

MASSACHUSETTS SIERRAN



**SIERRA
CLUB**
MASSACHUSETTS

Mapping the Massachusetts Road to Independent and Renewable Energy Sources by 2050

2015 / 2016
Volume 21, No. 1

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The bluebird carries the sky on his back

– Henry David Thoreau



SIERRA CLUB MASSACHUSETTS

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Message from the Chapter Chair

By Cathy Ann Buckley

We are approaching the final days of the fossil fuel age.

What will they be like?

How do they compare to the transition periods of wood to coal, coal to oil, and oil to gas?

They are likely to be very different for three reasons: 1) this transition will be faster, 2) we are switching primarily to fresh, local, renewable energy sources, and 3) we have to switch ever so quickly.

A faster transition. Past transitions took well over half a century. Coal surpassed wood in the U.S. around 1880. Oil surpassed coal in 1950. We are still witnessing the shift from oil to gas while simultaneously seeing the shift to renewables. Some countries already have a majority of their energy coming from renewable sources. To be on target to meet our legal requirements in Massachusetts, half of our energy needs must be supplied by renewables within the next two decades.

Fresh, local energy sources. We are transitioning to energy sources that will be more accessible to more people for less money. After the wood age, our sources of fuel have been fossilized remains that had to be wrested out of the earth. Coal mining and traditional oil and gas extractions are expensive and require huge capital investments. The newer extraction models such as fracking, tar sands oil, deep-water drilling, and shale oil are even more costly, as well as more destructive to the environment. While technology will be required to get them to our homes and businesses, energy sources such as solar and wind are not limited commodities. They are provided free every day - fresh and local.

Have to switch ever so quickly. Our health, our way of life and our very lives depend on making this transition lightening fast. While previous transitions upset older technologies, this one is likely to incur market turmoil and desperate attempts by the fossil fuel industry to hold on. That industry is the most profitable in U.S. history and has the resources to try to convince us that a prolonged transition is perfectly acceptable.

'May you live in interesting times' is presented as a Chinese curse. Let us turn it into a blessing. We are here, now, ready to devote ourselves, joyously and wholeheartedly, to preserving this great and beautiful habitat provided for us. Now that is a great cause - worthy of your time, your attention, and your resources. ✍



Massachusetts Sierran, Vol. 21, No. 1 2015/2016

The Massachusetts Sierran is sent to over 16,000 outdoor-minded, environmentally aware Sierra Club members

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Envisioning a Carbon-Free Energy Future for Massachusetts

Transitioning to a completely clean energy future is a Sierra Club strategy for solving the climate change crisis. Here in Massachusetts, the transition from a carbon-based energy portfolio to a carbon-free one is underway and, at least compared to the 49 other states, proceeding rather well. Although compared to other countries, such as Germany and Denmark, our efforts lag far behind. Today, the Massachusetts energy supply is composed primarily of natural gas, with only a few percent each contributed by coal, nuclear, hydroelectric, solar, and wind. So we know where we are today, and we know where we want to go, but what does that carbon-free destination look like? A study recently published by Stanford University researchers provides a glimpse of that future.

Mark Jacobson, Professor of Civil and Environmental Engineering, and his colleagues began by analyzing current energy usage and sources in California. Using this data, along with local weather patterns, energy consumption trends, and expected conservation efforts, they projected what the total energy load (including residential, commercial, industrial, and transportation) would be in 2050 and how that load could be met with 100 percent carbon-free wind, water, and solar (WWS) sources of various types. After honing their methodology using California as a first example, they extended their study to all 50 states.

The national study's analysis considered each state's unique geography and energy load characteristics. For example, during the day the sun's intensity varies with the hour as well as the location – in California, cloudy San Francisco receives less solar energy than sunny San Diego. Similarly, the load was modeled with its own time of day and geographical dependence and estimated under two different scenarios – business as usual (BAU) and with substantial conservation efforts (SCE). Both scenarios assumed that all energy loads were electrified, including those of the transportation sector. Ten different energy sources were contemplated for each state: 3 different types of photovoltaics – utility scale (UPV), residential (RPV), and commercial/governmental (CPV) – concentrated solar power (CSP), hydroelectric (HDR), onshore wind (ONW), offshore wind (OFW), geothermal (GEO), tidal, and wave device. The result was a concrete proposal of a mixture of carbon-free energy sources that could supply the complete projected load.

For Massachusetts, the total power load in 2050 was estimated to be 36GW for the BAU case and 21 GW for the SCE case. To meet the SCE load, the source energy portfolio is projected to be

allocated as shown in the table below with offshore wind supplying 55 percent.

This plan takes obvious advantage of the abundant wind resources available in New England, and also utilizes a substantial amount of PV solar which temporally correlates well with peak loads. This ambitious plan has far-ranging benefits beyond the complete mitigation of carbon emissions. Health benefits can be enormous but as Jacobson notes, “One of the main barriers to replacing the current fossil fuel infrastructure is that not many people and policymakers are aware of the quantifiable health impacts that fossil fuels pose.” Overall energy costs will be reduced since the recurring costs consist primarily of ongoing maintenance. Another benefit is that the monies expended on energy stay in Massachusetts instead of being shipped out of

So we know where we are today, and we know where we want to go, but what does that carbon-free destination look like?

state for oil and gas. The construction of these vast amounts of PV arrays and wind turbines will produce an economic boost creating thousands of new jobs in design, construction, and services. Furthermore, the expertise that Massachusetts will accrue in leading the way to a carbon-free future could constitute a new export product – renewable energy resource planning, construction, and maintenance. And maybe even energy itself.

This is not to say that there won't be challenges and difficulties on the path to this new sustainable future. The economic impact of the change will be far-reaching. Massive conservation efforts will be needed, more than are currently in place. And the enormous land and offshore areas required to site PV and wind installations will exert tremendous pressures on open spaces. The tradeoffs will be painful to make, but must be faced to achieve the goal of a sustainable climate.

But these issues can be faced down with a clear focus on the end goal, and the Jacobson study gives us the sharpest picture yet of what that goal looks like. With this clear focus, we can hit it. As Thoreau commented years ago, “if one advances confidently in the direction of his dreams, and endeavors to live the life he has imagined, he will meet with success unexpected in common hours.”



2050 Renewable Energy Sources For Massachusetts

Utility Photovoltaic	Residential Photovoltaic	Concentrated Photovoltaic	Hydro	Onshore Wind	Offshore Wind	Wave
22%	4%	3%	2%	13%	55%	1%

A Real Bridge to a Better Energy Future

Is natural gas really the future of energy in Massachusetts? Fracked gas has been relentlessly promoted as the answer to our energy needs, despite the well-documented risks of this energy source, and despite clean energy's potential to produce far more job-creating economic growth

for the region. Fracked-gas companies refuse to pay the full cost of expanding pipeline capacity, an indication that they recognize how cost-ineffective pipeline expansion would be.

Forcing the public to pay for expanded pipeline capacity—especially when there is a strong evidence that these pipelines will be used to export natural gas overseas, and when the approval process for new pipelines is so questionable—is just as shortsighted as forcing the public to pay for climate-related disasters caused by fossil-fuel pollution.

Instead of supporting the expansion of fracked-gas pipeline capacity, elected officials in the Commonwealth should consider the following:

Increasing the rate of the Massachusetts Renewable Portfolio Standard.

In 2014, Stanford University professor Mark Jacobson laid out a comprehensive proposal to move the United States away from dirty energy completely by 2050. Dramatically increasing the rate of the Renewable Portfolio Standard would help make the Bay State fossil-free ahead of schedule, creating over 100,000 jobs in the process. For more details on the Stanford study, see the previous article, *Envisioning a Carbon-Free Energy Future in Massachusetts*.

Fixing the dangerous leaks in existing pipeline infrastructure.

The region's borderline-decrepit infrastructure is a silent public-health hazard, damaging thousands of trees, threatening homes, costing on the order of \$100 million annually, and, most importantly, pumping methane, a heat-trapping gas even more dangerous than carbon dioxide, into our atmosphere, the consequences of which will ultimately cost billions. If natural gas is a "bridge" fuel to a clean-energy future, then this bridge is on the verge of collapse.

Pushing for mandatory home and business energy-efficiency audits.

In an April 16, 2015, appearance on WGBH's Boston Public Radio, Massachusetts Governor Charlie Baker declared, "I've

been a huge promoter of everything and anything we can do with respect to our ability to improve our efficiency, and if

If natural gas is a "bridge" fuel to a clean-energy future, then this bridge is on the verge of collapse.


you haven't had a Mass Save audit...you should get one." Governor Baker further noted that "you can...significantly reduce your electric bill and your energy bill if you do, and that's good for everybody...the number of [households and businesses that] have actually gone through this is incredibly small, relative to the number of [households and businesses] that are out there, which is unfortunate." That number should be 100 percent. Every homeowner, apartment building owner and business in the Commonwealth should undergo such an audit or face a moderate fine.

Scaling back restrictions on solar power production.

The artificial limit on solar production is profoundly illogical in an era when we need as much clean power as possible. In July, the state Senate voted to lift the artificial cap. Shortly thereafter, Governor Baker agreed to reduce limits on solar. Hopefully, the ultimate law will help ensure a strong solar future for the Commonwealth.

Pricing carbon in a manner proven to protect economic growth.

In April 2015, MIT held a forum on the merits of market-based carbon pricing measures, focusing on British Columbia's success in using a revenue-neutral carbon tax to reduce emissions while keeping the province economically vibrant. Revenue-neutral means that the fees that are collected are returned to those paying them, households, municipalities, businesses. State Senators Michael Barrett and Marc Pacheco are leading efforts in Massachusetts to put a price on carbon, with all or most of the revenue being returned to us. The concept of a revenue-neutral carbon fee has been endorsed by economists across the ideological spectrum, and should appeal to both conservative and progressive lawmakers.

The natural gas "bridge" to our renewable future is structurally and financially unsound. We have safe, reliable alternative routes. Let's use them. 



Pipeline Mania

Why are pipelines popping up everywhere? Why all the media advertising telling us how important they are to our comfort and security? Here in Massachusetts, we are witnessing: a major expansion of the Algonquin Incremental Market by the Spectra pipeline company; a proposal by Kinder Morgan for a brand new pipeline through western Massachusetts, southern New Hampshire, and back into northeast Massachusetts; and another Spectra project through suburbs south of Boston.

Interstate pipelines are approved by the federal government, through the Federal Energy Regulatory Commission (FERC). To build a new interstate pipeline, or expand an existing one, the pipeline company must show that it has customers - energy utilities, in this case. The export of natural gas requires permits both from FERC, for facilities, and from the US Department of Energy, for the commodity itself.¹

Why would the pipeline companies refuse to admit that the pipeline's primary purpose is to export gas? In addition to regulatory issues, it would be difficult to convince our governor to force ratepayers to cover the cost of pipelines whose primary purpose is to transport gas to foreign markets.

The fracked gas industry hires the pipeline companies to move their product. Without a way to transport the gas, the fracking could not continue. The pipeline companies operating in Massachusetts are Texas-based Spectra and Tennessee-based Kinder Morgan. The utilities enable the pipelines to be built by requesting lateral pipelines, so-called because they are laterals off the main pipelines. The lateral pipelines may not be needed for Massachusetts customers, but they are needed by the pipeline companies to justify the projects.

A case study will illustrate this process.

West Roxbury Lateral

Spectra submitted a proposal to FERC that included the West Roxbury Lateral (WRL), a five-mile line from Westwood through Dedham into West Roxbury. London-based National Grid, which requested this lateral, initially told residents that it was for their use. Then it was pointed out that 98 percent of West Roxbury is already served by natural gas. National Grid changed its story, citing unmet Greater Boston needs as the rationale. From then on, National Grid made a point of emphasizing that the WRL is not for West Roxbury.

¹ U.S. Natural Gas Exports: New Opportunities, Uncertain Outcomes, Congressional Research Service, January 28, 2015, <https://www.fas.org/sgp/crs/misc/R42074.pdf>

Besides the issue of whether we even need this pipeline is the safety issue, of paramount importance to those living and working near the proposed 750 pounds-per-square inch (psi) pipeline. An explosion of a lower-pressure pipeline (under 400 psi) in San Bruno CA in 2010 took eight lives, destroyed 35 homes, and caused an earthquake measured at 1.1 on the Richter scale.² In addition, the WRL ends at an active quarry site. The land purchased by Spectra once had a home on it but the quarry operators had to purchase the site and tear down the home because it had been severely damaged by the weekly blasting that still occurs there. Requests to re-route the project were denied by Spectra as that would require a new submission to FERC and would slow the project down.



Destination: Overseas

The bulk of the fracked gas that will come through MA is destined for export. How do we know this?

First, projected new pipeline capacity is much more than we need. If the new proposed pipelines were built, we would see an increase of 73 percent in capacity in the Commonwealth. Yet our "shortages" are minor and intermittent.

Second, Spectra has spoken openly about their export plan in Canada.

"...Spectra Energy Corp. is planning to build a new gas pipeline from the prolific Marcellus field in Pennsylvania to New England, where it can be connected to Spectra's Maritime and Northeast Pipeline, which would be reversed to carry gas into Nova Scotia.

That project has run into stiff opposition in Massachusetts but Spectra vice-president Richard Kruse said the company is confident it can overcome those hurdles, obtain federal approval and meet a 2017 in-service date."³

What about the natural gas shortages? Turns out our existing pipeline system is on average about half empty, and only at capacity a handful of winter days each year. We have begun dealing with those shortages by using imported liquefied natural gas (LNG), which is now plentiful and has dropped significantly in price.

What is the real plan? The fracked gas will be sent to Canada and converted to LNG. That process requires the gas to be lowered in temperature to a liquid state, then shipped in refrigerated tankers. The plan discussed in the Canadian article cited above indicates that the present ultimate destination is Germany. Natural gas prices in Germany as well as other European countries are about double those in Massachusetts [EIA].

Continued on next page

² <http://sanfrancisco.cbslocal.com/tag/san-bruno-explosion/>

³ *Ottawa Globe and Mail*, August 17, 2015: <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/two-national-energy-board-approved-lng-projects-hinge-on-us-permits/article25995937/>

...continued from page 5

What if the pipelines are built and the gas is exported? Would these companies sell us gas at a lower price than they could get in Europe? From the Congressional Research Service: *A significant rise in U.S. natural gas exports would likely put upwards pressure on domestic prices...*⁴

Climate Implications

The barrage of media ads also state that natural gas is clean. Is it? If there was no leakage of the gas, also called methane, then it would be much cleaner than other fossil-fuel alternatives such as coal or oil. It was initially hailed as a “bridge fuel to a clean energy future” - until all the leaks were discovered. It is estimated that natural gas is better for the climate than coal if leakage rates are kept below 3.2 percent.⁵

First, there are leaks at the fracking sites. Present estimates suggest some leakage rates of over 10 percent.⁶

Then there are leaks along the way, between the fracking sites and Massachusetts. Then there are the leaks here, directly beneath

4 *U.S. Natural Gas Exports: New Opportunities, Uncertain Outcomes*, Congressional Research Service, January 28, 2015, <https://www.fas.org/sgp/crs/misc/R42074.pdf>

5 <http://blogs.scientificamerican.com/plugged-in/methane-leakage-from-natural-gas-supply-chain-could-be-higher-than-previously-estimated/>

6 However, recent air monitoring by researchers at the National Oceanic and Atmospheric Administration and the University of Colorado, Boulder, near a gas and oil field in Colorado revealed fugitive methane emissions equal to 2.3 to 7.7 percent of the gas extracted in the basin, not counting the further losses that occur in transportation. Recent aerial sampling of emissions over an oil and gas field in Uintah County, Utah, revealed methane emissions equal to 6.2 to 11.7 percent of gas production. http://www.environmentamerica.org/sites/environment/files/reports/EA_Fracking-Numbers_scrn.pdf

our feet, estimated by two independent studies to be 2.7 percent.⁷

These leaks not only cost consumers in Massachusetts alone almost \$100 million per year, but kill trees, and are deadly climate pollutants. There is a great deal of attention given to carbon dioxide and its effect on climate change. Methane as a greenhouse gas (GHG) is 86 times worse. And while it “only” lasts in the atmosphere for 20 years, before changing to carbon dioxide, the climate scientists say these coming years are the most critical in determining whether we can level off at plus 3.6°F or not.

And the final blow — the pipeline and utility companies want the customers to take the financial risk of building these pipelines. The MA Department of Public Utilities (DPU) recently ruled that it is acceptable for electricity customers to pay surcharges to construct these pipelines, as most of the electricity in our state comes from the combustion of gas. As a matter of fact, of all the energy consumed in Massachusetts, 65 percent comes from natural gas.

This is a large price tag. It is estimated that the cost of all the new proposed pipelines in Massachusetts is \$8 billion. This would add to our already huge energy deficit: of the \$22 billion we (homes, businesses, municipalities, institutions) spend on energy in Massachusetts, \$18 billion leaves the state.

In Short, These Pipelines Do Not Make Financial or Climate Sense

These pipelines are unnecessary, dangerous, expensive, and pose a serious threat to our future place on the planet. They would ultimately have a negative impact on the Massachusetts economy and increase our energy deficit. Investing in old and dirty energy will slow the transition to the necessary clean, renewable energy supply.

This is the time to move full speed ahead toward that renewable energy future. Let's spend those dollars on tomorrow's energy, not yesterday's.

7 <http://www.pnas.org/content/112/7/1941>

Great egret, Davis Neck, Gloucester, MA (2015)
Credit: Ed Woll



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Beyond Coal

For several years the Sierra Club has been working with community members to retire the remaining dirty coal plants in Massachusetts. Residents have joined our efforts for many reasons. Whether they want to protect our beloved home state from the impacts of climate disruption, which is fueled by coal pollution, or protect their children that suffer from asthma attacks caused by polluted air, they all have one thing in common. All of them want their children and grandchildren to thrive in a clean energy economy.



Clean energy is the fastest growing industry in Massachusetts

Massachusetts is leading the nation as the first state to move away from coal as an energy source. The retirements of Salem Harbor, Brayton Point, and Mount Tom coal plants, as well as the pending retirements of other dirty fuel power plants, give Massachusetts the opportunity for major clean energy growth. Each year residents and businesses pay \$18 billion, an amount equal to almost half the state budget, to import energy from out-of-region and out-of-country energy companies. Massachusetts is the leader in energy efficiency five years running, employs 100,000 residents in clean energy, including 12,000 in solar, and has 900 MW of solar generating capacity.

Residents and businesses are seeing the benefits of solar energy every day in reduced and stabilized electricity costs. Clean energy is the fastest growing industry in Massachusetts; to promote future growth, we recommend following the proposed Next Generation Solar Framework produced by our friends at Acadia Center.¹

The Sierra Club supports the procurement of offshore wind, over the long term, by contracting for electricity from wind areas far off the coast of Massachusetts, and starting a new energy industry in Southeastern Massachusetts. Wind energy from across New England is part of the solution and should be integrated into the energy mix.

To achieve fully a clean energy economy, we need to integrate energy efficiency, solar, offshore wind, wind from Northern New England, and storage. To realize all of these, we must have a 2 percent annual increase in the Renewable Portfolio Standard (RPS). The Renewable Portfolio Standard means more clean renewable energy made locally by Massachusetts residents, more local jobs, and more dollars kept in the state. Massachusetts will remain at the forefront of the clean energy economy and continue to be a leader by proving that investment in modern energy is the right choice for our future.

1 <http://acadiacenter.org/wp-content/uploads/2015/06/Next-Gen-Solar-Framework-for-MA-Summary-July-1.pdf>.

What will switching to clean energy cost Massachusetts ratepayers? There is a story that investing in clean energy will raise costs. What you don't hear is that when it comes to bills, not rates but bills, i.e. what we actually pay, Massachusetts' residents and businesses are actually in the middle of the pack compared to other states.

That's because there is no cheaper fuel than the fuel not used through energy efficiency. Once you install solar or wind, the "fuel" is free. That is not the case with fossil fuels and it never will be. \$18B leaving our state every year is money that is not available to be invested locally in our own economy. Clean energy isn't just good for jobs and good for the planet, it is good for our wallets. Also, renewable energy is technology-based. The price of technology, as it matures, goes down. This is not true for the price of commodities, such as fossil fuels, which fluctuate tremendously, and go up as supplies decrease.

A MassINC poll from March of this year found that when it comes to new energy generation, Massachusetts' residents favor solar most, at 73 percent, then wind on land at 64 percent, and off shore wind at 63 percent.²

Let's give the people what they want. Let's give them clean energy!



2 <http://www.scribd.com/doc/260517631/Looking-for-Leadership-MassINC-Global-Warming>.

NOMINEES FOR MASSACHUSETTS CHAPTER + GROUP ELECTIONS

(listed in alphabetical order)

Chapter Executive Committee

PHILIPPA BIGGERS

As a Sierra Club volunteer, I have initiated a local electric vehicle event, volunteered for the Boston GreenFest, arranged Sierra Club collaboration with the Wellesley Green Collaborative, and engaged local representatives on gas leak issues. I feel a sense of urgency tackling environmental issues and I believe the public should become more responsive to sustainability issues. I enjoy volunteering with a regional/national organization, as these problems need to be addressed on a broader basis. In particular, I would like to be a liaison with local green groups.

KEITH BURROWS

Time grows short. We can no longer wait to act definitively on climate change or to address the forces that have prevented adequate responses to this point. As a technology and energy-efficiency professional, I've made a career out of tackling and solving complex problems while building relationships with others looking to do the same. I've been a Sierra Club member since 2004 and currently serve as vice-chair of the Greater Boston Executive Committee. With your vote, I'll bring my knowledge and experience to the Massachusetts Executive Committee and help address the critical energy and environmental issues facing the state.

DAVID HEIMANN

Exploring, enjoying, and protecting the environment is something I've done all my life, joining the Sierra Club to push this forward. Within the Chapter, I serve as Chapter Secretary and am on the GBG Excom and the Energy and Transportation Committees, and also attend meetings of related energy groups like the Massachusetts Wind Working Group and the Restructuring Roundtable. I'm especially proud of playing a key role in installing solar at my condo, saving

one-third of our electricity. In the coming term I will address renewables, energy efficiency, and energy infrastructure, as well as Chapter strategic planning and membership development.

JOHN LEWIS

I am soliciting your vote for a seat on the Chapter Executive Committee. I joined the Club in 1975 when it was the New England Chapter. Presently I am involved in opposing conversion of public parkland for commercial use such as blocking the long term ongoing attempt of the BRA (Boston Redevelopment Authority) to site a bar in the park on the end of Long Wharf. Also on issues involving transportation financing, the N/S Rail Link, transportation policies in Massachusetts, the MBTA and general club affairs and financial issues.

MADELINE PAGE

I have a strong record of working and winning on the issues that Sierra Club prioritizes. First, as a fellow with Environment America and now as Environment America's Global Warming Program Coordinator, I've been able to hone my fundraising, advocacy and recruitment skills working on clean water, climate and renewable energy campaigns. During our summer canvass and electoral campaign projects I have recruited and trained a staff of up to 50 people. In my current role, I work with staff in our 29 state organizations to develop the campaign goals, strategy and tactics on our Global Warming Solutions Campaign.

NATHAN PHILLIPS

I teach and conduct research in ecology and urban sustainability at Boston University. I led a team in 2013 to map over 3,000 natural gas leaks in Boston. This was the first study of its kind, and underpinned legislation passed in 2014 to address this problem. The MA Sierra Club's leadership in promoting the clean energy transition is more important than ever, with a potential expansion of natural gas infrastructure

threatening to undermine progress in renewable energy. I'd love to help the MA Sierra Club win more victories for clean energy, sustainable communities, and climate justice. I ask for your vote!

DEVONE TUCKER

As a member of the Massachusetts Sierra Club since 2011, I believe this organization is best situated to achieve the goal of making the Commonwealth the world leader in clean energy. In addition, I share the Club's passion for environmental justice; as a resident of Brockton, a city on the front lines of the fight for clean air and against dirty energy, I cannot underestimate the importance of the Club's work in this regard. Protecting the health of all communities in Massachusetts is a hard task—but the work of the Sierra Club will ensure this task is accomplished.

EDWARD WOLL

Ed asks for your vote to continue serving on the Executive Committee. In his 3 1/2 years, Ed invigorated the Energy Committee as its chair, was Chapter Vice-Chair, led two Director searches and is now Conservation Chair. He has been instrumental in authoring and promoting legislation to stop gas leaks, oppose pipelines, create a clean energy future and advance environmental justice. He testifies on most energy related environmental bills in developing annual legislative programs. He handles Chapter compliance, is on the Political Committee and serves on National Committees. He believes a strong Chapter can make a difference.

Greater Boston Group (GBG)¹

JOHN KYPER

I have been a member of the GBG for six years and am Chair of the Chapter Transportation Committee. A longtime Roxbury resident, I am concerned with the environmental needs of the inner city, and how businesses and government affect the lives of residents through policies like highway expansion and siting pollution-generating facilities. This struggle for equity epitomizes the state's neglecting the needs of its most vulnerable inhabitants. I strongly support enlightened environmental policy that seeks to eliminate generation of greenhouse gases and other toxins, and reduce our dependence on private automobiles by providing more benign and attractive alternatives.

GEORGE O'TOOLE

I have served on and attended several Greater Boston Group meetings and enjoy the Group. I am a life-long resident of Boston. I have been very politically active for the past 3 decades, serving as an elected Ward 7 Democratic delegate. I am also very active in the environmental movement. It is my hope to be elected to serve on the GBG and to be involved and helpful to the great work set forth.

JEFF PICARD

I've lived the better part of my life in Greater Boston and enjoy the outdoors in every season, whether it's outside watching a soccer game or climbing a mountain. Sharing these outdoor experiences with my children has enabled me to relive the excitement and wonder of all that the environment has to offer and a passion to see it maintained. I strongly believe that maintaining balance in everything is important, and I want to help shift the

1 The GBG covers Boston and much of the metropolitan area, including: Arlington, Belmont, Boston, Braintree, Brookline, Cambridge, Chelsea, Dedham, Everett, Lexington, Medford, Melrose, Milton, Needham, Newton, Quincy, Reading, Revere, Somerville, Stoneham, Waban, Wakefield, Waltham, Watertown, Wellesley, Weymouth, Winchester, Winthrop, and Wollaston.

environmental balance back in the right direction. With your support, and most importantly your vote, let me be your advocate.

JOHN PITKIN

I have been a committed grassroots activist and innovator for four decades and joined Sierra Club in 2013. I come to environmentalism through climate activism and now view the two causes as inseparable. I live in Cambridge. I co-initiated and helped organize the Mayor's Climate Emergency Congress in 2009, later initiated and wrote the first draft of a citizen's petition that led to the Net Zero Plan recently adopted by the City, and now serve as vice president of Green Cambridge. I am a demographer, now retired, and want to help the Sierra Club engage its members in climate action.

Cape Cod and Islands Group²

CHRIS POLLONI

I have long supported the conservation values of the Sierra Club and am seeking re-election to the Cape and Islands Excom. I have been active with solid waste issues and recycling. I have also in the past led outreach activities on Cape Cod. I ask for your vote, as I plan to continue these and other projects on behalf of Sierra Club members.

Thoreau Group³

TERRY GLEASON

Because climate and environmental issues are not being addressed by our national and state leaders with the urgency needed, community, church, and town groups have stepped up to create a true grassroots movement. As a Sierra Club Board Member, one of my goals has been to ensure

2 The CCI Group covers all of Barnstable, Dukes, and Nantucket counties. This includes the Elizabeth Islands, in Dukes County, and the portion of Bourne that is west of the Cape Cod Canal.

3 The Thoreau Group covers the communities of Acton, Bedford, Boxborough, Carlisle, Concord, Lincoln, Littleton, Maynard, Stow, Sudbury, Wayland, and Weston.

Sierra Club collaborated with those truly inspirational groups and individuals in the Thoreau Chapter area (west metro Boston). Our goal is 100% renewable energy by 2050 in order to pass on a livable environment to our grandchildren. With your support, Sierra Club's unique assets, and working with the grassroots groups, this is possible.



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CHAPTER EXECUTIVE COMMITTEE ELECTIONS - BALLOTS + VOTING INSTRUCTIONS

MAIL BALLOTS TO: Massachusetts Sierra Club Elections, 10 Milk Street, Suite 417, Boston, MA 02108-4600



Membership number **MUST** appear on the outside of the envelope for ballot to be valid (your 8-digit membership number appears above your name and address on the back page of this publication. A second ballot is provided for households with joint memberships so each member can vote. **Ballots must be received by 5:00 PM on Friday, December 18, 2015, to be counted.** If you have questions, contact Elisa Campbell at elisa.campbell@gmail.com.

OFFICIAL BALLOT

OFFICIAL BALLOT

The primary member (whose name is on the top of the address label) should use this ballot.

The joint member should use this ballot.

Part 1: All Massachusetts Chapter Active Members eligible to vote for the Chapter Executive Committee.

Part 1: All Massachusetts Chapter Active Members eligible to vote for the Chapter Executive Committee.

Chapter Executive Committee Nominees
(listed alphabetically) vote for a maximum of five:

Chapter Executive Committee Nominees
(listed alphabetically) vote for a maximum of five:

- PHILIPPA BIGGERS
- KEITH BURROWS
- DAVID HEIMANN
- JOHN LEWIS
- MADELINE PAGE
- NATHAN PHILLIPS
- DEVONE TUCKER
- EDWARD WOLL

- PHILIPPA BIGGERS
- KEITH BURROWS
- DAVID HEIMANN
- JOHN LEWIS
- MADELINE PAGE
- NATHAN PHILLIPS
- DEVONE TUCKER
- EDWARD WOLL

Part 2A: Only Greater Boston Group (GBG) members are eligible to vote for the GBG Executive Committee. On the address label look for “GBG” next to your name.

Part 2A: Only Greater Boston Group (GBG) members eligible to vote for the GBG Executive Committee. On the address label look for “GBG” next to your name.

GBG Executive Committee Nominees
(listed alphabetically) vote for a maximum of four:

GBG Executive Committee Nominees
(listed alphabetically) vote for a maximum of four:

- JOHN KYPER
- GEORGE O'TOOLE
- JEFF PICARD
- JOHN PITKIN

- JOHN KYPER
- GEORGE O'TOOLE
- JEFF PICARD
- JOHN PITKIN

Part 2C: Only Cape Cod & Islands Group (CCI) members can vote for the CCI Executive Committee. On the address label look for “CCI” next to your name.

Part 2C: Only Cape Cod & Islands Group (CCI) members can vote for the CCI Executive Committee. On the address label look for “CCI” next to your name.

CCI Group Executive Committee Nominees:

CCI Group Executive Committee Nominees:

- CHRIS POLLONI

- CHRIS POLLONI

Part 2B: Only Thoreau Group members eligible to vote for Thoreau Group Executive Committee. On the address label look for “THO” next to your name.

Part 2B: Only Thoreau Group members eligible to vote for Thoreau Group Executive Committee. On the address label look for “THO” next to your name.

Thoreau Group Executive Committee Nominees:

Thoreau Group Executive Committee Nominees:

- TERRY GLEASON

- TERRY GLEASON

Recycle Our Anthropogenic¹ Dinosaurs to Clean Energy - Brayton Point and Somerset Station

The Massachusetts vestiges of the era of coal are Brayton Point and the Somerset Station. These fossils together once generated over 1,700 Megawatts (MW) using 345 acres. They can be repurposed to showcase hybrid clean energy development employing solar and on-site wind to produce prime power. Firming, which smooths out the variability of solar and wind, can be done with battery storage (or temporarily with intermittently-used natural gas piston engines, using the existing natural gas pipeline).² The site's clean energy potential is over 60 MW. Its development can be done in parallel with upgrading the high-capacity, underutilized coal-plant era transmission lines to accommodate variable power sources. Additional excess transmission capacity will become available with closure of the Pilgrim Nuclear Power Station.

The site is also ideal as the land terminus for the electric cable from the offshore wind field south of Martha's Vineyard (an area its developers call the Saudi Arabia of wind), using additional site acreage for firming by battery storage.

The project will keep the state in the forefront of clean and renewable energy technology and management systems and advantageously and strategically repurpose these sites, with the prospect of expanding its use for firming offshore wind.

The Brayton Point Site



The 306 acre site is pictured here and below.³ The facility had employed up to 232 people. It has a deep water dock at the northern head of Good Hope Bay. The two 500-foot cooling towers and four several-hundred foot-high stacks should have many years of monitored wind data, as required by the Environmental Protection Agency.



The four coal, natural gas and oil fired generating units have a total rated capacity of 1,530 MW but have operated at

1 Meaning "of, relating to, or resulting from the influence of human beings on nature <anthropogenic pollutants>" Merriam- Webster Dictionary.

2 Firming means providing power at the times when the sun goes down and the wind stops.

3 http://en.wikipedia.org/wiki/Brayton_Point_Power_Station.

less than 15 percent of capacity for several years.⁴ The facility has been operated by Dominion, who bought it in 2005. It is scheduled to close in May 2017.⁵ Dominion sold the site to a private equity firm, Energy Capital Partners, who in turn included it in a package of fossil-fueled sites sold to Dynegy of Houston.⁶

The Somerset Station Site



The abandoned Taunton River 174 MW coal plant site Somerset Station, shown here, comprises 39 acres.

It is on a navigable river. It can be used for solar and energy storage in its present brownfield state without impairing the aesthetics of the area.

The hybrid Opportunity

The proposal to develop a renewable energy facility of at least 66 MW on the Brayton Point and Somerset Station sites takes advantage of existing clean energy technology using solar, wind and firming by battery. There are already large MW-size battery storage facilities being built in California and elsewhere. Properly planned, the site will have expansion capacity to provide firming for additional offsite variable sources, such as offshore wind south of Martha's Vineyard and regional land-based distributed energy sources of community solar and appropriately sited wind.

These reliable clean and renewable energy facilities provide better continuous long-term employment opportunities and a path to growth, as well as an increased tax base for the community. They also provide a predictable cost of energy, unfettered to volatile fossil-fuel markets. And modern wind towers are far more attractive than the existing dominating cooling towers and stacks.

Using a feasible target ratio of 65 percent solar, 35 percent wind, 230 acres can be used to produce perhaps up to 35 MW

Continued on next page

4 Schlissel, D. and Sanzillo, T. (2013). Conservation Law Foundation. Dark Days Ahead. Retrieved from <http://www.clf.org/blog/cleanenergy-climate-change/dark-days-ahead-the-financial-future-ofbrayton-point>.

5 <http://www.bostonglobe.com/business/2014/01/27/must-run-coal-plant-shut-down/O7YN3tbgFvxVEdxBgM8siM/story.html>.

6 http://www.bizjournals.com/boston/blog/bottom_line/2014/08/the-brayton-point-power-plant-is-being-sold-again.html?page=all.

...continued from page 11


of solar power. An additional four appropriately-sited wind towers of up to 5 MW could provide up to 20 MW for 55 MW total variable power. The existing Brayton Point dock facilities are capable of off-loading the equipment to be installed, including wind towers.

Getting to Some of the Specifics

The remaining 35 percent of the acreage can be used for firming facilities, using storage batteries, for example, and for operations. A rule of thumb is that firming power ought to be about 20 percent of variable capacity, or roughly 11 MW of the 55 MW total. The total site capacity could be as much as 66 MW. A rough estimate for a 66 MW hybrid system is \$130 to \$150 million, or \$2.0 to \$2.3 million per MW.

Installation of one MW of solar produces 15 to 20 jobs, or 500 or more jobs for a 35 MW solar plant. Additional modern technology jobs are created for building and operating wind and energy storage and firming facilities. The completed hybrid facility may employ up to 30 people, not including construction. A 600 MW natural gas plant would have about the same number or fewer employees, but none of the high technology opportunities of a clean and renewable energy facility. Local retraining programs now make eminent sense to produce green jobs for displaced coal-plant jobs.

The project also: (1) enhances opportunities in the area to build and support distributed energy facilities, again with modern technology jobs, (2) provides additional space for firming facilities for the wind energy from the planned off-shore project south of Martha's Vineyard, and (3) allows one to upgrade the existing large-capacity transmission grid to accommodate variable distributed energy sources (solar and wind).

Moreover, a profitable, multi-purpose hybrid energy plant will improve significantly the tax base for these sites. Massachusetts should seize this opportunity to be a national leader and build a state-of-the-art hybrid facility. 



Snowy owl, Plum Island, MA
Credit: Nathan Goshgarian ©2015

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A Call to Action: Close Pilgrim Sooner and Make Sure It's Cleaned Up!

We've reached the tipping point at the Pilgrim Nuclear Power Station in Plymouth. The conversation no longer is about whether it should remain open another 40 years. Instead it's about how fast it should close, how it can be made safe in the meantime, what "decommissioning" means, and who is going to pay for it. But closure is far from the final chapter. The same pressure and activism for closure is required to assure Entergy, Pilgrim's parent corporation, fully funds a thorough and safe clean-up.

Entergy has said it will close the nuclear power plant "no later" than 2019. Entergy's care with that language is because it has power supply agreements that run through that date with the regional energy grid operator, ISO New England. Breaking those contracts would trigger large penalties. But the reactor will also need to be refueled in 2017, a very costly process that involves even more costly maintenance and upkeep. Best guess: Entergy will find a way to get out of its ISO commitments, and close within two years. Activism can hasten that desirable result.

Why did Entergy announce closure now? The quick answer is that Pilgrim is not profitable. Best estimates are that the plant lost \$40 million in 2014.

The longer answer is that bad management, combined with citizen pressure and government safety oversight were body blows that put the plant on the ropes. Pilgrim recently was reclassified by the Nuclear Regulatory Commission (NRC) as a less safe "Category 4" plant, which is one step away from forced closure, because of a series of "scrams," or unplanned shutdowns, and other operating issues. Only one other nuclear facility in the country, an Entergy operation in Arkansas, is in category 4. Clearly Entergy decided the investment was not worth it.


Determined activism on Pilgrim was key. The intense scrutiny and protest covered everything from daily operations, emergency planning, monitoring, and evacuation to the spent fuel storage pool above the core reactor. Pushed hard by citizen concern, the Environmental Protection Agency (EPA) was ready to issue a new and long-overdue permit for water discharge. Pilgrim discharges a staggering 500 million gallons a day into Cape Cod Bay when the plant is at full power. While the EPA permit's terms are not yet known, it is clear that would have been an expensive fix - or an expensive legal process to fight it.

A pressing concern is that Entergy will have little incentive to invest, and the plant's experienced

operators will have every incentive to look elsewhere for work. That's not a recipe for safety. We will have to rely on the NRC and the plant operators to maintain the highest standards until the reactor shuts down.

The final chapter includes the need for Entergy to remove its spent fuel from wet storage quickly into dry storage, entombed in large cement vaults. If spent fuel remains on-site, Pilgrim will be a nuclear waste dump for a very long time.

Finally, a most important conversation is how to clean up the site quickly and allow for new uses that enhance our energy future, our economy and job opportunities. There is a significant amount of available land away from the fuel site, tainted but still valuable. That land has one amazing asset: some of the most robust, expensive electric transmission lines in the world, already connected to the grid. This 1,600-acre site on Cape Cod Bay can also be used to propel us toward a greener energy future. Those transmission lines can be used to redevelop the site for solar, wind, storage or even energy from Cape Cod Bay's 10-foot tides. A thousand acres of solar is 120 megawatts. And that is the opportunity to develop good jobs for the 600 people who presently pull a paycheck from Pilgrim.

This is the grist of life and of public policy and the essence of activism: to take best advantage of a tipping point and turn it into a substantially better result. 



Sierra Club Walter Starr Award



Vivien Li of Boston received the **Sierra Club Walter Starr Award**, which honors continuing work by a former member of the Sierra Club Board of Directors. Li served two terms on the Board from 1986 to 1992. In recent years, she has been active on a variety of national committees and teams.

Congratulations Vivien!

Photo: Sierra Club President Aaron Mair, Walter Starr Award recipient Vivien Li, and Sierra Club Executive Director Michael Brune.

A Clean Energy Path to Close Any Pilgrim Nuclear Energy Gap

On October 13, 2015, Entergy Corporation, the owner of Pilgrim Nuclear Power Station, announced that Pilgrim would close by June 2019. The Massachusetts Sierra Club has long sought closure of this obsolete, out of date and now admittedly unsafe nuclear plant in Plymouth. Pilgrim's closure presents the opportunity to continue and enhance our state's leadership in developing a clean energy economy. However, our current Governor has seized on the closure as an opportunity to increase our already excessive dependence on natural gas and on Canadian hydro in the name of energy diversity. Our state's economic future, energy independence and energy security are at risk with an energy path that further concentrates on natural gas and hydro.

We are already excessively dependent on natural gas for over 60 percent of our energy. The Governor's proposal is not diversification but an increase in concentration and risk. Our natural gas price has already gone from \$2 to \$7 to \$4.50 per thousand cubic feet (Mcf) in the short span of 5 years. That means, at current prices, every \$1 increase in the price of natural gas increases the cost of that energy to our economy by about 20 percent.^{1 2}

We cannot afford that volatility, and more pipelines do not solve that problem. The ultimate goal of pipeline companies and gas producers is to export US gas as Liquefied Natural Gas (LNG). As soon as we export LNG anywhere in the country, our prices will be governed by the higher and politically and financially more volatile global market. Any domestic market price control will be gone.

The role of natural gas in the state should be decreasing. The way to do that is to fill any energy gap using existing LNG import facilities.³ We can scale back on this stop gap source as we improve our efficiency and conservation and expand and diversify

our portfolio of clean and diverse energy sources. No new LNG facilities are needed.

More Canadian hydro does not guarantee a reliable energy source either. Canada's needs will trump ours. Our energy will be hostage to Canadian political forces and economics. In addition, why should we increase our dependence on foreign sources of energy? As with gas, that is not diversification but increased concentration and risk.

A counter argument is that solar and wind are "intermittent" and thus not capable of filling the Pilgrim gap.⁴ These variable sources are already cost competitive with gas and coal. The problem is that we do not have enough wind and solar installed. More and geographically separated wind and solar throughout the New England grid will substantially decrease wind and solar variability.^{5 6} Moreover, local energy storage can be used to mitigate variability. Such storage technology is already being deployed on large scale as demonstrated by California, the leader in developing energy storage facilities.^{7 8}

4 "Could extra LNG supplies help restrain winter gas prices?" Boston Globe, Oct. 26, 2015. http://www.bostonglobe.com/business/2015/10/25/more-lng-could-flow-boston-this-winter/ILzQmefj-SI08u6CcP1M0K/story.html?s_campaign=email_BG_TodaysHeadline&s_campaign.

5 "Hybrid Solar-Wind Farm Could Solve Variability Issue", <http://oilprice.com/Latest-Energy-News/World-News/Hybrid-Solar-Wind-Farm-Could-Solve-Variability-Issue.html>.

6 "How to Power the World without Fossil Fuels" Scientific American, April 2013. <http://www.scientificamerican.com/article/how-to-power-the-world/> "If you get the [power] transmission grid right you don't need a whole lot of storage. By combining wind and solar and geothermal and hydroelectric, you can match the power demand. And if you oversize the grid, when you're producing extra electricity you use it to produce hydrogen [for fuel-cell vehicles and ships as well as some district heating and industrial processes]. You can also spread the peak demand by giving financial incentives [for consumers to use power at off-peak times]. Some storage certainly would help; we have storage in the form of hydrogen and in concentrated solar power plants. There are many ways to tackle the intermittency issues."

7 "California Takes Lead In Developing Energy Storage" Climate Central, Jan. 13, 2015. <http://www.climatecentral.org/news/california-developing-energy-storage-18529>.

8 "GE Providing 8 MWh Of Utility-Scale Energy Storage For Cali Con Edison Project", Clean Technica, April 29, 2015. <http://cleantechnica.com/2015/04/29/ge-providing-8-mwh-utility-scale-energy-storage-cali-con-edison-project/>; "Utility-scale battery storage to reach 12 GW, \$8.44 billion by 2024", PV Magazine, Sept. 15, 2015. http://www.pv-magazine.com/news/details/beitrag/utility-scale-battery-storage-to-reach-12-gw--844-billion-by-2024_100021149/#axzz3nwIL3T6P.

1 All website references were accessed Oct. 26, 2015.

2 Marcellus fracked gas prices have ranged from \$1.89 to \$5.94 since 2008. Marcellus Shale, <http://www.marcellus-shale.us/natural-gas-prices.htm>. For the fluctuation of other wholesale and LNG import prices see "Natural gas USEIA," http://www.eia.gov/dnav/ng/ng_pri_sum_dcu_sma_m.htm.

3 "Could extra LNG supplies help restrain winter gas prices?" Boston Globe, Oct. 26, 2015. http://www.bostonglobe.com/business/2015/10/25/more-lng-could-flow-boston-this-winter/ILzQmefj-SI08u6CcP1M0K/story.html?s_campaign=email_BG_TodaysHeadline&s_campaign.

Such storage facilities can be deployed in the state well within the time it takes to build any new pipelines or a new Canadian hydro transmission line.⁹

A 2014 state sponsored study that anticipated the closure of Pilgrim and all existing Massachusetts coal plants projected a natural gas shortfall of only 0.6 to 1.2 billion cubic feet per day, based on then existing technology and regulations. That amount may seem like a lot but it is not; it deals with peak demand capacity, not base demand, and can be supplied by clean sources developed over the years it would otherwise take to build a gas pipeline or increase the capacity of electric transmission lines from Canada. LNG import capacity of 9 to 15 billion cubic feet, sufficient to cover that projected deficit for peak demand, already exists. No pipeline and no additional LNG import terminals are needed.

What do we do in the several years it would otherwise take to build new gas pipelines and electric transmission lines? We have led the nation in energy efficiency five years in a row and have thereby reduced energy demand by about 1 percent per year. That success has flattened our energy demand, and we have just begun to plumb its potential.

Also we must raise immediately the solar net metering cap to 1,600 Megawatts and higher. The failure to do so has stunted our solar industry growth and jeopardized over 70 MW of solar projects. That 70 MW translates to over 1000 local jobs and \$280 million in revenue.


We have yet to implement the General Court's farsighted legislation passed last year providing energy credits for clean thermal energy sources – solar, heat pumps and combined heat and power plants. Instead of accelerating that opportunity, the Governor's recent Executive Order 562 to review all regulations has slowed it down.

The gas and electric utilities own numbers show that every year at least \$50 million worth of natural gas leaks into our air. That amounts to over 3.0 billion cubic

feet or about 8.0 million cubic feet per day or over 1.4 percent of the peak deficit.¹⁰ We should close leaks first before adding pipelines.¹¹ A Harvard University study showed that Greater Boston's natural gas leaks may be three times more extensive, more expensive (\$90 million per year) and more damaging to the climate (equivalent to 8 percent of our greenhouse gas emissions) than was previously believed. And there is more credible evidence that the utilities' numbers are significantly low.^{12 13} It is clear that we should close leaks first before adding pipeline capacity.

We also need to price carbon properly to incentivize the transition to a clean energy economy.

We export \$18 billion per year to import fossil fuels – and even more to buy Canadian hydro. Let's keep those dollars here to invest in local clean and renewable energy, energy storage, energy efficiency and conservation. That path creates local jobs, stimulates local technology development and lets us become experienced experts in building a clean energy economy – an expertise that we can then export to the world. That should be our energy path – and part of our economic path.

So let's turn the Pilgrim gap into an age of growth, opportunity and self reliance with clean and renewable energy, a path that is consistent with our state's heritage. 



10 Leaked methane jeopardizes the state's ability to meet its greenhouse gas mandates. "The Myths of Natural Gas", <http://sierraclubmass.org/wp/?p=1065>.

11 These numbers are based on what the utilities reported to the Department of Public Utilities as reflected in the DPU's October 2015 report to the Joint Committee on Telecommunications, Utilities and Energy. "Report to the Legislature on the Prevalence of Natural Gas Leaks in the Natural Gas System", D.P.U. 15-GLR-01 September 18, 2015. http://web1.env.state.ma.us/DPU/FileRoomAPI/api/Attachments/Get/?path=15-GLR-01%2fReport_to_Legislature_92415.pdf. Calendar Year 2014 Massachusetts DPU Addendum to Forms RSPA F 7100.1-1 in Appendix C to above report. <http://web1.env.state.ma.us/DPU/FileRoomAPI/api/Attachments/Get/?path=15-GLR-01%2fAppC.pdf>.

12 Harvard University's recent study reported on the Boston Globe Jan. 22, 2015, shows that Greater Boston's natural gas leaks may be three times more extensive, more expensive (\$90 million per year) and more damaging to the climate (equivalent to 8% of our greenhouse gas emissions) than was previously believed. The Harvard study preceded publication of DPU's October 2015 report to the Joint Committee on Telecommunications, Utilities and Energy.

13 Study by HEET of Somerville and Cambridge, MA gas leaks, <http://www.heetma.org/squeaky-leak/squeaky-leak-report/>.

9 New Massachusetts pipelines come with additional problems. "The Threat of More Natural Gas Pipelines to Our Past and Our Future", <http://sierraclubmass.org/wp/?p=1131>.

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