Footprint to Wings

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Prepared Comment by Rezwan Razani

New Jersey Energy Master Plan Hearing – August 2015

Introduction

Thank you New Jersey Board of Public Utilities, Commissioners, and fellow citizens for the opportunity to comment on the New Jersey Energy Master Plan ("EMP").

I am Rezwan Razani, founder of Footprint to Wings Inc. I have a Masters in Regional Planning from Cornell University and a Bachelor of Arts in Environmental Science from University of California, Berkeley. Footprint to Wings Inc is a 501c3 nonprofit organization based in New Jersey that is launching, coaching and tracking the race to be the first net zero carbon state in America. Per the most recent (2011) ranking by EIA[1], New Jersey is #14 in the race, emitting 12.45 metric tons (MT) of carbon per person. New York is in first place with 8.1MT. The national average is 17.5 MT. We would like to see all states[2] achieve Net Zero Carbon, and New Jersey, with inspired leadership and active citizens, to get there first.

Our organization is concerned with the assumptions behind the State's choice of emissions targets; the level of commitment the State has to achieving a net zero carbon economy; and with how well the EMP clarifies both the assumptions and the options available.

We have been told our goal of "Net Zero Carbon" is an outlier. We do not seek to impose this goal on our fellow citizens. Rather, we recognize that in light of the planet level threat we face, the citizens of this State need to come together for an open, informed discussion of the energy and emissions landscape and make profound decisions. We see the EMP as the ideal vehicle to put everything on the table and inform citizens of the options available.

Our recommendations herein are geared to showing how the EMP, as a document, can best perform this role.

The Purpose of an Energy Master Plan in the days of Climate Change

We live in extraordinary times. Never before in history have so many people been as technologically empowered and connected as we are. And never before have we been faced with a global level problem that requires a fundamental rethinking of our energy supply and demand habits. We can take, at this moment, any one of several roads into our future. The rest of our civilization hinges on the choices we make now. These choices need to be informed with the best possible data, put in perspective.

The Purpose of an EMP in the days of Climate Change is to help citizens grasp what's at stake, to understand the full implications of the options they face, to enable them to make choices that reflect their true values and preferences. In order to fulfill its purpose, the EMP will have to be modified as follows:

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[1] http://www.eia.gov/environment/emissions/state/analysis/images/figure_5-lg.jpg
[2] http://fp2w.org/index.php/blog/article/check-emissions

- **Clarify the assumptions behind the choice of energy targets.** The EMP is missing the "Why." It has some mild targets. What climate modeling scenario are we basing these on? Why a 70% RPS goal (or the "80% by 2050" GWRA)? Have we chosen our goals based on the most scientifically probable risk, or based on political feasibility? Are minor reductions in emissions sufficient, or is there cause to go further, to net zero carbon? What is the cost of action and of inaction? How much time do we really have?

- **Lead by putting everything on the table and asking key questions**. The main job of the EMP is to be a reality check on ideas people have about tackling the huge problem facing us. Bring forward the most crucial issues, conflicts and information for decision making utility. Be bold. Aim for full disclosure. It's not the EMP's job to make the decisions, but it IS the EMP's job to clarify the decision citizens need to make, to drive insight by asking the right questions.

- **Include a Road Map to Zero Carbon Energy Supply with Both Renewable and Nuclear Scenarios.** It may not be politically feasible to declare a zero carbon goal at this time, but it is within the scope of the EMP to include information about how one would achieve that type of goal. You simply need to add (with full disclaimers) some "back of the envelope" net zero carbon road map scenarios. A 100% renewable road map scenario and a 100% nuclear road map scenario would be the minimum to provide crucial perspective and inform the needed conversation. It would also address a conflict that runs through the 2011 EMP.

- **Be User Friendly.** The EMP is packed with useful information, but it is not presented in a way that engages citizens and facilitates discussion, decision making and action. Clarify the information with useful infographics, units, conversions, and comparisons. "Math and Maps".

Most citizens would not consider "energy transition" to be an exciting topic. Most people would rather not think about it. Apathy is the default. However, we live in a time of climate change. To tackle this major collective challenge, we need the conscious, informed and enthusiastic commitment of a fair number of our fellow citizens. An Energy Master Plan needs to inform actual human beings in a way that is most effective for them to face a civilization threatening situation.

The climate change problem won't be solved until the solutions are executed and the excess CO2 is mopped up. There are a lot of steps we have yet to take, simply to choose the optimal solution mix.

The EMP can be designed to adequately inform us, to guide us through a systematic comparison of the options, and to thus provide decision making support. Once we've all waded through the options (clarified by the EMP) and made decisions (after reflection and conversation with each other), we are in the best position to take action, demanding the chosen solutions be executed. "Demand" could be consumer demand, shareholder demand, citizen/government demand.

At present, the options are not clear. It's up to the EMP to be the best line of defense in clearing up the confusion for us. It starts with clarifying the goal.

Clarify The Assumptions Behind Choice of Energy Targets.

The EMP is missing the "why." You can't get to the "why" without examining your assumptions. This examination is likewise missing from the EMP.

The Executive Summary opens by saying that there are no easy options confronting our dependence on fossil and nuclear energy, but doesn't tell us why this is a problem or if "independence from fossils and nuclear" is the goal. It announces the Christie Administration is committed to "furthering environmental objectives" but doesn't say what the objectives are. It says we are marching "toward deep structural changes in New Jersey's energy infrastructure" but doesn't say why or how quickly we need to march or how deeply we need to change things. All of the goals are incremental.

No explanation is given for the renewable portfolio standard (RPS) targets of 22.5% by 2021 and 70% by 2050, other than that they are legislated targets. We might assume the RPS has something to do with climate change, but the words "climate change" don't even appear once in the EMP.

The RPS goals of 70% of electricity from renewable sources by 2050 are much different from the Global Warming Response Act (GWRA) goals of limiting greenhouse gas emissions to 80% below 2006 levels by 2050. As electricity is only about 40% of energy, it appears the RPS goal of 70% of 40% clean energy - which is 28% clean energy and would presumably result in 28% less greenhouse gases - falls far short of the GWRA goal of 80%.

No explanation is given for this discrepancy or for the amount of transformation that would have to occur to achieve either target. And most importantly, no explanation is given for why 80% less GHG by 2050 is the GWRA goal in the first place.

Recommendation: Update the Glossary

Add "Climate Change", "Sustainability" and "Greenhouse Gases" to the glossary.

Recommendation: Reflect on the 70% RPS Target

Include a section that explains the purpose of the RPS goal, whether the goal is adequate for its purpose, and how the numbers were chosen. For those of us concerned with climate change, the 22.5%-70% RPS goal is not sufficient. Do we simply need to achieve a modest RPS, or is there a compelling reason to make a wholesale switch to a net zero carbon economy? This isn't clear from the EMP, and it needs to be.

Scientists say that not only do we need to get our emissions down to net zero, we also need to take extra carbon out of the atmosphere. To help make this point in a way that everyone can understand, I recommend you include the National Geographic Carbon Bathtub infographic in the EMP. - http://ngm.nationalgeographic.com/big-idea/05/carbon-bath

Recommendation: Reflect on the GWRA Targets

Examine the assumptions behind the GWRA's "80% by 2050" target. This could be in an appendix, but it needs to be somewhere in the EMP.

Explain where the GWRA got the "80% by 2050" numbers.

The best reference for this would be the Presidential Climate Action Project (PCAP) - http://www.climateactionproject.com/ and in particular, this summary of "Emissions Reductions Needed to Stabilize Climate" - https://www.climatecommunication.org/wp-content/uploads/2011/08/presidentialaction.pdf

Point out for the citizens of New Jersey that this target doesn't guarantee we will stabilize the climate. Not even close.

From page 4 of the pdf above: An 80% reduction in GHG by 2050 is necessary to stabilize CO2 concentrations (not climate change) at about 450ppm by 2050.

Why stabilize CO2 at 450ppm? From page 2 of the pdf: "To have a good chance **(not a guarantee)** of avoiding temperatures above [2°C], atmospheric concentrations of carbon dioxide would need to peak below about 400 to 450 ppm and stabilize in the long-term at around today's levels."

What are the odds that this will work? "stabilizing concentrations below about 400 CO2e **would give us about an 80% chance of avoiding** crossing the 2°C threshold."

Why 2°C? From page 1: "**Many analysts think we have already crossed into dangerous territory and that what we must now seek to avoid is truly catastrophic climate change.** The European Union and many scientific bodies have concluded that **avoiding the most severe outcomes** will require keeping the total global average warming to no more than 2°C relative to pre-industrial levels...While remaining below this threshold does not guarantee avoidance of significant adverse impacts, if we exceed it, impacts are projected to become much more severe, widespread and irreversible, and we are likely to cross more dangerous thresholds in the climate system that could trigger large-scale catastrophic events."

In other words, the 80% by 2050 GWRA numbers are geared to avoiding the most severe outcomes - and still only give us less than an 80% chance of success in that endeavor. How much less isn't clear. The "80% by 2050" goal aims to bring the concentration to 450ppm, and the "80% chance" was based on stabilizing at less than 400ppm.

This goal is inadequate, and witnessing people repeat it as a sensible target is surreal.

It's like mildly suggesting that people use a seatbelt as they are driving at 80mph toward a concrete wall, for a less than 80% chance of getting out of it alive. Maybe you'll get out alive (barely), but shouldn't the goal be to not hit the wall, to not mangle your body and total the car in the first place? Wouldn't it be much easier to steer in a different direction?

Don't we owe it to each other to change course?

And if the GWRA goals are so inadequate, how much less adequate is New Jersey's "70% electricity by 2050 RPS" target? Is this the best we can do? Is it all we are capable of? Is that all we are settling for? Our goal is not even a third as much as the GWRA goal, which itself is a political compromise.

Recommendation: Include the Cost of Inaction in the EMP

Is, "Wouldn't it be much easier to steer in a different direction?" a naïve question? We all know that changing direction is socially and politically difficult and carries a cost. We tend to focus on the difficulty. But what about the other side? What does it cost NOT to act? The EMP needs to let us know.

The cost of various specific actions are estimated in the EMP. What is missing is any estimate for the cost of inaction. Citizens need the cost of both action and inaction spelled out in clear and unflinching detail in order to make an informed decision. It is the job of the EMP to make this information as clear as possible.

What will climate change cost the state of New Jersey? What is it costing now? What would the damages be from only achieving the 70% electricity RPS goal? The 80% GHG GWRA goal? What are the consequences of NOT switching to a zero carbon economy?

Recommendation: Acknowledge denial and political compromise.

We are facing an enormous challenge that people would rather not think about. The EMP can't change the urge in people to deny and avoid, but it can put it on the table and shine light on it. As planners, it is our obligation to help overcome the mental barriers to problem solving. Some suggestions to help the EMP accomplish this.

- Reference and direct people to the book, "Don't Even Think About It: Why Our Brains are Wired to Ignore Climate Change" http://www.climateconviction.org/
- Don't turn away from looking at worst case scenarios. We need our eyes open. I quote James Box, climate scientist: "**We're on a trajectory to an unmanageable heating scenario, and we need to get off it.** We're fucked at a certain point, right? It just becomes unmanageable. The climate dragon is being poked, and eventually the dragon becomes pissed off enough to trash the place."[3]
- Reference "The Awful Truth About Climate Change no one wants to admit"[4] in which David Roberts invites us to contemplate the range of climate modeling scenarios and lets it sink in that politicians are basing our action on the most optimistic of these scenarios.

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[3] Source: http://www.salon.com/2014/08/06/climate_scientist_drops_the_f_bomb_after_startling_arctic_discovery/

[4] http://www.vox.com/2015/5/15/8612113/truth-climate-change

As any planner or engineer knows, you don't design for the best case, you design for the worst case.

Recommendation: Use a Nuclear Parable to Justify Talking About Worst Case Scenario.

As planners, it is our duty to include worst case scenarios. For the record, I include a study comparing Fukushima and Onagawa. We've all heard about what happened at Fukushima. A 9.0 earthquake off the coast of Japan unleashed a massive tsunami which took out the generator of the Fukushima nuclear power plant, resulting in a meltdown. What most of us haven't heard about is the nuclear power plant at Onagawa. Here is a report that compares the two power plants. http://www-bcf.usc.edu/~meshkati/Onagawa%20NPS-%20Final%2003-10-13.pdf

The key takeaway is this: The **Onagawa plant was closer to the epicenter of the earthquake**, and **hit with a higher tsunami** (47 foot vs. 43 foot for Fukushima). You haven't heard about Onagawa, because **there was no meltdown**. There was no meltdown, because the plant designers took the threat of a mega tsunami seriously and let the threat inform their design. They imagined the tsunami before it occurred, and took measures to protect their generator and other key equipment from the threat.

This is what we need to do with climate change.

I mention the Fukushima/Onagawa story for two reasons - one to point out that a nuclear power plant can withstand a 9.0 earthquake and a 47 foot tsunami. This will come up later. Two, to point out that a people that take a threat seriously are better prepared to deal with it when it occurs. The EMP must at the very least include a plan for the worst case scenario so that the citizens of this great state have an idea of how to prepare to deal with it.

It may not be politically feasible yet to adequately tackle Climate Change, but that's not the EMP's concern. The EMP's job is to supply clear and accurate information. The citizen's job is to make the right choices, to change their own behavior and to demand change from all the institutions and organizations of which they are a part.

Lead by putting everything on the table and asking key questions.

As written, the EMP has an abundance of information and some important reality checks. Put these in a user friendly frame, expand on them, shine a light on the conflicts, and you will have an ideal document for guiding the citizens of New Jersey through the decision making process. Key issues to highlight include:

Recommendation: Put the Timeline on the table

How much time do we have? Is 2050 soon enough? Is 2021 soon enough? The EMP Says, "The Christie Administration recognizes that New Jersey must take a far longer view than ten years in order to pour the energy foundation for a clean and secure energy future for decades to come."

Do we have "decades"? Do we have longer than 10 years? Per the PCAP, aren't we already in overtime?

Why ask the citizens to reconsider the timeline? Each person in the State needs to own this problem. It is not the job of the government to impose a doctrine but to execute the will of the citizens. This is a big decision, and we need every citizen to realize they need to make a choice.

Recommendation: Put the "Zero Carbon" question on the table

As noted above, the "80% by 2050" goal is inadequate, and the New Jersey "RPS of 70% electricity only" is even less adequate. Unfortunately, that's as far as our legislated targets go.

The EMP is a planning document, however, and has the flexibility to include examples, scenarios, tables and all kinds of useful information to provide insight to the legislated target. It is within its scope to provide information that enables the People of New Jersey to ask, "is keeping with the legislated target good enough for us? Is a world in which we (perhaps, it's not guaranteed) "avoid truly catastrophic climate change" good enough for us? Or do we want the option of considering a more ambitious scenario in which we actually stop and reverse climate change, and maintain our climate in the comfortable zone which we are presently accustomed to, if at all possible?"

That scenario is a net zero carbon scenario, maybe even a net negative carbon scenario. The option is omitted from the 2011 EMP but it must be included in the next version, even if only as a thought experiment.

If you don't include it, you're accountable to the people of this State for misleading them into thinking we didn't need to do anything. If you do include it, you have done your job, and it's on the citizens to decide if they want to heed the warning.

Most citizens of this great State aren't aware of just how serious the threat is. Those who are aware may not realize how much of a compromise "80% by 2050" is. The EMP needs to be responsible and explicitly make this information known.

We have faith that the people of New Jersey are capable of making tough decisions, if adequately informed.

Recommendation: Put Renewable Energy + Nuclear on the table

The EMP appears conflicted about both nuclear energy and renewable energy. This needs to be worked through in public.

The conflict with nuclear is seen in the first sentence of the Executive Summary which says, "there are no easy options in confronting our dependence on oil, nuclear power, and the mining of coal." This implies that our state goal is to be independent of nuclear power. Yet, every time the Global Warming Response Act (GWRA) is mentioned, it is followed with: "Unless the State pursues additional, in-state nuclear generation, a carbon-free generation resource, the current greenhouse gas reduction goals will be unattainable."

Are we trying to get rid of nuclear, or should we be building more? The EMP seems conflicted.

The conflict with renewables is woven throughout the EMP in the form of assertions that renewable energy is insufficient to solve our problem. Indeed the EMP suggests that even the modest "70% of electricity only" RPS target is not achievable by 100% renewable energy resources. It says this in the Executive summary and repeats it on page 76 and 77 with, "The Administration aspires to fulfill 70% of the State's electric needs from "clean" energy sources by 2050. This is achievable if the definition of clean energy is broadened beyond renewables to include nuclear, natural gas, and hydroelectric facilities."

This is a considerable conflict. The EMP as written implies that we need to develop more nuclear power plants or we will be unable to meet even our modest RPS goals. And yet the EMP doesn't have a roadmap for how many nuclear plants are required or where they might go. Neither does it support its assertion that a 100% renewable solution is inadequate. More detailed recommendations for clarifying zero carbon scenarios are in the "Road Map" section further below.

Recommendation: Put New Jersey's 50% Nuclear Secret on the Table

When we came across the above quote about changing the definition of clean energy to fulfill the 70% goal, alarm bells went off. It feels as if the reason that paragraph was inserted is to set things up to cheat - to simply switch the definition at a later date to achieve the RPS goal and avoid some legal penalty without making a real effort to meet the Renewable energy goals.

How would a definition change be cheating?

New Jersey currently gets about 50% of its electricity from nuclear power. If the RPS goal is 70% by 2050, and we are at 50% today, we are already 71.4% of the way to the 2050 RPS goal, 35 years ahead of schedule! We have 70%-50% =20% RPS to achieve to make the full 2050 goal. The 2021 RPS goal is 22.5% renewables - and if we can achieve that, we will have exceeded the 2050 RPS goal by 2021.

We will not stand by and watch nuclear energy be ignored until it's convenient to change the definition to meet a legal requirement. Our recommendation is to make it clear up front, in the executive summary and in every discussion of the RPS goals, that New Jersey is already getting over 50% of its electricity from carbon free nuclear energy, and that the RPS goal of 22.5% would take this up to 72.5% - blowing past the 2050 goal. The RPS goal of 70% would take things up to 120% and that gets us over the electricity barrier, and penetrating the rest of the energy. We can now talk about electrifying transport, heat and cooking and forging ahead to the 80% GWRA goal and beyond.

In other words, we recommend the EMP use the nuclear power as a booster to the RPS targets pushing them onward to meet the GWRA targets, not as a way to wiggle out of the RPS targets.

Recommendation: Put the need for a "Class 3: Nuclear" Category on the table

Rather than changing definitions, we need to add a new class of energy. Page 46-47 of the EMP defines Class 1 and Class 2 renewables. It doesn't make sense to add nuclear into either category. Nuclear is in a league of its own. Renewables proponents will not want to include nuclear in their category, anyway.

When nuclear gets its own classification, people can more effectively organize around it. Just as we have ZRECs (Zero Emission Renewable Energy Credits) now, we can start having ZNECs. Modeled after ZRECs we can set up Zero Emission Nuclear Energy Credit (ZNECs). These can add to consumer choice of energy supply and educate and uncover grassroots support for nuclear. Once the advantages and disadvantages of various energy choices are known, there may be more support for nuclear.

Creating "Class 3: Nuclear" will also bring up the distinction between "Net Zero Carbon" and "100% Renewables" and encourage public reflection on what our real goal is. Do we want renewables for their own sake, or is our goal "Net Zero Carbon" for the climate's sake? And what is the optimal way to achieve our goals?

Recommendation: Put Electrification on the table

Electrification of transport, heating, cooking and industry are curiously missing from the EMP, although you hint at it on page 77 by noting that there is energy use beyond electricity:

> "It is also important to note that, even if the State had a 100% renewable energy portfolio in 2050, additional GHG reductions in other sectors (transportation, highly warming gases, etc.) would be required to meet the Global Warming Response Act's (GWRA) 2050 GHG limit of 80% below 2006 levels by 2050. If the definition of clean energy is expanded to include carbon-emitting sources like natural gas, there will be a need for other GHG reduction strategies."

The best way to reduce GHG in those other sectors would be to electrify them. The EMP needs to point this out, and explain the advantages and disadvantages. According to this study in the Journal "Energy And Environmental Science"[5] switching to electricity for transport introduces substantial efficiencies. Is this true? If it is, make it clear in the EMP. Let citizens know the options and implications.

Per the study, "Conversion would reduce each state's end-use power demand by a mean of ~39.3% with ~82.4% of this due to the efficiency of electrification and the rest due to end-use energy efficiency improvements." Of course, if the electricity is generated from burning fossil fuels, that benefit disappears. In any case, the visual to illustrate this idea, which should be included in the EMP is:
http://pubs.rsc.org/services/images/RSCpubs.ePlatform.Service.FreeContent.ImageService.svc/ImageService/image/GA?id=C5EE01283J

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[5] http://pubs.rsc.org/en/Content/ArticleLanding/2015/EE/C5EE01283J#!divAbstract

The information from the above study drives The Solutions Project http://thesolutionsproject.org - an organization that has come up with a roadmap for a 100% renewable energy plan (Wind, Water, Solar) for each of the 50 States. In their plan for New Jersey, the calculated demand reduction from conversion to all electricity is 43%. http://thesolutionsproject.org/infographic/#nj

If by simply electrifying demand (and adding a few efficiencies) we will reduce energy demand by 43%, the question is, why doesn't the EMP have a clear roadmap for electrification of the state? Please supply one. Information would include:

- **Gas heating > Electric:** How many homes run on natural gas heating and what would it cost to switch to electric? Per household? Is there a transition plan?

- **What about geothermal?** With regard to home heating, on page 128 you say that geothermal heating is the most efficient of all types. You describe a 4000-home geothermal heat pump retrofit project in Fort Polk, LA which reduced electricity consumption in that city by 1/3. You did not include the cost of this project. That information would be valuable in the EMP, especially side by side with other options.

- **Electrifying Transport:** On pp. 133 the EMP discusses electric vehicles, mostly to point out the difficulty of adopting more of them. It would be more useful if you spelled out the steps required to electrify, and gave an estimate of the cost and challenges of each step so that we would have a clearer idea of what is involved.

- **Ten Year Electrification Plan:** Add all these parts up and create a scenario for a 10 year electrification plan. How would we switch most home heating in NJ to geothermal or electric, and to install enough electric charging stations to make electric driving feasible.

The EMP's job isn't to say how realistic all of this is, but to simply put down a back of the envelope road map that gives the main steps required, and rough costs. It is up to the citizens of NJ to decide if averting climate catastrophe is worth it. The point is, they need to at least have an idea of what it would take to make the big electrification switch.

A bonus of this exercise is that, when you put things in terms of what each household needs to do to switch to an electric world, it becomes more compelling for the individual to pay attention. This is their play. The EMP needs to be able to support citizens in making some major changes to their homes and modes of transport. We can't put this off until after 2050. We need to start figuring this out now. It could also be fun to think about upgrading your home and your ride, and all the activity involved can be an economic stimulus for the state.

Of course, it would not make sense to electrify everything if we don't have enough zero carbon electricity to power the change. That brings us to the Road Map to zero carbon energy supply.

Include a Road Map to Zero Carbon Energy Supply with Both Renewable and Nuclear Scenarios

Executing a zero carbon plan is difficult, but writing a scenario on paper is not. The EMP is the perfect place to clarify the options to get to zero carbon, with math and maps. Even if the political will is not there at this moment to execute the scenarios, we should at least have a ball park perspective of what the scenario would involve. You can add a disclaimer that makes it clear the scenarios are included for perspective.

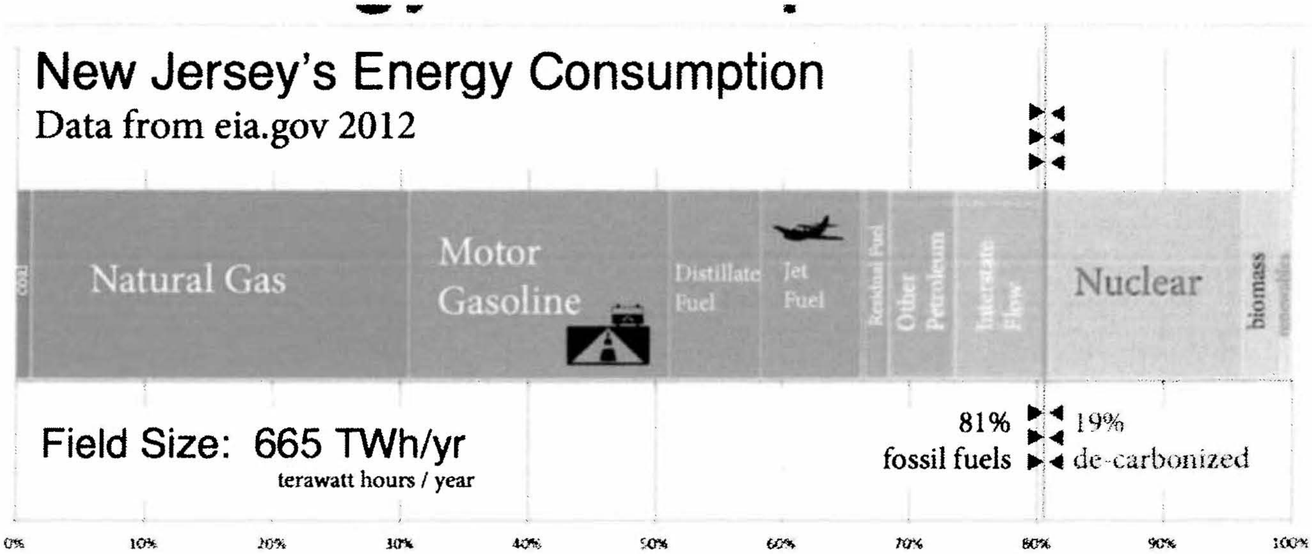
The work has partially been done. The Solutions Project has put out a rough plan for a 100% renewable New Jersey which is available on their website. However, their plan expresses things as a percent and thus lulls people into thinking there is a simple plan to follow. The EMP can flesh out this plan to clarify for the people of New Jersey what it would take on the ground to make it happen, and what their State would look like, physically, as a result.

Step 1: Baseline

Start with the baseline. Where are we now, and what do we have to do to get to zero?

Our recommendation is to unfold the scenarios with "Energy Supply Field Worksheets" that people can follow along and see the math - and how the numbers connect to a map of New Jersey, and the impact on the ground of the decisions.

We started with an infographic that shows our State's current energy consumption by energy type, arranged in an "Energy Supply Field" - like a football field.
http://fp2w.org/assets/infographic/NJ-Energy2012.jpg



The portion of energy that comes from each energy supply is placed on the field with zero carbon sources (nuclear, biomass, renewables) on one side of the carbon line, and fossil fuels on the other. As you can see, New Jersey is 19% fossil free overall, possibly more, as some of the interstate flow of electricity is renewable. As you recall, the GWRA goal is 80% GHG free by 2050, so it looks like we're 1/4 of the way there. Could we go all the way? To get to the Net Zero End Zone, we have 81% of the field to move down.

With the data laid out this way, the average citizen can get a better idea of the road ahead of us. We can think in terms of a football field and getting to the end zone, and we can appreciate the different "plays" that will be required at different parts of the field.

For example, "Motor Gasoline" is 20% of the field. The "play" there is "electrify transport and supply additional clean electricity to power the electrified fleet". Supplemental plays are "stop driving, telecommute" and so forth. Natural gas is about 30% of the field. Some of the natural gas is for power plants and the rest for heating buildings. The game to play there is "switch to geothermal and electric heating, and supply additional clean gas electricity to power those electric heaters". The problem here is that natural gas is used as the backup power for Wind and Solar, so a pure wind and solar game won't get rid of the natural gas. Jet Fuel is about 8% of the field and the game to beat there is air travel. You could reduce flying (substitute conference calls, take a train), you could increase efficiency of airplanes or promote innovation to non fossil fuel. It's hard to electrify flight. Sequestering carbon may be your only option there. Field by field, play by play, you work your way down to the end zone.

Disclaimer and Note on "665TWh"

We made this infographic last year, using data from the EIA: http://www.eia.gov/state/print.cfm?sid=NJ However, the EIA gives the data in British Thermal Units (btu). Total consumption in NJ in 2012 was given as 2,270 billion btu (it has increased since then). In any case, for our 2012 infographic, we converted btu to TWh/yr using 3,412 btu/kwh to get 665 TWh.

It turns out this conversion factor does not paint a clear picture of the energy required. The 3,412 btu/kwh is a thermal conversion factor for electricity consumed by the end user. Page 6 of the EIA "State Energy Data System 2013 Consumption Technical Notes" http://www.eia.gov/state/seds/sep_use/notes/use_technotes.pdf discusses how much primary energy is consumed to produce point-of-use energy:

> In 2013 the electric power sector consumed 38.4 quadrillion Btu of primary energy in order to provide 12.7 quadrillion Btu of electricity for sale. These data indicate that 67% of the primary (embodied) energy in the fuels consumed to generate the electricity was used (or "lost") in converting the primary energy to electricity and transmitting and distributing the electricity to the consumers, and 33% was used as site (point-of-use) electricity by consumers.

What this seems to mean is that in order to show electricity in btu, the EIA considers the 3,412 btu/kwh to be end use, and only 33% of the primary power of the electricity - so it uses a conversion factor closer to 10,400 btu/kwh to indicate how much fossil equivalent the electric source is supplying. This checks out with the nuclear power. The EIA credits 348.8trillion btu from nuclear power plants. If we use the 3412 btu/kwh number, that gives us 102 TWh of nuclear power in a year, which if we divide by 365 days per year, 24 hours per day gives us 11.6GW capacity. However, we know that there are only 4 power plants in New Jersey with a combined capacity of only 4GW - so it can't be 11.6. However, 4/11.6 is 34%.

Recommendation: Make Information available in terms of kWh not btu

The EIA has its reasons for using btu. We recommend processing the numbers to convert everything to kWh for energy, GW, MW for power. Why? To put everything in human terms, make it easier to compare things, and orient everything to electricity consumption. This is part of the effort to make energy math more transparent. This choice should be made, and explained in the EMP.

As David MacKay says in a book that every energy person should read - "Sustainable Energy, Without the Hot Air" http://www.withouthotair.com/c2/page_24.shtml

> "Nobody but a specialist has a feeling for what "a barrel of oil" or "a million BTUs" means in human terms. In this book, we'll express everything in a single set of personal units that everyone can relate to. The unit of energy I have chosen is the kilowatt-hour (kWh). This quantity is called "one unit" on electricity bills, and it costs a domestic user about 10p in the UK in 2008. As we'll see, most individual daily choices involve amounts of energy equal to small numbers of kilowatt-hours."

Moving up from individual level to power plant level calculations, we start to encounter megawatts (MW) and Gigawatts (GW). A wind turbine will be rated at 5MW capacity. A nuclear power plant will be about 1000MW, which is 1GW. Now we can more easily compare the two. Using watts, It is simple here to see that you would need 1000/5=200 wind turbines to have the same capacity as one nuclear power plant. And then someone could point out that the wind turbine has a 40% capacity factor, compared to the nuclear 90%, so you would need closer to 500 wind turbines. Pretty easy math to do once you get the hang of it.

Also, a household or a community can more easily see how much energy they use, and what percent of that wind turbine covers their needs every year.[6]

The "kWh/day" helps translate energy use to the personal level. The GW or MW tell us how much power our power plants have. TWh/yr tell us how much we have used as a State in the year - how everything adds up to the whole State.

Unfortunately, in quickly converting from the 2,270 trillion btu to TWh using the standard btu conversion rate of 3412 btu/kwh may have led to an inflated picture of New Jersey's energy use. Is 665 TWh a reasonable estimate? Should we take 33% or 226TWh? What about electric power inefficiencies? Make it 66% or 452 TWh? Is this "66% of the btu number" what Mark Jacobson

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[6] If the average American's share of our country's energy use is 200kwh/day - divided by 24 makes this an 8.3kW person. The 5MW turbine at 40% capacity is 40% x 5MW = 2MW or 2000kW - equivalent to 240 of those 8.3kW people's energy use.

et al meant in their 100% renewable energy study, when they said, "Conversion would reduce each state's end-use power demand by a mean of ~39.3% with ~82.4% of this due to the efficiency of electrification."

We ask the EMP clear up these questions. For the rest of this exercise, we will go with the 226 TWh number. The task for the EMP is to come up with the right number that reflects NJ energy use in TWh.

Recommendation: Convert energy into "energy infrastructure" units

Simply choosing the right units to express energy use isn't the point. Keep in mind why we are doing this in the first place. What we really want to illuminate is how much energy infrastructure we need to supply the energy. Everything is a number, until its a big thing in your back yard. And then it's much more than a number.

Our objective here is to help citizens convert these energy numbers into information about how their lives will be different. Energy infrastructure has a big impact on the ground. Making a transition to different energy will have a profound impact. Keep this objective in mind as you read through the math that follows.

Step 2: Show Two Paths to Decarbonizing Energy Supply

In the drive to be a net zero carbon state, we would decarbonize our entire energy supply, while electrifying consumption. The goal would be for electrification to be complete by the time all the power plants come online. Whatever can't be electrified and decarbonized will have to be offset with some type of carbon capture.

As noted in our discussion of TWh above, New Jersey would need 226TWh or 452 TWh of energy. That is 25GW or 50GW 100% Capacity. Now we just have to calculate how many power plants and support infrastructure we need to supply that energy. This varies depending on the capacity factor of each plant and the additional energy infrastructure required to ensure smooth operation of each supply. The EMP needs to clarify what it will take to supply that energy via:

Scenario 1: 100% Renewable Energy

Per the Solutions Project[7] for New Jersey, the energy breakdown is as follows:

- 3.5% Residential rooftop PV (solar)
- 2.8% Government/commercial rooftop PV
- 27.3% Solar PV plants
- 10% Onshore wind
- 55.5% Offshore wind
- The remaining 0.9% wave, tidal and geothermal.

[7] http://thesolutionsproject.org/infographic/#nj

The task for the EMP is to process this breakdown with math and maps. Translate these percents into power plants. Some of this work is already scattered throughout the EMP. We ask that you pull it all together in reference to a 100% Renewable scenario.

To illustrate what we mean, consider our back of the envelope analysis below. These are based on the 226TWh number:

3.5% Residential Rooftop PV: 3.5% x 226=7.91 TWh/yr. How many residences would need to add PV to their rooftops to supply this energy? Are we on track? Can we get this done within the decade? Let's incentivize this! 3.6 Million housing units - how many can use solar, geothermal? How many down, how many to go? What incentive programs are in place? How can people connect with them? This kind of information should be in the EMP.

2.8% Government/commercial rooftop PV: Ditto. How far along are we in covering this source? The EMP should help us track this progress.

27.3% Solar PV: The Solutions project calls for 27.3% of the energy to be from Solar PV plants. How much space would this take up, and how much would it cost? Here's our calculation:

27.3% x 226TWh=61.7TWh. Divide TWh by 365 days/yr and 24hr/day = 7GW capacity - at 100%. Of course, actual capacity is a fraction of nameplate capacity so you could multiply by the capacity factor, or you could go based on experience. How much energy does a typical PV park produce? In the case of Solar PV, the numbers range from 5w/m2 (in cloudier, northern states) to 10w/m2 (in sunny southern states).

PV Data from NREL: http://www.energymanagertoday.com/it-takes-2-8-acres-of-land-to-generate-1gwh-of-solar-energy-per-year-says-nrel-094185/

We would expect the EMP would produce numbers specific to NJ. If the solar PV park operates at 10w/m2, we'll need 700 million square meters, or 700 square kilometers for those 7GW. If 5w/m2, 1,400 square kilometers.

New Jersey is 22,608 km2, so this translates to 3-6% of the state, covered in solar PV parks.

3 to 6% doesn't sound like a lot, but it is about the size of Somerset County on the low end, and Sussex County on the high end. The entire county. Covered in solar panels. https://en.wikipedia.org/wiki/List_of_counties_in_New_Jersey

Recommendation: Show People Where the PV Parks Would Likely Go

We wouldn't put all the solar PV parks in one county. We would spread them out throughout the State. The EMP needs to include a suggested map of ideal locations for solar parks to meet this 27.3% need. The people in each of the affected areas need to know what to expect, to either demand it or seek alternatives. Citizens need to be able to see what is coming to inform their discussion. The EMP should try to make the visualization as real as possible. Work with Google maps to create an app that overlays images of the solar panels in each county and allows people to have a street view of the hypothetical PV parks.

And that's just 27.3% of our energy needs with the Solar PV Parks. On to wind.

Onshore Wind: The Solutions Project calls for 10% of our energy to come from wind. How many turbines would that be, and where would they go?

How many turbines on land: 10% x 226TWH/(365d/yr*24h/d)=2.6GW divide by 40% capacity - you need 6.5GW capacity. If you use 2MW turbines on land, that's 3,250 turbines. Use 5MW turbines and it's 2160. What turbines would we use in New Jersey?

Recommendation: Show People Where the Onshore Wind Turbines Would Likely Go

The EMP should show us the most likely choices of wind turbine size, and where we would put them. Don't just tell us how many there would be, tell us where they would most likely go and if there are any zoning issues around each one. This should be mapped out and available for discussion. How much space would the turbines take? The authors of the Solutions Project say the "footprint" of a wind farm is only the area where the turbine touches the ground. Regional planners, however, zone open space around the turbines to make room for the "runaway turbine" hazard. If you include the zoning, Per David MacKay, onshore wind produces at 2.5w/m2 so 6.5GW requires 2.6billion square meters, which is 2,600km2 which is 11% of the state of New Jersey, covered with wind turbines.

Does that sound right? Are we too high? Too low? Check our math. And produce a map showing the best places in the state to place these turbines and additional support infrastructure so that the citizens get a clear sense of where this will all be.

As with the Solar PV plants, include a digital overlay and street view via Google maps so that people can really SEE what their decision is.

Offshore Wind: The Solutions Project calls for 55.5% of our energy to come from wind. How many turbines would that be, and where would they go?

55.5%x 226TWh/(365d/yr*24h/d)=14GW now divide that by offshore wind's 40% capacity - you need 36GW capacity. Offshore wind turbines are 5MW, so 36GW/5MW= 7,200 turbines. The NJ coast is 130 miles long, so that comes to 55 turbines per mile, ALONG THE ENTIRE COAST of NJ. Is that reasonable? It seems to be. Mark Jacobson's plan is to have 144,000 wind turbines off the entire east coast. http://www.capewind.org/article/2012/09/15/889-power-east-coast-wind-doable-144000-offshore-turbines-study-says The length of the general coastline is 2,069 miles. 144,000/2069= ~70 turbines per mile.

Recommendation: Show Where the Additional Energy Infrastructure Would Go

We notice that on page 76 of the EMP the difficulty of providing this much energy with wind is discussed. The EMP states, "For example, to realize the required 25,000 megawatts (MW) of wind capacity by 2050, 5000 wind turbines of 5MW each, would need to be installed at a rate of at least two per week between now and 2050. This aggressive installation schedule does not begin to take into account other challenges which accompany renewables - intermittency, reliability, higher costs, and slow market penetration of new technologies."

Note that you say 5000 turbines are needed for 25,000MW (which is 25GW), so you present the wind at a 100% capacity and say, "that doesn't begin to take into account other challenges [like] intermittency." To account for the other challenges, explain that you would have to overbuild based on capacity factor, hence the need for 12,000 turbines, not 5000, and also the cost estimate for storage, and grid upgrade.

Give folks a ball park estimate of the materials required, where they would go and how much it would cost, otherwise they think it's easy and you are just being resistant. Math and maps.

Recommendation: Combine all the Maps for a 100% Renewable Overlay

At the end of this exercise, present the full map, showing the best locations for all of the energy infrastructure required for a 100% renewable solution. Show on the map where you would deploy the solar PV parks. Would it be one large county? Would they be broken up into bits and placed throughout the state? Where are the best areas for the onshore wind turbines? How near or far from the shore would the 55 turbines per mile up and down the entire coast be? What additional infrastructure is required to make it all work? Include various storage solutions and additional power lines required to move the energy around the state.

Use an overlay with Google maps to give people a realistic sense of where everything would be, based on where engineers seem to think is the best place to put these various items. Combine with augmented reality visualization so that a person could walk through the state and see the impending infrastructure while wearing Google glasses or the equivalent.

Include a line item budget with rough costs to give a ballpark sense of what each component of this solution would cost. Include estimates for money saved from health costs and jobs created.

Compare that side by side with the cost of climate change. How does it compare?

And finally, for those in the State who are not excited about the idea of all this energy clutter - make sure to include a nuclear alternative for comparison. The nuclear alternative will either win folks over to an appreciation of nuclear, or provide a threat to move action on the renewables (change - or else nuclear!)

Scenario 2: Going Nuclear

Recommendation: Address misconceptions about Nuclear in the EMP

The EMP has a responsibility to put nuclear power in Perspective. There is a lot of misinformation in circulation about nuclear. Most people get their view of it from Helen Caldicott and she is wildly misinformed. http://www.monbiot.com/2011/04/04/evidence-meltdown/ Include this information in the EMP. Additional information on nuclear is available here: http://fp2w.org/index.php/blog/article/nuclear-energy-information-to-inform-discussion

Half the time the EMP mentions nuclear, it is to say, "we can't meet the GWRA without it." If that is true, then it is very important that the EMP clear up the misconceptions about nuclear, and set the stage for public conversations about nuclear. To help with public conversations, please note we are promoting Renewable + Nuclear Living Room Conversations. It may be useful to have some of the EMP team participate in the conversation, as I imagine the authors are conflicted about the role of Nuclear. http://fp2w.org/index.php/blog/article/renewables-nuclear-conversation-its-time-to-talk #ReNuLRC

We notice on page 84 of the EMP it says, "Vexing economic, safety, and environmental questions have to be answered before the State can embark on or abandon the path of developing the next generation of nuclear power plants."

The job of the EMP is to answer these questions.

This is great word choice. "Vex" means "make (someone) feel annoyed, frustrated, or worried, esp. with trivial matters". If you ask questions about nuclear while trying to figure out how to manage it, you soon start to see that it is actually one of the safest, most environmentally benign and economically stable energy choices we have. Most people make assertions to the contrary on the flimsiest of evidence, to simply hold nuclear back. In the face of climate change, we can't afford such trivial issues preventing our use of such an important asset. Get to the bottom of this in the EMP. Put the facts before the citizens. Make it clear to them that the vexing questions have been answered and it is more a matter of taste than public safety.

Stand up for science, or at the very least, systematically place the actual information about risk from nuclear side by side with the information for the 100% renewables and for inaction on climate change (In the TRC Table?). Let the scales of science show the true measure of each choice.

In the opening sentence of the Executive Summary, you lump nuclear in with fossil fuels - don't do that. Later in the same paragraph you sandwich "the release of radiation at the stricken Fukushima Daiichi nuclear plants" between the deadly Macondo explosion and the loss of life at the Big Branch Coal Mine. This makes the danger of nuclear seem on par with coal and oil. It is not. If you are going to leave that as written, then add a paragraph noting that there has been no loss of life related to the Fukushima nuclear accident, nor is any expected! For the record, I am submitting the UNSCEAR report of the Fukushima Accident.
http://www.unscear.org/docs/Factsheet_E_V1406112_ebook.pdf

> "The UNSCEAR is a committee of scientists on the effects of atomic radiation. It is similar to the UN IPCC - the panel on climate change. If we're going to rely on a body of scientists (IPCC) to tell us that climate change is happening, we should rely on a similarly chosen body of scientists to evaluate the impact of a nuclear power accident. Their findings from Fukushima:
>
> - Cancer rates to remain stable
> - Theoretical increased risk of thyroid cancer among most exposed children

- No impact on birth defects/hereditary effects
- No discernible increase in cancer rates for workers
- Temporary impact on wildlife"

Nuclear Energy needs exoneration. If it were to challenge any energy supply to a "habeas corpse off" it would win handily. The bodies of the sick and injured will pile much higher with any other energy source for the amount of energy produced, even taking into account Chernobyl and Fukushima.

Deaths Per TWH - from http://nextbigfuture.com/2011/03/deaths-per-twh-by-energy-source.html

- 100: Coal (elect, heat,cook –world avg) (26% of world energy, 50% of electricity)
- 60: Coal electricity – world avg (26% of world energy, 50% of electricity)
- 170: Coal (elect,heat,cook)– China
- 90: Coal electricity- China
- 15: Coal – USA
- 36: Oil (36% of world energy)
- 4: Natural Gas (21% of world energy)
- 12: Biofuel/Biomass
- 12: Peat
- 0.44: Solar (rooftop) (0.2% of world energy for all solar)
- 0.15: Wind (1.6% of world energy)
- 0.10: Hydro (Europe death rate, 2.2% of world energy)
- 1.4: Hydro - world including Banqiao (about 2500 TWh/yr and 171,000 Banqiao dead)
- 0.04: Nuclear (5.9% of world energy)

Useful infographics and video to help people overcome their fear of radiation.

- Include xkcd's radiation chart in the EMP: http://xkcd.com/radiation/
- Invite everyone to watch Veritasium's video "the most radioactive place on earth". https://www.youtube.com/watch?v=TRL7o2kPqw0

Recommendation: Show People Where the New Nuclear Power Plants Would Go

In the end, we would rather have a combination of nuclear and renewables for a balanced zero carbon portfolio. The purpose of of a 100% nuclear exercise is to compare the quantities of nuclear power required to do the same job as a 100% renewable solution.

Using the same math as above, we need 25GW of energy for our 226TWh. At present, four power plants give us 4GW, so we need an additional 21 nuclear power plants. Is this right? Check the math. As noted above, we aren't sure of the TWh for an electrified NJ.

Where would we put an additional 21 power plants? The EMP should at least offer suggestions of where the most likely places are to host power plants. Let the citizens know, just as the EMP should let citizens know the most likely location for the wind turbines and solar farms based on engineering considerations. Clarify how much land area would be taken up by the power plants -

if you can cluster them. And add all this information to the TRC table, side by side with the 100% renewable solution, and the cost of inaction.

Assuming $10Bn per plant, that's $210Bn to get us to zero carbon. (Plus the electrification transition - but that would have been same for the 100% renewable solution.) How fast can we build 21 nuclear power plants? Can we get them up within a decade without disruption to most people's lives? Add it to the EMP.

In Sum: User Friendly Information on the Table, with a Ticking Clock

The point is to get useful information on the table so that we see what is associated with each energy path, and so that citizens can have informed conversations with each other about what their true preferences are. Personally, I am overwhelmed by how much energy clutter is required for the 100% Renewable solution. But I am still not clear how much nuclear is required, or what the optimal mix would be. I look forward to clarification by the EMP, delivered with the appropriate sense of urgency.

Final Recommendation: Discuss Lifestyle Change:

The EMP should also include a discussion of lifestyle change. It is easy to focus on technology but a more interesting question is: How can we transform our economy to be one where we don't need to run around producing stuff constantly in order to justify a paycheck? What is the most rational way to have an economy that supplies everyone with the best in quality of life, without excess waste? What has to change to make this happen? What is the carbon footprint of rentseeking behavior? What impact would a Universal Basic Income have on the unnecessary hustle? http://theweek.com/article/index/267720/america-is-running-out-of-jobs-its-time-for-a-universal-basic-income

The EMP doesn't need to endorse any of this, but it should note the emerging trends of rethinking the economy and create a space to discuss it in the context of its energy footprint.

In closing, we quote Steve Jobs

The EMP has the potential to have a significant impact on reversing climate change. Use the platform to its fullest capacity to inform the Citizens of New Jersey about what their options are. The EMP can be sober, and at the same time, contain a "Declaration of Carbon Independence." Push the boundaries. Let this dry planning document rise up and be all it can be so that New Jersey can be an amazing post carbon State. You have the power. Steve Jobs would agree:

https://www.youtube.com/watch?v=UvEiSa6_EPA
Transcript: "When you grow up, you tend to get told the world is the way that it is, and your life is just to live your life inside the world and try not to bash into the walls too much. But that's a very limited life. Life can be much broader once you discover one simple fact. And that is that everything around you that you call life, was made up by people that are no smarter than you. And you can change it. You can influence it. You can build your own things that other people can use. To shake off this erroneous notion that life is just there, and you're just gonna live in it,

versus embrace it. Change it, improve it. Make your mark upon it. And once you learn that, you'll never be the same again."

Thank you for the opportunity to comment on the New Jersey Energy Master Plan. If you have any questions about these comments, don't hesitate to contact us at Footprint to Wings. We look forward to continuing the conversation. Rezwan@fp2w.org

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August 24, 2015

EMP Update
Board Secretary
PO Box 44 S. Clinton Ave
Trenton, NJ 08625

Re: **Comments on Energy Master Plan**

Dear President Mroz and Commissioners of the New Jersey Board of Public Utilities:

We appreciate the opportunity to comment on the Energy Master Plan. Our comments are centered on New Jersey's largest renewable energy resource: Offshore Wind.

The 2011 Energy Master Plan followed Governor Christie's signing of the 2010 Offshore Wind Economic Development Act. The EMP appropriately included goals to implement offshore wind if only because this was a matter of law. This law, which calls for 1,100 MW of offshore wind by 2020, was largely enacted because the legislature, and the Governor, understood the potential economic benefits that would accrue to New Jersey as a result of implementing offshore wind[1].

There are many factors that need to be taken into account to create appropriate energy policy for the State – including cost of various generation alternatives, future natural gas prices, impact of climate change legislation, economic growth projections as well as local costs and benefits. It can be argued that energy markets have changed or perhaps that politics or support for offshore wind have changed since the 2011 EMP. It cannot, however, be argued that the law has changed regarding Offshore Wind. A revised EMP should take into account the goals of OWEDA and include a specific plan to implement regulations in conformance with the legislative directive. OWEDA provides the structure and direction required for the BPU to execute on the policy.

A sound policy for implementing Offshore Wind is as appropriate today as it ever was. With short term energy prices low and long term impacts of burning fossil fuels clear, now is the time to start on a path to responsible long term price stability. As President Kennedy said in January 1962: "The time to repair the roof is when the sun is shining". The sun is shining on us, for the moment, in the form of low energy prices from natural gas. Despite its low cost today, natural gas remains a limited resource that will eventually become scarce and expensive even possibly in the near term as the industry mobilizes to export gas to worldwide markets with more than triple our domestic cost. The 2011 EMP's goal of diverse

"The Offshore Wind Economic Development Act will provide New Jersey with an opportunity to leverage our vast resources and innovative technologies to allow businesses to engage in new and emerging sectors of the energy industry. Developing New Jersey's renewable energy resources and industry is critical to our state's manufacturing and technology future. My Administration will maintain a strong commitment to utilizing energy as industry in our efforts to make our State a home for growth, as well as a national leader in the wind power movement."

supply portfolio is particularly relevant in light of the attraction of short term gas prices[2]. Long term planning around the current abundance and low cost would be foolhardy. Offshore Wind, in contrast, is one of the few local resources that New Jersey can develop, use to provide a hedge against energy price uncertainty, and count on in perpetuity. It is one resource that creates local jobs.

The costs of Offshore Wind are declining driven by massive European programs to become energy independent. Now is the time for New Jersey to become familiar with Offshore Wind so that New Jersey is prepared to responsibly implement this technology as it becomes cost competitive with rising costs of traditional power.

The 25 MW demonstration scale project called for in OWEDA, as a precursor to implementing commercial scale projects, provides an ideal laboratory for implementing policy, evaluating its impact, validating costs and benefits, and refining the State's approach before allowing the hundreds of turbines to be erected that would satisfy the OWEDA's goal of 1,100 Megawatts of Offshore Wind.

It is common knowledge that you should walk before you run. Fishermen's Energy Atlantic City Demonstration project, already endorsed by the United States Department of Energy and fully permitted by the State of New Jersey, is the perfect low cost vehicle to test the waters on a small scale before implementing on a large scale. The BPU's experts have already determined that the project will create more benefits than costs[3]. The proposed project includes a solution to the long sought financing mechanism that would allow commercial scale projects to be financed. The proposed project, even without counting any of the benefits, would cost an average residential ratepayer less than 10 cents a month. This is a very small price to pay to attract a job creating industry to New Jersey that can hedge our energy costs for generations to come.

The EMP could explicitly integrate the lessons that can be learned from this implementing this small scale project. For instance the EMP can require a transparent third party evaluation of the payment plan mechanics - in action - to refine it to ensure that it results in the most cost effective financing for New Jersey ratepayers for subsequent projects. The EMP can also require that new projects be priced taking into account refined permitting limitations that would allow for 24-hour construction and optimized curtailment during construction – therefore reducing power prices. A precursor to integrating these lessons learned is, of course, to actually proceed with a demonstration scale project.

Lastly, New Jersey would be well served to formulate a plan in the EMP to engage with the Bureau of Ocean Energy Management. BOEM has observed the BPU's lack of progress in implementing offshore wind and has delayed leasing off the coast of New Jersey. New Jersey's interests would be optimized by increasing the number of BOEM lease areas so that more robust competition will be inspired thereby reducing proposed power prices.

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[2] 2011 EMP: "A diverse supply/demand portfolio is an effective hedge against the uncertainties and risks associated with energy production."

[3] "With documented economic benefits and a lower OREC price [i.e., 199.17], even if FACW's claimed benefits for tourism, environmental impacts, merit order effect and lessons learned are excluded, the Project provides net benefits of $33.4 million (net present value). The Project then meets the requirement to demonstrate net benefits to the State as required under the Act." [Boston Pacific, expert consultants to the New Jersey Board of Public Utilities in reviewing Fishermen's Energy OREC proposal]

In summary, we urge to BPU to include the following concepts when conceptualizing a revised EMP:

1. Include specific procedures to implement OWEDA. The 2011 EMP's goals of implementing 3,000 MW of offshore wind are secondary to concrete plans to implement OWEDA's required 1,100 MW;
2. Approve a demonstration scale project – whether configured as originally proposed, or as proposed in a newly open window, configured with proven turbines and traditional project financing;
3. Require that the demonstration scale project be used as a basis for validating or refining regulations;
4. Require lessons learned from a demonstration project be integrated into policy as a basis for implementing at a commercial scale;
5. Acknowledge that the Bureau of Ocean Energy Management leasing programs are not an impediment to implementing OWEDA.

New Jersey has the legislative foundation to lead the Offshore Wind industry, build a sustainable, local source of energy and capture a disproportionate share of the jobs. We should take advantage our lead while we can.

Sincerely,

Chris Wissemann
CEO Fishermen's Energy

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August 18, 2015

Richard S. Mroz, President
NJ Board of Public Utilities
PO Box 350
Trenton, NJ 08625-0350

RE: The NJ Municipal Shared Services Energy Authority Law (A.2385)

Dear President Mroz:

I write on behalf of New Jersey's nine municipalities that own and operate their own electric utilities as well as the only rural electric cooperative in the Garden State. All are members of the Public Power Association of New Jersey. These not-for-profit, locally-owned and controlled systems, their customers, and potentially all electric utility customers in New Jersey stand to benefit from the above captioned legislation.

A.2385 is now on the governor's desk. We respectfully ask that should the governor seek your opinion as a member of his cabinet that you voice support for bill. The creation of the Authority envisioned under A.2385 is wholly-consistent with at least three of the five goals in the 2011 NJ Energy Master Plan.

- New generation that may be built by the Authority – renewable and conventional – will drive down electric utility costs for all customers. While millions of dollars can be saved for the municipals and cooperative, all generation bid into PJM's Base Residual Auction can reduce capacity and congestion charges for all.
- It will promote a diverse portfolio of new, clean, in-state generation. And we know how to get this done. As an example, the City Vineland was named by the Solar Electric Power Association as the leader in 2011 among all US electric utilities in providing solar generated electricity to its customers. The City will add new gas-fired generation this year and will be capable of supplying its entire load of 160 mW. And the City offers among the lowest retail rates in New Jersey!
- The Authority will better position PPANJ members to take advantage of PJM's demand response, energy-efficiency, and energy conservation markets.

I have enclosed additional facts about A.2385, the Authority and its benefits. If you have any questions I would welcome the opportunity to meet with you at your convenience.

Thank you for your consideration.

Sincerely,

James A. Jablonski
Executive Director

Shoreline Energy Advisors, LLC

Shoreline Energy Advisors, LLC would like to thank the BPU for soliciting industry input relating to the New Jersey Energy Master Plan. We submit the following comments for your consideration.

General Observations:

This revision provides the opportunity to address a significant issue which has taken on greater urgency than perhaps previously recognized. That issue is the need for greater electric resiliency in the grid (generators, transformers, transmission lines, substations and distribution lines) that serve the people of New Jersey to assure their safety, prosperity and quality of life.

The potential for loss of grid power and prolonged periods of power outage have become more probable for several reasons, among these are:

1) Global warming and its effect on the severity and frequency of previously routine weather events;
2) Overloading of an aging and undersized electric distribution and transmission systems resulting in local distribution outages, transmission congestion and a dangerously continuous strain on the grid serving NJ;
3) Deferred maintenance and a generally blasé attitude from certain electric utilities on their need to upkeep and update critical transmission and distribution grid components, and;
4) The increased occasion for terrorist activities by those in conflict with the United States government. Unfortunately a prolonged outage of months resulting from this type of event is no longer beyond the realm of possibility.

Future outages will have a devastating effect on not only the economy of New Jersey but could also legitimately threaten the lives of those who reside here.

Another issue which remains is the potential for diminished air quality, which had been addressed in previous Master Plans. The retirement of aging central generating plants in New Jersey such as Oyster Creek, which serve wide pockets of New Jersey, will increase the need for western imports of generation. The replacement sources of generation will inevitably include power from coal plants in Ohio and Pennsylvania with emission profiles which are far less favorable than the generation they will be replacing. This will result in a degradation of air quality as emissions from these plants ride the prevailing winds from west to east.

Additionally, retirements of New Jersey-based generation and filling that void with out of state generation that needs to be transported into New Jersey will by definition, increase congestion on existing transmission lines serving the state, inevitably resulting in higher transmission capacity charges.

The multiple goals of improving resiliency, assuring national security, improving air quality, sustaining and growing local economies and controlling runaway electric prices are all policy objectives that can be effectively addressed with distributed generation and specifically, distributed generation designed for reiliency. We encourage to Board to take a focused and unambiguous approach in highlighting the need for resiliency in the development of its revised Energy Master Plan.

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Opportunity Costs of Current EMP Initiatives

Shoreline recognizes that the funds controlled by the Board are limited and believes that what is available should be leveraged to address deficiencies in the electric grid which arguably comprise one of the most significant threats to our economy, standard of living, energy costs and air quality.

The broadness of the current Energy Master Plan addresses many idealistic goals and policies but many of these ends should be subordinate to achieving reliable electric service. Placing objectives such as the development of innovative energy technologies on the same level of importance as resiliency, is short sighted and perhaps overly responsive to the parochial interests of manufacturers, developers and lobbyists for technologies such as fuel cells, solar photovoltaics and battery storage.

While job growth in these potentially emerging industries has been cited as a reason for supporting investment in these technologies, other states or governments already have a jump start on New Jersey in leveraging their development. Further, it would seem that we have more than enough installers to handle whatever photovoltaic growth is experienced in the future. This renders the job growth argument for funding these new technologies moot.

Indeed it might be reasonable to reconsider whether these types of economic development goals should even be part of the BPU's purview in light of the current economic constraints it faces. It could be argued that its goals with regard to electricity should be simplified to only address safe, reliable and economical service, particularly when there is such a glaring deficiency within the state with regard to resiliency and the reliability of certain utility suppliers.

What should be the Objective Function of this EMP?

If the BPU were able to focus on only the most important energy issues, its mission becomes much clearer. While it has identified resiliency as an emerging objective, the most expedient and economical way of facilitating resiliency does not include things like renewable fuel, solar PV with battery storage or fuel cells. If resiliency is the primary objective, and funds for energy initiatives are limited, the state may want to focus on simplifying the development of commercially proven technology that can facilitate the rapid development of resilient assets. Spreading limited public financial and human resources on developing technology like battery storage or fuel cells, which in many instances today are neither economical nor utilitarian, is not consistent with public interests. Indeed, many times PV, batteries and fuel cell projects are "force-fitted" to a load profile simply to qualify for preferred incentives or federal tax gimmicks, beneficial only to non-rate paying financial investors or non-regulated affiliates of subsidized electric utilities.

Natural gas fueled reciprocating engines or combustion turbines, with backup generation running on a storable liquid fuel such as diesel or propane, are the simplest, cheapest and certainly the most commercially proven alternatives available to achieve the objectives of distributed power and resiliency. In trying to simultaneously address renewable fuels and emerging technology, as well as resiliency, we divert the highest and best use of available funds. Additionally, complexity and the resulting scatter shot approach to program design and subsequent management by multiple parties such as the Board, its staff, utilities or contract managers, results in long delays in implementation and careless spending of public funding.

Although the environmental aspects of renewables and emerging technology alternatives represent desirable policy objectives, we question whether they should be accorded similar emphasis from the BPU as that given to proven technologies, particular for facilities that are deemed to be critical to the public good. Those types of facilities often have neither the technical sophistication nor human resources available to operate and maintain cutting edge, "first adopter" infrastructure in an optimal manner. In contrast, the infrastructure required for reciprocating engines, turbines and heat exchangers are commercially proven, readily available with an established network of service providers and, are readily understood and widely familiar to existing building operators.

Unique Attributes of Micro Grid Development

Micro grids consist of electric generator set(s) located at one or more of the sites of users who take power from the micro grid. They also consist of the electrical distribution infrastructure (wires, conduit, transformers, transfer switches, etc.) to distribute the electricity from the genset(s) to multiple buildings and, interconnections with the local utility's distribution system. The interconnection with the local utility allows the grid to both receive electricity from the utility system, and to export electricity from the micro grid system. In the case of a power outage, the micro grid needs to be capable of isolating itself from the utility distribution system, so that it can continue to generate electricity for the buildings served by the micro grid, without running the risk of exporting power to the utility system. Once the utility system is re-energized from its outage, the micro grid needs to be able to re-synchronize with it. The facilities served by micro gird when resiliency is a key objective are usually "critical facilities" which means the loss of their operation would cause a serious hardship on the public or on the critical population it serves.

One key distinction between a micro grid and other types of distributed or emergency generation is that it needs to be able to run for extended periods of time without the benefit of utility backup (i.e. not just the few hours or days conventional emergency generators are designed for). To assure a functional level of resiliency, some minimum amount of run time without having to rely on utility service for back up or supplemental power should be required by the program design (Connecticut's ground-breaking program requires a minimum of four weeks).

The micro grid system should be able to service the designated critical facilities on it at any time, day or night, winter or summer. This means that the micro grid needs sufficient generating capacity to supply needed electric on a hot, humid weekday afternoon in July, as well as a mild, dry Sunday morning in early October or late April. This capacity requirement is very different from what is usually encountered when considering normal on-site generation of electricity (i.e. conventional distributed generation or cogeneration). With a typical distributed generation project, the electrical generating capacity is usually sized to the "base load" as opposed to the "peak load" so that capital requirements are minimized and all distributed generation assets can run as much as possible to get maximum kilowatt hour (KWH) production from the system. The more KWH produced, the more the overall production is worth, and the faster the recovery of the capital invested in the project.

A micro grid will be different in that it will probably be sized at peak, or some function of peak, plus a safety margin often referred to by engineers as "n+1". For example while a cogeneration project sizes at baseload, a resilient micro grid might be required to size at peak load plus 20% +/-.

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The required design features of needing "excess capacity" that may not run round the clock, the extra cost involved in "interconnecting" with the utility grid and having the ability to isolate from the utility grid and to run alone, makes a functional micro grid serving critical facilities, very expensive to build.

The cost of generating electricity consists primarily of fuel cost, operations and maintenance cost, and capital recovery. When the high capital cost of a micro grid is factored into the cost of electricity, it is not surprising to find that the cost per KWH from this type of system will be higher than if the system were only designed to service base load. Additionally when comparing the cost of micro grid electric to the cost of electricity from incumbent utilities, the micro grid cost will be higher, probably much higher, unless incentive programs are designed to mitigate these inherently higher costs of micro grids serving critical facilities.

Changing Paradigms

The concept of "uninterruptible power" is not new and has been around for several decades however its application in the type of "critical" facilities that will facilitate a higher level of resiliency is a new and evolving trend. In the past, facilities like data centers that process credit card transactions, brokerage houses, etc., have used this type of generation because even a momentary lapse of electric to their computers would cost millions of dollars in lost transactions. Other facilities such as hospitals, air traffic controllers, the military and other government operations have also been willing to invest in this type of "fail safe" power in order to make sure they were never without facilities or applications that were involved with life or death situations. In the past, critical power energy users thought nothing of paying forty or fifty cents per KWH or even a dollar per KWH or more, as long as power was available when needed. This type of power was often referred to as "premium power" because of the insurance provided by the fail safe nature, and because the investment required in multiple levels of generation, switch gear, etc., justified the payment of a "premium" above that of the cost for traditional utility electricity.

Micro grids are sited locally and provide for their own distribution to the critical facilities they serve. Besides assuring critical electric service, they diminish the need for imports from out of state coal generators and in so doing, they will improve air quality and reduce congestion on T&D lines.

Even with these benefits, selling premium power to facilities in the public sector (where many critical facilities are likely to be located) is not an easy task. With ongoing budgetary constraints in the public sector, a major challenge is building a project that meets resiliency objectives, while providing electricity that is not significantly in excess of what the facility could expect to pay to their local utility or third party supplier. The expectation that the previously commonly accepted "premium" for fail safe power will decrease significantly or disappear altogether, represent a paradigm shift that makes these projects difficult to develop successfully and to subsequently sell to elected officials.

Suggested Program to Accelerate Resiliency with Micro Grids

The BPU should consider ways of lowering the cost of electric production from micro grids. This can be done with a series of programs and practices that will both lower the cost of fuel and capacity, and will enable other sources of revenue, for critical and resilient micro grid installations. Shoreline urges the Board to consider the development and implementation of an integrated program of assistance that includes:

- A grant of up to $50,000 per project (depending upon size, facilities served, etc.) to study a facility's , or collection of facilities, suitability for development of a micro grid. This study should focus on qualifying loads as critical, site characteristics, budget costs and technical and economic feasibility.
- A grant of at least $500 per KW of capacity to defray the necessary increased capital cost of developing and operating micro grids. This grant is higher when compared to current cogeneration or distributed generation assistance programs in order to recognize the increased cost of resiliency. The grant should not be limited to only distribution related assets but should include new generation if it is included as part of the project.
- Implementation of Virtual Net Metering (VNM) for electric production produced by micro grids. VNM would assign and qualify excess electric production from the micro grid going to both "affiliated accounts" (accounts which are owned and paid for by the same people served by the micro grid) and "non-affiliated" accounts (accounts owned by anyone in the service territory of the utility where the micro grid is located) as eligible for VNM treatment. If an emergency or outage situation were to occur, "supply" to these VNM non-critical loads could be curtailed and the installed generation would merely serve those loads originally identified as critical. While it is likely and reasonable to assume that the Local Distribution Company serving these loads would expect some level of compensation for lost accounts, accounting for some level of their lost capital recovery in utility tariffs, and spreading it over their entire customer base who by definition would benefit from resilient energy facilities. As with current VNM programs affecting solar photovoltaic generation, the amount of non-critical VNM KWH from micro grids should not exceed the annual volume of KWH usage at the accounts being served by the micro grid and should be reconciled at year end. VNM will allow the micro grid to absorb its capacity costs much faster than if there were no VNM, with a significant reduction in the cost per KWH of production from the micro grid, making it easier to sell to public entities.
- Establishment of a preferred firm gas distribution tariff for micro grids that allows for gas distribution charges that are at least 25% less than the distribution charges a cogeneration, fuel cell generator or interruptible gas tariff currently offers.
- Implementation of a program that requires electric utilities to achieve a gradually increasing percentage of the generation servicing customers in their territory with "resilient generation". This is analogous to the existing Renewable Portfolio Standard but it applies to resiliency as opposed to renewable fuels or generation. This resilient generation would not be owned, acquired or supplied by the utility but could be financed by them or their affiliates if they are interested in participating. The utility supplied debt should be traditional debt with interest rates low enough to encourage resiliency development. The generation would need to be located in the utilities territory. Each MWH of production from a resilient facility would create one "Electric Resiliency Credit" which would be a marketable financial instrument similar to Solar REC's. Failure of a utility to provide proof of achieving gradually increasing annual targets of resiliency in their territory would require them to purchase an Electric Resiliency Certificate from the owner of the micro grid. If as part of the program, cogenerated thermal is required to qualify for "Electric Resiliency Credits", required efficiencies, if any, should be relaxed from current 70% levels to the 40% of 50% level.
- A loosening of current regulatory requirements effecting the distribution of thermal energy to customers who may not be the facilities served by the critical and resilient electric service from the micro grid. Thermal credits from cogeneration are an important component in bringing the costs of production down however it is likely that thermal needs from a micro grid running VNM will not approach what the micro grid is capable of producing so any regulation aimed at making thermal utilization easier would be helpful to the development of these assets.

Attached to these comments as Attachment A is a worksheet that illustrates how implementation of the above-cited suggested initiatives would defray the cost of electricity produced for critical facilities from a micro grid, making them more economically attractive to likely critical facilities. It illustrates how the cost per KWH of resilient micro grid production would drop if these measures were adopted and implemented.

Re-consider Flexibility with Diesel Generation as Backup for Resilient Micro Grids

With regard to security of fuel supply, current thinking seems to infer that natural gas will always be an un-interruptible source of fuel. While this is probably a safe bet the great majority of the time, it is possible that pipeline operations could be disturbed with a wide-spread power failure in which case natural gas fueled power generation from facilities in this proposed program would not be able to meet their energy resiliency objectives. New Jersey may want to re-consider its treatment on the use of diesel fuels as part of micro grids where they are part of critical facilities. While diesel generators are not built to run for prolonged periods of time, during Sandy many emergency generators were forced to operate for this length of time and did so without incident although they are not designed to do so. Allowing diesel generation as an "emergency" component of the "n+1" requirements for micro grids should be considered and will lower the overall cost of these projects as diesel prime movers are much less expensive than natural gas prime movers.

Utilizing of Thermal Storage to Facilitate Resiliency

Another commercially proven technology that has been noticeably absent in being addressed by prior Energy Master Plans is Thermal Energy Storage (either in single buildings, in district settings or in combination with renewable technologies). Thermal Energy Storage, a simple technology that has been around for years, has the ability to reduce electric capacity requirements and save energy cost in jurisdictions where there are material differences in commercial on-peak and off-peak demand charges. Thermal Energy Storage should also be recognized as a technology which actually saves energy.

Energy savings from the use of Thermal Energy Storage come from several areas:

- Nighttime chiller operations take advantage of lower dry-bulb or wet-bulb temperatures relative to daytime values and because of this, the delta T required from chiller operation is lower at night, requiring less energy to achieve operating goals.
- Base load power plants which operate at night to supply electricity to chillers, have higher electrical generating efficiencies than the peak load plants which must operate during the day to meet increased daytime demand.
- Line losses decrease in the cooler temperatures of the evening when there is also less congestion and resistance in distribution and transmission lines.
- Thermal energy storage enables existing chillers to operate at their highest efficiencies for the majority of the day when their discharge rates are controlled. Required chiller output is correlated with the chillers' most efficient loading (saving energy because when there are part load operating regimes, chillers require significantly more energy per ton of cooling).

New Jersey still has a significant office, laboratory or institution based economy with hundreds of thousands of jobs in industries like insurance, banking, pharmaceuticals, education, health care and entertainment. Incentives that address the energy needs of these industries more would seem to have a large universe of potential participants. These vibrant New Jersey industries all share the common need for conditioned

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space in their offices, laboratories, classrooms, venues or hospitals. Programs geared toward lowering the costs of conditioning this space can create and sustain jobs by keeping the operating costs for these facilities competitive with other sections of the country.

When one considers the number of suburban or urban facilities in our state which house office, hospitals, colleges, universities, K-12 schools, laboratories, etc., and look at when they are using large amounts of energy, the potential value for Thermal Energy Storage should be readily apparent. None the less, current and past energy programs offer little assistance for the development of these systems. The only place Thermal Energy Storage could be offered financial assistance is in the custom measures portion of the Clean Energy programs or as a component of a Pay for Performance integrated program. The ill-defined and subjective nature of Custom Measures makes it very difficult to factor this technology into a capital budget. Pay for Performance has its own obstacles in terms of ease of implementation related to the extraordinary engineering and energy modeling efforts required and the fact that building owners must front the capital required in total before receiving any financial assistance.

While Thermal Energy Storage doesn't offer the panache and sexiness of renewable energy programs, there are many host sites which offer viable locations for these installations while having a minimal amount of collateral retrofitting, permitting or activist issues or hurdles to overcome.

When one looks at the cost of implementing thermal storage as opposed to building new generation, transmission and distribution capacity, there is a clear cut advantage for thermal storage. As an example consider the well-publicized case of a Texas VA Medical Facility which built a thermal storage system offering 24,628 ton hours of cooling. This system reduced the VA's peak demand by 2,934KW or almost 3MW. Built at an all-in cost of $2.2 million, or about $750/KW of capacity, this is comparable, or arguably much less than, the cost of adding generation and transmission capacity on a utility scale. While Texas has a bigger discrepancy between on peak and off peak demand rates than we currently do here in New Jersey, it is clear that both PJM and NJ BPU policy are pushing larger electric users toward a real time pricing structure which will undoubtedly result in higher demand components in electrical pricing.

When considering: 1) Energy cost saving potential to electric users; 2) Energy conservation potential; 3) Effects on facility operating costs; 4) Effects on job retention and creation, and; 5) Increased efficiency of utility capital employed when measured against other methods of assuring electric capacity, Thermal Energy Storage should be given more prominence in the overall energy policy than it has received in the past.

The New Jersey BPU should build strategies incorporating Thermal Energy Storage into future programs it initiates. Consider that a program with total funding of only $75 million over three years, incorporating both a grant and interest free loan component for developed Thermal Energy Systems would offset the need to build an additional 100MW of conventional generating and T&D capacity.

A program offering a grant incentive of $30 per ton of TES capacity with a loan for the balance of the cost of system development would be an effective way to encourage implementation of this technology and it would both reduce peak capacity requirements and lessen the occasion for transmission congestion and higher LMP's. The loan could be paid off over seven to ten years either interest free or with a subsidized interest rate similar to those offered by the EDA's Infrastructure Trust Fund. In either case the program would offer economy to the facility owner or occupant, energy conservation and a net cost per KW of capacity that is lower than costs for generating, transmission and distribution infrastructure capacity.

Any incentive program for Thermal Energy Storage needs to be coupled with rate making that incentivizes energy users to peak shave or reduce demand, i.e. time of day electric rates with meaningful rate differences for commercial rate classes.

Temporarily Redirect Electric Utility Program Initiatives from Efficiency to Grid Hardening

Funding collected in the Societal Benefits Charge continues to be used for many diverse programs managed by, and sometimes benefiting, electric utilities. These vary from programs like financial assistance to pay utility bills for lower income individuals and families to, promoting the development of renewable energy and implementation of energy efficiency.

One could question if the development and implementation of electric utility sponsored renewable / efficiency programs is where the BPU should currently be directing SBC dollars given the electric utility's other infrastructure needs. Efficiency is an important policy objective but it can also be argued that there exists a concurrent and universally recognized need for a hardening of T&D infrastructure. The Board should consider if the highest and best use of rate payer revenue directed to utilities is in hardening their aging and undersized grid as opposed to program management of renewable and efficiency programs? Many of the later are initiatives duplicative of programs offered by the BPU's Office of Clean Energy.

Consider the utility and economic value of placing a 200 watt solar panel on thousands of utility poles in the name of clean energy. Even without addressing their aesthetic contribution to streetscapes that are rapidly approaching the unsightliness of a pre-monopoly utility era, one could argue that this money would be better utilized for public good by applying it to grid hardening.

Asking electric utilities to develop and implement renewable and efficiency programs and having to both offset their relatively high administrative costs and compensate them with guaranteed rates of return that are higher than what would be required in the current private equity market, while also pressuring them to upgrade their T&D assets, diverts attention and focus from what is ostensively their primary public function, i.e. the supply and delivery of safe, reliable and reasonably priced electric service. Temporarily re-directing primary responsibility for renewable and efficiency programs back to the BPU, who could in turn utilize private industry to manage and deliver the benefits of these programs, should result in lower costs of implementation due to free-market economies while simultaneously offering utilities the opportunity to concentrate on a critical deficiencies in their systems. The resulting savings in SBC funds from this action can be used to partially defray the cost of the needed electric utility T&D upgrades.

Other Initiatives

The recent difficulty Fisherman's Energy has experienced in trying to get approvals for their demonstration offshore wind project off Atlantic City is disappointing and provides the Board with an opportunity to re-think how these necessary components of a renewable energy strategy should be developed. Simplifying the process necessary to develop offshore wind generation should be given more emphasis in this revision to the Energy Master Plan. Not only would this proven technology provide renewable generation on a much larger and democratic scale than photovoltaics, it would also provide significant volumes of renewable energy at times when solar cannot. Additionally, transmission of offshore wind electric from east to west, as opposed to west to east, should mitigate transmission congestion and the need for higher capacity charges.

Finally, we would like to see some type of phasing out of diesel fueled trucks used in the public sector and a phasing in of trucks fueled with natural gas. The negative aspects of particulate emissions from diesel vehicles has been under emphasized by media and clean air advocates. A legislative/ regulatory mandated phasing away from diesel to natural gas as a fuel for state, county and municipal vehicles will provide a baseload of users to facilitate the further development of natural gas refueling stations, and will also positively affect New Jersey air quality. The Board should consider a phasing in of this type of initiative perhaps driven by a "Portfolio Standard" and REC-type approach that government entities would have to adhere to. The implementation period should be long enough that it coincides with the timing of customary replacement time frames so that the negative effect on towns, cities, counties and other government entities with these types of vehicles is minimal.

Shoreline Energy Advisors appreciates the opportunity to offer its comments on the upcoming revisions to the New Jersey Energy Master Plan. If there are any questions on our perspective, or the need for clarification, we would be happy to address them.

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