodiesel Feedstock

Biodiesel is most often made from tallow, soybean, palm, canola, or used vegetable oil. Many of these sources have environmentally harmful practices associated with their production. As of August, 2007, biodiesel in Massachusetts comes mostly from soybean oil processed in Florida and also some animal tallow and soy from other parts of the U.S. The ideal feedstock for biodiesel is used vegetable oil. For more information on feedstocks, please see the Harvard Green Campus Initiative biodiesel feedstock fact sheet.

Bioheat Case Studies

Over a four-year period, B20 was field tested by Brookhaven National Laboratories in several hundred homes in the Northeast and no significant problems were found. Below are synopses of other pilot studies of sites that are similar to Harvard.

Vermont Biodiesel Project

The Vermont Biodiesel Project ran five successful pilot projects in 2004-2006, including tests of B20 bioheat in a lab and residential homes. The two heating oil dealers reported no system service calls related to bioheat. They also stated that:

> *In summary, we would like to say that B20 performed as well as No.2 fuel oil in a heating application. We will recommend it to any customer currently burning No.2 fuel oil. We were pleasantly surprised. We experienced no more problems with the boilers and furnaces at Middlebury College [using B20 bioheat] than we would expect from units running on No.2 fuel oil.*

Another pilot tested bioheat composed of #6 heating oil and various percentages of biodiesel (5%, 10%, and 20%) in industrial steam boilers with great success.

The boilers did not have any operational issues and the boilers actually needed less maintenance than usual. The biodiesel was added directly to the tank, since the heat and circulation of fuel provides enough heat and agitation to blend the fuels. They found that:

> *The benefits of using biodiesel mixed with #6 fuel oil include easier measurement of fuel in tanks, easier routine cleaning of the burners and strainers, lower emissions, lower demand for imported oil, and reduction of fossil CO_2 emitted.*

Schools Using Bioheat

Middlebury College
Colby College
Bates College
University of Southern Maine
Eastern Connecticut State University
Rhode Island Public Schools

States of Massachusetts and Maine

Due to the rising costs of oil, the State of Massachusetts tested 3% biodiesel mixed with #2 heating oil (B3). After a successful test, all state buildings that use #2 heating oil are now required to use a minimum of B3 bioheat. The minimum percentage of biodiesel will be progressively increased to reach the goal of using B10. The State of Maine has also been heating at least 19 buildings with B10 since 2004.

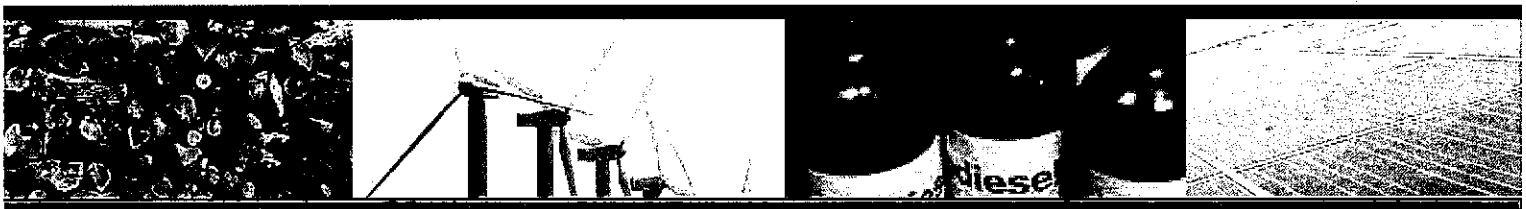
Recommendations

HGCI recommends the use of bioheat for the following reasons, it:

- Has been successfully field tested,
- Does not require any equipment conversions,
- Reduces equipment maintenance,
- Will lower Harvard's greenhouse gas emissions,
- Is a renewable resource,
- Reduces our dependence on foreign oil, and
- Will help stimulate the supply side of the market.

Sources for Purchasing Bioheat

World Energy: www.worldenergy.net
Mass Energy: http://massenergy.com
UOS: Mary Smith, 495– 0398



New York City Council

Donovan Richards-Chair Environmental Committee

Hearing – October 23, 2014

Int. 378 Amendment Administration Code

Presented by Mav Moorhead, NYH2O, 917.9232118

While other cities and countries around the globe have current achievements that have reached the 100% renewable goal there are other cities that have a goal of achieving 100% renewable in their future, many by 2035. The goal for New York City to reach 80% by 2050 is weak and appears to lack muscle and commitment to implement stronger renewable goals. There are many models by other cold weather cities and countries that can be researched and emulated. There are multiple strategies that are available for conservation as well as custom pathways for renewables that can be applied to NYC.

Recognition of the necessity for removing the New York City fossil fuel entrenchment utility model coupled with political will and serious commitment can surely step up the timeline on renewable capabilities to the achievement of 100% certainly before 2050. Because if we are content with waiting 35 years to achieve an 80% renewable goal that other cities around the world have answered 100% renewable goal presently much opportunity for the health, wealth and future advancement and recognition of New York City as the premier light of our nation will certainly be lost on so many levels.

We must keep step with the utter necessity to step up to the plate and take every possible action to implement substantive change right now. My testimony today includes Practical Conservation Solutions to aid in the reducing of Greenhouse Gas of which many could be implemented right now.

In addition, further, my testimony includes a list of cities and countries that have achieved 100% renewables, including Ithaca, New York, Evanston, Illinois as well as Oak Park, Illinois, a list of renewable goals that have been established, a list of green and carbon neutral cities within the coming decade, plus a list of plans to build renewable cities around the world.

Following up on those details, my testimony includes a recapitulation from the highly informative new film "The Future of Energy" highlighting quotes from the pertinent individuals and their agencies and companies driving the renewable actions that have already been completed and those that are in progress, serving as models for renewable projects moving forward.

NY H2O

New York City Council

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PRACTICAL CONSERVATION SOLUTIONS

MANDATES TO AID IN REDUCING GREENHOUSE GAS

TO IMPLEMENT NOW

Natural gas usage plainly allows for abundant fugitive methane leakage in New York City creating high levels of greenhouse gas contributing to climate change inhibiting efforts to reach expected goals for a reduction of greenhouse gas.

Marcellus Shale's high levels of Radon 222 are being transported into NYC homes, restaurants, commercial entities allowing a serious lung cancer threat into our kitchens, boiler rooms and appliances to millions of New Yorkers.

It is imperative that we not only mitigate the onslaught of resultant greenhouse gas factors from fossil fuels that its carbon footprint has produced but most certainly to institute immediately as many compounding measures as possible to stabilize, if not reverse, this crippling prospect of a resultant future climate change and accelerated levels of cancer.

A few suggestions include:

- **Conservation-Instituting mandates for NYC buildings to provide uniform heat throughout buildings thru use of conforming valves to no higher temperature of 72 degrees relieving our existing gross overheating that exists in so many NYC residential and commercial buildings.**

- **Promotion and subsidies for solar panels on roofs would substantially augment energy supply. All NYC owned property should be solar powered. Gas usage would dramatically decrease.**
- **Community Choice Aggregation model should be explored for NYC.**
- **Institute a mandate whereby office buildings turn off lights after a certain hour unless in direct use eliminating obvious energy waste.**
- **As part of the European policy that currently exists, 24 hour hall lighting minimized. Motion sensors implemented for efficiency and energy conservation to control hall lights when not in use eliminating waste.**
- **Mandate building retrofit upgrades to include upgrading insulation, increasing air barrier resulting in minimizing fossil fuel energy usage with the addition of implementing solar panels on roofs of every building.**
- **Direct building owners thru a mailing campaign with definitive steps to be taken regarding real conservation efforts. This could be accomplished with a menu of choices that would be phased in within a certain time frame. For example, a list of 10 choices on a Conservation Checklist of at least 3 of the choices by each landlord to be implemented within 1 year and progressing on to accomplish additional choices each year.**
- **A landlord reward system for accomplishing their conservation goals could be achieved with a corresponding percentage reduction of Real Estate Taxes for every choice on the Conservation Menu Checklist (not to mention a built in reduction of yearly NOI expenses), always a tried and true incentive. Fines for non-compliance.**

Deliberate measures to reverse usage of natural gas and other fossil fuels must be a central focus of PlaNYC, not simply mitigating the results of their usage. Energy usage must be decreased by a considerable sum and these measures, many of which have minimal costs, can be implemented immediately.

Mav Moorhead

NY H2O

917.923.2118

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RENEWABLE ENERGY SOLUTIONS

"Our ability to convert sunshine into usable energy has become much cheaper far more rapidly than anyone had predicted. The cost of electricity from photovoltaic, or PV, solar cells is now equal to or less than the cost of electricity from other sources powering electric grids in at least 79 countries. By 2020 as the scale of deployments grows and the costs continue to decline, more than 80% of the world's people will live in regions where solar will be competitive with electricity from other sources. These fossil fuel burning companies are openly discussing their fears of a "utility death spiral" as stated by Al Gore in his piece "The Turning Point".

He continues, "Germany, Europe's industrial powerhouse, where renewal subsidies have been especially high, now generates 37% of its daily electricity from wind and solar. Analysts predict that number to rise to 50% by 2020. Germany's two largest coal burning utilities have lost 56% of their value over the past 4 years. The losses have continued into the first half of 2014. In addition, throughout Europe the top 20 utilities reported losing half their value since 2008. According to UBS, 9 out of 10 European coal and gas plants are now losing money.

In the U.S. up to 49% of new generating capacity came from renewable in 2012. 166 coal fired electricity generated plants have either closed or announced closing. 183 new coal plants have been canceled since 2005. These closings have been due to substitution of gas for coal but the transition underway with renewable energy in both American and global energy markets is far more significant than one fossil fuel replacing another.

We are witnessing the beginning of a massive shift to a new energy distribution model from the "central station" utility grid model that goes back to the 1880's to a "widely distributed" model with rooftop solar cells, on-site and grid battery storage and micro grids."

"This year Citigroup reported that the widespread belief that natural gas, the supply of which has ballooned in the U.S. with fracked shale gas, will continue to be the chosen alternative to coal is mistaken, because it too will fall victim to the continuing decline in the cost of solar and wind electricity. Significantly, the cost of battery storage, long considered a barrier to the new electricity system has also been declining steadily, even before the introduction of new battery technologies that are now in advanced development.

Note that enough raw energy reached the earth from the sun in one hour to equal all of the energy used by the entire world in a full year.

The cost of carbon based energy continues to increase while cost of solar energy has dropped by an average of 20% per year since 2010. Authoritative energy economists such as Bernstein Research in their produced energy report predicted energy price deflation as soon as the next decade.

The rise in distributed alternate energy sources allows consumers to participate in the production of electricity through a policy called net metering. In 43 states homeowners who install solar PV to systems on their rooftops are permitted to sell electricity back into the grid when they generate more than they need. This crucial solar power net metering policy represents an existential threat to the future of electric utilities and their "utility death spiral." Ultimately, what saves money for their customer's cuts into the growth of the utilities profits and depresses their stock prices.

In 2000 many scoffed at the projection s that the world would be installing one gigawatt of new solar electricity by 2010.that goal was exceeded 17 times over; last year exceeded 39 times over and this year will exceed that benchmark as much as 55 times over. In May China announced that by 2017 it would have the capacity to generate 70 gigawatts of photovoltaic electricity."

***The Turning Point*, Al Gore, Rolling Stone, July3-17, 2014**Former Vice President and Nobel laureate, Al Gore is founder/chairman of the Climate Reality Project and Generation Investment Management. He wrote "Climate of Denial" in June 2011.

***The following information is recapitulated from "The Future of Energy"** highlighting the pertinent individuals driving the renewable actions that have been completed and in progress, serving as models for renewable projects moving forward.

The newly released film, "The Future of Energy" researched and written by Maximilian Dearmon, Theo Badashi & Missy Lahren, Directed by Brett Mazurek

Cities that have Achieved 100% Renewable

Palo Alto, Ca

Greensburg, Ks

Evanston, IL

Oak Park, IL

Ithaca, NY

Iceland

Las Gaviotas, Columbia

Kronprinzenkoog, DE

Dardesheim, DE

Schonaum DE

Extremadura, ES

Monte Tringo, Cape Verde

Samso, DK

Thisted, DK

Gussing, AT

Brunico, IT

Arese, IT

Botbadjang District, CM

N'Gaandere, CM

600,000 villages in Bangladesh

Rural communities in Mendanao Philippines

400,000 people in rural China

Kuzumaki, JP

Renewable Goal Established

Marin, Ca. 100%

San Francisco, Ca. 100%

Google USA 100%

San Jose, Ca. 100%

Lancaster, Ca. 100%

Scituate, Ma 100%

Bonaire 100%

Aruba 100%

2 million Peruvians provided w/solar power

Stockholm, SE 100%

Malmo, SE 100%

Denmark 100%

Hessen, DE 100%

Frankfurt, DE 100%

Munich, DE 100%

Germany 80%

Rotterdam, NL 100%

Fukushima Prefecture, JP

Scotland 100%	Isle of Maldives 100%
Isle of Wight, UK 100%	Island of Tuvalu 100%
Portugal 70%	Sidney, Australia 100%

List of Green and Carbon Neutral Cities within Coming Decade:

Vancouver, Canada	London, UK	Berlin, DE
Seattle, WA.	Paris, Fr	Amsterdam, NL
Toronto, Canada	Vargo, SE	
Santa Barbara, Ca.	Gothenburg, SE	
Costa Rico	Copenhagen DK	

Zero Net Energy Policies are where every building consumes only as much energy as each produces.

There are plans to build 100% renewable cities across the globe:

'Plan IT" Valley, PT	Tlanjin Eco City
Masdar City, UAE	Songdo, SK

The following are persons and organizations that are leading the way and have made substantial commitments to the Renewable Energy efforts here in the U.S.

Renewables100 Policy Institute, Diane Moss, Founding Director, engaged brilliant minds from around the world to attend the 1st renewable Energy Conference in the U.S. to share their renewable global visions. These leaders' goal is to shift the world to global renewable energy. "The plan has potential to create millions of jobs along with a healthy environment. The conversion will be to wind, water and sunlight by 2050, by 2030 this goal will total 80% and by 2020 all new sources will be wind, water and solar. It cuts across generations, nationalities, parties, socioeconomic strata. People seem to really get that our world can be fueled with 100% renewable sources. Numerous experts agree that that it's technologically possible to go to 100% renewable energy. The question is political will; it isn't if we go to renewable energy, it is how and when."

Mark Z. Jacobson, Director of Atmosphere/Energy Program, Stanford University, states that "It is technically and economically feasible to repower the entire world's energy for all purposes with renewable energy. The limitations are social and political rather than technical or economic."

Mayor R. Rex Parris, City of Lancaster, Ca. has a plan to get to net zero but states that "There are ordinances that have to be changed. Lancaster was the first city in US to mandate solar panels on all new buildings."Their goal is to be one of the solar capitols of the world. They put solar panels on every facility in the city, parking lots, and schools. They will be at net zero in 4 years. A city resident's electric bill used to be $300/mo. Now it's less than $100 with most months it's $1 or $2. Cities are looking for a stable revenue stream and are finding they can take control of their destiny thru their utility.

Jeremy Rifkin, Author/Economist,"The Third Industrial Revolution"; "We are on the cusp of a new convergence of Communication Energy. 5 Pillars to consider: we have to go to renewable energy; collect energy from every infrastructure, buildings; store the energy; have to share the energy on the internet; we have to plug utilities into our transportation, fuel cell vehicles. These 5 pillars are necessary for a new economic paradigm. New energy has to converge with advanced energy technologies powered by micro chips and the internet. We need to create our own energy and share it where it's needed. When we converge the internet with democratization of communication with distributed energy, we've empowered the human race to produce and generate their own electricity at net zero energy cost. They can then share it with neighbors across entire regions and continents just like we create information and share it on line. By democratizing communication with the internet as we expand out on the internet of things that we have, which is the communication internet, the energy internet and the logistics internet, we're democratizing energy. A game changer."

Scott Johnston, Exec. Dir. Vermont Energy Investment Corp, "What is called for is a global decarbonization Marshall Plan. We need to decarbonize our buildings, the grid, transition our vehicles and heating sources to electric because that's where we can build the renewals."

Paul Gipe, Author/Renewable Energy Industry Analyst; "If you give every American an opportunity to participate in the renewable energy revolution for their personal financial benefit and benefit for their communities they will jump at the opportunity."

Byron Benton, Training Director, Zero Net Energy Center, is "...putting people to work, making this a cleaner environment and, security wise, we're less dependent on foreign oil."

Daniel Wallach, CEO, Greenburg Greentown, Kansas City, in Greenburg, Ks, powered by 100% wind energy after catastrophic tornado destroyed 95% of the town. They rebuilt with combination of solar panels, wind turbines, reclaimed materials, high efficiency building envelope LED lighting and natural ventilation, green roof, geothermal heat pump in their new construction of the town.

Mayor Bob Dixon, City of Greensburg, Kansas; "Vision without action is merely a dream. Our effort is a cross generational effort that has been very rewarding."

Michael Estes, Manager, John Deere; they had to train the employees of John Deere on standards of LEED Platinum building and the importance of building to that level.

Danny Kennedy, President and cofounder Sungevity; "Fossil fuels are scarce and are governed by different rules of economics. The technical curve of solar comes down in price with mass production where fossil fuel goes up in price because they are finite. The more you use them the more expensive they become. Solar is becoming less expensive than conventional electricity. The cost is less money over the next 20 years than to use conventional electricity.

There is a new type of corporation which uses the power of business to solve social and environmental problems. These 'social benefit corporations' are emerging business models founded on the triple bottom line of people, planet and profit. Over 119,000 ending 2012 now work in the solar industry up from 90,000 in 2010, a double digit growth rate.

Warren Buffett has spent $7 billion on solar in the past couple of years."

Nutter, Director San Francisco Dept of Environment; "There are over 3600 solar installations in the city and county of San Francisco.2300 Megawatts within the county borders. The Department of Environment "SF Energy Map". It's a web based resource where anyone, residence or business can go online and enter their address and determine the solar potential of that building, the rebates that can be accessed, how much energy you can reduce, what your reduced energy bills will be, where I'm at today and where it will be in the future by having this energy map."

Peter Asmers, Principal Research Analyst, Navigate Research; "In the future when you buy your home it will come with solar. We will need more community based systems".

Shawn Marshall, Executive Director, Lean Energy US; "Marin County has the cleanest CCA (Community Choice Aggregation) program in the country. Soon to follow suit the City of Chicago recently signed its first aggregated contract and they're in the heart of coal country!
Mayor Rahm Emanuel saw the value in this. The City of Chicago did not sign a contract that had coal or nuclear and they demanded wind as well."

Governor Jerry Brown; "We have to get to zero net energy."

Mayor Stephen Cassidy, San Leandro, CA; "The first retro fitted zero net commercial building in the country is the zero Net Energy Center – IBEW. NECA Electrical Training Center in San Leandro, California. It's an example of how we can create millions of green jobs across the U.S. and lower our carbon emissions. This retrofitted building includes a solar tree that provides an electric car park and recharge center. There is no gas in the building. The gas is capped off. The building is all electric based so that they can produce all their own power The purpose of the building is to is to provide a solar apprentice program to train the future work force of electricians."

Byron Benton, Training Director, Zero Net Energy; "The union and the Contractor Association put individuals through a 5 year program, college credit classes, 8000 hours of hands on for the purpose of training this next work force to do retrofit or new construction throughout the country. They can be turned out as journeymen or foremen or general foremen in the future."

0 Net Energy Homes: The Fortunatos-Green Idea House, Hermosa Beach, CA, 2100SF, 2Bed 2Bath carbon free, solar, electric car, net 0 energy. "Producing more energy than they need on an annual basis *they make money annually on their solar array. House uses almost no energy during the day and the energy generated is driven into the grid and powers the rest of the houses on the street.* Sun high in the sky in summer and low in the sky in winter and with a 5' overhang the *building is dramatically shaded in summer and in winter heat will penetrate the windows and actually heat the house which accounts for 50-60% of heating & cooling of the house. In the kitchen: Energy efficient.* There is an induction cook top - boils water in 2 minutes with electromagnetic technology. Speedcook Advantium Oven which uses Convection Microwave technology – food is cooked faster than regular convection oven reducing amount of energy they use to cook. *They capped off the gas line. There's nothing combustible in the house.* The outdoor bar-b-que is electric. *The car charges simply as charging your cell phone.* Full charge lasts 62 miles. *No maintenance on the car – no oil change, no timing belt, brakes are meant to last the life of the vehicle. No filling up at the pump.* Electric Vehicles: There's a large range of electric vehicles available now: Nissan, Toyota, Ford, Smart Cars, Tesla, and electric motor cycles."

Billy Parish, Founder/President, Mosaic, Inc.; " Mosaic connects everyday investors to solar projects that otherwise wouldn't be funded by big banks. There are a lot of medium size schools, churches, hospitals that want to go solar but banks won't finance them. Mosaic is stepping in and creating financing for the installation of these systems that otherwise would lack resources for funding. There are a lot of people who want to see these institutions go solar and are willing to invest their dollars and will make their money back with a profit. Investors can earn between 4%-7% compared to 10 year Treasuries that yield 1.0% currently. Jan. 7, 2013 Mosaic was introduced. In initial tests, they facilitated about $1.1M in investments from 400 people to finance 12 rooftop solar plants in CA, NJ and Arizona."

"Much in the way 'Kickstarter' enables average citizens to find creative projects; Mosaic enables citizens to support local solar development. The difference is that those citizens earn back their investment." – Forbes

Jamie Henn, Cofounder 350.org; "Divestment movement to divest funds from fossil fuel companies has spread to over 300 colleges and university campuses in more than 100 cities and states and dozens of religious institutions who are demanding their institutions divest from the top 200 companies that own the vast majority of carbon reserves and begin to reinvest in renewables."

Marco Krapels, Executive VP, Rabobank; "Young people will be creating the software, windows that create electricity cars that self powers, will sell the solutions that already exist in an online store, the app for that, finance engineering that young millennials will all apply to make the solar revolution happen."

8. Mav Moorhead, NYH2O, 917.9232118

Additional Relevant Facts to Consider from the in-depth film "The Future of Energy"

CCA: Community Choice Aggregation is a local program that buysand generateselectric power for residential and commercial. Municipalities are taking back the decisions about where and how they get their energy from the investor end utilities and asserting their democratic right in making these decisions.

Solar panels on a house can replace the energy cost for the home as well as electrical costs for the electric car. The payback will come in 4 years. The system will last at least 25 years and will save cumulatively 100's of thousands of dollars over time.

3 main components for San Francisco to get to 100% renewable energy are reducing energy consumption, demand, net zero.

In Orville, Butte County, CA they are installing solar on low income homes working with students to give them hands on skills regarding installation. Students are invigorated to learn and implement alternate energy and fully understand this energy future is now upon us. **'Grid Alternatives'** have installed large installations on the West Coast and are now installing 7 systems in NJ and NY and are opening a NY, NJ office next year.

In Sonoma County their CCA Clean Power Program is going to provide 33% renewable energy with no *coal or nuclear* in the mix. That is a valuable choice for the people of Sonoma County to reduce greenhouse gas and addressing Climate Change.

33% of carbon emissions come from electricity. 2/3 of it comes from burning of fossil fuels.

28% of Greenhouse Gas emissions come from transportation.

93% of energy we use comes from petroleum.

10,000 pounds of CO2 each car pumps into the atmosphere in a year. Even if you get your electricity from a utility it still will dramatically reduce the amount of carbon a car pumps into the atmosphere coming from the utility instead of coming from the car.

Actions to Promote:

Local Government and Policy Makers

- Mandate Renewable Energy
- Save Dollars through energy efficiency
- Provide incentives for residents and businesses
- Create Create Community Choice Aggregation Program (CCA)

Business and Investors

- Become a B Corporation
- Power your business on renewal energy
- Upgrade your business to Zero Net Energy
- Invest in renewable energy
- Divest from fossil fuels

Individuals and Communities

- Buy and grow local food
- Ride bikes, carpool and car share
- Assist your schools and communities to go solar
- Divest from fossil fuels
- Explore renewable energy for your home, vehicle
- Bring climate education to your schools

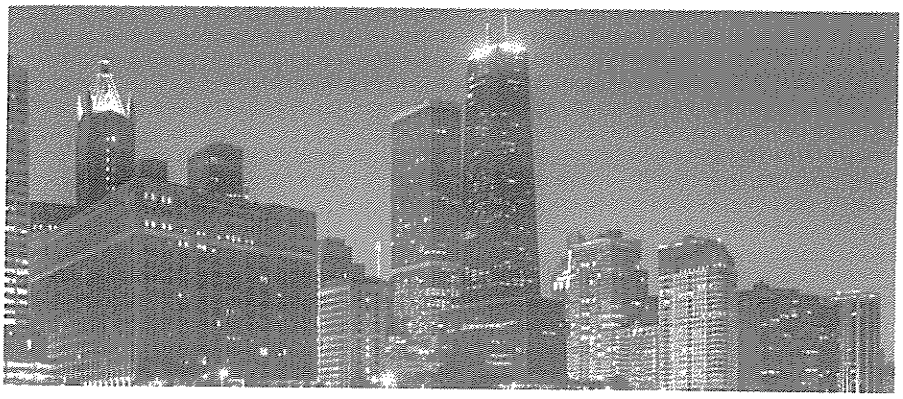
By taking decisive and positive immediate action to promote and enact Renewable Energy we can drive critical change that is imperative to every New Yorker's ability to enjoy future years ahead without undue climate hardship and all the devastating results that come with it. Mandates for conservation and efficiency, new energy models, tax breaks, additional incentives, and promotion of these drivers must be publicized widely to create widespread awareness.

Mav Moorhead

NY H2O

917.923.2118

Blog.



LEAN Energy's National CCA Summit

October 14, 2013 Designit Blog

Registration is now open for LEAN Energy's National CCA Summit, November 11-13 in Chicago, IL. The Summit is the only annual education and networking conference of decision-makers and stakeholders in the field of community choice aggregation (CCA)[1]. Since we last convened in early 2012, the CCA landscape has continued to be a dynamic and fascinating place, with rapid expansion in the Midwest and growing popularity in the Northeast. **Illinois** now takes the lead with over 600 CCAs and nearly 80% of its residential population served under aggregated contracts. **Ohio** has also seen continued growth, and with Cincinnati's leadership is making the switch to cleaner energy supported by renewable energy credits from in-State resources. **California** continues to slog its way toward more CCA programs, but continued utility resistance, regulatory constraints and the cost of start-up make it a challenging, albeit promising, local energy choice. CCA is starting to take hold in the State of **New Jersey**, with electricity rate reductions averaging 14% in the first wave of contracts there. **Massachusetts** is poised to grow with at least ten aggregation programs under review at the MA Department of Public Utilities, and **New York** is running pilot legislation that will allow Westchester County, NY to lead the way. The sleeper in this whole discussion is **Rhode Island**, which remains limited to municipal and school facility aggregation, but whose statute permits residential and business aggregation. True, there are process amendments that would improve their statute, but this is a State with untapped potential.

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CCA in the News

Written by Los Altos Town Crier Staff - Town Crier Staff Report - Los Altos Town Crier | Wed, Oct 22, 2014

Could Greener Power Come to Lafayette? - Lamorindaweekly | Wed, Oct 22, 2014

ComEd makes easier for customers to select electricity supplier - Energy Business Review | Tue, Oct 21, 2014

ComEd Makes It Easier for Customers to Choose Electricity Supplier - MarketWatch | Mon, Oct 20, 2014

TESTIMONY REGARDING NYC COUNCIL INT. NO. 378-2014 – Oct. 23, 2014

My name is Melissa Elstein, and I am a NYC resident, and a co- founding member of The West 80s Neighborhood Assn. and The NYC Coalition of Block and Community Leaders – though I am speaking today personally as a concerned resident and not representing a group.

Thank you to the NYC Council Speaker Melissa Mark-Viverito, the Environmental Protection Committee Chair Donovan Richards and full Committee, my City Council Member Helen Rosenthal, and the Public Advocate Letitia James for this opportunity to speak, and for your acknowledgement of climate change and its' causes and ramifications, the need to address and counter it, and your introduction of this local law No. 378-2014. I also thank those of you who marched at the historic People's Climate March this Sept. 21.

Upon reading the proposed law, the 10-page memo attached to it, and press release # 112-2014 dated Sept. 19, 2014, these are my comments and concerns in the order of the press release:

Reduce City's Greenhouse Gas Emissions by 80 percent

- Are there yearly goals set and to be monitored, or just the longer term 30 percent reduction by 2030 and the 80 percent reduction by 2050?
- Is this aggressive enough, considering that "Climate change is a global emergency . . . ." quoting City Council Member Dan Garodnick.
- What about a plan to discourage the use of fracked natural gas (a greenhouse gas), and not encourage boiler conversions to gas but to alternative energy sources (such as biogas and certain biofuels) that do not contribute to global warming through methane release during extraction and transfer (such as flaring at drilling sites, leaks at compressor stations, and pipelines). (See "Renew New York" and EE News article, attached).
- We need alternative energy infrastructure to gas pipelines, dangerous Liquified Natural Gas off-shore plants, and Con Ed gas clusters. We need clear energy policies that do not promote natural gas – such as off-shore and on-shore wind farms, solar panel "farms" in the low-building boroughs, energy storage. (See attached Prof. Mark Jacobsen report and The Solutions Project: NY diagram). In addition, how can we in good faith seek a ban on fracking in NY due to the risk of toxic chemical and gas contamination to our drinking water supply, upstate farms and wineries, yet create the demand for more gas from our neighboring States - who are suffering from such pollution to their water, land and air, and whose residents are being negatively affected in numerous ways including their physical and emotional well-being.
- Additionally, in NYC, there is the health concern about high radon levels (a carcinogen) in fracked gas transported from the PA Marcellus Shale. We need a NYC Council bill that mandates local monitoring of radon by the suppliers. (See overview of State Assembly Member Linda B. Rosenthal's proposed bill, attached).

Reduce the City's purchases of fossil fuels

- Will all city-owned vehicles be changed to hybrid, electric and/or biofuel?
- Will there be legislation requiring divestment for city pension funds from the fossil fuel industry?
- Can we add eliminating the use of gas-powered leaf blowers in the NYC Parks, which also contributes to noise pollution?

Innovative Solutions to Sustainability in Public Housing - Reducing waste by making a real commitment to recycling

- Reducing waste should not be limited to public housing. Recycling is great, but even better is a commitment to not using throwaway, one-time use containers in the first place. We need outreach and education throughout the city to businesses and consumers to encourage the avoidance of single-use plastics and paper in many forms (such as plastic bags, plastic water bottles recently banned by San Francisco, coffee cups with plastic lids from Starbucks for example, plastic sandwich containers, cups and straws – all of which are used for mere minutes and immediately discarded in our over-flowing street trash cans, and not even in the recycling cans in the same vicinity). Plastic is a petroleum-derived product linked to health concerns in manufacturing and consumption, and it is expensive for the city to collect, sort, recycle and/ or discard in land-fills – which contribute to global warming – or it ends up in our waterways and oceans creating more pollution and acidification. There is no "away", when we throw things away. We need a change in consciousness around our wastefulness, and make common-place the utilization of reusable refillable water bottles and coffee cups, metal straws, cotton and other reusable shopping and storage bags, lightweight washable travel cutlery – such as items by To-Go Ware, Kleen Kanteen, Mothering Mother, which are commonly available at stores such as Whole Foods and Westerly Market and online.

- Reducing use also reduces need for more sanitation vehicles, thus reducing costs to city and lowering air pollution rates.

Making Buildings Energy Efficient Citywide

- What about energy conservation? For example, why are buildings, and especially large office buildings, keeping lights on throughout the night – including bright terrace lights in residential buildings? And in the hot months keeping their air temperature so low that office workers are putting on sweaters and shawls to stay warm indoors? Should this not be regulated?

- What about white roofs? In order to reduce the "heat island effect", should not all buildings have light roofs (if not green, or solar paneled – if feasible?)

- Speaking of reducing the heat island effect, what about the use of street bioswales, larger tree beds that are systematically cultivated, tracking and replacement of dead trees from the Million Trees Project with effective street tree outreach, care and oversight.

Strengthen the NYC Clean Air Act

- Is there legislation regulating and limiting the smoke and soot that fills our air from what seems like the ever-growing number of hot food street vendors? Often, NYC streets are filled for hours with black smoke from these small carts.

Melissa Elstein

255 West 85th Street, NYC 10024

RenewNEWYORK

sane energy project

United for Action

Dear Co-op or Condo Representative,

New York City buildings are facing an important decision, brought on by new heating oil rules: which boiler fuel should they switch to? Many residents erroneously believe that the city has mandated a switch to natural gas; this is not the case. Many building managers believe that switching to gas is the best financial option, and while gas prices are at historic lows, that may appear to be the case. However, it's a choice that may prove regrettable on several counts. There are many considerations to take into account when deciding between options:

Gas prices will rise. Prices have historically been as high as $12-16 per MBTU. Current prices, below $3 per unit, are a temporary blip. At the moment, a glut of gas exists, due to the new extraction method known as "fracking," which makes it possible to release gas from previously unusable shale deposits. This glut is unlikely to last for several reasons:

- Shale gas reserves have been vastly overstated. Claims of a 100-year supply have been revised by 80% or more. The Potential Gas Committee, a respected source often cited by the gas industry, recently estimated that there is only 11 years worth of extractable gas.
- Patterns of actual production, as opposed to projections, show that less than 20% of wells produce at a profitable margin, and production at each well drops off precipitously after the first year.
- Drillers are already making moves to reduce supply in order to raise prices. Wells are being selectively shuttered, a tactic used typically by OPEC.
- Various pipelines and LNG port conversions are already planned. Once producers realize their desire to export, the U.S. will compete with hungry overseas markets, where gas currently sells for $16 per unit. The price of domestic gas will skyrocket.
- The "shale gas revolution" is proving to be a shell game, not unlike the housing bubble. In fact, several drillers are surviving not by drilling but by bundling and reselling leases, in exactly the same way the mortgage crisis was created. Many drillers are deep in debt and complaining they can't hold out with gas at current prices. The cracks in the façade are beginning to show.
- The April 24th seminar, "Fraconomics," will explore in depth the true economics of shale gas.

Conversions are costly and unnecessary. The price to convert a multi-family building to gas can run anywhere from $150,000 to upwards of $1.5 million. While Con Ed does offer rebates and discounts for running pipes to clustered buildings, there are no incentives that cover the internal cost of conversion, such as decommissioning the oil tank, lining the chimney, boiler replacement, and sundry other changes. And by the time Con Ed actually has the needed infrastructure in place, gas prices are likely to be higher.

Meanwhile, many buildings can meet the new emissions requirements with much less expensive changes, and without losing the flexibility to burn oil. Most boilers are already capable of burning alternative liquid fuels, such as No. 2 or biodiesel. Even if an old tank is found to be too leaky to handle these thinner oils, replacement can cost as little as $10,000. Rebates of up to 20 cents per gallon bring the cost of biodiesel blends down almost as low as the cost of No. 6 oil. Even though biodiesel has a lower BTU, because it burns so much more cleanly and efficiently, the volume used can be up to 10% less than traditional oils. Given these facts, it makes little financial sense to take on a costly conversion to gas.

Gas is explosive. Heating oils and biodiesel have a low flash point and are safer than gas. Gas is highly volatile and requires the construction of large, high-pressure pipelines. One current project, the Spectra pipeline, proposes to build a 30" pipeline into the historic West Village, with gas running at a pressure similar to that of a fire hose. A pipe of comparable size and pressure blew up in San Bruno, California in 2010, blasting a crater 4 stories deep, and razing 38 homes. On average, nationally, a pipeline accident occurs about once a week. Gas leaks along pipelines are so common that industry has a term for it: LUGs (lost unaccounted gas). LUGs typically account for 3-12% of the total volume, and leak 24/7.

Since there are already pipes running all over our subterranean city, there may be a sense that "it must be safe." Two large mains cross the city, with smaller pipes feeding gas to stoves. However, if more buildings convert to gas, it will mean a lot more pipes, a lot more big pipes, more leaks, and more risk of explosion.

The gas itself is changing. The old "conventional" gas we used to get here in NYC is running out. Currently, 80% of newly produced gas is extracted by hydraulic fracturing, or "fracking." In the near future, *all* gas will be fracked, a process that creates risks to our air and water quality, and produces at least one element we don't want in our New York City apartments: radon. Radon is released with the gas and travels through the pipes to the point of use, i.e., to our boilers, stoves, and laundry rooms. When radon is inhaled in even minute quantities, it causes lung cancer; in fact, it is the second leading cause of lung cancer after smoking. As more of NYC's gas is supplied by nearby shale deposits, the level of radon in our gas is likely to rise to unsafe levels. (Our gas already contains some radon, as shown in a recent citywide radon test). Imagine the risk to residents, staff, and property value if your building's gas supply were to become carcinogenic. Imagine the impossibility of converting every apartment stove to electric; few buildings have the available service required for such a conversion.

The cost of fracking will affect everyone. The costs of climate change and the threat to New York City from rising oceans and extreme weather are estimated to be in the billions of dollars. Fracking adds exponentially to climate change. Studies from credible institutions such as Cornell University have shown that the extraction and use of methane, a greenhouse gas 20 times more powerful than CO2, will have the same or worse effect on climate as coal or oil.

Hydraulic fracturing uses approximately 350,000 pounds of toxic chemicals, many unidentified, mixed with 5 to 8 million gallons of water and sand for each frack job, and has been shown to cause ground water contamination. If buildings all over New York switch to gas, it will create a greater demand to frack upstate, and will threaten our watershed. An impact study by the NYC Department of Environmental Protection concluded that hydraulic fracturing in or near our watershed would be catastrophic.

There are no reasonable options for disposal of frack wastewater. Some proposals would ship the waste to municipal treatment plants, which do not have the capability to remove these toxins. The costs to our state and country as fracking affects the health of residents and workers will be hard to bear. The cost of our food will rise as industrialization reduces farmland and poisons animals and crops. The boom and bust cycle of drilling will leave rural areas devastated and unable to recover for new, cleaner economies.

There ARE alternatives. Buildings can meet new emissions standards without the heavy cost and risk involved with switching to gas. The use of biodiesel and bioD blends make burning oils cost effective as well as environmentally healthier. Solar thermal systems can greatly reduce the cost of heating hot water. Efficiency measures can reduce energy expenses from 30-75%. Please review the enclosed report to better understand your options. Thank you for your consideration of this important issue.

Don't be fooled into switching.

If you would like us to meet with your board or residents, get more info, or be placed on our mailing lists for upcoming events and workshops, please email us: David Braun of United for Action can be reached at: db@nowlookup.com Clare Donohue of Sane Energy Project can be reached at clare@SaneEnergyProject.org.

http://www.eenews.net/eenewspm/2014/10/15/stories/1060007399

CLIMATE:

Expanded use of natural gas won't slow global warming -- study

Katherine Ling, E&E reporter

Published: Wednesday, October 15, 2014

Using more natural gas won't slow the growth of greenhouse gas emissions by 2050 and isn't "necessarily an effective substitute for climate change mitigation policy," according to a study published online today in the journal *Nature*. The **study** says inexpensive natural gas would replace not only higher-emission fossil fuels like coal but also low-carbon, expensive sources like nuclear reactors and renewable energy.

Moreover, the study says, greenhouse gas emissions would continue growing because of releases of methane and increased total energy use as the economy is spurred by inexpensive gas.

"The effect is that abundant natural gas alone will do little to slow climate change," said Haewon McJeon, the study's lead author and an economist at the Energy Department's Pacific Northwest National Laboratory (PNNL).

"Global deployment of advanced natural gas production technology could double or triple the global natural gas production by 2050, but greenhouse gas emissions will continue to grow in the absence of climate policies that promote lower-carbon energy sources."

McJeon added, "Abundant gas may have a lot of benefits -- economic growth, local air pollution, energy security and so on. There's been some hope that slowing climate change could also be one of its benefits, but that turns out not to be the case."

Even if natural gas consumption rises by as much as 170 percent by midcentury, the study says, there would be only a slight change in the current trajectory of carbon dioxide emissions, either reducing it by 2 percent or expanding it by 11 percent.

Most models reported the increased use of natural gas would cause a small increase of up to 7 percent in "climate forcing" emissions -- elements that affect the amount of energy the planet draws from the sun and the amount of energy the planet radiates back into space -- that are a major cause of climate change, the study says.

Five research teams from the United States, Australia, Austria, Germany and Italy did the study. In a change from other analyses, the researchers used five independently developed "integrated assessment models" that accounted for energy use, the economy and climate -- and those systems' interactions through 2050 -- and all independently came to the same conclusion that abundant natural gas use would not slow climate change.

The project was led by the Joint Global Change Research Institute (JGCRI), a collaboration between PNNL and the University of Maryland. Other groups contributing to the study include BAEconomics, the International Institute for Applied Systems Analysis, the Potsdam Institute for Climate Impact Research, the Euro-Mediterranean Center on Climate Change and Resources for the Future.

JGCRI is a private-public partnership funded by the Global Technology Strategy Project, whose current and recent sponsors include Chevron Corp., the Electric Power Research Institute, Exxon Mobil Corp., Japan's National Institute for Environmental Studies and DOE's Office of Fossil Energy, according to PNNL.

The paper assumes the world is "acting under market forces with no additional policies," but the team is working on extending the analyses to consider the implication of additional policies such as limits on greenhouse gas emissions or policies to promote renewable energy, according to a blog post by study co-author Brian Flannery, a fellow at Resources for the Future.

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Examining the feasibility of converting New York State's all-purpose energy infrastructure to one using wind, water, and sunlight

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HIGHLIGHTS

- New York State's all-purpose energy can be derived from wind, water, and sunlight.
- The conversion reduces NYS end-use power demand by ~37%.
- The plan creates more jobs than lost since most energy will be from in state.
- The plan creates long-term energy price stability since fuel costs will be zero.
- The plan decreases air pollution deaths 4000/yr ($33 billion/yr or 3% of NYS GDP).

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ABSTRACT

This study analyzes a plan to convert New York State's (NYS's) all-purpose (for electricity, transportation, heating/cooling, and industry) energy infrastructure to one derived entirely from wind, water, and sunlight (WWS) generating electricity and electrolytic hydrogen. Under the plan, NYS's 2030 all-purpose end-use power would be provided by 10% onshore wind (4020 5-MW turbines), 40% offshore wind (12,700 5-MW turbines), 10% concentrated solar (387 100-MW plants), 10% solar-PV plants (828 50-MW plants), 6% residential rooftop PV (~5 million 5-kW systems), 12% commercial/government rooftop PV (~500,000 100-kW systems), 5% geothermal (36 100-MW plants), 0.5% wave (1910 0.75-MW devices), 1% tidal (2600 1-MW turbines), and 5.5% hydroelectric (6.6 1300-MW plants, of which 89% exist). The conversion would reduce NYS's end-use power demand ~37% and stabilize energy prices since fuel costs would be zero. It would create more jobs than lost because nearly all NYS energy would now be produced in-state. NYS air pollution mortality and its costs would decline by ~4000 (1200–7600) deaths/yr, and $33 (10–76) billion/yr (3% of 2010 NYS GDP), respectively, alone repaying the 271 GW installed power needed within ~17 years, before accounting for electricity sales. NYS's own emission decreases would reduce 2050 U.S. climate costs by ~$3.2 billion/yr.

1. Introduction

This is a study to examine the technical and economic feasibility of and propose policies for converting New York State's (NYS's) energy infrastructure in all sectors to one powered by wind, water, and sunlight (WWS). The plan is a localized microcosm of that developed for the world and U.S. by Jacobson and Delucchi (2009, 2011) and Delucchi and Jacobson (2011). Recently, other plans involving different levels of energy conversion for some or multiple energy sectors have been developed at national or continental scales (e.g., Alliance for Climate Protection, 2009; Parsons-Brinckerhoff, 2009; Kemp and Wexler, 2010; Price-Waterhouse-Coopers, 2010; Beyond Zero Emissions, 2010; European Climate Foundation (ECF), 2010; European Renewable Energy Council (EREC), 2010; World Wildlife Fund, 2011).

Limited plans are currently in place in New York City (PlaNYC, 2011) and NYS (Power, 2011) to help the city and state, respectively, provide predictable and sustainable energy, improve the

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quality of life, and reduce climate-relevant emissions. NYS also has a renewable portfolio standard requiring 30% of its electric power to come from renewable sources by 2015 (NYSERDA (New York State Energy Research and Development Authority), 2012). Although current plans for NYS and other states, countries, and continents are visionary and important, the plan here goes further by proposing a long-term sustainable energy infrastructure that supplies *all* energy from wind, water, and solar power, and provides the largest possible reductions in air pollution, water pollution, and global warming impacts. This study represents the first effort to develop a plan for an individual state to provide 100% of its all-purpose energy from WWS and to calculate the number of WWS energy devices, land and ocean areas, jobs, and policies needed for such an infrastructure. It also provides new calculations of air pollution mortality and morbidity impacts and costs in NYS based on multiple years of high-resolution air quality data.

In brief, the plan requires or results in the following changes:

(1) Replace fossil-fuel electric power generators with wind turbines, solar photovoltaic (PV) plants and rooftop systems, concentrated solar power (CSP) plants, solar hot water heater systems, geothermal power plants, a few additional hydroelectric power plants, and a small number of wave and tidal devices.
(2) Replace all fossil-fuel combustion for transportation, heating and cooling, and industrial processes with electricity, hydrogen fuel cells, and a limited amount of hydrogen combustion. Battery-electric vehicles (BEVs), hydrogen fuel cell vehicles (HFCVs), and BEV–HFCV hybrids sold in NYS will replace all combustion-based passenger vehicles, trucks, buses, non-road machines, and locomotives sold in the state. Long-distance trucks will be primarily BEV-HFCV hybrids and HFCVs. Ships built in NYS will similarly run on hydrogen fuel cells and electricity. Today, hydrogen-fuel-cell ships, tractors, forklifts, buses, passenger vehicles, and trucks already exist, and electric vehicles, ferries, and non-road machinery also exist. Electricity-powered air- and ground-source heat pumps, heat exchangers, and backup electric resistance heaters will replace natural gas and oil for home heating and air conditioning. Air- and ground-source heat pump water heaters powered by electricity and solar hot water preheaters will provide hot water for homes. High-temperatures for industrial processes will be obtained with electricity and hydrogen combustion. Petroleum products may still be used for lubrication and plastics as necessary, but such products will be produced using WWS power for process energy.
(3) Reduce energy demand beyond the reductions described under (2) through energy efficiency measures. Such measures include retrofitting residential, commercial, institutional, and government buildings with better insulation, improving the energy-out/energy-in efficiency of end uses with more efficient lighting and the use of heat-exchange and filtration systems; increasing public transit and telecommuting, designing future city infrastructure to facilitate greater use of clean-energy transport; and designing new buildings to use solar energy with more daylighting, solar hot water heating, seasonal energy storage, and improved passive solar heating in winter and cooling in summer.
(4) Boost economic activity by implementing the measures above. Increase jobs in the manufacturing and installation industries and in the development of new and more efficient technologies. Reduce social costs by reducing health-related mortality and morbidity and reducing environmental damage to lakes, streams, rivers, forests, buildings, and statues resulting from air and water pollution. Reduce social costs by slowing the increase in global warming and its impacts on coastlines, agriculture, fishing, heat stress, severe weather, and air pollution (which otherwise increases with increasing temperatures). Reduce long-term macroeconomic costs by eliminating exposure to future rises in fossil fuel prices.
(5) The plan anticipates that the fraction of new electric power generators as WWS will increase starting today such that, by 2020, all new generators will be WWS generators. Existing conventional generators will be phased out over time, but by no later than 2050. Similarly, BEVs and HFCVs should be nearly the only new vehicles types sold in NYS by 2020. The growth of electric vehicles will be accompanied by a growth of electric charging stations in residences, commercial parking spaces, service stations, and highway rest stops.
(6) All new heating and cooling technologies installed by 2020 should be WWS technologies and existing technologies should be replaced over time, but by no later than 2050.
(7) To ensure reliability of the electric power grids, several methods should be used to match renewable energy supply with demand and to smooth out the variability of WWS resources. These include (A) combining geographically-dispersed WWS resources as a bundled set of resources rather than as separate resources and using hydroelectric power to fill remaining gaps; (B) using demand-response grid management to shift times of demand to match better with the timing of WWS power supply; (C) oversizing WWS peak generation capacity to minimize the times when available WWS power is less than demand and to provide power to produce heat for air and water and hydrogen for transportation and heating when WWS power exceeds demand; (D) integrating weather forecasts into system operation to reduce reserve requirements; (E) storing energy in thermal storage media, batteries or other storage media at the site of generation or use; and (F) storing energy in electric-vehicle batteries for later extraction (vehicle-to-grid).

2. How the technologies were chosen

The WWS energy technologies chosen for the NYS plan exist and were ranked the highest among several proposed energy options for addressing pollution and public health, global warming, and energy security (Jacobson, 2009). That analysis used a combination of 11 criteria (carbon-dioxide equivalent emissions, air-pollution mortality and morbidity, resource abundance, footprint on the ground, spacing required, water consumption, effects on wildlife, thermal pollution, water chemical pollution/radioactive waste, energy supply disruption, and normal operating reliability) to evaluate each technology.

Mined natural gas and liquid biofuels are excluded from the NYS plan for the reasons given below. Jacobson and Delucchi (2011) explain why nuclear power and coal with carbon capture are also excluded.

2.1. Why not natural gas?

Natural gas is excluded for several reasons. The mining, transport, and use of conventional natural gas for electric power results in at least 60–80 times more carbon-equivalent emissions and air pollution mortality per unit electric power generated than does wind energy over a 100-year time frame. Over the 10–30 year time frame, natural gas is a greater warming agent relative to all WWS technologies and a danger to the Arctic sea ice due to its leaked methane and black carbon-flaring emissions (discussed more below). Natural gas mining, transport, and use also produce carbon monoxide, ammonia, nitrogen oxides, and organic gases.

Natural gas mining degrades land, roads, and highways and produces water pollution.

The main argument for increasing the use of natural gas has been that it is a "bridge fuel" between coal and renewable energy because of the belief that natural gas causes less global warming per unit electric power generated than coal. Although natural gas emits less carbon dioxide per unit electric power than coal, two factors cause natural gas to increase global warming relative to coal: higher methane emissions and less sulfur dioxide emissions per unit energy than coal.

Although significant uncertainty still exists, several studies have shown that, without considering sulfur dioxide emissions from coal, natural gas results in either similar or greater global warming-relevant-emissions than coal, particularly on the 20-year time scale (Howarth et al., 2011, 2012a, 2012b; Howarth and Ingraffea, 2011; Wigley, 2011; Myhrvold and Caldeira, 2012). The most efficient use of natural gas is for electricity, since the efficiency of electricity generation with natural gas is greater than with coal. Yet even with optimistic assumptions, Myhrvold and Caldeira (2012) demonstrated that the rapid conversion of coal to natural gas electricity plants would "do little to diminish the climate impacts" of fossil fuels over the first half of the 21st Century. Recent estimates of methane radiative forcing (Shindell et al., 2009) and leakage (Howarth et al., 2012b; Pétron et al., 2012) suggest a higher greenhouse-gas footprint of the natural gas systems than that estimated by Myhrvold and Caldeira (2012). Moreover, conventional natural gas resources are becoming increasingly depleted and replaced by unconventional gas such as from shale formations, which have larger methane emissions and therefore a larger greenhouse gas footprint than do conventional sources (Howarth et al., 2011, 2012b; Hughes, 2011).

Currently, most natural gas in the U.S. and NYS is not used to generate electricity but rather for domestic and commercial heating and for industrial process energy. For these uses, natural gas offers no efficiency advantage over oil or coal, and has a larger greenhouse gas footprint than these other fossil fuels, particularly over the next several decades, even while neglecting the climate impact of sulfur dioxide emissions (Howarth et al., 2011, 2012a, 2012b). The reason is that natural gas systems emit far more methane per unit energy produced than do other fossil fuels (Howarth et al., 2011), and methane has a global warming potential that is 72–105 times greater than carbon dioxide over an integrated 20-year period after emission and 25–33 times greater over a century period (Intergovernmental Panel on Climate Change (IPCC), 2007; Shindell et al., 2009). As discussed below, the 20-year time frame is critical.

When used as a transportation fuel, the methane plus carbon dioxide footprint of natural gas is greater than for oil, since the efficiency of natural gas is less than that of oil as a transportation fuel (Alvarez et al., 2012). When methane emissions due to venting of fuel tanks and losses during refueling are accounted for, the warming potential of natural gas over oil rises further.

When sulfur dioxide emissions from coal are considered, the greater air-pollution health effects of coal become apparent, but so do the lower global warming impacts of coal versus natural gas, indicating that both fuels are problematic. Coal combustion emits significant sulfur dioxide and nitrogen oxides, most of which convert to sulfate and nitrate aerosol particles, respectively. Natural gas also emits nitrogen oxides, but not much sulfur dioxide. Sulfate and nitrate aerosol particles cause direct air pollution health damage, but they are "cooling particles" with respect to climate because they reflect sunlight and increase cloud reflectivity. Thus, although the increase in sulfate aerosol from coal increases coal's air-pollution mortality relative to natural gas, it also decreases coal's warming relative to natural gas because sulfate offsets a significant portion of coal's CO_2-based global warming over a 100-year time frame (Streets et al., 2001; Carmichael et al., 2002). Coal also emits "warming particles" called soot, but pulverized coal in the U.S. results in little soot. Using conservative assumptions about sulfate cooling, Wigley (2011) found that electricity production from natural gas causes more warming than coal over 50–150 years when coal sulfur dioxide is accounted for. The low estimate of 50 years was derived from an unrealistic assumption of zero leaked methane emissions.

Thus, natural gas is not a near-term "low" greenhouse-gas alternative, in absolute terms or relative to coal. Moreover, it does not provide a unique or special path to renewable energy, and as a result, it is not bridge fuel and is not a useful component of a sustainable energy plan.

Rather than use natural gas in the short term, we propose to move to a WWS-power system immediately, on a worldwide scale, because the Arctic sea ice may disappear in 20–30 years unless global warming is abated (e.g., Pappas, 2012). Reducing sea ice uncovers the low-albedo Arctic Ocean surface, accelerating global warming in a positive feedback. Above a certain temperature, a tipping point is expected to occur, accelerating the loss to complete elimination (Winton, 2006). Once the ice is gone, regenerating it may be difficult because the Arctic Ocean will reach a new stable equilibrium (Winton, 2006).

The only potential method of saving the Arctic sea ice is to eliminate emissions of short-lived global warming agents, including methane (from natural gas leakage and anaerobic respiration) and particulate black carbon (from natural gas flaring and diesel, jet fuel, kerosene burning, and biofuel burning). The 21-country Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants recognized the importance of reducing methane and black carbon emissions for this purpose (UNEP (United Nations Environmental Program), 2012). Black carbon controls for this reason have also been recognized by the European Parliament (Resolution B7–0474/2011, September 14, 2011). Jacobson (2010a) and Shindell et al. (2012) quantified the potential benefit of reducing black carbon and methane, respectively, on Arctic ice.

Instead of reducing these problems, natural gas mining, flaring, transport, and production increase methane and black carbon, posing a danger to the Arctic sea ice on the time scale of 10–30 years. Methane emissions from the natural-gas system and nitrogen-oxide emissions from natural-gas combustion also contribute to the global buildup of tropospheric ozone resulting in additional respiratory illness and mortality.

2.2. Why not liquid biofuels?

This study also excludes the future use of liquid biofuels for transportation and heating. In addition to their creating more air pollution than gasoline for transportation, their tank-to-wheel efficiency of combustion is 1/4th to 1/5th the plug-to-wheel efficiency of electricity for transportation. This tends to make the energy cost-per-distance much higher for biofuel vehicles than electric vehicles. In addition, the land required to power a fleet of flex-fuel vehicles on corn or cellulosic ethanol is about 30 times the spacing area and a million times the footprint area on the ground required for wind turbines to power an equivalent fleet of electric vehicles (Jacobson, 2009).

Liquid biofuels are partially renewable with respect to carbon since they remove carbon dioxide from the air during photosynthetic growth. However, liquid biofuels require energy to grow and, in some cases (e.g., corn for ethanol) fertilize crops, irrigate crops (although not in NYS), distill the fuel (in the case of ethanol), transport crops to energy production plants, and transport the liquid fuel to its end use locations. For transportation, the resulting environmental costs of liquid biofuels are high, particularly for air and water quality (Delucchi, 2010), and greenhouse gas emissions are at best only slightly less than from using fossil fuels, and may

be far worse when indirect land-use changes due to using land for fuel instead of food are fully considered (Searchinger et al., 2008). Moreover, carbon emissions from an advanced biofuel, cellulosic ethanol for flex-fuel vehicles, are about 125 times those from wind energy powering electric vehicles without considering indirect land use changes (Jacobson, 2009) and higher if indirect land use changes are accounted for (Searchinger et al., 2008). For these reasons alone, reviews by international agencies have recommended against the use of liquid biofuels for transportation (Bringezu et al., 2009; Howarth and Bringezu, 2009).

Ethanol combustion, regardless of the source, increases average air pollution mortality relative to gasoline due to the aldehyde and unburned ethanol emissions from ethanol fuel combustion (Jacobson, 2009; Anderson, 2009), and the effect increases at low temperature (Ginnebaugh et al., 2010, 2012). Ethanol and biodiesel fuel also increase air pollution from their upstream production more than do gasoline or diesel fuel, respectively (Delucchi, 2006). By contrast, electric and hydrogen fuel cell vehicles eliminate nearly all such pollution (Jacobson et al., 2005).

Much less analysis of the impacts of liquid biofuels for heating has been done than for transportation, but the fundamental issues remain the same. Namely, liquid biofuels for heating produce air pollution because they are combusted; require energy to grow, produce, and transport thus result in more emissions, and require much more land than solar power for the same energy output.

2.3. Temporary role of solid biofuels

The NYS plan allows for the temporary heating use of certain solid biofuels, such as wood pellets, energy crops grown on unused farmland, and agricultural waste and of biogas extracted from landfills and derived from anaerobic digestion of organic wastes. The use of such solid biofuels and biogas will be phased out by 2030–2050.

Solid biofuels combusted for cogeneration of electric power and heat are more efficient than liquid biofuels for transportation and are widely used in this way across northern Europe (Campbell et al., 2009; Howarth and Bringezu, 2009; Bringezu et al., 2009). Much of NYS is rural, with large expanses of old abandoned agricultural land, much of it now second-growth forest. Such land can produce large quantities of biomass. For example, the 8-county (Broome, Chemung, Chenango, Delaware, Schulyer, Steuben, Tioga, and Tompkins) Southern Tier economic development region of NYS is estimated to be able to produce 1.9 million dry tons annually of biomass for energy, with half of this coming from wood-chip harvest and the rest from dedicated energy crops such as switchgrass or willow (Woodbury et al., 2010). This is equivalent to 3 tons per year for every resident of this area, more than enough to alone supply all domestic heating needs.

Using biomass for heat allows farmers and forest owners to produce an energy crop on land that would not otherwise be used and to make use of low-value wood, increasing economic productivity and producing agricultural and forestry jobs. However, solid biomass should be used carefully so as not to over-harvest forestlands or use high-quality agricultural land. The scale of use is important as well, as moving and processing solid biomass takes substantial energy and carbon; the biomass should be used near the point of harvest to reduce this energy cost and the resulting environmental pollution. Using landfill biogas allows methane that would otherwise escape to the air to be used for energy. Similarly, converting organic waste to biogas allows the use of material for energy that would be processed biologically and released to the air in any case.

For two reasons, the use of solid biofuels and biogas in our plan is only temporary. First, biomass or biogas for energy requires much more land than solar power producing the same electricity and heat. For example, the growth of switchgrass for electric power requires about 115 times more land area than the use of solar PV to provide the same electric power based on biomass data from Kansas Energy Report (2011). If biomass combustion is used for both electricity and heat, switchgrass still requires 70 times more land area than does solar PV. Thus, one acre of land growing switchgrass for electricity produces 1/70th to 1/115th the usable energy of the same land with PV on it. Since electricity can run (a) air-source heat pumps very efficiently, (b) electric-resistance backup heating to produce heat, and (c) electrolyzers to produce hydrogen that can be used safely for home and building heat (KeelyNet, 2009), the use of solar PV for electricity and electricity-derived heat is more efficient than is the use of biomass for the same purpose in terms of land use and reducing air pollution.

Second, the use of solid biofuels or biogas for electricity and heat is still a combustion process, resulting in similar air pollution health and mortality impacts as fossil fuel combustion. Because solid biofuels for energy would be grown and processed in NYS, NYS "upstream" air pollution emissions from such processing will likely increase compared with current fossil fuel upstream emissions, most of which occur out of state (Woodbury et al., 2010). Because feedstock will be transported primarily by truck, road congestion, erosion, and pollution emissions will also likely increase (Woodbury et al., 2010). For these reasons, solid biofuels and biogas are to be phased out during 2030–2050 in the NYS plan.

3. Change in NYS power demand upon conversion to WWS

Table 1 summarizes the changes in global, U.S., and NYS end-use power demand between 2010 and 2030 upon a conversion to a 100% WWS infrastructure (zero fossil fuels, biofuels, and nuclear

Table 1
Contemporary (2010) and projected (2030) end-use power demand (TW) for all purposes by sector, for the world, U.S., and NYS if conventional fossil-fuel and wood use continue as projected and if all conventional fuels are replaced with WWS technologies.
Source: Jacobson and Delucchi (2011) for the world and U.S., NYS values are calculated with the same methodology but using EIA (Energy Information Administration, U.S.), 2012a end-use demand data. The U.S. and NYS populations in 2010 were 307,910,000 and 19,378,000, respectively. Those in 2030 are estimated to be 358,410,000 (USCB (United States Census Bureau), 2011) and 19,795,000 (Cornell Program on Applied Demographics, 2011), respectively, giving the U.S. and NYS population growths as 16.4% and 2.15%, respectively.

Energy sector	Conventional fossil fuels and wood 2010			Conventional fossil fuels and wood 2030			Replacing fossil fuels and wood with WWS 2030		
	World	U.S.	NYS	World	U.S.	NYS	World	U.S.	NYS
Residential	1.77	0.38	0.026	2.26	0.43	0.025	1.83	0.35	0.020
Commercial	0.94	0.28	0.023	1.32	0.38	0.025	1.22	0.35	0.022
Industrial	6.40	0.86	0.009	8.80	0.92	0.009	7.05	0.74	0.007
Transportation	3.36	0.97	0.036	4.53	1.10	0.037	1.37	0.33	0.011
Total	12.47	2.50	0.094	16.92	2.83	0.096	11.47	1.78	0.060
Percent change							(−32%)	(−37%)	(−37%)

energy). The table was derived on a spreadsheet from annually-averaged end-use power demand data as in Jacobson and Delucchi (2011). All end uses that feasibly can be electrified will use WWS power directly, and remaining end uses (some heating, high-temperature industrial processes, and some transportation) will use WWS power indirectly in the form of electrolytic hydrogen (hydrogen produced by splitting water with WWS power). As such, electricity requirements will increase, but the use of oil and gas for transportation and heating/cooling will decrease to zero. The increase in electricity use will be much smaller than the decrease in energy embodied in gas, liquid, and solid fuels because of the high efficiency of electricity for heating and electric motors.

The power required in 2010 to satisfy all end use power demand worldwide for all purposes was about 12.5 trillion watts (terawatts, TW). (End-use power excludes losses incurred during production and transmission of the power.) About 35% of primary energy worldwide in 2010 was from oil, 27% was from coal, 23% was from natural gas, 6% was from nuclear power, and the rest was from biofuel, sunlight, wind, and geothermal power. Delivered electricity was about 2.2 TW of all-purpose end-use power.

If the world follows the current trajectory of fossil-fuel growth, all-purpose end-use power demand will increase to ~17 TW by 2030, U.S. demand will increase to ~3 TW, and NYS power demand will increase to ~96 GW (Table 1). Conventional power demand in NYS will increase much less in 2030 than in the U.S. as a whole because the NYS population is expected to grow by only 2.15% between 2010 and 2030, whereas the U.S. population is expected to grow by 16.4% (Table 1, footnote).

Table 1 indicates that a conversion to WWS will reduce world, U.S., and NYS end-use power demand and power required to meet that demand by ~32%, ~37%, and ~37%, respectively. The reductions in NYS by sector are 21.0% in the residential, 12.3% in the commercial, 20.0% in the industrial, and 69.5% in the transportation sectors. Only 5–10 percentage points of each reduction are due to modest energy-conservation measures. Some of the remainder is due to the fact that conversion to WWS reduces the need for upstream coal, oil, and gas mining and processing of fuels, such as petroleum or uranium refining. The remaining reason is that the use of electricity for heating and electric motors is more efficient than is fuel combustion for the same applications (Jacobson and Delucchi, 2011). Also, the use of WWS electricity to produce hydrogen for fuel cell vehicles, while less efficient than the use of WWS electricity to run BEVs, is more efficient and cleaner than is combusting liquid fossil fuels for vehicles (Jacobson et al., 2005). Combusting electrolytic hydrogen is slightly less efficient but cleaner than is combusting fossil fuels for direct heating, and this is accounted for in the table.

4. Numbers of electric power Generators needed

How many WWS power plants or devices are needed to power NYS for all purposes assuming end use power requirements in Table 1 and accounting for electrical transmission and distribution losses?

Table 2 provides one of several possible future scenarios for 2030. In this scenario, onshore wind comprises 10% of New York's

Table 2
Number of WWS power plants or devices needed to provide New York's total annually-averaged end-use power demand for all purposes in 2030 (0.061 TW from Table 1) assuming the given fractionation of demand among plants or devices and accounting for transmission, distribution, and array losses. Also shown are the footprint and spacing areas required to power NYS as a percentage of New York's land area, 122,300 km^2.

Energy technology	Rated power of one plant or device (MW)	Percent of 2030 power demand met by plant/device	Number of plants or devices needed for NYS	Nameplate capacity of all devices (MW)	Footprint area (percent of NYS land area)	Spacing area (percent of NYS land area)
Onshore wind	5	10	4020	20,100	0.000041	1.46
Offshore wind	5	40	12,700	63,550	0.00013	4.62
Wave device	0.75	0.5	1910	1435	0.00082	0.039
Geothermal plant	100	5	36	3600	0.010	0
Hydroelectric plant	1300	5.5	6.6[a]	8520	3.50[a]	0
Tidal turbine	1	1	2600	2600	0.00061	0.0095
Res. roof PV system	0.005	6	4.97 million[b]	24,900	0.15[c]	0
Com/gov roof PV system	0.10	12	0.497 million	49,700	0.30[c]	0
Solar PV plant	50	10	828[b]	41,400	0.25	0[c]
CSP plant	100	10	387	38,700	0.60	0[c]
Total		100		254,000	4.82	6.13
Total new land required					0.96[d]	1.46[e]

Rated powers assume existing technologies. Percent power of each device assumes wind and solar are the only two resources that can power NYS independently (Section 5) and should be in approximate balance to enable load matching (Section 6) but that wind is less expensive (Section 7) so will dominate more. The number of devices is calculated by multiplying the NYS end use power demand in 2030 from Table 1 by the fraction of power from the source and dividing by the annual power output from each device, which equals the rated power multiplied by the annual capacity factor of the device. The capacity factor is determined for each device as in the Supplementary Information spreadsheet of Jacobson (2009), except that onshore wind turbines are assumed here to be located in mean annual wind speeds at hub height of 7.75 m/s and offshore turbines, 8.5 m/s (Dvorak et al., 2012a). From that study, 9200 km^2 of NYS land area has mean wind speeds > 7.75 m/s at 90 m, and the average wind speed in those areas is 8.09 m/s. From the present table, only 1786 km^2 of onshore wind is needed. Land and spacing areas are similarly calculated as in the Supplementary Information of Jacobson (2009).

[a] NYS already produces about 89% of the hydroelectric power needed for the plan (Section 5). See Jacobson (2009) for a discussion of apportioning the hydroelectric footprint area by use of the reservoir.

[b] The solar PV panels used for this calculation were Sun Power E20 panels. The average capacity factor for solar assumed was 18%.

[c] For central solar PV and CSP plants, nominal "spacing" between panels is included in the plant footprint area.

[d] The total footprint area requiring new land is equal to the footprint area for onshore wind and geothermal, plus 2.75% of the footprint area for hydroelectric, plus the footprint area for solar PV and CSP plants. Offshore wind, wave and tidal are in water, and so do not require new land. The footprint area for rooftop solar PV does not entail new land because the rooftops already exist and are not used for other purposes (that might be displaced by rooftop PV). Only 2.75% of the hydropower requires new land because 89% of hydroelectric capacity is already in place and, of the remaining 11%, three-quarters will come from existing reservoirs or run-of-the-river.

[e] Only onshore wind entails new land for spacing area. The other energy sources are either in water or on rooftops, or do not use additional land for spacing. The spacing area for onshore wind can be used for multiple purposes, such as open space, agriculture, grazing, etc.

supply; offshore wind, 40%; residential solar rooftop PV, 6%; commercial/government solar rooftop PV, 12%; PV power plants, 10%; CSP plants, 10%; hydroelectric power, 5.5% (of which 89% is already in place), geothermal power, 5%; tidal power, 1%; and wave power, 0.5%.

Rooftop PV in this scenario is divided into residential (5-kW systems on average) and commercial/government (100-kW systems on average). Rooftop PV can be placed on existing rooftops or on elevated canopies above parking lots and structures without taking up additional undeveloped land. PV power plants are sized, on average, relatively small (50 MW) to allow them to be placed optimally in available locations.

Wind (50%) and solar (38%) are the largest generators of electric power under this plan because they are the only resources sufficiently available to power NYS on their own, and both are needed in combination to ensure the reliability of the grid. Wind is currently less expensive than solar, particularly at latitudes as high as in NYS, so wind is proposed to play a slightly larger role.

Since most wind and all wave and tidal power will be offshore under the plan, most transmission will be under water and out of sight. Transmission for new onshore wind, solar power plants, and geothermal power plants will be along existing pathways but with enhanced lines to the greatest extent possible, minimizing zoning issues. Four methods of increasing transmission capacity without requiring additional rights of way or increasing the footprint of transmission lines include the use of dynamic line rating equipment; high-temperature, low-sag conductors; voltage up-rating; and flexible AC transmission systems (e.g., Holman, 2011). To the extent existing pathways need to be expanded or new transmission pathways are required, they will be applied for using regulatory guidelines already in place.

Footprint is the physical space on the ground needed for each energy device, whereas spacing is the space between some devices, such as wind, tidal, and wave power. Spacing area can be used for open space, agriculture, grazing, etc. Table 2 provides footprint and spacing areas required for each energy technology. The table indicates that the total new land footprint required for this plan is about 0.96% of New York's land area, mostly for solar PV and CSP power plants (as mentioned, rooftop solar does not take up new land). Some additional footprint is proposed for hydroelectric as well, but that portion may not be needed if run-of-the-river hydro, imported hydro, or hydro from existing reservoirs that do not currently produce electric power is used. Additional space is also needed between onshore wind turbines. This space can be used for multiple purposes and can be reduced if more offshore wind resources are used than proposed here. The total additional land footprint needed (0.96% of the state) is minimal compared with the footprint of agriculture in the state (23.8%) and the footprint of house lots, ponds, roads, and wasteland used for agriculture (1.9%) (USDA (United States Department of Agriculture), 2011). Fig. 1 shows the relative footprint and spacing areas required in NYS.

The number of devices takes into account the availability of clean resources as well as of land and ocean areas. NYS has more wind, solar, geothermal, and hydroelectric resources than is needed to supply the state's energy for all purposes in 2030. These resources are discussed next.

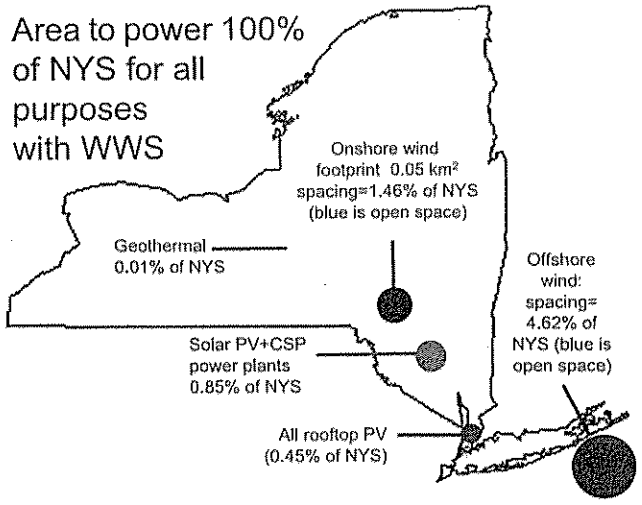

Fig. 1. Spacing and footprint areas required to implement the plan proposed here for NYS, as derived in Table 2. Actual locations would differ. The dots are only representative areas. For wind, the small red dot in the middle is footprint on the ground and the blue is spacing. For the others, the footprint and spacing are similar to each other. In the case of rooftop PV, the dot represents the rooftop area to be used. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

5. WWS resources available

This section discusses raw WWS resources available in NYS. Fig. 2 shows NYS's onshore and offshore annual wind resources from Dvorak et al. (2012a) in terms of a wind turbine's capacity factor, which is the annual average power produced divided by the rated power of a turbine. If only half the high-wind-speed land (capacity factor > 30%) in NYS were used for wind development, 327 TWh of wind energy would be harnessed, enough to provide more than 60% of NYS's 2030 WWS end-use power demand for all purposes. However, this plan proposes that only 10% of NYS's 2030 power demand come from onshore wind.

Dvorak et al. (2012a) mapped the East Coast offshore wind resources and Dvorak et al. (2012b) proposed locations for an efficiently interconnected set of offshore East Coast wind farms, one of which would be off of Long Island's coast. Offshore resources significantly exceed those onshore. The U.S. has not yet built an offshore wind farm, and some have expressed a concern over their potential environmental impacts. However, a study of over a decade of experience of offshore wind in Denmark by the International Advisory Panel of Experts on Marine Ecology found little damage to wildlife (Dong Energy, Vattenfall Danish Energy Authority, and Danish Forest and Nature Agency, 2006).

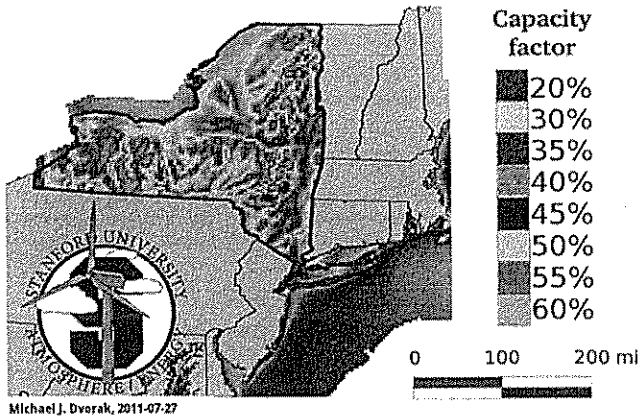

Fig. 2. Capacity factors at 90-m hub height in NYS and offshore in Lake Ontario, Lake Erie, and the Eastern seaboard, as calculated with a 3-D computer model evaluated against data assuming 5-MW RE-Power wind turbines with rotor diameter D≈126 m from simulations run in Dvorak et al. (2012a, 2012b). Capacity factors of 30% or higher are the most cost-effective for wind energy development.

Despite NYS's high latitude, solar resources in the state are significant. NREL (National Renewable Energy Laboratory) (2008) estimates NYS's solar resources as 4–4.5 kWh/m^2/day. Based on these numbers, only 0.85% of additional land (beyond existing rooftops) is needed to provide 38% of the state's energy for all purposes in 2030 in the forms of CSP plants, PV power plants, and rooftop PV. This assumes that 18% of the state's new energy comes from rooftop PV on existing urban structures (Table 2).

Geothermal resources in NYS (NREL (National Renewable Energy Laboratory), 2009) are also abundant. Geothermal energy production requires little land area (Table 2) and is proposed to provide only 5% of NYS's total energy in 2030.

NYS has a hydroelectric potential of 38.6 kW/km^2 (5 GW, or 43.8 TWh/yr) of delivered power (DOE (Department of Energy), 2004). It can currently produce about 60% of this. For example, in 2009, hydroelectric supplied about 26.1 TWh/yr (3 GW delivered power), or 21% of NYS's electric power consumption of 131 TWh/yr. Under the plan, hydro will produce about 3.3 GW, or 5.5% of the total delivered power for all purposes in NYS in 2030. Hydro currently produces 89% of this amount. Sufficient in-state and, if necessary, imported hydroelectric power is available to provide the difference. Most additional in-state hydro may be obtainable from existing dams that do not have turbines associated with them.

Tidal (or ocean current) and wave power are proposed to comprise a combined 1.5% of NYS's overall power in 2030 (Table 2). Tidal and wave resources off the East Coast are both modest. However, tidal power has already been used to generate electricity in the East River through the Verdant Power Roosevelt Island Tidal Energy Project.

6. Matching electric power supply with demand

An important concern to address in a clean-energy economy is whether electric power demand can be met with WWS supply on a minutely, daily, and seasonal basis. Previous work has described multiple methods to match renewable energy supply with demand and to smooth out the variability of WWS resources (Delucchi and Jacobson, 2011). Such methods include (A) combining geographically-dispersed WWS resources as a bundled set of resources rather than separate resources and using hydroelectric or stored concentrated solar power to balance the remaining load; (B) using demand-response management to shift times of demand to better match the availability of WWS power; (C) over-sizing WWS peak generation capacity to minimize the times when available WWS power is less than demand and provide power to produce heat for air and water and hydrogen for transportation and heating when WWS power exceeds demand; (D) integrating weather forecasts into system operation; (E) storing energy in batteries or other storage media at the site of generation or use; and (F) storing energy in electric-vehicle batteries for later extraction (vehicle-to-grid). Here, we discuss updated information on only a couple of these methods since Delucchi and Jacobson (2011) discuss the other methods.

Several studies have examined whether up to 100% penetrations of WWS resources could be used reliably to match power demand (e.g., Jacobson and Delucchi, 2009; Mason et al., 2010; Hart and Jacobson, 2011, 2012; Connolly et al., 2011; Elliston et al., 2012; NREL (National Renewable Energy Laboratory), 2012; Rasmussen et al., 2012; Budischak et al., 2013). Using hourly load and resource data and accounting for the intermittency of wind and solar, both Hart and Jacobson (2011) and Budischak et al. (2013) found that up to $>99.8\%$ of delivered electricity could be produced carbon-free with WWS resources over multiple years. The former study obtained this conclusion for the California grid over 2 years; the latter, over the PJM Interconnection in the eastern U.S., adjacent to NYS, over 4 years. Both studies accounted for the variability in the weather, including extreme events. Although WWS resources differ in NYS compared with these other regions, the differences are not expected to change the conclusion that a WWS power system in NYS can be reliable. NYS has WWS resources not so different from those in PJM (more offshore wind and hydroelectric than PJM but less solar).

Eliminating remaining carbon emission is challenging but can be accomplished in several ways. These include using demand response and demand management, which will be facilitated by the growth of electric vehicles; oversizing the power grid and using the excess power generated to produce district heat through heat pumps and thermal stores and hydrogen for other sectors of the energy economy (e.g. heat for buildings, high-temperature processes, and fuel-cell vehicles); using concentrated solar power storage to provide solar power at night; and storing excess energy at the site of generation with pumped hydroelectric power, compressed air (e.g., in underground caverns or turbine nacelles), flywheels, battery storage packs, or batteries in electric vehicles (Kempton and Tomic, 2005).

Oversizing the peak capacity of wind and solar installations to exceed peak inflexible power demand can reduce the time that available WWS power supply is below demand, thereby reducing the need for other measures to meet demand. The additional energy available when WWS generation exceeds demand can be used to produce hydrogen (a storage fuel) by electrolysis for heating processes and transportation and to provide district heating. Hydrogen must be produced in any case as part of the WWS solution. Oversizing and using excess energy for hydrogen and district heating would also eliminate the current practice of shutting down (curtailing) wind and solar resources when they produce more energy than the grid can accommodate. Denmark currently uses excess wind energy for district heating using heat pumps and thermal stores (e.g., Elsman, 2009).

7. Costs

An important criterion in the evaluation of WWS systems is to ensure that the full costs per unit energy delivered, including capital, land, operating, maintenance, storage, and transmission costs, are comparable with or better than costs of conventional fuels.

Table 3 presents estimates of 2005–2012 and 2020–2030 costs of electric power generation for WWS technologies, assuming standard (but not extra-long-distance) transmission and excluding distribution. The table also shows the average U.S. delivered electricity cost for conventional fuels (mostly fossil) under the same assumptions. For fossil-fuel generation, the externality cost, which includes the hidden costs of air pollution morbidity and mortality and global warming damage (e.g., coastline loss, agricultural and fish losses, human heat stress mortality, increases in severe weather and air pollution), is also shown. Table 4 breaks down the externality costs.

Table 3 indicates that the 2005–2012 costs of onshore wind, hydroelectric, and geothermal plants are the same or less than those of typical new conventional technologies (such as new coal-fired or natural gas power plants) when externality costs of the conventional technologies are ignored. Solar costs are higher. When externality costs are included, WWS technologies cost less than conventional technologies.

The costs of onshore wind, geothermal, and hydroelectric power are expected to remain low (4–8.8 cents/kWh) in 2020–2030. Costs of other WWS technologies are expected to decline to 5–11 cents/kWh (Table 3). These estimates include the costs of local AC transmission. However, many wind and solar farms may be sufficiently far from population centers to require long-distance transmission.

For long-distance transmission, high-voltage direct-current (HVDC) lines are common because they result in lower transmission

Table 3
Approximate fully annualized generation and short-distance transmission costs for WWS power (2007 U.S. cents/kWh-delivered), including externality costs. Also shown are generation costs and externality costs (from Table 4) of new conventional fuels. Actual costs in NYS will depend on how the overall system design is optimized as well as how energy technology costs change over time.

Energy technology	2005–2012*	2020–2030*
Wind onshore	4[a]–10.5[b]	≤4[a]
Wind offshore	11.3[c]–16.5[b]	7[b]–10.9[c]
Wave	>11.0[a]	4–11[a]
Geothermal	9.9–15.2[b]	5.5–8.8[g]
Hydroelectric	4.0–6.0[d]	4[a]
CSP	14.1–22.6[b]	7–8[a]
Solar PV (utility)	11.1–15.9[b]	5.5[g]
Solar PV (commercial rooftop)	14.9–20.4[b]	7.1–7.4[h]
Solar PV (residential rooftop)	16.5–22.7[e]	7.9–8.2[h]
Tidal	>11.0[a]	5–7[a]
New conventional (plus externalities)[f]	**9.6–9.8 (+5.3)=14.9–15.1**	**12.1–15.0 (+5.7)=17.8–20.7**

* $0.01/kWh for transmission was added to all technologies as in Delucchi and Jacobson (2011) except for distributed generation projects (i.e. commercial and residential solar PV).

[a] Delucchi and Jacobson (2011).

[b] Lazard (2012).

[c] Levitt et al. (2011).

[d] REN21 (Renewable Energy Policy Network for the 21st Century) (2010).

[e] SEIA (Solar Energy Industries Association) (2012). Residential LCOE: Calculated by multiplying the Lazard (2012) Commercial LCOE by the ratio of the Residential PV $/Watt to the Commercial PV $/Watt=$0.149 ($5.73/$5.16)–$0.204($5.73/$5.16).

[f] The current levelized cost of conventional fuels in NYS is calculated by multiplying the electric power generation by conventional source in NYS (EIA (Energy Information Administration, U.S.), 2012b) by the levelized cost of energy for each source (Lazard, 2012 for low estimate; EIA (Energy Information Administration, U.S. (2012c) for high estimate) and dividing by the total generation. The future estimate assumes a 26.5% increase in electricity costs by 2020 (the mean increase in electricity prices in NYS from 2003 to 2011, EIA (Energy Information Administration, U.S.), 2012d), and twice this mean increase by 2030. Externality costs are from Table 4.

[g] Google (2011), 2020 projection.

[h] The ratio of present-day utility PV to present-day commercial and residential PV multiplied by the projected LCOE of utility PV.

Table 4
Mean (and range) of environmental externality costs of electricity generation from coal and natural gas (Business as Usual—BAU) and renewables in the U.S. in 2007 (U.S. cents/kWh). Water pollution costs from natural gas mining and current energy generation are not included. Climate costs are based on a 100-year time frame. For a 20-year time frame, the NG climate costs are about 1.6 times those of coal for the given shale:conventional gas mixes.
Source: Delucchi and Jacobson (2011) but modified for mean shale and conventional natural gas carbon equivalent emissions from Howarth et al. (2011) assuming a current shale:conventional NG mix today of 30:70 and 50:50 in 2030 and a coal/NG mix of 73%/27% in 2005 and 60%/40% in 2030. The costs do not include costs to worker health and the environment due to the extraction of fossil fuels from the ground. (These estimates apply to the U. S. Section 8 estimates external costs specifically for NYS.)

	2005			2030		
	Air pollution	Climate	Total	Air pollution	Climate	Total
Coal	3.2	3.0	6.2 (1.2–22)	1.7	4.8	6.5 (3.3–18)
Natural gas (NG)	0.16	2.7	2.9 (0.5–8.6) [a]	0.13	4.5	4.6 (0.9–8.9) [a]
Coal/NG mix	2.4	2.9	5.3 (1.0–18)	1.1	4.6	5.7 (2.7–15)
Wind, water, and solar	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02

[a] McCubbin and Sovacool (2013) estimate slightly higher air pollution-plus-climate-change costs for natural-gas fired power plants in California: 1.4–9.5 cents/kWh for 1987–2006, and 1.8–11.8 cents/kWh projected for 2012–2031 (2010 dollars).

losses per unit distance than alternating-current (AC) lines. The cost of extra-long-distance HVDC transmission on land (1200–2000 km) ranges from 0.3 to 3 U.S. cents/kWh, with a median estimate of ~1 U.S. cent/kWh (Delucchi and Jacobson, 2011). A system with up to 25% undersea transmission would increase the additional long-distance transmission cost by less than 20%. Transmission costs can be reduced by considering that decreasing transmission capacity by 20% reduces aggregate power among interconnected wind farms by only 1.6% (Archer and Jacobson, 2007). The main barrier to long distance transmission is not cost, but local opposition to the siting of lines and decisions about who will pay the costs. These issues must be addressed during the planning process.

In sum, even with extra-long-distance HVDC transmission, the total social costs of all WWS resources in 2020–2030, including solar PV, are expected to be less than the 17.8–20.7 cents/kWh average direct plus externality cost of conventional electricity.

WWS will provide a stable, renewable source of electric power not subject to the same fuel supply limitations as fossil fuels and nuclear power. Due to the eventual depletion of coal, oil, natural gas, and uranium resources, their prices should ultimately rise although technology improvements may delay this rise. Table 5 projects fuel costs from 2009 to 2030 of selected conventional fossil fuels used for transportation, heating, and electricity production in NYS. The table indicates a 19–37% anticipated increase in the cost of natural gas and a 109% increase in the cost of gasoline during this period. A benefit of WWS is that it hedges NYS against volatility and rises in long-term fossil fuel prices by providing energy price stability due to zero cost of WWS fuel.

Table 5
Projected unit costs of selected conventional fossil fuels over the period 2009–2030 in NYS.
Source: NYSEPB (New York State Energy Planning Board) (2009), Energy Price and Demand Long-Term Forecast (2009–2028). Annual growth rate factors provided in reference document have been extrapolated for the period 2029–2030.

Fuel type	Projected changes in fuel cost, 2009–2030 (2009 dollars/MMBTU)		Percent change (%)
	2009	2030	
Gasoline—all grades	$19.30	$40.39	109
Natural gas—electric	$6.30	$10.14	27
Natural gas—residential	$13.58	$16.19	19
Natural gas—commercial	$10.27	$13.06	27
Natural gas—industrial	$8.73	$11.98	37

8. Air pollution and global warming cost Reductions in NYS due to WWS

Conversion to a WWS energy infrastructure will reduce air pollution mortality and morbidity, health costs associated with mortality and morbidity, and global warming costs in NYS. These impacts are quantified here.

Air pollution mortality in New York is estimated in two ways, a top-down approach and a bottom-up approach. The top-down approach is described first. The premature mortality rate in the U.S. due to cardiovascular disease, respiratory disease, and complications from asthma due to air pollution has been calculated conservatively to be at least 50,000–100,000 per year by several sources. From Braga et al. (2000), the U.S. air pollution mortality rate was estimated at about 3% of all deaths. The all-cause death rate in the U.S. is about 804 deaths per 100,000 population and the U.S. population in 2011 was 308.7 million. This suggests an air pollution mortality rate in the U.S. of ~75,000 per year. Similarly, from Jacobson (2010b), the U.S. death rate due to ozone and particulate matter was calculated with a three-dimensional air pollution-weather model to be 50,000–100,000 per year. These results are consistent with those of McCubbin and Delucchi (1999), who estimated 80,000–137,000 due to all anthropogenic air pollution in the U. S. in 1990, when air pollution levels were higher than today.

The population of NYS in 2011 was 19.5 million, or 6.3% of the U.S. population. A simple scaling of population to the U.S. premature mortality rate from Jacobson (2010b) yields at least 3000–6000 annual premature deaths in NYS. Since a large segment of New York's population lives in cities, this estimate is likely conservative since the intake fraction of air pollution is much greater in cities than in rural areas.

Mortalities from airborne inhalation of particulate matter ($PM_{2.5}$) and ozone (O_3) are next calculated with a bottom-up approach. This involves combining measured countywide or regional concentrations of each pollutant with a relative risk as a function of concentration and U.S. Census Bureau population by county or region. From these three pieces of information, low, medium, and high mortality estimates of $PM_{2.5}$ and O_3 are calculated with a health-effects equation (Jacobson, 2010b).

Tables 6 and 7 show the resulting low, medium, and high 2006 premature mortalities estimates in NYS due to $PM_{2.5}$ and ozone respectively. The medium values for the state as a whole were about 3300 $PM_{2.5}$ mortalities/yr, with a range of 800–6500/yr and ~710 O_3 mortalities/yr, with a range of 360–1100/yr. Thus, overall, the bottom-up approach gave ~4000 (1200–7600) premature mortalities per year for $PM_{2.5}$ plus O_3. The top-down estimate falls within this range.

Table 6
NYS annually-averaged 2006 $PM_{2.5}$ concentrations and resulting estimated annual premature mortalities. Appendix Table A1 contains details and data by county.

New York State	2006 $PM_{2.5}$ ($\mu g/m^3$)	Population (thousands)	Total 2006 Mortalities from $PM_{2.5}$		
			Low estimate	Medium estimate	High estimate
Total	**9.3**	**19,380**	**820**	**3260**	**6480**

Concentration data were from NYSDH (New York State Department of Health) (2011). The methodology is described in the text.

Table 7
Average Annual 2009–2011 premature mortalities due to ground-level ozone by New York region.

	Annual premature mortalities due to ground-level ozone		
	Low estimate	Medium estimate	High estimate
Region 1	55.1	110	164
Region 2	103	205	306
Region 3	37.7	75.1	112
Region 4	10.7	21.4	32.0
Region 5	26.5	52.8	78.9
Region 6	8.4	16.8	25.1
Region 7	18.9	37.7	56.4
Region 8	15.8	31.5	46.8
Region 9	80.8	164	244
Total	**356**	**713**	**1070**

Hourly ozone data at individual monitoring stations were obtained for January 2009–October 2011 from NYDEC (New York State Department of Environmental Conservation (2011). The 1-h maximum ozone for each day was determined from all hourly values during the day. Monitoring stations were then grouped by regions defined by the NYS Department of Environmental Conservation. Region 1=Western New York, Great Lakes Plain; Region 2=Catskill Mountains and West Hudson River Valley; Region 3=Southern Tier; Region 4=New York City and Long Island; Region 5=East Hudson and Mohawk River Valleys; Region 6=Tug Hill Plateau; Region 7=Adirondack Mountains. Mortalities were calculated each day for each region based on ozone relative risks and a health-risk equation, as in Jacobson (2010b). The low-threshold for ozone premature mortality referenced in this study was 35 ppbv.

USEPA (United States Environmental Protection Agency) (2006) and Levy et al. (2010) provided a central estimate to the value of a statistical life at $7.7 million in 2007 dollars (based on 2000 GDP). The value of life is determined by economists based on what people are willing to pay to avoid health risks as determined by how much employers pay their workers to take additional risks (Roman et al., 2012). With this value of life, 4000 (1200–7600) premature mortalities (both adult and infant) due to air pollution cost NYS roughly $31 ($9–$59) billion/yr.

Additional costs due to air pollution result from increased illness (morbidity from chronic bronchitis, heart disease, and asthma), hospitalizations, emergency-room visits, lost school days, lost work days, visibility degradation, agricultural and forest damage, materials damage, and ecological damage. USEPA (United States Environmental Protection Agency), 2011 estimates that these non-mortality-related costs comprise an additional ~7% of the mortality-related costs. These are broken down into morbidity (3.8%), recreational plus residential visibility loss (2.8%), agricultural plus forest productivity loss (0.45%), and materials plus ecological loss (residual) costs. These estimates are conservative, as other studies in the economics literature indicate considerably higher non-mortality costs. McCubbin and Delucchi's (1999) detailed, comprehensive analysis of air-pollution damages at every air quality monitor in the U.S found that the morbidity cost of air pollution

(mainly chronic illness from exposure to particulate matter) is 25–30% of the mortality costs. Delucchi and McCubbin (2011) summarize studies that indicate that the cost of visibility and agriculture damages from motor-vehicle air pollution in the U.S. is at least 15% of the cost of health damages (including morbidity damages) from motor-vehicle air pollution. Thus, the total cost of air pollution, including morbidity and non-health damages, is at the very least ~$8.2 million/death, and probably over $10 million/death.

Given this information, the total social cost due to air pollution mortality, morbidity, lost productivity, and visibility degradation in NYS is conservatively estimated to be $33 (10–76 [using $10 million/death for the upper end]) billion per year. Reducing these costs represents a savings equivalent to ~3% of NYS's gross 2010 domestic product of $1.1 trillion.

One set of cost estimates for global warming (in 2006 U.S. dollars) to the U.S. alone is $271 billion/yr by 2025, $506 billion/yr by 2050, $961 billion/yr by 2075, and $1.9 trillion/yr by 2100 (Ackerman et al, 2008). That analysis accounted for severe-storm and hurricane damage, real estate loss, energy-sector costs, and water costs. The largest of these costs was water costs. It did not account for increases in mortality and illness due to increased heat stress, influenza, malaria, and air pollution or increases in forest-fire incidence; thus, it may be conservative.

Averaged between 2004 and 2009, NYS contributed to 3.39% of U.S. and 0.636% of world fossil-fuel CO_2 emissions (EIA (Energy Information Administration, U.S.), 2011). Since the global warming cost to the U.S. is caused by emissions from all states and countries worldwide, it is necessary to multiply the cost of global warming to the U.S. by NYS's fraction of global CO_2 emissions to give the cost of global warming to the U.S. due to NYS's greenhouse gas emissions. The result is $1.7 billion/yr by 2025, $3.2 billion/yr by 2050; $6.1 billion/yr by 2075; and $12 billion/yr by 2100. NYS's emissions are also increasing the health and climate costs to other countries of the world.

In sum, the current fossil-fuel energy infrastructure in NYS causes ~4000 (1200–7600) annual premature mortalities, which together with other air-pollution damages cost the state ~$33 billion/yr (~3% of its annual GDP). Fossil fuels emitted in the state will also result in ~$1.7 billion/yr in global warming costs to the U.S. alone by 2025. Converting to WWS in the state will eliminate these externalities and their costs.

Since every 1 MW of installed WWS capacity costs ~$2.1 million averaged over all generation technologies needed, the $33 billion annual air-pollution cost is equivalent to ~16 GW of installed WWS power every year. Since the state needs ~271 GW of installed WWS power to deliver the 60 GW needed (Table 1) to power the state for all purposes in 2030, the payback time to convert the state as a whole to WWS, is ~16 years from the mean air-pollution-cost savings alone. The payback time accounting for air-pollution plus global-warming-cost savings is ~15 years; that accounting for air-pollution plus warming-cost benefits plus electricity sales at no profit is 10 years; that accounting for these plus 7% profit is ~9.8 years.

9. Jobs and earnings due to new electric power plants and devices

This section discusses job creation and earnings resulting from implementing the WWS electric power infrastructure described in Table 2. The analysis is limited to the electric power generation sector to provide an example. Additional jobs are expected in the electricity transmission industry, electric vehicle and hydrogen fuel cell vehicle industries, in the heating and cooling industries, and with respect to energy use for high-temperature industrial processes, but estimates for these sectors are not provided here due to the large undertaking such a calculation requires.

9.1. Onshore and offshore wind

The job creation and revenue stream resulting from generating half of NYS's all-purpose power in 2030 from onshore plus offshore wind (Table 2) were estimated with the Jobs and Economic Development Impact (JEDI) wind model (DOE (Department of Energy), 2012).

Scenarios were run assuming the development by 2025 of 200 onshore wind farms containing 4020 5-MW turbines with a total nameplate capacity of 20,100 MW and 400 offshore wind farms containing 12,700 turbines with a total nameplate capacity of 63,550 MW.

The development of the onshore wind farms is calculated to create ~61,300 full-time jobs and > $4 billion in earnings in the form of wages, services, and supply-chain impacts during the construction period. It is also estimated to create ~2260 annual full-time jobs and > $162 million in annual earnings in the form of wages, local revenue, and local supply-chain impacts post-construction.

The development of the offshore wind farms is estimated to create 320,000 full-time jobs and > $21.4 billion in earnings during construction and 7140 annual full-time jobs and > $514 million in annual earnings post-construction. (Section 9.5 discusses the extent to which WWS jobs merely displace jobs in the current energy sector.)

9.2. Concentrated solar power plants, solar PV power plants, and rooftop solar PV

The job creation and revenue stream resulting from generating 38% of NYS's all-purpose energy in 2030 with concentrated solar power (CSP, 10%) and solar PV plants and residential rooftop devices (PV, 28%), were estimated with the JEDI Concentrated Solar Power Trough and PV models (DOE (Department of Energy), 2012).

Scenarios were run assuming the development by 2025 of 38,700 MW in nameplate capacity of CSP projects, 41,400 MW of solar PV plant projects, and 75,000 MW of residential, commercial, and government rooftop PV projects.

The CSP projects are estimated to create ~401,000 full-time jobs and > $41 billion in earnings during construction and ~15,700 full-time jobs and > $2 billion in annual earnings post-construction.

Solar PV plants are estimated to create ~1,160,000 full-time jobs (> $83 billion in earnings) during construction and ~5690 full-time jobs (> $390 million in annual earnings) post-construction.

Rooftop PV systems are estimated to create ~2,420,000 full-time jobs (~$159 billion in earnings) during construction and ~9620 full-time jobs (> $676 million in annual earnings) post-construction.

9.3. Hydroelectric, tidal, and wave

In line with the guidelines of PlaNYC, nearly 7% of NYS's total energy in 2030 will be generated from hydroelectric, tidal, and wave power (Table 2). At most, about 944 MW of additional installed hydroelectric will be needed for the present plan, since 89% of hydroelectric is in place (Table 2). This translates into 2360 additional post-construction full time jobs assuming 2–3 full time jobs are created per MW of hydropower generated in 2025 (Navigant Consulting, 2009). Temporary construction and other supply chain jobs are not included in this projection. Temporary construction jobs for hydroelectric are estimated as 6.5 full-time equivalent (FTE) jobs/MW. FTEs are jobs during the life of the construction phase (Navigant Consulting, 2009). This gives 6200 construction jobs for hydroelectric. With the approximate ratio of

$70,000 per job (based on the ratios determined here for wind and solar), the earnings during construction of hydroelectric plants are estimated as ~$430 million during construction and $165 million/yr after construction.

For wave power (1430 MW needed) and tidal power (2600 MW needed) the same number of construction and permanent jobs per installed MW as offshore wind power are assumed, giving 7200 construction jobs and 161 annual permanent jobs for wave power and 13,100 construction jobs and 292 annual permanent jobs for tidal power. Earnings during the construction period of wave farms are estimated as ~$504 million, and those during operation, ~$11 million/yr. Earnings during construction of tidal farms are estimated as ~$920 million, and those during operation, ~$20.5 million/yr.

9.4. Geothermal

The construction of 5635 MW of geothermal capacity in the western United States has been estimated previously to create 90,160 construction and manufacturing jobs plus 23,949 full time jobs after construction (Western Governor's Association, 2010). Assuming the same relationship holds for NYS in 2025, the 3600 MW of geothermal energy (5% of total) needed for NYS will amount to the creation of ~57,600 construction and manufacturing jobs and ~15,300 post-construction jobs. With the approximate ratio of $70,000 per job, the earnings during construction of geothermal plants will be ~$4 billion during the construction period and $1 billion/yr thereafter.

9.5. Summary of jobs and earnings

Summing the job production from each sector above gives ~4.5 million jobs created during construction and ~58,000 permanent annual jobs thereafter for the energy facilities alone developed as part of this plan. Total earnings during the construction period for these facilities (in the form of wages, local revenue, and local supply-chain impacts) are estimated as ~$314 billion and permanent annual earnings during operation of the facilities, ~$5.1 billion/yr

Additional jobs and earnings are associated with the enhancement of the transmission system and with the conversion to electric and hydrogen fuel cell vehicles, electricity-based appliances for home heating and cooling, and electricity and hydrogen use for some heating and high-temperature industrial processes.

The number of permanent jobs created by the electric power sector alone is expected to exceed significantly the number of lost jobs in current fossil-fuel industries. The reason is that nearly all energy for NYS with the proposed plan will be produced within the state, whereas currently, most oil, natural gas, and coal used in the state is mined out of the state or country, so jobs in those industries are not in NYS. In fact, the total number of mining jobs (for all natural resources combined) in NYS in 2011 was approximately 5700 (NYSDL (New York State Department of Labor), 2011). The total number of workers in the NYS utility industry in 2011 was about 37,100 (NYSDL (New York State Department of Labor), 2011). Even if the current electric utility industry plus mining jobs were lost due to a conversion with the present plan, they would be more than made up by with the 58,000 permanent jobs resulting from the present plan. The present plan would also result in the replacement of gas stations with electric charging and hydrogen fueling stations, likely exchanging the jobs between the industries. Similarly, the plan will require the growth of some appliance industries at the expense of others, resulting in job exchange between industries.

The increase in the number of jobs due to WWS versus the current fossil fuel infrastructure is supported independently by Pollin et al. (2009), who determined from economic modeling that, for each million dollars spent on energy production in the United States, oil and gas create 3.7 direct and indirect jobs, whereas wind and solar create 9.5 and 9.8 jobs, respectively. The difference in relative numbers of jobs created in NYS is likely to be larger than this due to the fact that many oil and gas workers and suppliers come from out of state. Since WWS resources are generated in state, their capture will provide more jobs to NYS residents. In addition, even though some of the jobs in NYS might come at the expense of jobs in other states, Pollin et al. (2009) indicate that for the U.S. as a whole, the wind and solar power industry will employ many more people than will an energy-equivalent fossil-fuel industry.

In addition, the development of the large-scale energy infrastructure proposed here should motivate research and development of new technologies and methods of improving efficiency. Much of this research will come from higher education and research institutes in NYS, creating jobs in these sectors. Demands created by infrastructure development should similarly motivate inner-city job training programs in the energy-efficient building and renewable energy industries.

10. State and local tax revenue and other cost considerations

The implementation of this plan will likely affect NYS's tax revenue and may require tax policy changes to ensure that state revenue remains at the level needed. Some revenues will increase and others will decline.

The increase in the number of jobs due to the plan over the current energy infrastructure is expected to increase personal income tax receipts. In addition, as more of NYS's infrastructure is electrified under the plan, revenues from the Utility Tax, which currently accounts for slightly less than 1.5% of state tax revenue, will increase.

NYS may experience higher property tax revenues than under an alternative, natural gas, infrastructure. Property values may decrease with shale gas drilling due to the increases in noise, conflicts with neighbors, lawsuits with gas companies, health complaints, and increases in crime in previously sparsely populated rural areas. In addition, banks may be unwilling to issue residential-rate mortgages on residential properties in gas drilling areas since industrial activity and the storing of hazardous material on the property violate residential mortgage requirements. Similarly, some insurance companies may not issue policies on such properties. Property tax revenues are expected to increase with some WWS technologies, such as rooftop PV and solar thermal due to the higher home values that result from installation of these local energy technologies. A study of the effects of 24 existing wind farms within 10 miles of residential properties in 9 states found no effect on property values (Hoen et al., 2009). Thus, a conversion to WWS should result in higher property values and tax revenues than should a fossil fuel-based infrastructure.

Finally Delucchi and Murphy (2008) show that in 1991 and 2000, the effective U.S. federal corporate income tax rate (tax paid divided by taxable income) in the oil industry was half that of all other industries, resulting in a tax "subsidy" in the year 2000 of $9.4 billion. Replacing fossil fuels with WWS energy in NYS alone could result in higher corporate income-tax revenues to the nation and may set an example for other states.

Revenues directly associated with the sale of petroleum fuels, such as the Motor Fuel Tax and the Petroleum Business Tax, will diminish as the vehicle fleet is made more efficient and ultimately transitions away from petroleum altogether. These tax revenues currently account for less than 2.5% of state tax revenue; however, they are sources of funds for the Highway and Bridge Trust Fund, the Dedicated Mass Transportation Trust Fund, and the

Mass Transportation Operating Assistance Fund. Another potential loss in tax revenue will be from the ad valorem tax on shale gas development.

As diesel fuel is phased out, goods will increasingly be transported by means other than commercial freight, and revenue from the Highway Use Tax will diminish. This tax accounts for less than 0.2% of state tax revenue at present, but is also a large contributor to transportation infrastructure and operation funds (NYSA (New York State Assembly), 2011).

Other tax revenues associated with passenger vehicle use are not expected to decrease significantly. These include Motor Vehicle Fees, Taxi Surcharge fees, and Auto Rental Tax. These collectively account for approximately 2% of State tax revenue and contribute to the state's dedicated mass transportation and highway and bridge funds.

Some lost revenues can be regained by applying a mileage-based road use tax on noncommercial vehicles similar to the Highway Use Tax levied on commercial vehicles in NYS. This has been considered at the Federal level (NSFIFC (National Surface Transportation Infrastructure Financing Commission), 2009) and piloted in Oregon (ODT (Oregon Department of Transportation), 2007).

There are other cost considerations. For example, the conversion from fossil fuels to WWS will likely reduce environmental externality costs, thereby possibly preserving some jobs that would otherwise be lost under future fossil fuel development in NYS. Some industries that are vital to upstate NY economies and require clean water and air include agriculture, tourism, organic farming, wine making, hunting and fishing, and other outdoor recreation industries. WWS development is unlikely to adversely impact these industries, whereas future shale gas development may negatively impact these industries.

It is expected that costs to communities in NYS will increase with shale gas development, and these costs will likely be much lower or not exist with WWS development. Such costs include increased demand on police, fire departments, first responders, social services, and local hospitals. Damage to roads and resulting repair and maintenance costs have been substantial where shale gas development has taken place, especially in Texas and Arkansas. WWS development is unlikely to cause such extensive long-term damage to roads and infrastructure.

Thousands of miles of natural gas pipelines represent an opportunity cost to NYS, as future building and economic development will not be possible on or adjacent to the pipelines. The tradeoff for these pipelines with WWS is an increase in transmission lines. However, transmission lines, while resulting in some similar issues, do not carry the risk of gas leakage or explosive fires, such as the $5 billion fire that destroyed a residential neighborhood in San Bruno, California, on September 10, 2010.

Finally, extractive industries, including fossil fuels, are known for their boom and bust cycles. Renewable energy industries, and in particular WWS, are long-term sustainable industries, unlikely to be subject to boom and bust cycles.

11. Reducing energy use in Buildings, Neighborhoods, and commercial complexes

The proposed plan will continue existing efforts to improve energy efficiency in residential, commercial, institutional, and government buildings to reduce the demand for electric power in NYS. It will also encourage the conversion of buildings, neighborhoods, and commercial complexes to sustainable ones that use and store their energy more efficiently.

First, energy efficiency measures in buildings, appliances, and processes have the potential to reduce end-use power demand in the U.S. by up to 23% by 2020 (McKinsey and Company, 2009). Such a demand reduction exceeds the modest reduction of 5–10% proposed in Table 1 of the present study. The NYS demand reduction is conservative to ensure that it does not underestimate the number of energy devices and plants needed for NYS. If demand reduction is larger than 5–10%, then the NYS plan will be easier to implement. Efficiency measures include improving wall, floor, ceiling, and pipe insulation, sealing leaks in windows, doors, and fireplaces, converting to double-paned windows, using more passive solar heating, monitoring building energy use to determine wasteful processes, performing an energy audit to discover energy waste, converting to LED light bulbs, changing appliances to those using less electricity, and using hot water circulation pumps on a timer, among others.

Historically, efficiency programs targeting multifamily households have resulted in overall energy savings of approximately 20% (Falk and Robbins, 2010). For such households, the NYSERDA Home Performance with Energy Star program reportedly achieved annual savings of approximately 15% of average household electricity usage and over 50% of heating fuel savings for natural gas-heated homes (NYSERDA (New York State Energy Research and Development Authority), 2011).

Second, designing new buildings, neighborhoods and commercial complexes or retrofitting existing ones to use and store energy more efficiently has the potential to reduce significantly building energy required from the grid, transmission needs, and costs. Four methods of improving energy use and storage in buildings include: (1) extracting heat in the summer and cold in the winter from the air and solar devices and storing it in the ground for use in the opposite season, (2) recovering heat from air conditioning systems and using it to heat water or air in the same or other buildings, (3) extracting heat (or cold) from the ground, air, or water with heat pumps and using it immediately to heat (or cool) air or water, and (4) using solar energy to generate electricity through PV panels, to recover heat from water used to cool the panels, and to heat water directly for domestic use (e.g., Tolmie et al., 2012). The Drake Landing solar community is a prototype community designed primarily around the first method, that of seasonal energy storage (Drake Landing, 2012).

12. Timing of plan

This plan anticipates that the fraction of new electric power generators as WWS will increase starting today such that, by 2020, all new generators will be WWS generators. Existing conventional generators will be phased out gradually, but no later than 2050. Similarly, all new heating and cooling technologies will be WWS technologies by 2020 and existing technologies will be replaced over time, but by no later than 2050.

For transportation, the transition to BEVs and HFCVs has potential to occur rapidly due to the rapid turnover time of the vehicle fleet (~15 years) and the efficiency of BEVs and HFCVs over fossil-fuel combustion vehicles. However, the actual rate of transition will depend on policies put in place and the resulting vehicle and energy costs. BEVs and HFCVs exist today, but due to their efficiency over combustion, they are proposed to be the only new vehicles sold in NYS by 2020. Several electric vehicles are currently available (e.g., Tesla Model S, 499 km (310 mile) range; Tesla Roadster, 391 km (243 mile); Renault Fluence Z.E., 185 km (115 mile); Citroen C-Zero, 177 km (110 mile); Mitsubishi I MiEV, 177 km (110 mile); Tazzari Zero, 140 km (87 mile); Ford Focus, 129 km (80 mile); Nissan Leaf, 117 km (73 mile)). The growth of electric vehicles will be accompanied by an increase in electric charging stations in residences, commercial parking spaces, and service stations. Most charging will be done with 220 V chargers

over several hours, but 440 V chargers are now available for faster charging. For example, the Tesla Model S includes 440 V, 160 A charging capability that will allow sufficient power for a 310 mile range in about 1 h.

13. Recommended first Steps

Below are recommended short-term policy steps to start the conversion to WWS in NYS.

13.1. Large energy projects: offshore/onshore wind; solar PV/CSP, geothermal, hydro

- Direct the New York State Energy Research and Development Authority (NYSERDA) to issue a new main tier solicitation to meet its existing renewable portfolio standard (RPS) commitments through 2015, selecting and contracting with sufficient wind and solar projects to do so.
- Extend the RPS in NYS. The 30% RPS currently sunsets in 2015. Propose to ramp up the RPS each year to get to 50% by 2025 (2% per year).
- Set a goal of at least 5000 MW offshore wind by 2020. Direct the New York Power Authority (NYPA) and the Long Island Power Authority (LIPA) to issue requests for proposals (RFPs) for new power generation from offshore wind as part of their generation and procurement budgets.
- Set up a Green Bank, which is a vehicle for public–private financing in conjunction with long-term contracts for large wind and solar development projects in NYS. An example Green Bank exists in Connecticut. The Green Bank would include a statewide version of the Department of Energy Loan Guarantee Program that focuses specifically on WWS energy generation projects. Such a program will reinvigorate private lending activity.
- Lock in upstate coal-fired power plants to retire under enforceable commitments. At the same time, streamline the permit approval process for WWS power generators and the associated high-capacity transmission lines and eliminate bureaucratic hurdles involved in the application process. Promote expanding transmission of power between upstate and downstate and between onshore and offshore, in particular.
- Work with regions and localities, and the federal government (in the case of offshore wind) to reduce the costs and uncertainty of projects by expediting their physical build-out by managing zoning and permitting issues or pre-approving sites.
- Encourage regulators to require utilities to obtain permission for a certain capacity of electric power to be installed before auctioning off projects to lowest-bidding developers. Currently, a pre-approved Power Purchase Agreement between a utility and particular project developer is required before permission from the regulators can be obtained. This change will ensure end-users obtain electricity at the lowest price.

13.2. Small energy projects: residential commercial, and government rooftop solar PV

- Extend the New York Sun (NY Sun) program to a multi-year program to finance rooftop and on-site solar projects in the state.
- Implement virtual net metering (VNM) for small-scale energy systems. The following recommendations will render utility-scale wind and solar power net metering conducive to corporate clients, and pave the way for a more widespread subscription to off-site generating project for the public at large.

(1) Remove the necessity for subscribers to have proprietorship in the energy-generating site.
(2) Expand or eliminate the capacity limit of renewable power under remote net-metering for each utility.
(3) Remove the barrier to inter-load zone transmission of net-metered renewable power.
(4) Expand Public Service Law 66.j to reduce red tape and enable off-site virtual net-metering from upstate to downstate, and from the outer boroughs to Manhattan.

- Streamline the small-scale solar and wind installation permitting process. Currently, each municipality has its own permitting process and fee structure. Creating common codes, fee structures, and filing procedures across a state would reduce a barrier to the greater implementation of small-scale solar and wind.
- Develop community renewable energy facilities, whereby a community buys power from a centralized generation facility. The facility feeds power into the grid, and the utility credits the kilowatt-hours to the accounts of individuals, businesses, and any other electricity customer that sign up. The facility may be located anywhere in the utility's service territory, since all that is required is a bill crediting arrangement by the utility. This brings many advantages: economies of scale of the facility, siting in an ideal location, and broader inclusiveness. Many electricity users cannot install a renewable energy system, because they are renters or because their property is not suitable for a system. Community renewable energy is inclusive because it enables anyone, whether living in rural New York or an apartment building in Manhattan, to buy the power without having to host the system. New York already has a community renewable energy program, but it is restrictive. A simple legislative fix would enable this approach to be used widely.
- Encourage clean-energy backup emergency power systems rather than diesel/gasoline generators. For example, work with industry to implement home energy storage (through battery systems) accompanying rooftop solar to mitigate problems associated with grid power losses.
- Implement feed-in tariffs (FITs) for small-scale energy systems. FITs are financial incentives to promote investment in renewable power generation infrastructure, typically by providing payments to owners of small-scale solar PV systems to cover the difference between renewable energy generation cost (including grid connection costs) and wholesale electricity prices.

13.3. Energy efficiency in buildings and the grid

- The current target for energy efficiency is 15% less energy use below forecasted levels by 2015. Expand the target significantly beyond 2015 and increase investment fivefold from both public and private sources. This requires the New York State Public Service Commission (NYSPSC) to increase NYSERDA and utility requirements and budgets for efficiency.
- Promote, through municipal financing, incentives, and rebates, energy efficiency measures in buildings, appliances, and processes. Efficiency measures include improving wall, floor, ceiling, and pipe insulation, sealing leaks in windows, doors, and fireplaces, converting to double-paned windows, using more passive solar heating, monitoring building energy use to

determine wasteful processes, performing an energy audit to discover energy waste, converting to LED light bulbs, changing appliances to those using less electricity, and using hot water circulation pumps on a timer, among others.
- Encourage conversion from natural gas water and air heaters to heat pumps (air and ground-source) and rooftop solar thermal hot water pre-heaters. Incentivize the use of efficient lighting in buildings and on city streets.
- Encourage utilities to use demand-response grid management to reduce the need for short-term energy backup on the grid. This is a method of giving financial incentives to electricity users to shift times of certain electricity uses to times when more energy is available.
- Institute, through Empire State Development Corporation, a revolving loan fund to pay for feasibility analyses for commercial Energy Services Agreements. The revenues from these retrofits are amortized as a majority percentage of the Energy-Cost Savings realized as direct result of these retrofits. ROI's can be realized in 5–10 years with 10–20 year Energy Services Contracts. Allocating some of these revenues back to the fund will render it sustainable.
- Extract heat in the summer and cold in the winter from the air and solar devices and store it in the ground for use in the opposite season. The Drake Landing solar community is a prototype community designed primarily around seasonal energy storage (Drake Landing, 2012).
- Recover heat from air conditioning systems and use it to heat water or air in the same or other buildings at the same time.
- Extract heat (or cold) from the ground, air, or water with heat pumps and use it immediately to heat (or cool) air or water.
- Recover heat from water used to cool solar PV panels to heat water directly for domestic use.

13.4. Vehicle electrification

- Coordinate items below so that vehicle programs and public charging stations are developed in sync. Create a governor-appointed EV Advisory Council, as has been done in states such as Illinois and Connecticut, to recommend strategies for EV infrastructure and policies. Council members should include representatives from state agencies, environmental groups, utilities, auto companies, and EV charging infrastructure companies.
- Leverage and augment the technical and financial assistance of the U. S. Department of Energy's "Clean Cities Program" activities, focusing on the deployment of EVs.
- Adopt legislation mandating the transition to plug-in electric vehicles for short- and medium distance government transportation and encouraging the transition for commercial and personal vehicles through purchase incentives and rebates.
- Encourage fleets of electric and/or hydrogen fuel cell/electric hybrid buses starting with a few and gradually growing the fleets. Electric or hydrogen fuel cell ferries, riverboats, and other local shipping should be encouraged as well.
- Encourage and ease the permitting process for the installation of electric charging stations in public parking lots, hotels, suburban metro stations, on streets, and in residential and commercial garages.
- Ensure that new charging infrastructure is vehicle-to-grid (V2G)-capable, and integrated into a statewide "smart grid" system.
- Set up time-of-use electricity rates to encourage charging at night.
- Provide electric vehicle drivers access to high-occupancy vehicle (HOV) lanes.
- Use excess wind and solar produced by WWS electric power generators to produce hydrogen (by electrolysis) for transportation and industry and to provide district heating (as done in Denmark) instead of curtailing the wind and solar.

13.5. Industrial processes

- Provide incentives for industry to convert to electricity and electrolytic hydrogen for high temperature and manufacturing processes where they are not currently used.
- Encourage industries to use WWS electric power generation for on-site electric power (private) generation.

14. Conclusions

This study examined the technical and economic feasibility of and proposed policies for converting New York State's energy infrastructure for all purposes into a clean and sustainable one powered by wind, water, and sunlight producing electricity and hydrogen. Such a conversion is estimated to improve the health and welfare of NYS residents, thereby lowering their medical, insurance, and related costs, and is expected to create jobs to manufacture, install, and manage the infrastructure.

The study found that complete conversion to WWS in NYS will reduce end-use power demand by ~37%, due mostly to the efficiency of electricity versus combustion, but also due partly to energy efficiency measures.

If complete conversion to WWS occurs, the 2030 NYS power demand for all purposes (not only electricity) could be met by 4020 onshore 5-MW wind turbines (providing 10% of NYS's energy for all purposes), 12,770 off-shore 5-MW wind turbines (40%), 387 100-MW concentrated solar plants (10%), 828 50-MW solar-PV power plants (10%), 5 million 5-kW residential rooftop PV systems (6%), 500,000 100-kW commercial/government rooftop systems (12%), 36 100-MW geothermal plants (5%), 1910 0.75-MW wave devices (0.5%), 2600 1-MW tidal turbines (1%), and 7 1300-MW hydroelectric power plants (5.5%), of which 89% are already in place. The onshore wind capacity installed under this plan (~20.1 GW) would be less than twice the 2012 installed capacity of Texas.

Several methods exist to match renewable energy supply with demand and to smooth out the variability of WWS resources. These include (A) combining geographically-dispersed WWS resources as a bundled set of resources rather than as separate resources and using hydroelectric power to fill in remaining gaps; (B) using demand-response grid management to shift times of demand to match better with the timing of WWS power supply; (C) over-sizing WWS peak generation capacity to minimize the times when available WWS power is less than demand and to provide power to produce heat for air and water and hydrogen for transportation and heating when WWS power exceeds demand; (D) integrating weather forecasts into system operation to reduce reserve requirements; (E) storing energy in thermal storage media, batteries or other storage media at the site of generation or use; and (F) storing energy in electric-vehicle batteries for later extraction (vehicle-to-grid).

The additional footprint on land for WWS devices is equivalent to about 0.96% of New York's land area, mostly for CSP and PV. An additional on-land spacing area of about 1.46% is required for on-shore wind, but this area can be used for multiple purposes, such as open space, agricultural land, or grazing land, for example.

The land footprint and spacing areas (open space between devices) in the proposed scenario can be reduced by shifting more land based WWS generators to the ocean, lakes, and rooftops.

2020–2030 electricity costs are estimated to be 4–8.8 cents/kWh for most WWS technologies and 5–11 cents/kWh for others (including local transmission and distribution), which compares with about 17.8–20.7 cents/kWh for fossil-fuel generators in 2030, of which 5.7 cents/kWh are externality costs. Long-distance transmission costs on land are estimated to be 1 (0.3–3) cent/kWh for 1200–2000 km high-voltage direct current transmission lines.

Although the cost of WWS electricity is expected to be lower than that of fossil fuels and all energy in a WWS world will be transformed to electricity, infrastructure conversion will result in other cost tradeoffs not quantified here. For example, conversion from combustion vehicles to electric and hydrogen fuel cell vehicles and from current combustion-based heating technologies to electricity based technologies may result in large initial cost increases to consumers, when relatively low levels of vehicles are being manufactured. However, as production of new vehicles increases and technology matures, manufacturing costs will decline, and this, combined with the lower energy and operating costs of electric vehicles, may result eventually in electric vehicles having a total lifetime cost comparable with that of conventional gasoline vehicles (Delucchi and Lipman, 2010),

The plan is estimated to create ~4.5 million jobs during construction and ~58,000 permanent annual jobs thereafter for the proposed energy facilities alone. Total earnings during the construction period for these facilities (in the form of wages, local revenue, and local supply-chain impacts) will be ~$314 billion and permanent annual earnings during operation of the facilities will be ~$5.1 billion/yr

The implementation of this plan will likely increase personal income, property, and utility tax revenues in NYS relative to the current infrastructure. At the same time, it will reduce fuel-tax revenues. These can be made up from either the utility taxes or mileage-base road fees.

The plan effectively pays for the 100% WWS energy generation infrastructure to power NYS for all purposes over 15 years solely by the reduction in air-pollution costs to the state and global warming costs to the U.S. from state emissions. Annual electricity sales equal to the cost of the plant divided by its expected life (~30 years) reduce the payback time to ~10 years. The current fossil-fuel infrastructure does not provide the air-quality benefits to NYS, so it's payback time with annual electricity sales equal to the cost of the plant and fuel divided by the expected plant life is ~30 years; assuming a 7% profit, it is ~28 years.

This plan may serve as a template for plans in other states and countries. Results here suggest that the implementation of plans such as this in countries worldwide should reduce global warming, air, soil, and water pollution, and energy insecurity.

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Appendix A1

See Appendix Table A1.

Table A1
NYS annually-averaged 2006 $PM_{2.5}$ concentrations and resulting estimated annual premature mortalities by county.

County	2006 $PM_{2.5}$ ($\mu g/m^3$)	Population (thousands)	Total 2006 Mortalities from $PM_{2.5}$		
			Low estimate	Medium estimate	High estimate
Albany	9.4	304	8.4	33.4	66.5
Alleghany*	8.2	49	0.9	3.5	6.9
Bronx	13.9	1385	88.4	351	695
Broome**	10.3	201	7.0	27.8	55.4
Cattaraugus*	9.6	80	2.3	9.3	18.6
Cayuga*	8.3	80	1.5	5.9	11.8
Chautauqua	8.3	135	2.5	10.0	20.0
Chemung*	8.2	89	1.6	6.3	12.6
Chenango*	10.3	50	1.8	7.0	13.9
Clinton*	5.5	82	0.9	3.6	7.3
Columbia*	9.4	63	1.7	6.9	13.8
Cortland*	8.3	49	0.9	3.7	7.3
Delaware*	10.3	48	1.7	6.7	13.2
Dutchess**	10.7	297	11.3	45.1	89.7
Erie	10.9	919	36.4	145	289
Essex	5.5	39	0.4	1.7	3.5
Franklin*	6.0	52	0.6	2.5	4.9
Fulton*	11.5	56	2.5	9.8	19.6
Genesee*	10.3	60	2.1	8.3	16.5
Greene*	9.4	49	1.4	5.4	10.8
Hamilton*	6.0	5	0.1	0.2	0.5
Herkimer*	6.4	65	0.8	3.3	6.6
Jefferson*	6.4	116	1.5	6.0	12.0
Kings	12.8	2505	138	547	1090
Lewis*	6.4	27	0.4	1.4	2.8
Livingston*	8.9	65	1.5	6.0	12.0
Madison*	8.3	73	1.4	5.5	10.9
Monroe	9.5	744	21.1	84.1	168
Montgomery*	11.5	50	2.2	8.9	17.7
Nassau	10.8	1340	52.0	207	412
New York	14.4	1586	108	427	845
Niagara	10.4	216	7.7	30.7	61.2
Oneida**	10.5	235	8.5	34.1	67.8
Onondaga	8.3	467	8.7	34.7	69.1
Ontario*	8.9	108	2.5	9.9	19.8
Orange	9.7	373	11.2	44.5	88.7
Orleans*	10.0	43	1.4	5.5	10.9
Oswego*	8.3	122	2.3	9.1	18.1
Otsego*	10.5	62	2.3	9.0	18.0
Putnam*	10.4	100	3.5	14.0	27.9
Queens	11.6	2231	101	402	800
Rensselaer*	9.4	159	4.4	17.5	34.9
Richmond	12.2	469	23.5	93.5	186
Rockland*	10.4	312	11.0	43.7	87.1
St. Lawrence	6.4	112	1.4	5.8	11.5
Saratoga*	11.5	220	9.8	38.9	77.3
Schenectady**	11.5	155	6.9	27.4	54.5
Schoharie*	9.4	33	0.9	3.6	7.2
Schuyler*	8.2	18	0.3	1.3	2.6
Seneca*	8.2	35	0.6	2.5	5.0
Steuben**	8.2	99	1.8	7.0	14.0
Suffolk	10.4	1493	53.1	212	422
Sullivan*	9.7	78	2.3	9.3	18.4
Tioga*	10.3	51	1.8	7.1	14.1
Tompkins*	9.4	102	2.8	11.0	21.9
Ulster*	9.7	182	5.5	21.8	43.4
Warren*	5.5	66	0.7	2.9	5.8
Washington*	5.5	63	0.7	2.8	5.6
Wayne*	9.5	94	2.7	10.6	21.1
Westchester	11.0	949	38.4	153	304
Wyoming*	10.9	42	1.7	6.7	13.2
Yates*	8.7	25	0.5	2.2	4.3
Total	**9.3**	**19,380**	**820**	**3260**	**6480**

Concentration data were from NYSDH (New York State Department of Health) (2011). The methodology is described in the text.

* 2006 data for these counties were not available, so an average of data from adjacent or nearby counties was used.

** 2006 data for these counties were not available, so 2003 values were used.

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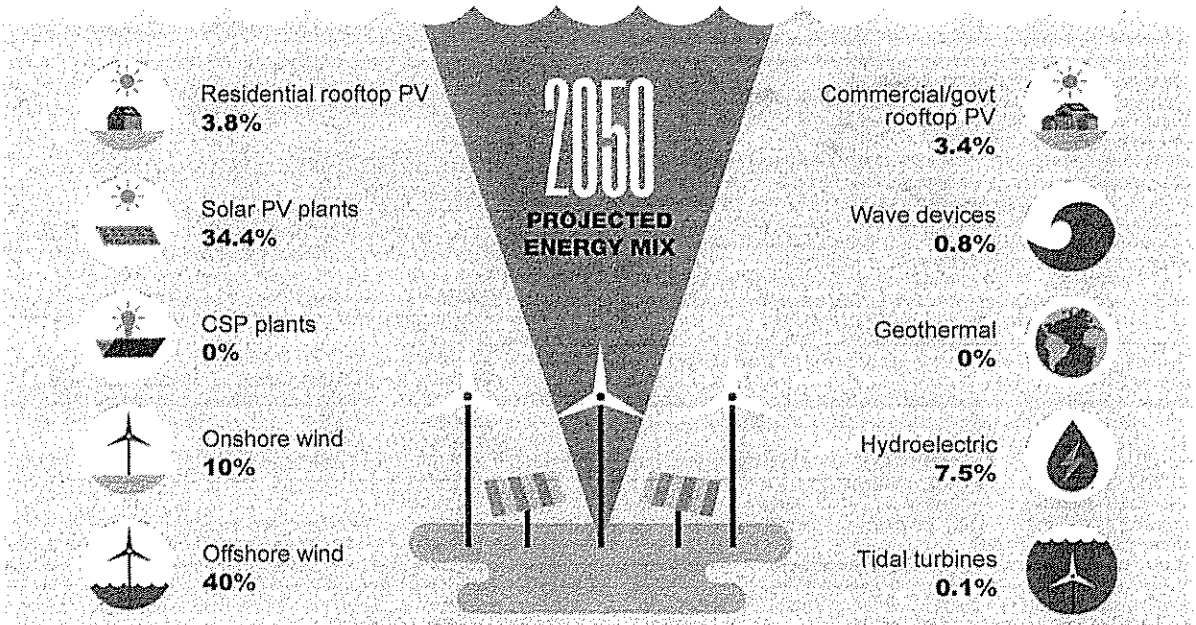
THE SOLUTIONS PROJECT: NEW YORK

Transition to 100% wind, water, and solar (WWS) for all purposes
(electricity, transportation, heating/cooling, industry)



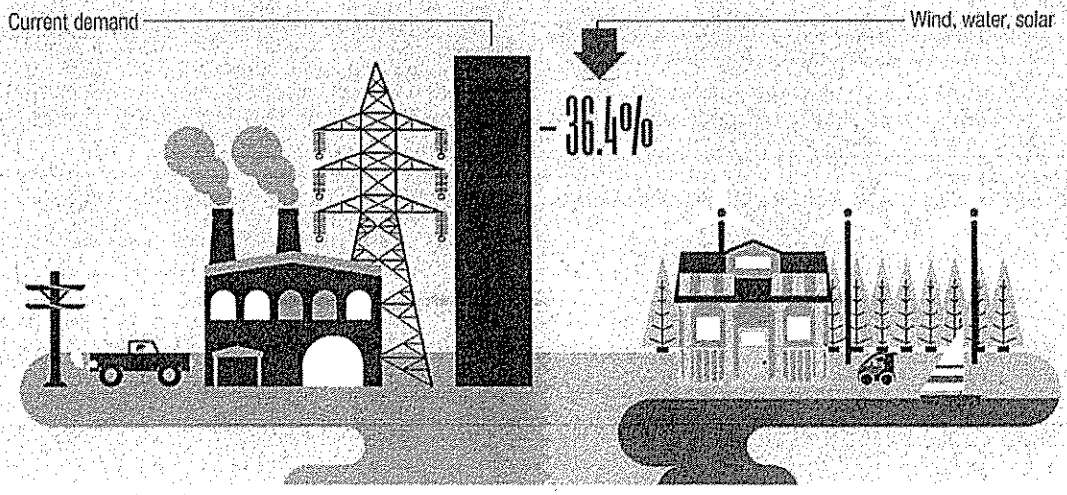
40-Year Jobs Created

Number of jobs where a person is employed for 40 consecutive years

Construction jobs: **180,200**

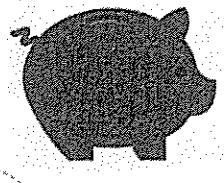
Operation jobs: **97,000**

Using WWS electricity for everything, instead of burning fuel, and improving energy efficiency means you need much less energy



Avoided Mortality and Illness Costs

Avoided health costs per year:



2% of state GDP

Air pollution deaths avoided every year: **3,140**

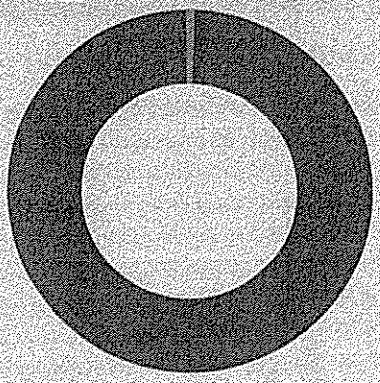
= **1,000**

Plan pays for itself in as little as **10 years** from air pollution and climate cost savings alone

Percentage of New York Land Needed for All New WWS Generators

0.76% Footprint area

1.65% Spacing Area



Future Energy Costs 2020-2030

BAU (Business as usual) **WWS (Wind, water, solar)**

State average fossil fuel plus nuclear energy costs* **14.9¢/kWh**

*Health and climate externality costs of fossil fuels are another 5.7¢/kWh

State average WWS electricity costs **6.9¢/kWh**

Money in Your Pocket

= **$1,000**

Annual energy, health, and climate cost savings per person in 2050: **$4,600**

Annual energy cost savings per person in 2050: **$2,100**

*Data from Stanford University – For more information, visit http://www.stanford.edu/group/efmh/jacobson/Articles/I/WWS-50-USState-plans.html

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THE

News from Assemblymember

LINDA B. ROSENTHAL

WINTER 2014

DISTRICT OFFICE: 230 West 72nd Street, Suite 2F, New York, NY 10023
Phone: 212.873.6368 • Email: rosenthall@assembly.state.ny.us

Radon: The Hidden Danger That Could Be Lurking in Your Kitchen

I am the sponsor of legislation, bill A.6863, which will protect the public against exposure to radioactive, cancer-causing radon from natural gas pipelines. Radon is the second leading cause of lung cancer after smoking in the country. With the proliferation of pipelines carrying natural gas to homes across the State and the requirement in New York City that home heating fuel be replaced with natural gas or a cleaner burning alternative, it is critical that the State act to set standards for maximum allowable levels of radon in gas delivered to homes. Though all natural gas delivered to consumers in the United States contains some level of radon, the concentration of radon in the gas decreases over time as the gas travels from far off distances and into our homes. With the potential for gas development in the Marcellus Shale in upstate New York, radon levels in the gas delivered to homes in New York may be higher due to the shorter travel time, which will not allow for its dissipation. In fact, the Spectra Pipeline, which runs from New Jersey, under the Hudson River and into Manhattan at 10th Avenue and Gansevoort Street, is already delivering natural gas from the Marcellus Shale to thousands of homes across New York City. My bill will require that the New York State Department of Health monitor the levels of radon in the natural gas distributed to homes, report those levels on a publicly accessible website and either remediate or shut down gas delivery altogether if the radon levels exceed certain internationally agreed-upon levels for safe exposure.

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Tom Wigsmuller

Address: 441 Shore Road

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: ALEXIA FILPO

Address: 94-25 57TH AVENUE ELMHURST, NY

I represent: NYCSEC

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: RYAN BAXTER

Address: 570 Lexington Ave, 2nd Fl, NY, NY 10022

I represent: REBNY

Address: Same as Above

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 738 Res. No. _____

☑ in favor ☐ in opposition

Date: 23 Oct 2014

(PLEASE PRINT)

Name: Bob Wyman

Address: 203 W 85th, Apt PH2, NY, NY, 10024

I represent: Self

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 0378 Res. No. _____

☒ in favor ☐ in opposition

Date: Oct 23, 2014

(PLEASE PRINT)

Name: Philip H. Kahn

Address: 120 East End Ave. 9-C New York NY

I represent: Citizens Climate Lobby

Address: Manhattan chapter

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: MAVOLINE MOORHEAD

Address: 2 JANE ST. NYC

I represent: (NYH2O) DCS

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Emily Dean, Director of Energy Programs

Address: Ozgem Ornektekin, Deputy Commissioner

I represent: of Energy Management

Address: DCAS

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Daniel Zarrilli, Acting Director,

Address: Office of Long-Term Planning & Sustainability

I represent: Bill Goldstein, Mayor's Office 10/23/14

Address: DCAS

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Bill Goldstein, Senior Advisor to the Mayor

Address: on Recovery, Resiliency, and Infrastructure

I represent: Office of the Mayor

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Olivie Freud

Address: 305 West 75th St

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Rick Bell

Address: 536 LaGuardia Place, NY, NY

I represent: American Institute of Architects

Address: 536 LaGuardia Place N.Y. NY

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Ya-Ting Liu

Address: _____

I represent: New York League of Conservation Voters

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Nicole Minichello

Address: 74 Linden St.

I represent: ~~United Fed~~ self

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23

(PLEASE PRINT)

Name: Dehran DUCKWORTH

Address: 531 Barretto St. Bx NY

I represent: Tri State Biodiesel

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. 378

☑ in favor ☐ in opposition

Date: 10/24/14

(PLEASE PRINT)

Name: Pamela Drake Gregory

Address: 820 E. 10 St. Brooklyn 11230

I represent: Safe Energy Coalition

Address: c/o Ken Gale, 220 E. 85 St #5R, NYC 10028

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. 378

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: MARTHA CAMERON

Address: 696 President St, 11215

I represent: Self

Address:

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Margery Schab - Board Member

Address: 530 E 90th St Apt 2G

I represent: Damascus Citizens for Sustainability

Address: PO Box 147 Milanville PA
office in Narrowsburg NY

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: Oct 23

(PLEASE PRINT)

Name: John MANISCALCO

Address: 183 Madison Ave. NY NY

I represent: New York Oil Heating Association

Address:

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Melissa Elstein

Address: 255 W. 85 st NYC 10024

I represent: Myself

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: KEN GALE

Address: 220 E 85th ST NYC 10028

I represent: NYC SAFE ENERGY COALITION, ECO-LOGIC WBAI-FM

Address: NYFREAD@RISEUP.NET

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: 10.23.14

(PLEASE PRINT)

Name: Nancy Anderson

Address: 30 Broad Street, NYC

I represent: Sallan Foundation

Address: 30 Broad St, NYC

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. 378

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Patrick Robbins

Address: 142 Lefferts Avenue Brooklyn NY 11225

I represent: Sane Energy Project

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. 378

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Kim Fraczek

Address: 153 Montrose ave Brooklyn, NY

I represent: Sane Energy Project

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Alice Slater

Address: 446 E 86 St

I represent: NYC Safe Energy Coalition

Address: 446 E 86 St NY NY 10028

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Wendy Scher

Address: 15 Thames St #2, Bk, 11206

I represent: NY Safe Energy Coalition

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: STEPHANIE LOW

Address: 1215 5 Ave.

I represent: _____

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☑ in favor ☐ in opposition

Date: OCT 23

(PLEASE PRINT)

Name: DANIEL GIANFALLA

Address: ~~United~~ 101 Brooklyn, NY

I represent: United Metro Energy Corp

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☑ in favor ☐ in opposition

Date: Oct 23 2014

(PLEASE PRINT)

Name: WYLDON KING FISHMAN

Address: 5270 Sycamore Ave Bx 10471

I represent: NY Solar Energy Society

Address: 5270 Sycamore Ave BX 10471

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: PATRICK ALMONRODS

Address: 301 W. 108TH ST. #9A, NYC 10025

I represent: 350 NYC

Address: SAME AS ABOVE

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: Oct. 23, 2014

(PLEASE PRINT)

Name: Catherine Skopic

Address: 140 West Broadway, NYC 10007

I represent: NYAG's Office, White

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: R Frank Rodia

Address: 455 Park Ave, 5SE

I represent: NYC Group of the Sierra Club

Address: 1115 Broadway, 11th Fl.

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: SUSANNAH DYEN

Address: 50 Broadway 29th Fl

I represent: ALIGN

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: GUSTI BOGOK

Address: 130 W. 16th St. #41

I represent: Sierra Club Atlantic Chapter Gas Drilling Task Force

Address: 130 W. 16th St. #41 NY, NY 10011

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: ANNIE WILSON

Address: 11 Park Place 701

I represent: NY Env. Law & Justice Project - NYC Clean energy Coalition

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition 10/23/13

Date: _____

(PLEASE PRINT)

Name: Jeanne ROBERT ALPERN

Address: 140 EIGHTH AVE., BROOKLYN, NY 11215

I represent: MYSELF

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 0378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/13

(PLEASE PRINT)

Name: Raya Salter

Address: _____

I represent: NRDC

Address: 40 W 20th ST NYC 10011

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☑ in favor ☐ in opposition

Date: 10-23-14

(PLEASE PRINT)

Name: JUSTIN GREEN

Address: 205 Clinton Ave #8C

I represent: Build it GREEN

Address: 64 9th Street, Brooklyn, NY

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Regine Cornwell

Address: 150 W 21 St

I represent: Jeff Zimmerman & The Damascus Citizens for Sustainability

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Catherine Nelson Hughes

Address: _____

I represent: CB1 - Manhattan

Address: 49-51 Chambers St.

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. ~~525~~

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: PAMELA DRAKE GREGORY

Address: 820 E. 10 ST. BROOKLYN NY 11230

I represent: Safe Energy Coalition/Sierra Club/Natural Resources Defense Council

Address: c/o Ken Gale, 220 E. 85 St. 5R, NYC 10028

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☒ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: LISA DICARLO

Address: 325 West 93rd Street

I represent: 350 NYC and Sierra Club

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: DANIEL GIANFALCA

Address: UNITED METRO

I represent: UNITED METRO ENERGY

Address: 500 KINGSLAND AVE BROOKLYN

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Kevin Murungi

Address: _____

I represent: Global Kids, Inc.

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: _____

(PLEASE PRINT)

Name: Buck Moorhead

Address: 245 W 29th St NYC 10001

I represent: Damascus Citizens for Sustainability
New York Passive House

Address: _____

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Ling Tsou

Address: 80 Beekman Street, NY, NY 10038

I represent: United for Action

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☐ in favor ☐ in opposition

Date: 10.23.14

(PLEASE PRINT)

Name: Denise Kentzman

Address: 261 Madison Ave NY, NY 10016

I represent: EnviroAdvancement

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/13

(PLEASE PRINT)

Name: Jeanne Bergman

Address: 20 E. 9th St 18A NY NY

I represent: _____

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☒ in favor ☐ in opposition

Date: 10/23/2014

(PLEASE PRINT)

Name: CECIL SCHEIR & RICHARD LEIGH

Address: 20 BROAD ST #705 NY, NY 10005

I represent: URBAN GREEN COUNCIL

Address: same

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. 378 Res. No. _____

☑ in favor ☐ in opposition

Date: 10/23/14

(PLEASE PRINT)

Name: Edie Kantrowitz

Address: 333 McDonald Avenue #5D Brooklyn NY 11218

I represent: UFA, NYCFC, NYC SEC, CARP

Address: _____

Please complete this card and return to the Sergeant-at-Arms