

The Pursuit of An Ecological Future:

Making Economic Growth Mean Ecological Improvement

Market Rules and Structures for Sustainable Growth

by

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Introduction: What Can and Must be Done

1. Yesterday: A N.H. Journey

Yesterday, we drove north into New Hampshire on a warm mid-January morning. It was a return to familiar territory. I'd lived in Central New Hampshire for over thirty years.

Starting on my farm in nearby West Lebanon, Maine, my life was an unanticipated forty year journey and sometimes adventure. I began as back-to-the-lander and writer from New York City in the early 1970s, and then found myself as non-violent anti-nuclear activist with the Clamshell Alliance, immersed in energy issues and opposition to the Seabrook nuclear project. This led to work, starting in the 1980s, first as energy auditor, then energy consultant, cooperative organizer, solar power entrepreneur and sustainability director, all paralleling my efforts as writer and social theorist.

N.H. still feels like home, a place that shaped my adult consciousness, and the lessons that inform this book. And it is in a journey to New Hampshire that I found in microcosm a good model for our global dilemma, for business and pollution as usual that's keeping us on the fossil fuel path toward self-destruction. This is the path that not only allows pollution for free, but also the ongoing distortion of free markets to maintain the profits and prerogatives of polluters.

This book addresses how we can and must change. It considers how we can overcome market failure that keeps fossil fuels in the saddle and riding humanity hard toward a cliff. It advances, in detail, plans for an ecological growth strategy to build a prosperous and sustainable world that can be powered entirely by sustainable renewable energy resources.

An ecological growth strategy is based on applying our democracy, our markets, and our entrepreneurial energy in a fashion that lets economic growth mean ecological improvement. It uses the very core of our market economy, the incentives of the price system, guided by and new market rules and ecological taxation, as the primary tools to get this done.

To be clear, an ecological growth strategy is the best path to increased and sustainable earning per share (EPS), a metric near and dear to the hearts of both prudent investors and sharp speculators. Business and pollution as usual is the path to destruction and economic collapse. The aggressive pursuit of sustainability means , not only an ecological future, but also sustainable profits and increased income for all. It's a plan for sustainable global economic growth and an end to poverty. That's the value proposition.

New Hampshire is a good place to start our exploration, and to help open our eyes, and to help us realize that what seems intractably difficult may not be all that hard if enough of us decide that enough is enough.

We will examine first, in Part I of this introduction, the intertwined history and fate of Public Service Company of New Hampshire, the state's largest utility and of Merrimack Station coal plantⁱ, the Seabrook Nuclear Projectⁱⁱ, and citizen oppositionⁱⁱⁱ.

This will set the stage, in Part 2 of the Introduction to begin consider the focus of this book, the shape of a solution to the ecological crisis of our times, why prompt action is a necessity, and how we can succeed in building an ecological civilization that is sustainable and prosperous through the pursuit of an ecological economic growth strategy.

An ecological growth strategy will include a global series of transformative technological changes such as the adoption of continental scale efficient renewable energy systems. Our recent plan for a China -East Asia Renewable Supergrid from the China International Working Groups informs our analysis of these possibilities.^{iv}

In embracing an ecological growth strategy, we are not removing the profit motive, nor abolishing capitalism as necessary steps in order to create a sustainable world. The Pursuit of an Ecological Future is based on two basic premises:

First, the democratic market system when faced with gathering ecological catastrophe will respond vigorously, and, by necessity, second, practice the requisite mixture of limitation, restraint, and focused expansion for economic growth leading to ecological improvement and construction of the material basis of a sustainable civilization.

An ecological growth strategy is designed to respond to the gravity of the global ecological

crisis in a swift and timely fashion before our options are foreclosed by irreversible consequences. It is crucial for us to understand that continuing to subject the ecosphere to unremitting pollution and habitat destruction will lead to dramatic and non-linear change as the ecosphere, responding to changes on a geologic and planetary scale, finds a new equilibrium, one that is decidedly unfriendly to human civilization.

- **Scope of the Book**

First, starting in Chapter One, we will explore, in depth, the ecological growth strategy, its policies, programs and dynamics, as well the forces that inform it as an expression of the co-evolutionary forces of sustainability. We will consider policies, technical measures, markets and ecological taxation and market price signals and enter the political thicket.

Second, will examine of the continuation of business as usual as an evolving, not static practice. We will consider the inevitable future focus on attempts for the mitigation of consequences of accelerating global ecological instability, and attempts at geo-engineering that will unfold as mitigation efforts prove futile and the accelerating pace of change overwhelms us.

Third, we will examine the path of limitation and contraction, that will likely follow the collapse of business as usual as part of a desperate struggle for survival. Limitation and contraction is a post-modern variation of Lincoln Steffens' one less than prescient remark about the depression era Soviet Union, "I have seen the future and it doesn't work" strategy to do less with less, and to divide a smaller pie.^v

A Drive Along the Merrimack

Decades of conflict in New Hampshire over energy and the environment were driven not by issues of technical design, but by matters in the realm of politics, finance, and business profits. Events were shaped by the market rules and politics supporting business and pollution as usual. These allowed

pollution for free and the shifting of costs to those downwind and to future generations, that, in turn, defined our commonsense, and what was now considered economic, good business, and acceptable risk. Understanding and untangling these threads and how they interacted will help inform the road ahead toward a sustainable future. We begin driving by north into New Hampshire.

A January thaw had become a protracted warm spell. At the Hooksett rest stop, a white column of smoke poured from the stack of Merrimack Station, the 459 megawatt coal fired Bow, NH power plant of Public Service Company of NH. Until a few years ago, when an expensive new scrubber system was installed by state mandate, the exhaust had a distinctive brownish hue as particulates poured into the air and then rained down along the Merrimack Valley that had become an asthma hot spot. Merrimack Station has two boilers. The first built in 1960 had 114 megawatts when there was little thought of the coming transformation of Southern New Hampshire. The second boiler was completed in 1968 of 346 MW. Megawatts. The following link provides a good and zoomable satellite image of the coal plant on the river:

http://overconscientious/index.php?title=Merrimack_Station

Merrimack Station had always been about cheaper and reliable electricity from coal. Its pollution and its consequences apparently an acceptable result of doing business. It was part of the “New Hampshire advantage” that attracted businesses and migrants with comparatively lower costs from Massachusetts just south of the border.

Southern New Hampshire was transformed in the last third of the 20th century from a mosaic of sleepy country towns, best known for rural icons like the venerable Robert Frost farm in Derry.^{vi} Almost overnight, it seemed, the Merrimack Valley and much of Southern New Hampshire became one of the fastest growing regions of the country. Farms were almost as scarce as hen's teeth, and new business and industry and subdivisions sprouted like mushrooms.

Electricity demand soared with runaway growth, and the Bow plant became the reliable base of Public Service electricity supply, with coal delivered by rail or by barge on the Merrimack. Rising electric demand convinced Public Service to think big and transform itself, as well, by becoming lead owner, with a 35.7% share, of the Seabrook two reactor, 2300 megawatt nuclear project, at the time, the nation's largest. Seabrook Station and its opponents would become a consuming focus for Public

Service Company for decades. And while the Seabrook struggle raged, Merrimack Station receded from public attention as the Seabrook nuclear issue and its consequences transformed Public Service and had national consequences, and global resonance for the future of nuclear power and utilities.

- **Public Service Company, The Seabrook Nuclear Plant, and the Citizen Opposition**

Public Service Company was just big enough to support the financial weight of a then less than 2 billion dollar nuclear project. But almost nothing went right. A chain of unanticipated events unfolded, including, as the Seabrook project was in its earliest stages, what seemed to be barely relevant. Citizen resistance in the NH Seacoast stopped a planned Aristotle Onassis NH oil refinery in Durham, with crude unloading planned for the rich town of Rye, not far from the poor town of Seabrook.

When refinery activists turned their attention to the Seabrook project, they were not taken very seriously by a Public Service that was used to getting its way. Public Service had a champion in Governor Meldrim Thomson, a man with little patience with opposition, an acolyte of the new right, a man who wanted to arm the National Guard with nuclear weapons.

Gov. Thomson had little trouble deciding to consider Seabrook and other Town meeting votes against the nuclear project as merely advisory and ignore them. Public Service put itself in the position of being committed to endlessly pushing through a giant and very long-term energy project while ignoring vocal majority local opposition, as well as seizing land through eminent domain.

Unsurprisingly, Seacoast people pushed back. They did so by rewriting the rule book for grassroots opposition informed by a particularly stubborn Yankee grit and wry sense of humor. “I knew that guy Emit Domain and he's a skunk,” it was said. And Public Service and Meldrim Thomson played perfect foils. “You can't fight city hall, but you can poop on the steps,” Seabrook resident Dianne Garland told me.

The local Seabrook chant “Se-Se-Se-A / Sea brook-Seabrook -ook/ A-yah-abubba-ayah” melded with the anti-nuclear anthem *Acres of Clams*, written by Charlie King to the fiddle tune *Rosin the Bow*. “I lived all my life in this country /I love every flower and tree/ I expect to life here till I'm 90/ It's the nukes that must go and not me/ It's the nuke's that must go and not me my friend/ It's the nukes that must go and not me...”

The Seabrook project brought forth decades of non-violent citizen opposition in the courts, the regulatory arena, and in the streets. While the legal intervenors carried on battles in the hearing rooms, Clamshell strategy combined non-violent direct actions with interventions to cut off the flow of money for the project working in many venues, and employing many styles. Clamshell left no financial stone unturned. The bankers and Wall Street ultimately had as much or more to say then the regulators. An account of some aspects of Clamshell activities outside of the financial realm is in Appendix A.

What's of particular relevance of the Clamshell experience to future struggles against business as usual is as an example of how an initially small group of people with deep concern on an ecological question refused to accept business as usual, and ultimately enlisted tens of thousands of activists and had a substantial influence upon the shape of things to come.

This is the model behind mass withdrawal of consent. Tens become hundreds, become thousands, can become millions in the streets. Watching the documentary *Tahir Square*, for example, about the Egyptian uprising and revolution is to see that explosive growth when literally millions, who cannot stand it any more, demand change and justice. And *Tahir Square* is also a cautionary tale about the resilience of powerful groups to struggle to maintain their privilege in the face of change., and the difficulty of translating demands to effective political action. Three years after the uprising against Mubarak, the future course of events remains to be seen, as it does for us all.

The Dash for Cash to Keep the Seabrook Project Afloat

Beyond the local opposition Public Service disregarded, at least at first, there were also events unfolding that Public Service did not expect, and couldn't control. Arab oil embargoes led to soaring

prices, spiking interest rates on capital, collapsing economies and slackening electric demand. The nuclear accident at Three Mile Island led to more mandated design changes and regulatory delays. There were construction problems and many years of soaring project costs and uncertainty about if the project would ever be completed and licensed.

To maintain the flow of money to keep the project alive and seemingly moving forward, meant the need to raise electric rates *now*, and to boost return on investment, eventually rising to the 20% annual return range offered on increasingly exotic speculative unsecured investments. This risky paper was aggressively peddled to increasingly nervous investors as Public Service kept turning turning over more and more rocks looking for capital. And the dash for cash was further complicated by determined citizen action to stop nuclear investment.

Project costs mounted, with project licensing now vigorously opposed by the State of MA, following the Chernobyl disaster raising concerns about the impossibility of evacuating the nearby MA seacoast in the event of disaster, and putting another road block in the way of easy finance.

In the Financial Arena

Clamshell's engagement with finance was not an accident. Clamshell members like Renny Cushing, Peter Kellman, Kristie Conrad, Kate Walker, Jeff Brummer understood the fight from the start not simply a question of misguided technology, but as a matter of economics, finance, and profit.

The following vignettes give a flavor of the nature and variety of Clamshell Actions intersecting with the financial sphere with at least partial success. This is what empowerment, non-violence, and events on the ground are like, before the retrospective judgement of history to criticize or to praise. Wittgenstein wrote, "The meaning of a question is the method of answering it..."^{vii}

- By a single vote in the New Hampshire House of Representatives, Clamshell stopped the securitization of Seabrook debt by guaranteed the State of New Hampshire. Legislator Robin Read, a dedicated Clam, told me he appealed again at the last minute to the legislator sitting next to him to vote the right way, and he did. We had entertained the legislators walking into the State House with a calypso song written by Clam staffer Adam Auster--"Bailout, It's a bailout. / Bailout come and we

wanna to say no./ One billion, two billion, three billion more./ Bailout come and we wanna say no... ”

- When Charles Bayless, new financial vice -president and money harvester for Public Service, bragged to Clamshell member Mary Metcalf, a very proper woman, that Public Service was going to raise Arab oil money from Bahrain and Kuwait we went to work. I traveled to New York and met with the Bahrain delegation to the UN, and to the Kuwaiti Embassy in Washington where a senior diplomat assured me that he was very familiar with Clamshell and that Kuwait had no intention of involving itself in American politics, and would make investments in only what was directly related to their interests, such as the Santa Fe railroad.

- Working in the Clamshell Alliance office, I received a phone call from the junk bond boys, Drexel, Burham, Lambert. They wanted to discuss with me Clamshell's future plans and our assessment of the likelihood of Seabrook's licensing and wanted to be receive our newsletter. Public opposition had become a major factor for investors and the calculus of fear and greed that kept the Seabrook project afloat.

- A Clamshell affinity group, accompanied by a Boston Globe reporter, occupied the board room on the First National Bank of Boston, then the lead bank for Public Service Seabrook finance. Wearing business clothes, the Clam affinity group announced that they were from the Manhattan Project and were arriving for a board meeting. Months later, on Oct. 29, 1979, the 50th anniversary of the Great Crash, the Manhattan Project encircled and blockaded the New York Stock exchange to oppose nuclear investment and call for renewables investment instead. The Exchange operated because enough brokers and clerks slept on cots the night before.

- During the Oct. 29, 1979 Manhattan Project Wall Street Action action, the late Chet Brickett, grey haired and distinguished wearing a suit and tan raincoat, like a broker for sure. Chet slowly made his way through the crush of police, demonstrators and frustrated brokers to get to the revolving door of the stock exchange building that the cops kept open enough to allow a very slow trickle of people to come and go. When Chet finally finally entered the revolving door, he stopped moving and opened his raincoat whose lining was covered with anti-nuclear buttons.

- On the east side of the Exchange, there's the image in my mind of looking up at the belly of a police horse stepping over our affinity group as we sat with our arms linked. The cops had

cleared a gap in the line using men and horses. Our arms were still linked, while the horse was moving ahead toward the gap, and suddenly Read Robin threw himself into the gap, pulling with him Judy Elliott, Annie Alpert and myself. Horses are apparently, and thankfully, very careful where they put their feet. The horse stepped over us and the brokers remained on the outside. (As they warn in TV car commercials: Experienced affinity group trained in non-violence, do not attempt.)

- Later in the afternoon, there was an impromptu march along Wall Street and then south down Broadway that became a spontaneous ticker tape parade. Paper rained down from the upper floors banks and brokerage offices whose windows were filled with people watching the action. The police, as workers, did not appear particularly friendly to the brokers and seemed amused as brokers got down on their hands and knees to worm their way through the blockade. But taking over Broadway had crossed the line of acceptable disruption. The parade was stopped and then dispersed by a line of mounted cops. People moved away did not sit down in the street. While this was happening, near me, a very small young woman pushed a very large cop. The officer stared down at her and said, Why did you do that? “ I'm just trying to be an island of peace and calm...”

- After we were arrested and load into buses, on the way to processing, I had an interesting conversation with a cop about what we were doing and why it was not futile. When I said to him that if enough people were not afraid of being arrested, and not afraid of going to jail the gears could not turn smoothly--that suddenly ended the conversation. Of course, I was afraid of jail, but in actions once arrested I felt, as did many others, the willingness to stay. And that meant, after the 13 days in the armories following the April 1977 action that incarcerated 1414 that the authorities did not want further long term mass incarcerations. This pattern persists today. The Occupy movement was harassed, sabotaged, dispersed, and occasionally subject to ultra-violence, but mass arrests and mass long-term incarceration was generally not in the play book.

Activists continued to turn up the heat. Public Service's normal bank and bond finance for the Seabrook Project dried up, and more and more unsecured debt at higher interest rates were the last recourse. Paper was back-stopped by the promise, some day, of rate hikes to come to be approved by a Public Utilities Commission agreeing that Seabrook nuclear investment would be considered useful and prudent at any cost.

• **Financial Collapse of Public Service and Seabrook Unit I Licensing**

At first, Seabrook was promoted as being even cheaper than coal in the “too cheap to meter” days of nuclear power optimism, before the financial and environmental problems of light water nuclear reactors and their wastes became all too apparent.

And then, when construction costs soared, and rates spiked to pay for the Seabrook plant while it was being built, the argument for nuclear power was that soaring electricity demand meant that Seabrook project was needed to keep the lights on. “What do you want N.H? Hot showers or cold showers?” Public Service asked in full page ads in the Manchester Union Leader, the only statewide newspaper.

As projected costs climbed well over 6 billion, the project finally collapsed economically when no more funds could be raised at any price, leading to the cancellation of reactor Unit II, and the bankruptcy of Public Service Company.

But that was not the end of the project. Unit I finally and painfully went on line in 1989, helped mightily by H.W. Bush White House support. Seabrook Unit I was the last nuclear plant to be commissioned in the United States, as well as among the most costly.

The Public Service economic collapse was the first major utility bankruptcy since the Great Depression. It brought down several smaller partners as well. Public Service exited bankruptcy as a wholly owned subsidiary of Northeast Utilities (NU) based in Connecticut. Its Seabrook share was sold to others at cents on the dollar while regulators eventually socialized the losses and kept the profits private, making sure the ratepayers paid off unsecured bond holders.

Merrimack Station remained Public Service Company's largest generation asset after the NU rebirth of Public Service, and it was back to burning coal while extracting funds from ratepayers to pay for the Seabrook debacle.

Merrimack Station After the Seabrook Licensing Struggle

Public Service, because of the Seabrook nuclear project, was perhaps the most examined and fought over utility in the country. But the operating coal plant at Bow received comparatively little attention from safe energy activists.

In the last twenty years or so, with the evidence of asthma and other respiratory problems increasing, and Seabrook Unit one finally online, attention turned in a big way to coal particulate emissions. But carbon dioxide from Bow and global warming was not high on the NH political radar. And, in fact, it still is not today. The State's greenhouse gas reduction plans, and its program under the Regional Green House Gas Initiative (RGGI)^{viii}, does not plan to do anything about Merrimack Station in Bow. Merrimack Station operated relatively quietly, and still does today as the state's single largest point source of carbon pollution, challenged by the Sierra Club, and now by a suit by the Conservation Law Foundation for violating the Clean Air Act that's been making its way through federal courts for years.^{ix}

Governor Shaheen, now Senator Shaheen, made reduction of mercury and particulate emissions from Bow a priority, in the 1997-2003 period. After much struggle and debate, Gov. John Lynch, in 2006, signed a bill mandating installation of a scrubbing system. The costs would be become part of the rate base and paid by ratepayers.

Electricity competition as a consequence of the Seabrook financial debacle and spiking electric rates came to New Hampshire, but Merrimack Station was never included. In 1997 the State became a National leader with a test of retail competition for large electricity users. I helped make the market as a consultant, negotiating one of the first contracts for retail electricity to supply Southern New Hampshire University. The supplier would obtain paper title to power assets delivered into NH sufficient to serve the university that were delivered as always by the distribution utility for SNHU, Public Service Company.

Public Service Co of New Hampshire maintained a unique position in states with retail competition by being allowed to keep ownership of its fossil fuel plants. Public Service convinced politicians and regulators that the coal fired plants at Merrimack and in Newington could offer below market electric rates. Merrimack station was embraced as keeping electricity prices below neighboring states with less coal, and with more newer, more efficient and less polluting natural gas

plants. At the time, before fracking, natural gas was considerably more costly than coal. Pollution and its consequences was an acceptable price to pay for competitive advantage in the minds of the politicians and businessmen, although certainly not to the victims who were not given a seat at the table in the decision making process.

Cheaper coal power was also a key part of the deal struck by the Shaheen administration for agreeing to a settlement and bailout of so-called stranded costs from the Seabrook project. The Public Utilities Commission and the Governor agreed to a deal that raised electric rates for years to pay investors for almost all the value of their unsecured paper invested in Public Service in a deal more than vaguely familiar in spirit to the bailout of the bankers and financial speculators following the 2008 global financial collapse.

The benefit for ratepayers of the stranded cost deal would come from the sale of cheaper coal power that would keep New Hampshire electric rates competitive. And the deal was done. Merrimack Station remained operational, not as a merchant plant subject to the vagaries of the market, but as a privileged asset and bastion of the NH economy. The economic “bargain” from ongoing coal pollution is, of course, a global issue. From the United States, to Germany, to China mega-polluting coal, because it is cheaper, appears to be an irresistible. And once the coal plants are in place, there is enormous inertia to keep operating. In 2008, Merrimack Station burned 534,420 tons of coal.^x

In 2014 the Clean Air Task Force estimated, using methodology of Abt Associates, in a study of the consequences of U.S. coal plant emissions estimated 7,500 deaths annually, reduced from an estimated 24,000 a year in 2,400. The reduction attributed to aggressive regulatory enforcement and required scrubber installation.^{xi}

• Merrimack Station After the Scrubber

The scrubber reduced sulfur 90%, mercury 80%, and reduced fine particulates. Particulates are a complex mixture soot, heavy metals, sulfur dioxide and oxides of nitrogen. Small particulates that get stuck deep in your lungs if inhaled represent the major respiratory health risk.

The exhaust plume from Merrimack Station is a mixture of the hot gases from combustion air,

oxides of nitrogen, remaining fine particulates, sulfur and mercury, water vapor, and about 2.08 pounds of carbon dioxide for each kilowatt hour of electricity produced by coal. ^{xii}

This amounts to an impressive total of 948,000 pounds of carbon dioxide an hour at full capacity or 474 tons. That's 11,381 tons of carbon dioxide a day. In 2006, Merrimack Station carbon dioxide emissions were 3,530,530 tons.^{xiii} This means the plant operated at an 85% load factor suggesting it ran full bore most of the time in 2006 when it was not offline being serviced.

In 2010, 91 percent of global carbon emissions, 33.4 billion tons, came from fossil fuel and cement manufacture.^{xiv} The EPA just announced that in U.S. carbon dioxide emissions increased 2 percent in 2013 after years of decline as the economy recovers.^{xv}

Complacency about carbon emissions is, unfortunately, not just a New Hampshire trait. Indeed, in an analysis of carbon sources and sinks in *Nature Geoscience* found that “The current growth in global anthropogenic CO-2 emissions is tightly linked to the growth in GDP...The key to sustained emissions reductions after the global economy recovers lies in restructuring the primary energy use to decouple emissions from GDP.”^{xvi} As predicted, the Great Recession following the global financial collapse of 2008 led to decline in both global GDP and global carbon emissions. And as the economy recovered in 2010 so did the pace of increasing carbon emissions.

The Clean Air Task Force and Abt Associates quantified and monetized the health consequences of coal power plant operation. Applying this methodology to Merrimack Station, 2012 health consequences of operation represent, in effect, a subsidy for plant operation. Projected were two deaths (\$15,000,000), 6 heart attacks (\$730,000), 51 asthma attacks (\$3,000), 3 hospital admissions (\$67,000), 2 chronic bronchitis (\$960,000), 2 asthma ER visits, \$1,000), total \$16,761,000 per year.^{xvii}

Merrimack Station, it so happens, through the vagaries of utility markets and finance and the low cost of fracked natural gas, is no longer profitable. If it was forced to sell power as a merchant plant into the market, it would operate only during higher priced peak market periods, typically when it's very cold in winter, or very hot in summer, regardless of being allowed to continue to pour carbon into the atmosphere for free. Apparently, the inability of Public Service to sell Merrimack Station Power at a profit against natural gas competition once again Public Service Company with financial

instability. The talk yet again is of another stranded cost deal to bail out yet again utility investors and maintaining their privilege to operate Merrimack Station and pollute. If natural gas prices don't rise, there will be trouble.

Neither Public Service Company, the State of New Hampshire, nor the EPA seem to have an interest in closing Merrimack Station anytime soon, or requiring it to remove the carbon, or even to pay for its release—which would render the plant even more unprofitable. Nor have they considered seriously the clear opportunity to bring waste heat from the plant to nearby cities of Manchester and Concord to provide heat and hot water instead of dumping waste heat into the Merrimack. District heat would displace natural gas and oil for heating, and reduce the net carbon produced by about half since the heat being dumped into the river would displace oil and natural gas being burned. And, if the electricity generated by coal at Merrimack was used to power air to air heat pumps, more than three times as efficient as gas and oil heat, and also to power LEDs for lighting, the total net carbon could be dramatically slashed.

My associate Pentti Aalto and I, at the Southern New Hampshire University Office for Sustainability did a study, “Alternatives to Retrofit Scrubbers for Merrimack Station Coal Power Plant in Bow N.H.: A Conceptual Analysis” that examined District heat conversion of Merrimack Station (see Appendix B). The study was met with silence by both the State and Public Service. That's business, pollution and self-destruction as usual. Who would want to find out what's really possible?

Looking Downriver

What does the past forty years of the conflicts over energy in NH mean?

There's a mixture of results. But the remnants of the old polluting path remain, as well as the determination of Public Service to enforce its will upon a resistant public.

One of two planned Seabrook reactors is operating, owned by a merchant operator of nuclear plants. It was the last light water reactor of its kind to go on-line. And a new generation has not, as yet, succeeded it. The old Merrimack coal plant continues to pour carbon dioxide into the atmosphere with a reduced amount of other pollutants. Public service went bankrupt. Common stock holders were wiped out, but the speculators got paid out of ratepayer pockets. Thousands of opponents risked arrest.

The legislature passed some good laws for retail electric competition and renewable development, but they were gutted in implementation by utility intervention at the Public Utilities Commission, and in the legislature. Only recently, is competition reaching NH residential users and threatening the financial future of Public Service trying to sell coal power into a market usually with cheaper natural gas on the margin to determine price.

There is still no comprehensive and effective NH plan for efficient renewable resource development. And the big fight in NH about the environment and energy is again focused on Public Service Company. This time it's about plans to build the above ground Northern Pass high voltage direct current power-line project to move Canadian hydropower, at a profit, to the Boston market.^{xviii} Northern Pass was planned with no provision for interconnection for NH renewables, because of the older HVDC technology choice that makes inter-connection difficult, and an insistence that is uneconomic to put the transmission lines underground.

In contrast to NH, across the country, California has adopted and is vigorously pursuing an efficient renewable energy future^{xix} that has the potential to expand into a western renewable supergrid.^{xx} “State energy and environmental agencies are joining forces with the California Independent System Operator Corporation (California ISO) to expand cooperation for a new era in electricity that keeps California at the forefront of carbon-cutting innovation and green jobs creation.”^{xxi}

NH has not turned to the efficient renewable energy path, even with a succession of Democratic governors in power voicing support, at least on paper, for renewable energy, despite unprecedented citizen activism and the ecological and financial consequences of polluting energy. In California, like NH, concerns of the safe energy movement in California, led by the Abalone Alliance, played a significant role. But in California, the development of renewable energy on a large scale gained momentum, and was reflected in policy implementation on the highest level, supported by politicians of both parties from the Gubernator to Jerry Brown.

NH is a study of inertia, of business and pollution as usual, of meaningful, but limited, changes on the margin in response to dedicated citizen opposition and intervention. But the California success is studiously ignored by Washington and not logically embraced as a national model. Let's pretend it's not there and keep our back turned.

During the winter, I've kayaked in the Merrimack just south of Merrimack Station in January. The River is never completely iced over because of river water used to condense and cool the steam from the plant and allow the water to be returned to the boilers for another go round while the now

heated river water was returned to the Merrimack.

Great for winter kayaking in NH. The only place I could reliably be on the water twelve months of the year. I put in just south of the plant and kayaked carefully downriver, threading my way past and around the sometimes thick and heavy floating chunks of ice moving downstream that had broken off from the frozen portions of the river to the north. It wasn't unpleasant. I had my back to the plant and the river to the south in front of me looked almost wild. I also learned some interesting things about ice. Ice not only moves with the current, but can move almost with the speed of the wind and can offer some real excitement if it's coming at you. But the most striking thing in winter kayaking I found happens in a heavy snow squall. Somehow, the snow seems to be rising out of the water, an optical illusion as I paddle.

As long as you keep your back turned away from the problem, as I did on the Merrimack and keep facing what wild land still remains, all is well. Unfortunately, that is not likely to be a successful survival strategy.

2. Is There Another Way?

Business and pollution as usual offers a future leading us relentlessly toward global ecological crisis as billions of tons of carbon dioxide pour unimpeded into the atmosphere each year in a world dependent upon and addicted to fossil fuels.

Is there another way? Is it possible, is it even conceivable that we can transform economic growth from a force moving in lockstep with fossil fuel pollution, to a transformative force for ecological improvement, where the growth of GDP means carbon emissions decline and the ecosphere heals?

Must economic growth of any kind remain the enemy of life? Must an efficient renewable energy powered world remain an unfulfilled promise until a distant future? For the remainder of the 21st century, must we suffer the dire consequences of permitting business and pollution as usual until we have irreversibly and tragically unleashed global forces leading to catastrophic climate change? Can renewable resources networked on a continental scale, using high voltage direct current transmission networks (HVDC), really provide clean power to power our world, to light and heat and

cool our homes, power our factories, run our vehicles. replace the vast majority of fossil fuels within the 21st century if we act as if our lives and our futures and our children's future depend upon it? In *The Pursuit of an Ecological Future*, we will explore in detail how renewable energy can get the job done.

• **Getting the Prices Right**

Carbon-dioxide is our leading long-term global ecological threat. But fossil fuel carbon dioxide is certainly not our only major source of pollution, depletion, and ecological damage that threatens the biosphere and our well being. Solving the carbon dioxide problem is a necessary, but not sufficient step, toward an ecological future. How can we deal with habitat destruction, with depletion of resources, with poisoning of our air, water, soils, with draining of aquifers, with sweeping the sea clear of fish, the leveling of forests, the erosion of soils, the consequences of an industrialized agriculture based on enormous inputs of fossil fuels for fertilizers, pesticides, anti-biotics, and an industrialized aquaculture? Visit Haiti and the area around Fukushima nuclear complex and understand that ecological crisis is immediate and dire and not limited to consequences of climate change.

How can the myriad of transactions in a global economy for a plethora of goods and services be informed by ecological signals to help achieve ecological ends? Can we do more than just slow the pace of ecological degradation? Can we find a way to help let all economic activity be informed by ecological signals?

Can we, in fact, find a way to make markets work the way they were intended, that is, to send clear and accurate price signals to investors, producers, consumers?

The quick answer is that by using comprehensive ecological consumption taxation on all goods and services, for example, either in the form of a smart sales tax, an ecological value added tax, or a structure of ecological taxes on pollution sources and sinks and on ecological impact, we can raise the prices on unsustainable goods and make sustainable goods of similar quality less expensive, more profitable and gain market share. Business people pursue lower costs and higher profits. Consumers search for lower prices.

Ecological taxes can be phased in as zero new net revenue taxes, replacing dollar for dollar existing taxes such as income and payroll taxes. Ecological taxes tend to be easy to administer. For example, a smart sales tax, since it is paid by businesses on the value-added by their sales, uses the credit for invoice system on their purchases and is therefore almost entirely self-enforcing since businesses have every reason to file their taxes to claim credit for all *their* purchases.

Under an ecological value added tax system, all goods and services will be rated based on degree of sustainability using objective measures based first on industry averages which will provide an ongoing incentive to improve performance and lower tax rates.

An ecological tax system focused on pollution sources and sinks and ecological impact can, for example, easily replace all property taxes with carefully calibrated ecological impact taxes, and income taxes with assessment on pollution sources and sinks.

An ecological tax system of whatever style need be comprehensive to seal the hole in the market bucket and stop the costless flow of pollution externalities that sustains business and pollution as usual.

• **An Ecological Growth System**

We, in fact, have the tools to build an ecological growth system that can use trillions of dollars of future investment for ecological improvement and building through enterprise a sustainable and prosperous future.

This means changes in the rules for business as usual. It means the withdrawal of consent from industrial pollution as usual. It means transforming our energy system. It means transforming our tax system. And it also means, of course, the rise of a mass citizen led movement to demand change.

No one in an ecological growth system will be permitted to continue to pollute endlessly, with impunity, and without charge. This does not mean shuttering factories tomorrow and putting millions out of work. What it does mean is to begin to send economic signals throughout the economy that ratchet up slowly, but not too slowly, that allows businesses to make strategic decisions and investments in sustainable processes and products to maintain long-term profitability and profits.

The truth of the matter is that there are, in fact, today myriad mega-polluters, old factories and production facilities “grandfathered” and exempted for decades from complying with environmental regulations long-ago adopted for all new plants. They will continue to operate as long as they do not

have to spend money comply with requirements for ecologically sound, and usually much more efficient, operation. For example, there are the old coal plants grandfathered under the clear air act, and old paper mills still permitted to use dioxin creating chlorine for paper bleaching. They are competitive only to the extent that they are allowed to continue to pollute as they always have as fully depreciated assets with minimal investment in operation and maintenance expenses beyond the minimum required to keep the plant running.

I was part of a team that did an energy audit of the W.R.Grace Chemical plant in Nashua, N.H. Corporate headquarters ran the old facility very hard indeed and had no interest in our suggested and economically cost effective low payback energy improvements. The Company apparently would make investments only in what increased output and gross income, and not in expenses that reduced operating costs and increased margin per pound of product. The diligent plant engineers had to respond to over-firing their fire-tube boilers leaving vanadium deposits from flame impingement on the boiler walls, the vanadium coming from ancient sea-slugs that formed part of the oil. The insulating deposits which reduced heat transfer and boiler output had to be chiseled off the tubes. Of even greater concern, was that the heavy use of the chiller near design basis whose sudden failure represented a potential major safety danger.

Under an ecological tax system, a dollar of income produced from unsustainable and inefficient conduct would be taxed at a substantially higher rate thus sending crystal clear signals to corporate. Today, a dollar of income from poison pays the same tax as a dollar of sustainable income.

If net income from unsustainable conduct was triple that of sustainable conduct, the market would quickly discipline polluters once the ecological tax system was fully operational. The five to ten year phase in giving fair warning to incumbent polluters to change. Under an ecological tax system improvements in efficiency would mean in addition to reduction in costs, a reduction in tax rates from reducing pollution, depletion, and ecological damage under an ecological tax regime .

An Example of the Signaling Power of Ecological Taxation

An ecological tax system will quickly send unmistakable signals to both customers and to Wall Street, where the bottom line, not good sense, rules. In the following example, the combination of an efficiency improvement and a reduced ecological tax rate increases company earnings per share (EPS)

by 54%. The market can and will follow very quickly ecological taxation price signals.

In a simplified example, currently a chemical plant has income before taxes of \$25 million on \$175 million of capital investment. Under a 30% tax rate, net income after taxes is \$17.5 million.

The company is considering either a major \$10 million dollar energy efficiency improvement with a two year simple payback, saving \$5 million a year in operating expenses, or an expansion of existing production process that would increase gross income by \$5 million dollars a year. The investment is to be financed from cash on hand from retained corporate earnings.

If production is expanded, net company income (ignoring depreciation) before taxes is \$30 million. At a 30% rate, taxes are \$9 million. Total net income after taxes is \$21 million a year. Not bad.

Under an ecological tax system, a \$10 million dollar investment in efficiency results in \$5 million a year savings. Income before taxes is now also \$30 million. But because of dramatic reductions in pollution, depletion and ecological damage, income from the plant is now taxed at a 10% rate. From the standpoint of Wall Street, net income has soared from \$17.5 million a year to \$27 million a year. Increasing the all important EPS (Earning Per Share) by \$9.5 million, or 54% in one year would warm the heart of both a Warren Buffet considering buying a company, or an option trader betting on a positive quarterly earnings report to get in and out with a handsome daily or weekly profit.

• **Last and Best Chance**

An ecological growth strategy is, I believe, the market system's last and best chance before unfolding ecological crisis and economic collapse foreclose options beyond a brute struggle for survival. This book is not another contribution to the peak oil, the sky is falling, all is certainly lost genre. Nor is it another: 'Step one: abolish corporate capitalism' manifesto.

Making economic growth mean ecological improvement encourages us to what we do best, apply our entrepreneurial energy to build an ecological growth system and unleash an age of sustainable global prosperity and peace. It therefore entertains the prospect that the profit driven free market, given requisite new market rules, proper price signals, and supportive government action might, just might, pursue a high economic growth strategy that results in both ecological improvement and profit. This is our chance, at last, to prove that ecological economic growth is not an oxymoron.

The hour indeed is late. If we do not act very soon, the sands will run from the hour glass and

we shall all be overtaken by the consequences of ongoing and increasing mega-pollution. Keep going in the wrong direction and it should be no surprise that we get there sooner or later.

But it is still within the power of productive market systems, I believe, to make the necessary changes in market rules and investments to create a global ecological growth system. This must be based on actions changing the rules that govern our economy that will overcome market failure that supports pollution depletion and ecological destruction.

The good news is that, at bottom, to build an ecological future if we pursue an ecological growth agenda now, we don't need a revolution to seize power. We don't need to abolish markets, or capitalism, or banks. In fact, we don't need subsidies. We don't need higher taxes. Essentially, all we need to do is insist that we end the ability to pollute for free. We need new market rules to get the prices right ultimately for all goods and service up and down supply chains from basic inputs to finished outputs. This can be done systematically and comprehensively by an ecological consumption taxation system to send clear market prices for sustainability. And if market prices can reflect true costs, the market price system will do for us much of what needs to be done. But not all.

It must be democratic government, following the will of the people, not the polluters, that makes and maintains this structure of new market rules, regulation, investment, and responses to market failure that supports a transformative strategy for global ecological growth.

Of course, politically, this is no small order. People such as the millionaires of the U.S. Senate and the representatives of the polluters in positions of wealth, power and high office throughout the land will require some tough love to do the right thing. On the other hand, this is a value proposition for enormous economic growth and prosperity based on economic growth leading to ecological improvement on a global scale. This will mean creation of enormous amounts of wealth in sustainable business and sustainable investment that will be broadly distributed to workers, communities as well as business. Politically, the improvement of the general interest of the overwhelming majority is counterposed to the narrow self-interest of the recalcitrant polluters who turn a blind eye to clear, new market opportunities for sustainable business and cling like grim death to polluting ways.

Nevertheless, enough of those profiting from business and solution as usual will use their not inconsiderable power and money to defend the status quo. Success will, in all likelihood, require a

massive withdrawal of consent from business as usual and the rapid growth of an enormous citizen movement where the hundreds become thousands, who become millions in the streets. And recent history provides many relevant and encouraging examples of seemingly improbable reversals of fortune.

When Vaclav Havel was a writer and activist in Czechoslovakia under Soviet domination. He finally made a decision to act as if he was a free man in a free country, able to write and say what he thought. He was committed to “living in truth”. Havel described what this meant in his essay “The Power of the Powerless” assuming the standpoint of a once obedient community greengrocer. “Let us now imagine that one day something in our greengrocer snaps and he stops putting up the slogans merely to ingratiate himself. He stops voting in elections he knows are a farce. He begins to say what he really thinks at political meetings. And he even finds the strength in himself to express solidarity with those whom his conscience commands him to support. In this revolt the greengrocer steps out of living within the lie. He rejects the ritual and breaks the rules of the game. He discovers once more his suppressed identity and dignity. He gives his freedom a concrete significance. His revolt is an attempt to live within the truth.”^{xxii}

Havel was harassed and jailed and marginalized, and many people were afraid to be seen with him. But he persisted living as if he was in a free country until, to his considerable surprise, he found himself president of the free Czech Republic.

We need remember the lessons of the truth tellers who exemplified the wisdom of Victor Hugo, “All the forces in the world are not so powerful as an idea whose time has come.” It's that time for us to live within the truth. We don't want to discover one day that we have waited and waited until business and pollution as usual has unleashed irreversible climate catastrophe and mere survival is best we can expect. It's time to speak. To act.

Today and Tomorrow

The Pursuit of An Ecological Future will address what can happen when we open our eyes. What are the choices we face, both good and bad, what are pathways forward?

It is the standpoint of this book that economic growth can mean ecological improvement, and that we can move from self-destructive industrial business as usual to a sustainable and prosperous ecological civilization rooted in democracy, markets, peace, and an integrated sustainable energy, agriculture, forestry and industrial ecology. This is a sustainable world as a value proposition for ecological transformation throughout the economy.

This is sustainable growth strategy to build a global efficient renewable energy system to replace fossil fuels and nuclear energy, to improve end use efficiency of production by an order of magnitude, a factor of ten, to pursue most vigorously a sustainable agriculture, aquaculture, and forestry. This is a world of information exchange and sale, where information and zero pollution-zero waste production is central. Our central challenge is that of the imagination, and therefore is political, not technical.

New market rules and regulations can establish the basis for profitable global investment of the trillions that must be expended to transform industrial business as usual to an ecological future. And this regime for ecologically led growth need be global. The imposition of high import duties on foreign products that do not comply with a nation's environmental rules is well understood and is permitted under GATT trade rules. Thus Americans need not fear a flood of cheaper and polluting foreign imports. In fact, it is the export of jobs to countries with lower wages and lower ecological standards that has been the source of job loss around the world as part of a race to the bottom. Competitive advantage, if we are to survive and to prosper, can no longer come from allowing more pollution.

The trillions that will be spent on futile attempts at mitigation, and trillions that will be spent on resources wars on an afflicted planet can instead be the profitable investments in an ecological future. A global ecological transformation is a prescription, as well, not just for common survival, but for a global end to poverty and war. It will require mechanisms for transfer of information and assets from rich to poor, both within and between nations, to help inform and catalyze the ecological transformation. This is not charity or aid. Rather, it will be to the long term benefit and profit of all. The choice is between a largely peaceful and sustainable global world where trade in information and sustainable production is several orders of magnitude larger than current global product, or an increasingly desperate attempt to preserve the lives and privileges of the few within gated communities

and guarded borders in an ecologically collapsing world.

The Pursuit of an Ecological Future will offer a guide to moving from where we are within the grasp of business and pollution as usual moving relentless toward self-destruction. But the industrial emperor has no clothes. We have the ability individually and collectively to withdraw our consent and cooperation with self-destruction. We can choose instead to pursue a path toward a prosperous and ecologically sound future. This book is meant as tool and resource to both encourage and advance what can become the great mission and adventure of the 21st century, the global convergence on an ecological civilization as a consequence of the most determined and vigorous pursuit of economic growth that leads to both human betterment and ecological improvement.

It is the message of this book that this can be done. But it is up to all of us to act to make it happen.

Chapter 1: Getting From Here to There

Loomings

How do we get from self-destructive industrial business as usual, courting ecological catastrophe, to a sustainable ecological civilization that will be prosperous, dynamic, and free? How do we get from here to there?

An ecological transformation is the order of the day. We have the knowledge. We have the tools. We have the entrepreneurs. We have the workers. We have the scientists and engineers. We have the bankers. We have the democracy. What we lack is the political will to stop cooperating with the self-destruction of our civilization in the interest of short-term profit by polluters and poisoners, by business as usual.

Fatalistic pessimism seems to abound. United Nations global conferences on climate change consistently fail to adopt any meaningful plans and end with a commitment that they must and will take effective action the next time around, a year or more in the future. Not even a plan catering to the interests and power of the mega-polluters and the maintenance of their profits and power such as emergency development and use of carbon capture and storage for fossil fuels is forthcoming.

But there are real alternatives to apply our democracy, entrepreneurial energies, high technology, and traditional wisdom to build a sustainable, richer, saner and safer world for our children, grandchildren and generations to come. To say the task is difficult and success improbable does not mean it can't be done. Black swan events regularly undermine both smug certainties and the poverty of our imaginations. The likelihood that the Soviet Union and its empire would swiftly collapse, or that Nelson Mandela would walk out of prison to become President of a multi-racial democracy should expand our willingness to entertain prospects for an ecological future beyond the limits of the "can't do" pundits. Who forecasted that an Arab spring would sweep across North Africa and topple the powerful regimes of Qaddafi and Mubarak?

A sudden and rapidly spreading withdrawal of consent from self-destruction and pollution as usual will put an end to industrial business as usual and begin the process of healing ecological response to industrial excess.

Our Goal

This book is meant to help inform and convince that an ecological future is a path to both lasting sustainability and prosperity, to more jobs, more profit, more peace, more happy families. And the best news is that we already have the tools we need in our democracy, science, and productive capacity to get the job done.

• Relevant Questions

We will examine a number of crucial questions and answers including:

How can we make economic growth mean ecological improvement?

How can the pursuit of an ecological future as a global imperative and the trillions of dollars of investment to build it be approached as a business value proposition for economic growth ?

How will this investment expand a sustainable global economy by an order of magnitude, end poverty, stop resource wars, build dynamic markets and democracies?

How can we make the market price system a primary tool for ecological transformation through ecological consumption taxation to send clear signals throughout the economy for sustainable conduct through investment, production, and consumption decisions *in* markets?

How will Adam Smith and profit seeking by business people, and search for bargains and lower costs by consumers drive the ecological transformation?

How will wealth creation must become synonymous with ecological improvement?

How can democratic adoption of the new market rules and regulations that drive investment, consumption and production decisions respond to the inevitable market failures and provide the structures that guide investment capital?

How will ecological consumption taxation make sustainable goods and services become cheaper than polluting, depleting and ecologically damaging competitors, become more profitable, and gain market share?

How can an ecological value added tax be used to replace all income taxes?

How can building an ecological civilization be the opening for economic growth not economic contraction?

How can we use high technology, the second law of thermodynamics, and classical methods to improve efficiency by a factor of ten while slashing pollution and waste?

Following the ecological path means that millions and millions of new jobs in sustainable production will be created. The high polluting utility industry, for example, represents the world's greatest agglomeration of capital. The trillions to be spent on building the efficient sustainable renewable energy system will be at the heart of a global economic and ecological renaissance. This will include the conversion of existing technology toward a zero emissions-zero pollution path such as conversion of urban fossil fuel power plants to district heating and cooling, to half carbon emissions, and then the use of carbon capture technologies.

Following the ecological path informed by new market rules that send clear price signals for sustainable investment, production, and consumption decisions means that profit seeking in the 21st century will be informed by the pursuit of economic growth that leads to ecological improvement and the aggressive conversion to sustainable norms by many existing, once polluting companies.

That's the enthusiastic assessment of possibilities and prospects. There are more questions to be addressed.

Realism and Future Paths

We must be realists. Building an ecological future is certainly a socially determined choice. It is also a necessity. But it is only one choice among many. We will examine three likely pathways:

1. The ecological path of economic growth leading to ecological improvement;
2. Business as usual and the emerging attempts at mitigation and geo-engineering;

3. Embracing the path of no growth and economic contraction as the only viable tactic to survive on an ecologically afflicted planet.

1. The Ecological Path of Economic Growth Leading to Ecological Improvement

First, this book will consider in depth, pathway number one, an ecological growth strategy, and its dynamics, strengths and challenges. We will address issues of how to properly structure economic growth leading to ecological improvement. We will also examine a constellation of historical, philosophical, political, economic questions that shape the nature and prospects of an ecological future.

• Structuring Economic Growth Leading to Ecological Improvement

This book will consider the pursuit of an ecological future as:

- A growth strategy for making economic growth mean ecological improvement;
- Making the price system send clear signals for sustainability and therefore to business people to guide investment and production decisions, and to consumer to guide purchases. What's sustainable will be cheaper, gain market share, and be more profitable.
 - Replacing all taxes on income with ecological consumption taxes, such as an ecological value added tax or a system based on ecological assessments on sources and sinks and ecological impact, to send clear signals for production and consumption.
 - Building continental scale efficient renewable energy grids based on high voltage direct current networks (HVDC) that can replace all fossil fuels and nuclear energy that will power our factories, heat and cool our homes, power our vehicles.
 - Embracing a zero-waste, zero pollution global production system governed by an industrial ecology where all the products of one process become inputs for others.
 - Transforming agriculture to sustainable practices replacing conventional high energy, toxic chemical, and soil destroying inputs.

- Making forestry a sustainable domain of habitat protection and restoration and long-term economic productivity.

- Developing a coherent global structure to fairly transfer assets and information from rich to poor to help finance and potentiate global ecological transformation through a system of small assessments on sustainable energy production, agriculture and forestry. The use of sustainable resources can be approached in a manner similar to Norway's Petroleum Fund to be reinvested in further sustainable development. We will examine Sustainable Assessments to Value Ecosphere (SAVE) as an example of a means to fairly transfer technology and assets from rich to poor to help finance sustainable development both within and between nations.

Issues Shaping and Informing Policy Questions

We must address issues that encompass much more than describing the proper form for ecological consumption taxation and technical fixes. We must understand questions that lie beneath policy questions. If our future under the impositions of business and pollution as usual seems dire, we must be willing to ask questions beyond the technical. We need to find the intellectual, social and political keys to facilitate moving forward, in the same manner that reality left the apartheid South African government no choice but to unlock Mandela's cell and to agree to elections for a multi-racial democracy as the best and, in fact, only really viable option.

- **The Deep Nature of Sustainability**

If the pursuit of sustainability is the guide for fundamentally transformative action to build an ecological future, we must consider questions such as the deep nature of sustainability in the ecosphere and what it means for transformative change. Sustainability is more than a fashionable business term. Sustainability in the ecosphere acting as a basic co-evolutionary force. Sustainability is the process where life responds to all influences in ways that shape the ecosphere to maximize the prospects for life, and where life evolves in response to these changes in a ceaseless process of co-evolution, of

cybernetic feedback webs of signal and response.

Sustainability is the force that has enabled life to survive periodic mass extinctions and then to thrive. Sustainability is a force that human consciousness and the movement for an ecological future is now become a part of the countervailing and healing response to the consequences of human created mega-pollution on a planetary and geological scale. It is correctly argued that the holocene epoch has given way to the anthropocene. Will the evolution of the anthropocene lead to an ecological future or continue down the path of self-destruction? An ecological growth system in response to the existing conditions of mega-pollution is a manifestation in the 21st century of billions of years of sustainability and co-evolution of ecosphere and life.

Sudden and non-linear change resulting from ever increasing pollution leading to negative dire ecological consequences, can alternatively be the path to sudden and dramatic healing social and political change. Healing ecological social change can and, I believe, will happen very quickly and suddenly. This both is intended to help guide an ecological reformation to come.

• **Historical Context**

Historically, there are good reasons for optimism in that an ecological turn represents a healing response to industrial excess. An ecological future is a reflection of necessity which is consonant both with necessity to abstain from self-destruction before it's too late, and with historical processes of excess leading to healing change. Such dynamics of healing response to excess often require an increase in scale and complexity as a way to resolve existing intractable problems. A global ecological growth system will follow this path as *both* a healing response to industrial mega-pollution, *and* as a great expansion on a global scale of complex webs of ecological market actors expanding trade, relationships, economic activity, self-management, and customized production.

Historically, looking backwards, we see a European world ruled by absolutism, aristocracy and church gave rise with dizzying speed to the Enlightenment, industrial and political revolution, democracy, chattel slavery for industrial inputs, mechanization, high technology, mega-pollution, imperialism, globalization, world war, the global corporation and global finance, a new wave of

democratization, and global cyberspace. Looking forward, an ecological global growth system is a logical healing step. It means a future not of less and less, but of more, different, and better. Its aspirations include in its success an end to global poverty, the replacing of a global war system with a peace system, a great expansion of sustainable economic activity in the context of a zero-pollution, zero waste economy. Its success means we will be richer, happier, and freer.

• **Freedom and Community**

An ecological future, on an ongoing basis, must balance economic growth and ecological well being. This balance will be reflected in the social and political sphere. At the same time, we must balance the dynamic of freedom and community as crucial to achieving economic growth and ecological improvement. Industrialism and totalitarianism have amply demonstrated that without community, freedom becomes license and abuse, to be expressed as the license to pollute and the license to dominate; and that without freedom, community becomes totalitarianism and dictatorship which acts with impunity including the impunity to pollute and to dominate. An imbalance between freedom and community leads to similar painful ends. By maintaining the balance between freedom and community, as a social expression parallel to the balance between growth and ecological health, an ecological civilization can maintain the fragile and crucial balance between both social and ecological spheres.

This, above all, is a dynamic social process wrought by the sometimes rough and tumble struggles between freedom and community. It is not handed out. It is built and struggled for. It rises from below. The wisdom and truth comes from those most intimately and directly concerned with outcomes through the process of subsidiarity. The local can voice its opinion on global matters. But a village does not determine what happens globally, anymore than a conclave of global leaders can effectively determine exactly what should happen in every village. This is a manifestation of subsidiarity, of the dynamic of freedom and community and the appropriate exercise of power.

Both freedom *and* community must be protected and respected as key values. The community must act not as the enemy of freedom, but it's protector; freedom must not as the enemy of

community, but protect community from the impositions of power.

And freedom and community, on the most basic level, represents the dynamic of the one and the many, and, therefore, ultimately encompassing all. How can either the one or the many be conceived as the source of ultimate evil since we are always and ever both. On the Great Seal of the United States are the words “E Pluribus Unum”, Out of Many, One. This suggests is the words of the Hebrew bible “Tov I Ra,” literally 'Good and Bad’ but connoting, “Everything.” This is what the dynamic of freedom and community engages, everything, glories, warts and all. It is the work of our democracy and our politics to engage and equilibrate on an ongoing basis this crucial dynamic. Freedom without the bounds and countervailing limits of community is a centrifugal force that pulls apart the system; community without the expression of freedom and its countervailing energy is a centripetal force that crushes the system.

• **Dynamics of An Ecological Future Rising**

We will explore the process and dynamics of an ecological future rising. Does an ecological civilization emerge by following a sufficient number of prescriptions in a similar manner to the emergence of solid matter from a quantum world of mostly empty space once there are sufficient number of atoms of the right kind in one place?

Is an ecological civilization an emergent feature of an industrial system under certain circumstances? If we grasp a bundle of key measures, for example, if we build continental renewable energy systems, adopt new market rules and ecological taxation that sends price signals for sustainability, and adopt proper supplemental regulation for sources and sinks of pollution, and ways of responding swiftly to market failure, is that sufficient, and will an ecological civilization appear?

We will consider if this process of emergence of an ecological social order is dependent upon more basic choices of how we organize and manage ourselves beyond the bundle of technology and market fixes that will condition an ecological growth program? Perhaps the existing mega-pollution path was conditioned, at bottom, by more than failures to put market prices on pollution. What allowed industrialism to slip the bonds of limits on the obvious consequences of its behavior?

Today clearly we know that we are on the path to self-destruction, and we have the tools to make enormous improvements. Yet business as usual continues. And the problem is not simply the self-interested resistance, greed, and denial of mega-polluters. We need to consider more than our plans and stated good intentions in pursuit of sustainability and ecological ends.

James C. Scott, for example, in *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* examines the failures of high modernist central planning efforts from scientific forestry in Germany, to planned economies in the Soviet Union, to planned cities like Brasilia.^{xxiii} A key lesson is not the failure of all planning and the triumph of unregulated markets. Rather, it is the imposition of planning from above that steam-rollers the knowledge, wisdom, and choices not only of those most directly concerned, but of every divergent opinion.

Scott compares the self-managing strain of communism of Rosa Luxemburg and Alexandra Kollontai to that of Lenin's dictatorial centralism. Rosa Luxemburg noted that "only experience is capable of correcting and opening new ways. Only unobstructed, effervescing life falls into a thousand new forms and *improvisations*, brings to light creative force, itself corrects all mistaken attempts".

We cannot impose an ecological growth system, we can establish basic principles and conditions and incentives to potentiate its success. Perhaps it's the free market of Adam Smith informed by price signals for sustainability, combined with the self-managing commons regimes of Elinor Ostrom, and the dynamic city regions of Jane Jacobs. In building an ecological future we must be ever mindful of the difference between *planned by*, thinking like a state controlling all details, and *planned for*, by providing a framework for future development, creativity, and local initiative in response to local realities.

Is what works best what must be generalized as precondition for an ecological future? And how we do we establish a framework to facilitate that? For example, must we encourage the development of the dynamic entrepreneurial city regions described by Jane Jacobs writ large and expanded through global cyberspace within the context of new market rules and proper price signals? Is that the most effective way to move from here to there? Is it the only way? And how do we do that?

Examining An Ecological Growth Strategy

Exploring an ecological growth strategy, our task is to do more than just advance programs and policies in a vacuum as prescriptions get the job done. We are not designing an imaginary future utopia starting with a blank slate and open land. We are not pursuing the best, or the ideal future. We are considering how we can go with hand we have been dealt while there is still time to change our fortunes.

We do not have the luxury any more to make changes on the margin. Just to reduce the rate of increase of pollution depletion, and ecological damage will certainly be futile. Further, just to modestly reduce the absolute amount of ecological insult is now inadequate. An ecological growth strategy is the healing path toward sustainability and prosperity. As such, I can find few fundamental objections beyond the self-interest of business and pollution as usual.

The plan for an ecological growth strategy is not an attempt, for example, like Jacque Fresco's Venus Project, to redesign civilization. The Venus Project presents an ecological design driven future built by some sort of an ecological technocracy applying dispassionate scientific analysis. This ecological technocracy functions as a resource based economy that operates without a market, without capitalism, and apparently without much regard for politics. Indeed, the website proclaims, "The Venus Project: Beyond Politics, Poverty and War".^{xxiv} Neither are we embracing the highly politicized program of a libertarian radicalism, for markets without capitalism as necessary for ecological survival.^{xxv}

We all watched in amazement and horror as the global financial crisis unfolding in 2007-8 led to the provision of trillions of dollars with stunning speed to keep the system and voracious speculators whole and remain largely in positions of power while many millions lost their jobs and their homes. At what point, will the future of our civilization itself call forth similar effort and energy for the sake of an ecological future?

In retrospect, the successful application of an ecological growth strategy will likely be viewed as the sort of radical reforms that FDR instituted in response to the Great Depression. The dynamics of these radical reforms to come and their success may include, and be complemented, by the growth of a

strong self-managing cooperative sector practicing social entrepreneurship and a revived labor movement with expanded power of co-determination. A strong cooperative and labor movement will bring key stake holders to the table to help guarantee that economic growth means ecological improvement.

An ecological growth strategy will, by its nature, make use of a series of inter-related technological fixes. For example, the use of renewable energy networks to replace fossil fuels. Our technical discussions will show, in detail, how we can build continental scale renewable grids to replace all fossil fuels and nuclear energy such as our recent plan for a China-East Asia Renewable Supergrid.^{xxvi}

Our technical work will address how we can improve efficiency by orders of magnitude, how we can make industry, agriculture, forestry, aquaculture pursue profitable and sustainable norms. But the ultimate challenge we will see is not technical, but political. The problem is not that we lack the technological acumen to build a sustainable world. We lack the political will to do so, and to get from here, the self-destructive conduct of business and pollution as usual, to there, an ecological future.

It is unlikely that radical reforms leading to the adoption of an ecological growth strategy will come from above or from spontaneous pursuit of enlightened self-interest. To a great or lesser extent, a transformation that will enable us to follow an ecological path will in all likelihood involve a broad citizen movement from below that non-violently and creatively engages the forces of business and pollution as usual.

• **Variations of Ecological Norms**

Clearly, a U.S. ecological future will differ from a Chinese ecological future and differ from an African and from a European. Will there be greater convergence or divergence upon a future norm?

An ecological growth system is predicated upon markets informed by new market rules. Does it also follow that this must mean the market friendly institutions of the rule of law, political democracy and freedom? Must democracy and freedom mean the inevitable adoption of multi-party parliamentary forms? Or can democracy and an independent judiciary exist within the context of internal elections

within a ruling party?

China, for instance, has adopted the pursuit of an ecological future as a central tenet of state policy, and stated a willingness to trade a reduction in the rate of economic growth for ecological improvement. On paper at least, the 2013 3rd Plenum of the 18th Chinese Communist Party Congress “pointed out that to establish an ecological civilization, we must establish systematic and integral ecological civilization institutions and systems, and use institutions to protect the ecology and the environment... systems, draw red lines for ecological protection systems and ecological compensation systems... and reform ecological and environmental protection and management systems.”^{xxvii} While it struggles with pollution, China has become world's largest solar and wind manufacturer. China has also embraced policies supporting the rule of law and an independent judiciary and expanded the role of voting for local officials. We will consider the question will China, by no means a parliamentary democracy, help lead the way toward an ecological future?

It is in the context of business as usual that our choices become clear. In the face of destruction, the ecological path is obviously, a saner choice. An ecological civilization is what can and must come next. But *can* certainly does not mean it *will*. If we continue to follow the path of mega-pollution, at worst, we suffer the fate of the Easter Islanders that left the island with an impoverished small fraction of the population living amidst the grand Aku statues of past glory. At best, we are forced by ecological stinging along a long path of limitation and contraction while we struggle to survive and the ecosphere slowly heals. We all have work to do.

2. Business as Usual and the Emerging Attempts at Mitigation and Geo-engineering

Second, we will look at business as usual. Business as usual clings to its prerogatives and its ability to continue to pollute for profit. Its mantra is, “There is no alternative. Pollute or shut down.” Pollution and habitat destruction is part and parcel of business as usual. Industrial capitalism has been described as a system for generating externalities, for reducing and shifting costs of capitalists (or government state capitalists) for pollution, depletion and ecological damage. These real costs to be paid by others down wind, downriver, or by future generation are given the marvelously opaque

economic label of externalities. This means external to the business cost structure of producers or sellers only, not external to the ecosphere and its inhabitants.

- **Externalities**

Externalities range from “accidents” like the BP Gulf oil blowout, the poisoning of water in West Virginia and states down river by a chemical leak, to the daily conduct of legal and customary pollution pouring into air and water and soil that constitutes the overwhelming majority of ecological damage. It is neither accidental, unintended, illegal, or secret. It complies with all regulation and is approved and licensed by the EPA or other regulatory authority.

If our problem was merely the enforcement of existing regulation we would be in a very different situation. It is the normal and legal consequences of business as usual that is the heart of the crisis, not illegal acts or unintended disaster. And of course, such “accidents” are frequently the inevitable consequence of valuing the maximization of profit as opposed to maintaining a wide margin necessary for safe operation.

It is only years *after* the Macondo well blow out in the Gulf, that BP introduced a new and better blow out preventer, after having successfully resisted calls both for dual blow up preventers and a predrilled emergency well to quickly cut-off flow if both blow out systems failed. “Too costly and we don't need that since our systems we promise won't fail.”

Protection from accident is often by design that values safety more than maximizing profits. As an energy consultant and a certified boiler operator, I noticed when working in New York City that all boilers had two low water cutoffs that will shut off the boiler ignition if water level drops below safe levels. I was told this happened after explosions when the single boiler shut off failed when debris in poorly maintain systems kept the float from sinking and shutting off the boiler.

In a similar situation, with much graver consequences was the failure to protect the reactors and the spent fuel pools of the GE boiling water reactors at the Fukushima nuclear complex from the consequences of earthquake and tsunami. Apparently, both the earthquake supports and the height of the seawall was designed to withstand what was considered to be the greatest credible earthquake and

tsunami threat. Unfortunately, the earthquake and the tidal wave exceeded the design basis of the protection leading to catastrophic melt downs, fire and explosions, and ongoing release of radiation. The spent fuel pool at reactor four, jammed with highly radioactive fuel rods, sits high in the air above the damaged reactor whose building is collapsing.

Underway in 2014, is a desperate and highly dangerous race to transfer the fuel rods to a somewhat safer location in the common fuel storage pool on the ground, The danger of these fuel rods, held by damaged racks in the pool, is the potential for a catastrophic explosion and fire if they come into contact in the withdrawal process, or if another major earthquake strikes. An uncontrolled spent fuel pool fire and/or explosion could render much of Japan, including Tokyo, uninhabitable. In retrospect, it appears to be madness to allow continued operation of any of these reactors anywhere in the world with spent fuel pools suspended in the air, or to continue to store large amounts of spent fuel next to the reactor in industrial buildings with no containment structure.

• **The Necessity for an Ecological Turn**

The consequences, as part of business as usual, of both ordinary and extraordinary ecological externalities will make unmistakably clear the necessity for an ecological turn. We behave as if we can continue on our polluting ways for many decades. The day of reckoning supposedly postponed, in our imaginations at least, to when we are experiencing global temperature rises of 3 degrees Centigrade, or more, perhaps much more, and “the band stops playing”.

But the ever worsening consequences are already present. We will not have the luxury of many decades of slowly worsening conditions. It's 110 degrees this January on the tennis courts of the Australian Open while drought potentiated wild fires rage, and California reports its worst ever winter drought. How many more Hurricane Sandy's and worse will afflict us? How many more catastrophic floods and droughts? When will the ever worsening “new normal” of business as usual lead to the realization that there are better alternatives to the path of self-destruction and commensurate action.

The discussion of business as usual, informed by my discussions with physicist and professor of meteorology, Dr. Sam Miller of the Judd Gregg Institute of Plymouth State University, will indicate that a great unwinding of the conventional order is likely to happen sooner, rather than later. We will not have to wait until a catastrophic increase in average global temperature in fifty or seventy-five years overtakes us. The weakening of the Arctic vortex in winter 2014 leading to warming across Europe and Russia and cold in the U.S is a small taste of the consequences of changing global climate and weather dynamics as a consequence of warming. Warming has already led to shifting northward of the sub-tropical high pressure ridge leading to the kind of prolonged summer heat waves in the United States and Russia and Australia. The heat is already unrelenting not just under the pitiless Texas sun, but north through the plains and grain belt to the Dakotas.

We will see how sooner, rather than later, the shift in the equatorial high pressure ridge into grain producing regions of the temperate zone, threatens a period of prolonged drought, perhaps followed by catastrophic flooding, over one of the planet's major food production areas. The consequences will be famine, mass migration of the desperate, and resource wars and will likely usher in a radical crisis for the global economy and global political order.

Under business as usual, this is the most likely future, and is likely to lead to and the involuntary adoption of a program of limitation and contraction in a struggle for survival.

• **Mitigation and Geo-engineering**

Business as usual is embracing escalating attempts at marginal mitigation of ecological consequences. Billions can be spent on protection of valuable city land from storm damage and rising seas. This is now a politically acceptable stance for politicians. It offers solace to voters and does nothing to interfere with the prerogatives of those who continue to pollute and poison and contribute to the ongoing torrent of green house gas emissions. Sea walls and gates can be built to seal Lake Ponchartraine and protect New Orleans. The Dutch who understand the sea as enemy are advising New York on grand protective schemes to protect the City.

Meanwhile, irreversible melting and increasing instability is reported in a major Antarctic ice sheet as the sea levels continue to rise, and Arctic melting will lead to an open Arctic ocean in the summer. This threatens quick change in the earth's albedo, absorbing, and not reflecting, sunlight, leading to increased melting in Greenland and Antarctica that pour enormous amounts of fresh water into the oceans. The danger is not only rising sea levels, but the potential to interfere with global thermo-saline circulation responsible for the relative warmth of Europe, despite its northerly latitudes.

Increasing warming also means the melting of methane hydrates in Arctic tundra and seabeds. A warming Arctic threatens quick release of enormous amounts of potent greenhouse gases much more powerful than carbon dioxide. Mass methane release has been associated geologically with rapid warming events that if duplicated would be absolutely catastrophic for humanity. Business as usual appears not to be troubled. There is much talk in the fossil industry, for example, of mining and using the melting hydrates as another plentiful and cheap source of natural gas now increasingly accessible in a melting arctic. Don't worry, methane harvesting will meet all EPA regulations.

- **Geo-engineering**

It is inevitable that if we continue to allow the operation of business and pollution as usual we will be forced to turn in desperation to geo-engineering.

Mitigation attempts will lead to attempts at geo-engineering to halt the unfolding catastrophe. This will mean attempts, for example, to pour even more sulfur and black carbon particles into the upper atmosphere to shield the planet from sun; or attempts to dump iron in the ocean to grow carbon dioxide consuming plankton, or mirrors in space to cloak the planet; or building millions of towers to collect carbon and chemically transform to carbonate or pump the gas into underground caverns. Many attempts at geoengineering will introduce further ecological instability.

Limitation and Contraction for Survival Driven by Partial Collapse

Third, is the path of limitation and contraction driven by unfolding partial collapse and economic contraction, a path of doing less with less as a matter of necessity and survival. There is an extensive literature of peak oil and collapse, climate change and collapse, of the inevitable evils of economic growth of any sort, and that the only choice for humanity is a combination of a smaller and smaller pie. Limitation and contraction rests firmly upon the faith that it is somehow impossible to have any economic growth system without pollution, depletion, and ecological damage that overwhelms the carrying capacity and health of the biosphere. A popular position is that population must shrink to a small fraction of the present, or at least most economic activity must be local, and localism will become a necessity for everyone.

The point of contraction and limitation doctrine is much more than the often correct assertion that local production can produce better food, competitive products, and local jobs in a sustainable manner, and gain economic advantage by saving transportation and distribution costs and consequences and advertising expenses and associated ecological impact. The core intent of contraction and limitation is not the commendable growth of a strong local economic *sector* in a green economy or the growth of green cities including much organic urban food production and manufacture that I completely support as a crucial *part* of an ecological future.

Instead, the contraction and limitation enthusiasts believe that the consequences of peak oil and ecological stringency will mean not the replacement of gas engines with electric vehicles powered on a renewable electric system, but the collapse of traditional fuel networks and transport and localism by necessity.

The path of limitation and contraction rejects, or accepts only in the most constrained fashion, economies of scale of the local *and* the demonstrated export power of flexible local production networks made up of large numbers of cooperating and entrepreneurial small producers. This has been demonstrated in the northern Italian region of Emilia Romagna, or by the Mondragon Cooperatives in the Basque Region of Spain. The cooperatives in both Emilia Romagna and Mondragon do not only produce for small scale and local use, but have a strong and successful export orientation and an

entrepreneurial business culture. Ten percent of the work force are cooperative members in Emilia Romagna but the cooperatives produce 30 percent of the area GDP and up to 60 percent of GDP in some cities. ^{xxviii}

Localism in the ecological growth path, as part of a strong local sector, in contrast to limitation and contraction doctrine, can be the use, for example, of semi-automated local photovoltaic array production, machine tools produced by Spire in Bedford MA. These are sold around the world for modest scale PV array assembly for installation on a community's buildings at a price that's competitive with costs of building and shipping and distributing and advertising arrays from China. Spire's largest markets are in Africa, South America and Bangladesh. Spire is also producing large one kilowatt size PV models designed for very large solar fields by semi-portable production systems designed to move panels from assembly plant to nearby solar mega-field. ^{xxix}

Limitation and contraction rejects or discounts greatly the prospects for trade in information of all sorts on a renewably powered energy system. Similarly it rejects possibilities for any but a *local* sustainable agriculture, aquaculture, and forestry; or prospects for large scale industrial production governed by an industrial ecology of zero pollution-zero waste where all outputs of one production process become inputs for another; or prospects for the use of 3-D printers using sustainable inputs for production, or the emerging and potential enormous increases of efficiency from nano-technology for energy and manufacture; and denies the import of industrial ecological engineering as a discipline that can make sustainable and reusable all aspects of a large scale and complex product cycle.

An ecological path, in fact, means that processes and products that cannot adapt to ecological norms must be limited and contract, but this is not the general rule. Some processes and some materials cannot be used unless adapted to ecological norms supported by a price systems that sends clear price signals for sustainably up and down supply chains.

Contraction and limitation does have industrial business as usual on its side. Continuation of industrial business and pollution as usual and it's worsening consequences will, if we wait too long, make the path of limitation and contraction a necessity.

The essential argument of this book is that an ecological path is, by far, the most preferable and realistic alternative. It is the one we must pursue before the opportunity to do so is foreclosed by

unfolding ecological consequences of our polluting and ecologically damaging ways.

What unfolds will likely be a mixture of the three paths. Purity is a property only of academic examples and models, not of society and history. As business as usual declines, and an ecological path unfolds, some contraction and limitation will be adopted by necessity. The central matter is a question of choice and emphasis and consequence not perfection of models.

Continue too long on the path of business as usual and self-destruction the more we flirt with collapse, the more likely it will be that self-destruction will, at best, lead to involuntary self-limitation and painful contraction and the reduction of population and economic activity through war, famine, epidemic.

The future is predicted. An increasingly popular theme for movies and novels, from popular to literary, is future dystopia of collapse and catastrophe from partial to total, from Cormac McCarthy post-apocalyptic novel *The Road* (2006) to films like *Elysium* (2013) where the good life is now lived only by the elite residents on a space station orbiting an afflicted planet. But what will happen will be influenced and determined, in part, by the choices we make and the actions we take. This book is a call to action and an examination of possibility and prospect.

At best, business as usual will mean an ever increasing focus on increasingly desperate steps for mitigation with the worse and quickest consequences visited upon the poor nations, exponentially increasing the likelihood of economic and political collapse and disruption for better and for worse. Already, it's argued that drought and the rising price of grain was a key factor in the Arab spring and revolts against dictatorial regimes. But life will be increasingly difficult for us all. Yes, New York may be able to build dikes protecting the most valuable land, abandoning some areas to the sea, as has Louisiana for New Orleans--while leaving those on the bayou to the south at the mercy of the sea as oil exploration cutting channels and laying pipelines and rising sea levels continues to degrade the marshes. But what will happen in Bangladesh with no capital and no hope?

Withdrawal of Consent

Dramatic and revolutionary change is rooted in the withdrawal of consent and resistance to regimes whose conduct was both unbearable and impossible. The same will happen to industrial business as usual. The question is when, and will it be in time to prevent the worst consequences of our ecological misdeeds?

I don't want to spoil the climax, but the continuation of industrial business and pollution as usual makes our future choices increasingly constrained. As the intensification of climate related disasters, storms, famine, drought, and floods will make increasingly clear that a mindless continuation of business as usual will become, not just ill advised, but impossible. The inertia of the system, the conventional pursuit of greed and ever-more without regard for consequences will soon no longer be considered as common sense and the practice of smart, albeit greedy business. The question of course is how soon.

When consent is withdrawn remains to be seen. But a mass withdrawal of consent from business and pollution as usual will happen. The question is not if, but when? The worst dictatorships, that thought they would exist for 1000 years, vanished surprisingly quickly and sometimes with little violence following a withdrawal of consent.

An ecological transformation is not predicated upon a seizure of state power or upon violence, but upon a withdrawal of consent from industrial business and pollution as usual, and the adoption of a program for economic growth leading to swift ecological improvement. This is the application of the tools of democracy, government, labor, industry to the pursuit of ecological ends informed by a system of ecological market rules supported by the necessary government mechanisms to respond swiftly to market failure, to prime the pump when necessary, to take measures to facilitate sustainable development, and to help supply in a timely fashion sufficient capital and resources.

It calls for the kind of effort in WWII. Ford went from producing of private cars every 49 seconds at the River Rouge Plant, ^{xxx}to the construction of a B-26 bombers rolling off the assembly lines every hour at Willow Run to fight the war against fascism.^{xxx} Mass production of aircraft by Ford was proposed by labor leader Walter Reuther. Under the leadership of industrial engineer Charles

Sorenson, Ford applied the lessons of car manufacture to an the efficient manufacture of an infinitely more complex device with 488,000 components and established the basis for lean manufacture and just-in-time production systems.^{xxxii}

A swiftly growing belief in the necessity of healing change will give rise to a mass movement needed to unleash the economic forces and technical wizardry for sustainable growth. It's well worth remembering The Wide Awakes, a mass movement of young people that suddenly developed around the Lincoln presidential campaign in 1860, and that spread like wildfire from city to city. Around the country, tens of thousands of young men and then women joined Wide Awake groups with pseudo-military discipline and uniforms. They usually marched silently in formation through the streets with only the sound of drums and the tramp of boot heels, carrying a symbol of an all seeing eye. The Wide Awake Rally on the Boston Common on Oct. 16, 1860 is described by Adam Goodheart in his book *1861: The Civil War Awakening*;

“Then, at exactly 7:45, with the firing of a single shot ten thousand torches sputtered and flared to life...Like a rivulet of lava spilling from a volcanic crater, the ranks of men erupted in a single stream out of the ragged old field. The rhythm of their tramping boots increased to double time as the procession swung onto Beacon Street... The marchers carried not just torches but flags, split rails [for Lincoln the rail splitter], flapping linen banners...they did not plow straight ahead this time but almost danced, zig-zaging in formation from one side of the street to the other, imitating the crooked path of a split-rail fence.^{xxxiii}

This book is meant to provide a guide to a profitable and sustainable future for all. An ecological future is a better way. It is not the only way. It is based on turning our personal, economic, political and technical energies toward the building of a prosperous and sustainable future.

It's time to face these realities, to wake up, to turn around and look clearly at the smoke stack behind us, and chart a course through the river ahead before we hit the breaking ice.

Appendix A

Clamshell Alliance

The Clamshell Alliance was organized in 1976 as the citizen's last resort to non-violence civil disobedience to oppose the construction of the Seabrook New Project in Seabrook New Hampshire and support the development of renewable resources. Years of opposition including votes by the Town of Seabrook and other NH Seacoast Towns were ignored by Public Service Company of NH and NH State government determined to push forward with the project regardless.

Clamshell became the paradigmatic grassroots anti-nuclear non-direct action group and inspired of dozens of similar local alliances. From the first civil disobedience action on Aug 1 1976, when 18 Clams walked down the railroad tracks onto the Seabrook site, to 1989 when Seabrook unit I went online Seabrook site many thousands of Clams were arrested in a wide range of civil disobedience action large and small at the Seabrook site and many other locations from Washington hearing rooms to Wall Street to boardroom of the First National Bank of Boston to the NH Statehouse. The largest action of 2500 occupiers and 1415 arrest was in April 1977. But large action in the 1,000 range still took place in the late 1980s.

The success of Clamshell is not just to be measured in the number of arrests and number of actions. The rise of the grassroots anti-nuclear movement was contemporaneous with the accelerating collapse of the plans to build new reactors following Richard Nixon's plan for 1,000 reactors by the year 2000. Many dozens of reactors were cancelled. And nuclear power became to be understood as both ecologically dangerous and as a failed technology without a complete nuclear fuel cycle and requiring endless subsidy. The worldwide concern in the aftermath of the Three Mile Island, Chernobyl, and now Fukushima nuclear disasters need to be understood, in part, on the basis of the actions of the grassroots anti-nuclear movement.

Thousands of Seabrook opponents fought the project for decades in the streets and the hearing rooms. Clamshell was not alone. The Seacoast Anti-pollution League and their Attorney Robert Backus, and the New England Coalition Against Nuclear Pollution fought for decades an intervention battle sometime in alliance with other groups.

Clamshell is particularly interesting because of the wide diversity of tactics employed that went far beyond sit downs, site occupations and blockades both large and small. Clamshell's activities included ongoing work to limit and discourage investments of all kinds from the Seabrook project and worked strenuously against rate hikes and took the fight into the political arena including playing the NH card in both Republican and Democratic presidential primaries to gain commitments from would-be presidents to oppose Seabrook plant licensing for a range of reasons including evacuation and nuclear waste as well as to support renewable resources. Clamshell is worth paying attention to as a study in prolonged, dedicated, and creative non-violent resistance relevant to our future struggles for ecological change in the face of great odds. Below are reflections on some aspects of Clam's work focusing first on the financial arena, and next on the broad range of action.

From The Seabrook Struggle

The Seabrook opposition led thousands of people, “to reshape our imaginations due to changed circumstances” in the words of the late Chuck Matthai, Clam organizer. We were educated in the school of necessity and empowerment that led to an incredible mixture of experience. I found myself moving from being afraid to talk in front of a library audience of a dozen to addressing mass rallies of thousands.

The memory of the fear and then the exaltation on April 30, 1977 was when wearing our backpacks my affinity group as part of 250 others that had camped at “South Friendly”, on the land of Tony and Maria Santasucci in Seabrook on the edge of the Seabrook construction site, leaving the beautiful sheltering woods. We then climbed up and then down over the high construction rock-pile at the edge of the Santasucci land. The well armed police lining the fence enclosing the Seabrook site watching, with helicopters whirling menacing overhead. And then we were walking along the fence and around the end at the tidal marsh to join 2500 Clams on the Seabrook site in our occupation that led to the creation of dozens of similar citizen alliances following our example.

Doing what needed to be done to raise funds, I began promoting rock concerts and recruiting big time talent to volunteer their time. Clamshell became my source of income (about \$100 a week)

learning from former AP reporter and Clamshell media spokesperson how to take over that job. That led to strange moments like waking up to my own voice on the clock-radio.

During the protracted licensing struggle I found myself knelling in front of the car of NRC Chair Lando Zech as he tried to leave the south gate of the Seabrook site after an unannounced inspection. Clam Billy Donavan closed the gate behind him and Dianne Dunfey, Kurt Ehrenberg and I knelled in front of his car a greek chorus telling truths about Seabrook project and our opposition as the driven moved slowly closer and closer...

While Chinese students were occupying Tienanmen Square, we staged a large cvili disobedience action at the Seabrook Dog Track whose owner which did not think that a nearby nuke was good for his business. Surrounded my more than 1,000 clams, I remember standing in the parking lot while Clam Paul Gunter held a powered megaphone high overhead turning around in a circle as I discussed the scenario plan of using cleverly hinged wooded ladders to climb over the fence. My affinity group was part of the first wave on North side closet to the reactor. I remember climbing over and reaching the line of NH State cops. I thin guide strong guy met we face to face. We pushed each other hard for a few seconds and then I was sitting down. And that night six year old Emily Hinnandael who had climbed over the fence with her parents and older sister and was released, refused to leave the site in solidarity until she saw that was released. That parents felt comfortable risking arrest with their kids in a challenging action was a reflection our our commitment to non-violence that was understood by both demonstrators and authorities. There were tense moments and some physical confrontation but it did not pose danger to others.

Acting as pro se lawyer, I became comfortable of defending myself and making motions in District and in Superior Court informed and inspired by the example of Clamshell member Renny Cushing. I found myself defending Clam Guy Chichester against an injunction after he was arrested to cutting down a Seabrook warning poll as an act of civil disobedience sitting next to him, as if I was a lawyer, arguing with the Superior Court Judge, resenting evidence that the affidavit cobbled together by Public Service was demonstrably untrue (that made no difference to the judge).

One afternoon I was told that I was to arrested for a felony, “Criminal Liability for the Conduct of Others” as one of the Seabrook 5. I remember calling my lawyer Jon Meyer, who was on the board

of the NH Civil Liberties Union, from a phone booth near Seabrook and asked him what I should do, visions of going underground not exactly dancing in my head. Give yourself up, he said. And I did. Sooner after, I was surprised and heartened in a way hard to explain. At the next Clamshell demonstration seeing hundreds of Clams were wearing a button that read Clamshell Leader. After much legal and political machinations, and influenced by our solidarity, the case was eventually dropped before trial.

Public Service over the years used it's political power to reverse a chain of regulatory decisions in multiple venues from the New Hampshire Public Utility Commission, to the EPA, to the Nuclear Regulatory Commission and Federal Courts which had the effect of making opponents just fight harder and harder.

Each of the thousands that spent many years in the Seabrook struggle had their own mixture of fear, empowerment, and discovery. Each long-term activist participating in many hundreds of actions and events large and small, their own experiences of fear and bravery. In retrospect, what now seem trivial acts of standing up were, in fact the evidence of facing the fear and moving forward. And the boldest and most perilous acts became routine and well calibrated and well controlled risks. It will be a similar mixture of facing the fear and experience and commitment that will ultimately lead to a change in business and pollution as usual and a common withdrawal of consent.

Appendix B

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Alternatives to Retrofit Scrubbers for Merrimack Station Coal Power Plant in Bow N.H.: A Conceptual Analysis

Problem

Should PSNH spend almost \$500 million to install mandated pollution scrubbers at its old coal-fired Merrimack Station in Bow, N.H., or are there other and better ways to spend this money and meet New Hampshire's energy, economic, and health needs?

Challenge

The Office for Sustainability at Southern New Hampshire University was asked by the Sierra Club to explore this question. We approached the question with open minds, with the aim of finding economically, ecologically, and socially sustainable solutions to this problem.

Are there alternatives to installing scrubbers that:

1. Reduce carbon mercury and sulfur pollution by more than the required 80%.
2. Slash carbon emissions from the Merrimack plant that's New Hampshire's largest point source of carbon dioxide.
3. Provide competitively priced power for N.H. ratepayers.
4. Capture the waste heat from Merrimack Station and find ways to use it for heating homes, institutions, and businesses instead of dumping it into the Merrimack River and the atmosphere.
5. Maintain the tax base for Bow, N.H.

6. Develop new and profitable business opportunities coordinating the activities of electric supplier PSNH and natural gas supplier National Grid, and/or other interested parties.
7. Attract new federal infrastructure dollars to help fund this innovative energy project.

The Scrubber Mandate and Controversy

The State of N.H. in RSA 125-O:11, enacted in 2006, requires Public Service Company of New Hampshire (PSNH), owned by Northeast Utilities (NU), to install new scrubber technology that will achieve at least an 80 percent reduction in mercury emissions at its 430 megawatt coal-fired Merrimack Station in Bow, N.H. by July 1, 2013. The project would include the installation of a new chimney and water treatment facility, and has a cost estimated in Public Service Co.'s latest 10-Q filing of \$475 million, far beyond the original \$250 million estimate.

The N.H. Public Utilities Commission, in a letter dated Aug. 22, 2008 (DE: 08-103), "determined pursuant to RSA 365:5 and 365:19 to inquire into: the status of PSNH's efforts to install scrubber technology; the costs of such technology; and the effect installation would have on energy service rates (previously referred to as the default service charge) for PSNH customers."^{xxxiv} The NHPUC in Order No. 24898 allowed the project to proceed at the discretion of PSNH.

On Oct 20 2008, a petition under DE 108-13 was filed by TransCanada Hydro Northeast Inc. and a group of N.H. industrial customers, including Stonyfield Farm, asking to suspend order No. 24898 following the announcement of PSNH's intent to begin site work on the project on Nov. 2, 2008.^{xxxv}

Merrimack Plant and Low-Cost Coal Power

The 430 megawatt Merrimack plant currently provides 38% per cent of Public Service Co electricity. The current low-cost of coal is combined with the unique regulatory situation of Public Service Company to make Merrimack Station a source of relatively low-cost electric power.

Public Service Co. was allowed to keep ownership of its older fossil fuel plants, including Merrimack Station, and not divest, in spite of the coming of retail electric competition. Ratepayers receive power from these owned Public Service facilities, plus additional power purchased from the ISO-NE wholesale market. Rates for N.H. customers are set periodically by the New Hampshire Public Utilities Commission.

It should be noted that the "low-cost" of Merrimack coal power is based on shifting costs for health and ecological effects for mining, transporting, and burning coal. This includes the effects of mercury and sulfur in New Hampshire and of carbon dioxide on climate globally. Merrimack Station is New Hampshire's largest point source of all

three pollutants. It is increasingly likely that in response to the gathering global climate emergency either substantial and escalating new carbon taxes, or a carbon ceiling with a cap and trade requirement will be imposed and remove any competitive advantage from pollution at Merrimack Station.

Proposed Sustainable Solution

We believe we have identified a solution that can substantially satisfy all seven challenges we posed for an alternative to the costly installation of Merrimack Plant scrubbers.

Our proposed sustainable alternative plan:

1. Construct on the Merrimack Station site a new advanced combined cycle 400 megawatt natural gas plant. The base budget cost of such a new plant according to the U.S. energy information agency is \$654/kw installed or \$263.2 million.^{xxxvi} This leaves an additional \$211 million from the current \$475 million scrubber budget for further work with no increase in cost. The actual cost on an existing site given existing electric and material handling infrastructure may, in fact be less. Actual cost, of course, needs to be determined by careful and objective analysis.
2. The new combined cycle plant will provide sufficient power for Public Service. By itself, the gas plant will largely eliminate mercury and sulfur pollution and substantially reduce carbon dioxide emissions by substituting natural gas for coal. Natural gas is widely recognized as the transition fossil fuel to serve as a bridge for a smart renewable and distributed generation based electric grid. Electric cost reduction efforts need to be placed on improving end use efficiency using high efficiency lighting, motors, air conditioning and refrigeration, and innovative heat pump technologies. We cannot maintain a sustainable future based on burning coal. While theoretically “clean coal” could be the equal of natural gas, natural gas is already available and gasified coal is not, and coal still entails the costs and effects of mining and treatment.
3. The new plant would maintain Bow tax base.
4. Waste heat from the plant should be reclaimed instead of being dumped into the river or the atmosphere. Heat reclamation can be accomplished without reducing electrical efficiency. The hot water using the existing B&M railroad right of way can be piped directly to Manchester to provide District heating and potentially District cooling. The hot water heat can be combined with heat pumps to bring water temperature to needed end use levels of existing buildings. Heat pumps could also take advantage of Merrimack River water to provide district cooling and

further supplemental heating if needed.

5. The Manchester District heating and cooling system could be constructed by a number of entities including, for example, National Grid, the current natural gas supplier, who would then sell hot and chilled water. Public Service would provide hot water to the system from Merrimack Station. The City of Manchester would not be required to either own or finance the system, although that option is open if the city finds that is in its interest. The cities of Hartford and St. Paul have substantial expertise in constructing new district heating and cooling systems. Pentti Aalto of the SNHU Office for Sustainability has much district heating and cooling expertise that can be a resource for all interested parties.
6. The District heating and cooling system would further slash New Hampshire carbon dioxide emissions, placing New Hampshire in the vanguard of cost effective global warming solutions.
7. The entire project would be a natural choice for funding for new infrastructure projects by the new Obama administration.

Where Do We Go From Here

Now is the time, before construction has begun on the well intentioned, but now too costly scrubber project, to chart a new sustainable course. Working together, we can craft a solution that will benefit N.H. and satisfy the triple bottom line of sustainability; the economic, the ecological, and the social. The Office for Sustainability at SNHU stands ready to assist the parties in this effort.

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Office for Sustainability SNHU

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