REPLACING FITZPATRICK

How the Closure of a Nuclear Reactor can Reduce Greenhouse Gasses and Radioactive Waste, while Creating Jobs and Supporting the Local Community

ABSTRACT

An analysis of replacement scenarios for the FitzPatrick nuclear power plant shows that the reactor's entire electricity output could be replaced by lower-cost, clean energy resources with funds left over for worker and community transition support and fossil fuel displacement.

White Paper prepared by Alliance for a Green Economy and Nuclear Information and Resource Service

An electronic version of this White Paper can be found at
www.allianceforagreeneconomy.org/replacing_fitzpatrick.

Summary of Key Findings

This preliminary analysis by Alliance for a Green Economy and Nuclear Information and Resource Service examines the arguments for subsidizing the FitzPatrick nuclear reactor, particularly around the potential impact on greenhouse gas emissions and the economic hardship for the local community. We set out to compare the cost of clean replacement for FitzPatrick's electricity output as well as alternatives to economically supporting the municipalities and workers currently reliant on FitzPatrick.

Our key conclusions:

- **FitzPatrick's full electricity generation could be replaced with energy efficiency and wind at less than the current cost of electricity from the nuclear plant.**
- **Diverting all of FitzPatrick's revenue to clean energy could result in additional reductions in greenhouse gas emissions, equivalent to a 264 MW coal plant or 330 MW combined cycle natural gas plant.**
- **Replacing FitzPatrick with efficiency and wind could create more than twice the number of jobs currently provided by Entergy at FitzPatrick.**
- **Municipalities and workers affected by FitzPatrick's closure could be supported through the economic transition for a lower cost than subsidizing FitzPatrick, if the state proactively negotiates with Entergy for a responsible and immediate decommissioning.**

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White Paper by Alliance for a Green Economy and Nuclear Information and Resource Service
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1 Introduction and Summary

The FitzPatrick nuclear reactor, located near Oswego, New York, is at the center of a fierce debate over New York's energy future. FitzPatrick, like many aging reactors across the U.S., has become uncompetitive and unprofitable. Entergy, the company that owns FitzPatrick, has announced it may close the plant soon. Many in Oswego, including local elected officials and workers at the plant, are rallying to try to save FitzPatrick, while hundreds of others from the region and from across New York are advocating that the plant should close.

There is no dispute that Oswego County and local communities around FitzPatrick currently rely on Entergy for tax revenue and for jobs. There are approximately 600 workers at FitzPatrick, and Entergy pays about $17.3 million annually in property taxes. FitzPatrick is reportedly Oswego County's fifth largest private-sector employer. The negative local economic impacts of closure have been the focus of much of the discussion around Entergy's announcement that it might close the plant. Advocates for keeping FitzPatrick open are also using climate change as a rationale for subsidizing the reactor. They claim New York cannot meet its climate goals if nuclear plants close.

Less talked about so far have been the negative impacts of keeping FitzPatrick open, especially if Entergy requires a subsidy in order to do so. Subsidizing FitzPatrick could cost tens of millions of dollars per year, which would most likely be paid by National Grid customers in the form of increased electricity rates.

Like all nuclear reactors, FitzPatrick also poses an environmental threat to the surrounding population, in the form of radiological releases, the accumulation of nuclear waste, and the potential for a catastrophic meltdown that could render large parts of Upstate New York uninhabitable.

There is also an opportunity cost to keeping FitzPatrick running. The electricity revenues going to Entergy to operate FitzPatrick represent money that will not be used to build truly renewable and clean energy

resources, many of which are cheaper than FitzPatrick. In addition, money can be spent on a just transition for workers and the Oswego community, enabling a solid plan for the future.

In the absence of public numbers from Entergy as to how much it is losing at FitzPatrick and a basic lack of understanding statewide and regionally about the costs and potentials for renewable energy development, it can be difficult for the average resident to form an informed opinion about the region's energy future.

Alliance for a Green Economy (AGREE) and the Nuclear Information Resource Service (NIRS) decided to perform a preliminary, fact-based analysis of the choices before us. Here's what we looked at:

- Based on the proposed subsidy for the Ginna nuclear reactor in neighboring Wayne County, NY, we have estimated what we believe is the minimum subsidy Entergy would require to keep FitzPatrick operational.
- We analyzed the costs of alternative, clean energy sources to determine whether and how FitzPatrick could be replaced with energy efficiency and wind, as well as the impact on greenhouse gas emissions.
- We looked at the potential job impacts of a scenario for replacing electricity generated by FitzPatrick with wind power and energy efficiency.
- We developed a "just transition" scenario for the local community in Oswego County, which includes utilizing the skilled workforce for the decommissioning process, property-tax replacement for municipalities, and job training and wage support for workers moving to other fields.

OUR CONCLUSIONS IN BRIEF

- It appears likely that FitzPatrick's electricity output could be replaced by energy efficiency retrofits and wind at a lower cost than the reactor costs today at current electricity prices. This means that for the same price that consumers pay for FitzPatrick's output today, Central New York could replace FitzPatrick *and* additionally displace other fossil fuel generation.
- The job creation potential for replacing FitzPatrick with efficiency and wind is more than twice the number of jobs currently provided by Entergy at FitzPatrick.
- FitzPatrick's decommissioning trust fund is a resource that can and should be used to keep a large portion of the current workforce employed in the clean-up and decommissioning of the reactor.
- For the same price as a potential subsidy for FitzPatrick – $40 - $60 million per year – the state could instead provide property tax replacement for local municipalities and wage support for workers.

2 About this White Paper

Alliance for a Green Economy (AGREE) is a Syracuse, NY based coalition of environmental and social justice organizations. AGREE works for safe, affordable energy and the development of a green economy in New York State. Our goal is a prosperous, safe, and healthy New York, fulfilling the promise of conservation, energy efficiency, and safe, clean renewable energy sources to end our state's reliance on wasteful and environmentally destructive forms of energy. We seek to capitalize on the opportunity to revitalize the state's economy which a clean energy transition would provide, particularly in regions and urban centers that are economically struggling. AGREE works to promote a transition to a carbon-free and nuclear-free future and educates the public about alternatives that can revitalize the economy and safeguard human health and the environment. As the primary nuclear watchdog organization in Upstate New York, AGREE has been faithfully monitoring Entergy's FitzPatrick nuclear reactor for the last four years. We have raised multiple safety and economic issues concerning FitzPatrick with the Nuclear Regulatory Commission. We advocate for the closure of FitzPatrick and the reactor's replacement with clean energy resources.

Founded in 1978**,** the **Nuclear Information and Resource Service (NIRS)** is the national information and networking center for grassroots organizations and environmental activists concerned about nuclear power, sustainable energy, radioactive waste, and the environmental and public health effects of radiation. NIRS's mission is to advance the fastest possible transition to a nuclear-free, carbon-free sustainable energy supply; to advocate for responsible and environmentally just solutions to radioactive and toxic waste; and to promote the greatest possible protections from the health and environmental effects of radiation. We provide policy expertise and informational resources on energy and radioactive waste, and we monitor policy developments on the national and state levels. NIRS initiates and supports strategic campaigns to advance public health and safety, environmental justice, corporate and government accountability, and sustainable energy. We also work closely with the international movement, and have a long affiliation with the World Information Service on Energy, through which we are part of a network spanning 12 countries on five continents.

In analyzing the potential options for FitzPatrick's future, we acknowledge our anti-nuclear perspective. However, we undertook to be conservative and careful in our analysis out of our own interest in developing a realistic understanding of the options. We endeavor to present factual information to the public about the choices before us. We believe Central New York was saddled with the risks and burdens of nuclear power, largely because the public was not provided with accurate information and sufficient voice in the state's energy planning decisions. In order to make better energy and economic development choices in the future, the public needs accurate information, as well as a voice in the process.

This white paper contains a preliminary analysis, in which we took a somewhat rough look at the options and created general calculations. Throughout the analysis, we discuss our methodology and why we think our calculations are both conservative and reasonable. We hope this white paper will spark interest in a more detailed analysis by state governing bodies and independent technical experts as part of their deliberation process over how to approach the potential retirement of FitzPatrick.

3 WHY IS FITZPATRICK LOSING MONEY AND HOW MUCH WOULD IT TAKE TO KEEP THE PLANT RUNNING?

FitzPatrick is one of several reactors across the U.S. that is economically challenged. The economics for nuclear reactors have never been good. They have always required public subsidies for construction, accident insurance, and for dealing with the highly radioactive waste they produce. However, in recent years, the national nuclear fleet has become increasingly expensive to maintain and operate because the plants are getting older, the cost of nuclear fuel is on the rise, and new post-Fukushima safety regulations are going into effect. Due to the negative economic outlook, there have been several nuclear closures announced in the last few years, including Kewaunee, San Onofre, Crystal River, and Vermont Yankee.

Specifically for FitzPatrick, Entergy faces the following challenges:

- The costs of maintenance for FitzPatrick are rising due to the age of the reactor, which has now been operating for over 40 years. Entergy recently spent millions of dollars replacing tubes in the main condenser at FitzPatrick, and the company faces other required upgrades if it wants to keep operating the reactor.
- Electricity demand in Central New York is essentially flat, which is helping to drive down wholesale electricity rates. From 2005-2014, demand declined in Central New York by 7%[1], reversing the historical trend of constantly growing demand. Flat and declining demand is a result of increased use of energy efficient appliances, weatherization programs, rooftop solar installations, and New York's changing economy.
- FitzPatrick faces stiff market competition from natural gas as well as wind. Wholesale electricity prices have declined 30-40% since 2008.[2] Wind generation grew 3,000 percent from 2004 to 2015 in New York, and is projected to more than double in the next few years.[3]

We do not see the economic outlook for FitzPatrick changing on its own. The trends are moving against nuclear energy, in favor of cleaner, cheaper, and/or more flexible energy sources. Therefore, the only way to make it worth it to Entergy to keep FitzPatrick running is to provide the company a public subsidy or to change the wholesale electricity market rules to favor nuclear power over other energy sources. Either option would cost the public tens of millions of dollars per year.

Entergy has not said how much it would need to keep FitzPatrick running, but we can make an educated guess based on a similar situation in neighboring Wayne County. In the case of the Ginna Nuclear Power Plant, negotiations between the reactor's owner, Constellation Energy Nuclear Group, and the local utility company,

[1] NYISO. 2015 Load & Capacity Data: Gold Book. April 2015. Table I-4a: Historic Energy Usage and Coincident Peaks (p. 22)
http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Planning_Data_and_Reference_Docs/Data_and_Reference_Docs/2015%20Load%20and%20Capacity%20Data%20Report.pdf
[2] NYISO Day-Ahead LBMP data, Zone C (CENTRL), 2008-2012.
http://www.nyiso.com/public/markets_operations/market_data/custom_report/index.jsp?report=dam_lbmp_zonal
[3] NYISO Power Trends Report – 2015.
http://www.nyiso.com/public/webdocs/media_room/press_releases/2015/Child_PowerTrends_2015/ptrends2015_FINAL.pdf

RG&E, arrived at a subsidized price equivalent to approximately $50 per megawatt hour (MWh), or 5 cents/kilowatt-hour (kWh). The $50 per MWh is a good conservative guess for what Entergy might require just to keep FitzPatrick operating. This is consistent with reports by the nuclear industry's trade association on plant operating costs, showing that single-reactor plants like Ginna and FitzPatrick averaged $50.54/MWh in 2012.

To calculate what a subsidy for FitzPatrick might look like, we simply calculate the cost of electricity in the market and compare it to $50 per MWh. The average market rate for electricity in Load Zone C, where FitzPatrick is located, over the last 5 years, is $40.71 per MWh.[4] This results in an estimated subsidy of $9.29 per MWh. We then multiply the per MWh subsidy by the number of megawatt hours that FitzPatrick generates annually (on average 6,606,792 MWh) to arrive at an annual subsidy.

Based on recent market rates, we estimate that the annual subsidy needed to keep FitzPatrick in business would be approximately $61.4 million.

In order to provide a more conservative estimate, we also calculated a potential subsidy based on a period when electricity prices were higher (2008-2012). Using that five-year average of $44/MWh, the estimated annual subsidy for FitzPatrick would be least $40 million, or $6/MWh. This conservative estimate of $40 million will be used throughout this analysis.

[4] NYISO Day-Ahead LBMP data, Zone C (CENTRL), 2010-14.
http://www.nyiso.com/public/markets_operations/market_data/custom_report/index.jsp?report=dam_lbmp_zonal

4 CAN FITZPATRICK BE REPLACED BY CLEAN ENERGY?

With growing concern over greenhouse gas emissions and climate change, the nuclear industry has made itself out as a "clean" alternative to fossil fuels. Putting aside nuclear power's other negative environmental impacts and dangers, we think it's reasonable to wonder whether the shuttering of FitzPatrick would jeopardize the greenhouse-gas reductions necessary to prevent catastrophic climate change. Therefore, we looked at whether it is possible and cost effective to replace FitzPatrick with clean energy sources.

We developed a scenario that puts half the money spent by consumers today on FitzPatrick into energy efficiency retrofits (which includes weatherization and efficient lightbulbs and appliances) and invests the other half into onshore wind power. Why did we choose efficiency and wind? We chose efficiency because it is the lowest cost resource for consumers and the biggest bang for their buck.[5] It also has the highest job creation potential and it has many co-benefits, which include improved comfort, indoor air quality, and health. Dollar for dollar, it is the best investment of consumer money. We chose wind because it is the next cost-effective renewable resource.[6] Upstate New York has abundant, untapped wind potential, and it can be built relatively quickly at a large scale.

We found that not only is it economical to replace FitzPatrick with a combination of energy efficiency retrofits and wind, but doing so would be cheaper than continuing to operate FitzPatrick, even with no subsidy for the reactor. Replacing FitzPatrick with clean energy sources could drive down utility rates for the region and create extra renewable generation to further replace fossil fuel generation.

An important assumption built into our model is that, while we pay for FitzPatrick every single year, investing in energy efficiency and wind represent mostly upfront costs. The costs are normally financed over a period of time, with little ongoing operational or maintenance costs. In our model, we projected financing the costs over 20 years.

Here are the numbers:

- At $44 per MWh, electricity customers pay approximately $290,698,848 annually for FitzPatrick's electricity.
- If we spent half of that ($145,349,424) on energy efficiency, we could get the equivalent of 5,813,977 MWh in energy use reductions.
- If we spent the other half on wind, we could build enough wind power to generate 2,190,630 MWh annually, with an installed capacity of 834 MW.

This would provide (through efficient savings and renewable generation) an annual total of 8,004,607 MWh, or 21% more (1,397,815 MWh) than FitzPatrick delivers to the grid every year. These "extra" megawatt-

[5] Energy efficiency reductions from utility-run programs typically cost around $25 per MWh

[6] While wind power costs are continuing to decline, we conservatively use an unsubsidized cost estimate of $2 million per MW, roughly 33% higher than recent costs of $1.5 million per MW.

hours could be returned to customers in the form of avoided costs or could be used to help displace other dirty generators like coal or gas plants in the region.

The replacement of FitzPatrick with clean energy is not a question of *if* but rather *when.* New York has set a goal of 80% reduction in greenhouse gas emissions by 2050 and an interim benchmark of 40% reductions by 2030. FitzPatrick is only licensed through 2034, and so far no nuclear power plant has operated until the end of its license. Even if the plant somehow manages to stay open until its license expires, it will need to be replaced well before 2050.

5 REPLACEMENT RELIABILITY ANALYSIS

It is unknown whether any of FitzPatrick's output is needed to maintain reliable electrical service in Central New York. There is a large surplus of generation capacity in Central New York[7] to meet demand without FitzPatrick, but we do not yet know whether there are transmission constraints that would cause an issue. This will only be revealed with a reliability study. These studies are required once a company makes a decision to retire and notifies the Public Service Commission of its intention. In preparation for any reliability concerns that may arise from FitzPatrick's retirement, we analyzed our replacement scenario above for its capacity reliably to meet electricity demand.

There are many ways to measure the predicted output of any given energy source:

- **Nameplate/Installed Capacity:** The full capacity of a resource to produce when it is at 100% efficiency
- **Capacity factor:** A ratio of the actual output of the generator over a given period of time, relative to its maximum possible output
- **Derated Capacity Value:** A measurement of the reliability of a resource to be available at peak energy usage times.

To determine the ability of our FitzPatrick replacement scenario to meet demand during peak energy use times, we looked at the derated capacity value of energy efficiency and wind. Energy efficiency essentially has a derated capacity of 100% because it reduces the amount of energy used by the household or businesses. With the consumption gone, there is no need to meet that demand. Wind has a peak capacity value in the Northeast of 13.2%.[8]

Peak Capacity Value of the Replacement Scenario:

Resource	Peak Capacity Value (MW)
Efficiency	664
Wind	110
Total	774

This means that our replacement scenario has a peak capacity value (or reliability value) representing 92% of FitzPatrick's capacity.

[7] NYISO. 2015 Load & Capacity Data: Gold Book. April 2015. Table III-3a: Capability by Zone and Type – Summer and Table III-3b: Capability by Zone and Type – Winter (pp. 58-59). http://www.nyiso.com/public/webdocs/markets_operations/services/planning/Documents_and_Resources/Planning_Data_and_Reference_Docs/Data_and_Reference_Docs/2015%20Load%20and%20Capacity%20Data%20Report.pdf

[8] U.S. Energy Information Administration. Energy resource planners credit only a fraction of potential wind capacity. May 13, 2011. http://www.eia.gov/todayinenergy/detail.cfm?id=1370#

6 THE JOBS IMPACTS OF REPLACING FITZPATRICK WITH EFFICIENCY AND RENEWABLES

To calculate the potential job creation resulting from the energy efficiency retrofits and wind in our scenario, we used a report by the Political Economy Research Institute (PERI), titled, "The Economic Benefits of Investing in Clean Energy."[9] In that report, the researchers modeled direct, indirect, and induced job creation resulting from each million dollars invested in a variety of energy sources. Direct job creation is the number of jobs created by the work of building or running the energy source itself. Indirect job creation represents the potential job impacts from the supply chain for the resource. Induced job creation is the economic benefit produced when workers paid by the direct and indirect jobs spend their paychecks.

The PERI report estimates:

Energy Source	Direct jobs per $1 million invested	Indirect jobs per $1 million invested	Induced jobs per $1 million invested	Total jobs per $1 million invested
Efficiency Retrofits	7	4.9	16.7	28.6
Wind	4.6	4.9	13.3	22.8

Based on our scenario for replacing FitzPatrick with efficiency retrofits and wind, we estimate an annual direct job creation impact of 1,400 jobs (1,017 for efficiency, 383 for wind) each year for 20 years, or more than 2.3 times the number of jobs FitzPatrick can sustain.

It's important to note that even though we would pay for these jobs over 20 years, and we calculated them over a 20 year timeframe, the retrofits and the wind construction could and should be done in the first few years, which would mean much higher jobs impacts in each year, but for fewer years. However, to keep the analysis consistent with FitzPatrick, which provides roughly the same number of jobs each year, we estimated the above numbers based on a 20-year timeframe.

The PERI analysis did not include nuclear energy in its estimates, so we have no way to compare indirect and induced job impacts. Nonetheless, we provide the figures here for our replacement scenario: 6,068 total jobs estimated annually (4,170 efficiency, 1,898 wind).

[9] Political Economy Research Institute. "The Economic Benefits of Investing in Clean Energy." June, 2009. http://cdn.americanprogress.org/wp-content/uploads/issues/2009/06/pdf/peri_report.pdf

7 DECOMMISSIONING AS THE FOUNDATION FOR A JUST TRANSITION

Having shown that climate change concerns could be met at lower cost and with higher job creation than continuing the operation of FitzPatrick even without a subsidy, we turn to the remaining argument to keep FitzPatrick open: to prevent economic hardship to the local community brought on by closure.

We analyzed whether it was possible to provide relief to the local community – in the form of tax replacement, transitional wage support, and economic development investments – in a way that was economical compared to the cost of subsidizing FitzPatrick.

Above, we calculated the cost of a subsidy for FitzPatrick to be at least $40 million per year, but possibly $60 million per year if the most recent electricity rates are used. This is money that FitzPatrick supporters are proposing consumers should pay in order to save approximately 600 jobs and sustain $17.3 million in local property taxes. There are many ways to spend $40-60 million in Central New York, where several areas suffer from high unemployment and underfunded schools. We know there is not consensus on whether it's fair for the state to unilaterally decide that keeping jobs and property taxes in Oswego is a priority over other public needs. Nonetheless, we set out to calculate what it would take to support the community through the transition. While addressing climate change and converting to clean energy sources will produce large, positive economic benefits, we support assisting communities that experience negative local impacts in the process.

First, we look to FitzPatrick's decommissioning trust fund as a resource that can be used to keep workers employed at FitzPatrick beyond closure. This is a resource unique to nuclear power plants, mandated by the Nuclear Regulatory Commission because of the long-lasting hazards of radioactive contamination. The trust fund for FitzPatrick had $738 million at the end of 2014[10], which is money already set aside for the cleanup of the plant. If Entergy is convinced, or required, to begin the decommissioning process right away, a large portion of the current workforce could be retained for a period of time using that fund.

We assume that about half of the workforce could be retained for decommissioning, and compensated by Entergy and the decommissioning fund for several years. The 50% number is derived from the decommissioning of the Rancho Seco reactor in California and Vermont Yankee in Vermont.

It's important to note that this is not a given. Entergy could instead mothball the reactor for up to 60 years using the SAFSTOR decommissioning option. If they want to keep workers at the plant, utilize their institutional knowledge and training, and ensure that cleanup begins immediately, the state and local governments will need to negotiate an agreement with Entergy, as the state of Vermont did in 2013, after the company announced plans to close Vermont Yankee. New York has a foot in the door with FitzPatrick's decommissioning fund. Unlike most decommissioning trust funds, which are solely controlled by nuclear owners themselves, FitzPatrick's fund is still owned by the New York Power Authority. This gives the state a stronger bargaining position in determining how the decommissioning trust fund will be used.

[10] Entergy Nuclear Operations. Decommissioning Funding Status Report to U.S. Nuclear Regulatory Commission. Attachment 9. March 30, 2015.

We developed a comprehensive decommissioning and community protection scenario, based on an agreement Entergy entered into with the State of Vermont for the closure of Vermont Yankee. That agreement includes a number of important provisions:

- Transfer of nuclear waste from the fuel pool to dry-cask storage within six years
- Initiation of decommissioning within six months after the decommissioning trust fund has accumulated enough money
- $25 million in local economic development funds (paid over four years)
- $20 million for cleanup of non-radiological contamination (paid over four years)
- Establishment of an independent, state-appointed Community Advisory Panel to monitor decommissioning activities, with public meetings

Under our scenario, we assume that 300 workers will be retained for the decommissioning of FitzPatrick. If 10% of the new jobs created by clean energy replacement went to FitzPatrick workers (140 jobs), and Entergy transferred 10% of FitzPatrick's workforce (60 jobs) to other positions in the company, that would reduce the number of workers requiring long-term wage replacement and career transition assistance to 100. Even assuming Entergy agreed to bear none of the costs related to community and worker protection, that would leave money for other community benefits such as job training, cleanup, and economic development:

Expense	**Cost**
Property Taxes	17,300,000
Wage Replacement at $120,000/year	12,000,000
Training and Job Placement (at $30,000/worker)	3,000,000
Toxic Cleanup Fund	5,000,000
Economic Development	2,700,000
Total	40,000,000

The $40 million annual budget for this scenario is roughly equal to the minimum cost of subsidizing FitzPatrick, at a rate of $6/MWh. If FitzPatrick's electricity were replaced with wind and efficiency, as we modeled, the electricity would cost customers about $36/MWh, 17% less than our estimated market price of electricity. Together, a comprehensive approach to replacing and decommissioning FitzPatrick would be $42/MWh, still cheaper than the market price of electricity, and about $60 million per year less than subsidizing the continued operation of FitzPatrick. Furthermore, this assumes Entergy would pay none of the community worker and protection costs. If Entergy agreed to bear a share of those costs, as it has in Vermont, then the cost to utility customers would be substantially less.

8 NET ENERGY COST SAVINGS AND EMISSIONS REDUCTIONS

In addition to the economic and environmental benefits we have identified, the clean energy and community and worker protection scenarios we recommend could also result in savings to electricity customers. This is possible even if customers bear the entire cost of replacing property taxes and transitional assistance for displaced FitzPatrick employees. The cost of energy efficiency and wind generation in our clean energy replacement scenario is 17% less than the market price of electricity. If only as much efficiency and wind were developed to replace the electricity FitzPatrick generates, it would cost customers over $50 million less per year. That means the cost of replacing property taxes and wages for displaced workers could still be paid for, at less than the conservatively projected cost of subsidized power from FitzPatrick:

Basic Energy Replacement	**FitzPatrick**	**Clean Energy**
Energy	6,606,792 MWh	6,606,792 MWh
Price	$44/MWh	$36.32/MWh
Cost	$290,698,848	$239,935,169
Subsidy or Community Protection	$39,640,752	$40,000,000
Total	$330,339,600	$279,935,169

If the full amount of renewable energy and efficiency we project were developed, there would be substantially greater benefits. In that scenario, wind and efficiency provide 21% more energy than FitzPatrick generates. That would displace primarily fossil fuel generation, resulting in a significant net reduction in greenhouse gas emissions. The additional 1,397,815 MWh of electricity is equivalent to the output of a 264 MW coal plant, or a 332 MW combined cycle natural gas plant.[11]

In addition, there would be even greater cost savings to customers by avoiding the purchase of more expensive electricity. That would result in over $60 million per year in lower energy costs. Again, community and worker protections could be paid for, with a net savings of over $20 million as compared to projected energy prices:

Basic Energy Replacement	**FitzPatrick + Market Power**	**Clean Energy**
Energy	8,004,607 MWh	8,004,607 MWh
Price	$44/MWh	$36.32/MWh
Cost	$352,202,725	$290,698,848
Subsidy or Community Protection	$39,640,752	$40,000,000
Total	$391,843,477	$330,698,848

[11] U.S. Energy Information Administration. Electric Power Monthly. Table 6.7.A. Capacity Factors for Utility Scale Generators Primarily Using Fossil Fuels, January 2013-July 2015. September 24, 2015. Rated capacity figures computed from average capacity factor values for coal plants (60%) and combined cycle natural gas plants (48%), to generate 1,397,815 MWh of electricity. http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_a

If the cost of the program applied only to National Grid's service territory, and were distributed equally among the utility's 1.8 million electricity customers, the average customer would save $12 per year compared to electricity at projected market prices, without subsidizing FitzPatrick. If, instead, the state were to provide subsidies to prevent FitzPatrick from closing, it would cost National Grid customers at least $40 million per year more than the market price of power. In that case, customers would pay $61 million more each year than in our clean energy and just transition scenario. That would amount to $34 more each year, for the average customer than replacing FitzPatrick with clean energy and supporting workers and the community through the economic transition.

9 CONCLUSION

As the above analysis shows, compared to cleaner alternatives, providing a subsidy for FitzPatrick is costly to ratepayers and the environment. There are major opportunity costs for allowing FitzPatrick to operate, even without a subsidy. If FitzPatrick were to close and the money currently going to the reactor in the market were instead directed into energy efficiency and wind, the entire output of FitzPatrick could be replaced. Money would be left over to build additional renewables or to lower energy prices. Our efficiency and wind scenario is 92% as reliable in meeting peak demand as FitzPatrick, and would result in a significant additional reduction in greenhouse gas emissions.

Pursuing a replacement scenario with a combination of efficiency and wind would create more than twice the number of jobs that FitzPatrick offers today. This job growth could be sustained over 20 years, or frontloaded into the first five years, which would increase the number of wind industry jobs annually four-fold.

Finally, if policymakers deem a subsidy is necessary only to prevent job losses and save local municipalities from tax-revenue losses, this could be accomplished at lower cost than subsidizing FitzPatrick's continued operation. The decommissioning trust fund could and should be put to work immediately so as to not delay the cleanup at FitzPatrick and to keep a large portion of FitzPatrick's skilled workforce employed for years to come, while utilizing their institutional knowledge and training. Direct payments to municipalities and to those workers unable to find a new job would then be cheaper than subsidizing Entergy to indirectly provide for those costs.

We conclude that if Entergy decides to close FitzPatrick, the Cuomo administration should let it do so and focus efforts on expanding tomorrow's energy sector and supporting the community through the economic transition. Concerns over climate change and economic hardship can be satisfied through more affordable means. We also believe a better long term plan for the community and for workers is possible that will not be achieved by a short term subsidy.