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The Earthquake in Japanese Energy Policy

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More than a week after March 11, when northeastern Japan was hit by a magnitude 9.0 earthquake and 7-metre tsunami, the death toll remains unknown. It seems certain to exceed 20,000, as whole sections of some communities were washed out to sea. Search and rescue groups are grimly at work finding bodies alongshore and beneath the rubble and debris.

The human losses are already enormous, and now the slow erosions of humanity threaten: there are sad reports of hundreds of elderly left to die in hospitals and care homes in the stricken areas. And the economic losses are climbing into the stratosphere as stocks fall, foreigners flee, and millions of workers and consumers simply stay at home. All the numbers are huge: half a million people barely getting by in poorly supplied shelters; the iconic bullet-train damaged at 1100 locations that will take "considerable time" to repair; a projection of reconstruction costing upwards of USD 200 billion.

In this article, I argue that while Japan's crisis reaches across public health, provisioning, financial policy, and the like, it centres on energy. Energy is the world's largest business, at fully 10 per cent of the USD 60 trillion global economy. It is certainly the bedrock sector of any modern economy. And in this crisis, Japan's power generation, energy security, and energy plans have taken perhaps the most profound and protracted blow. Energy is already the critical short-term challenge. That will not change in the medium- and long-term either. But policy choices made now, in the midst of this crisis, and right in its wake, will be of utmost importance in shaping the future. Energy policy, it is often said, responds to crises rather than elections, and Japan is reeling from an unprecedented shock in what was already a fraught global context. Japan's predicament may in fact be far worse in its urgency, and the global implications of inadequate or inapt responses more dire, than the collapse of it bubble economy two decades ago or even the global financial shock of just a few years past. This article begins by assessing the nature and magnitude of Japan's crisis. But it goes on to show how Japan could emerge from the disaster, one that has effectively nullified its energy strategy, much stronger for it. Japan is at present menaced by several concurrent, concatenating crises. But with smart and responsible energy policies and politics, it could pioneer approaches that help lead us all out of our increasing dire, energy-centred dilemmas.

The Power Elite's Nuclear Nightmare

Of course, the immediate energy problem is that the mounting chaos at the stricken reactors might quickly become far worse. Japan remains close to the edge of a nuclear catastrophe, with the ominous prospect of significant volumes of highly toxic spent fuel, including deadly plutonium, being released to the winds. The evening of the earthquake brought reassuring words of a routine shutdown from Prime Minister Kan Naoto, who echoed the advice of Tokyo Electric Co (TEPCO), the reactors' owner. But the following days delivered increasingly unnerving revelations of "station blackouts" and "partial meltdowns" in Fukushima. And now we confront the surreality of main battle tanks fighting the reactor fires as radiation drifts over the Kanto region of 45 million people, including metropolitan Tokyo's 13 million residents. How bad this gets is anyone's guess.

Fukushima reactors explode

Meanwhile, the International Atomic Energy Association, the US and Chinese governments and others are calling on Japan's authorities to share more information about what is going on. The Americans have deployed satellite and other assets to collect information on their own, but thus far have released it only to the Japanese government. The lack of credible information is giving conspiracy theorists and doomsayers a field day. In the first week after March 11, Japan was embraced in an outpouring of global sympathy. But to a radiation-panicked world, Japan now risks losing credibility and instead appearing reminiscent of North Korea and other so-called rogue states.

The reactors at the core of the crisis are the legacy of vested interests' dominance of Japan's energy policy. Key actors in this "power elite," if you will, are Japan's 10 monopolized utilities that have the country divided into their respective fiefs. They are backed by bureaucrats in the Ministry of Economy, Trade and Industry (METI) as well as a broad swath of the political class. Their priorities have led to a focus on, indeed an obsession with, nuclear power.

Japan's response to the past decade's surge of oil and other fossil-fuel prices and risks has been to aggressively promote nuclear as the key alternative. At present, Japan gets close to 30 percent of its electricity from nuclear reactors. Its 2010 Basic Energy Plan also aims at making nuclear power the key driver in Japan's electricity supply by raising its share to about 50 percent of electricity by 2030. The authorities propose to realize this objective by constructing 9 new nuclear plants by 2020 and at least 14 by 2030. Longer-term goals include the extraordinarily ambitious goal of securing 60 percent of all energy needs, not only electricity, from nuclear sources by 2100. The power elite are united not only by concrete incentives, but also by the idealism of true believers who brook no interference in their grand plans.

The nuclear component is also the key part of regionally centralized production and transmission network that is vulnerable to the country's frequent earthquakes and accompanying tsunamis. The power industry overall is vertically integrated in its regional silos and largely self-regulated, with a lamentable record of cutting corners as well as outright corporate fraud. For decades, a host of well-informed critics have long foreseen precisely this kind of crisis. Like those who warned of Wall Street's derivatives and "too big to fail," Japan's nuclear policy critics were ignored by the vested interests and captive regulators who collude in a policymaking network seized by group-think, centred on concentrated benefits, and skilled at using the state to diffuse risks and costs. Allowing the power elite's idealism and incentives to run riot now sees precious human, material and political resources deployed to fight a nuclear crisis when they should be devoted to saving lives and giving succor in the wake of the natural disaster.

Let us look at the bleak numbers in the power sector. The Fukushima 1 and 2 power stations house 12 nuclear reactors that represent about 10 gigawatts of electrical generating capacity. That is roughly one-fifth of Japan's total of about 47 gigawatts of nuclear generating capacity. Much of the Fukushima stations' nuclear generating capacity is now wrecked or in the process of being ruined. No matter what happens, the reactors will likely all be inoperable - for political

as well as technical reasons - for a considerable period of time, perhaps permanently. There is also significant damage to other thermal (ie, coal, gas and oil) generating capacity and to the transmission grid.

In a richly detailed and compelling March 17, 2011 analysis of the power crisis, titled "After the Deluge," the Nautilus Institute survey this thermal and nuclear damage to the power capacity of TEPCO and the Tohoku Electric Power Co utility in the northeast. They sketch a "best case" scenario wherein all thermal generation and the nuclear plants outside of the immediately affected area can be brought back online. Even with this optimistic outlook, their analysis of the numbers suggests that TEPCO faces a significant shortfall of supply, especially to meet the enormous demand surge of summer. And that, to repeat, is their best-case scenario.

We are already witness to the initial stages of Japan's energy shock. Electricity is the fuel of the modern economy. And this is particularly true in Japan, where public policy has sought to electrify as much consumer and corporate energy consumption as possible. One reason for this is that Japan is dangerously reliant on imported fuels, getting nearly half of its primary energy from oil and importing about 90 percent of that oil from the increasingly unstable Middle East. Now, hit by this crisis right at home, the authorities have called on firms and households to reduce power consumption to the bare minimum. Train and subway schedules have been trimmed back. Toyota has shut down all its domestic car plants until at least the 22nd of March. A host of businesses are shuttered or operating on short hours. But even this very high level of cooperation in squeezing consumption is not enough. The world's largest urban region is already subject to hastily designed and haphazardly implemented rolling blackouts.

And on the horizon is the heat and humidity of summer, when power demand peaks at about 50 percent higher than normal levels. In what is already one of the world's most energy-efficient countries, no amount of no-necktie "cool biz" or Tea-Party-style fantasizing about "global cooling" will hold back the swelling torrent of demand. Tokyo's protracted sauna of July and August will therefore keep energy policy foremost in political and specialist circles as well as the public debate. This continued salience of the power problem might work to the advantage of vested interests or it may fuel an alternative strategy centred on sustainable energy. Where we go from here depends on politics.

Let us take a closer look at TEPCO, the core of the complex of vested interests.

Tepco's Shinsaiwashi Building

As noted, TEPCO is the utility that owns and runs the stricken reactors. It is the fourth largest utility in the world, Asia's largest, with total assets (in fiscal 2009) of YEN 12.6 trillion and gross income of YEN 4.8 trillion. With 280.2 terrawatts of electricity sales (again for fiscal 2009), TEPCO dominates fully one-third of the enormous, 858.5 terrawatt Japanese power market. Forty percent of TEPCO's power is generated by nuclear plants, and the firm champions the world's largest nuclear power building programme. TEPCO's losses are going to be enormous as a result of this crisis, and its shares have already plunged from the pre-crisis 2300 level to about 900 as of March 18th. Losses might even extend beyond yet more financial costs on its book and the accounts of the state. Certainly TEPCO confronts the threat of being displaced from its perch, losing its immense nest of concentrated benefits. The utility has staked its corporate reputation on being able to deliver power, uninterruptedly and at reasonable cost, through a focus on investment in nuclear. In the midst of this catastrophe, it cannot deliver electricity from assets that many Japanese citizens now know could and should have been built to withstand a gigantic but predictably-sized tsunami. The outrage will likely not subside anytime soon. Rolling blackouts, poorly designed and coordinated, add to the confusion and loss of economic output. And then there is that long, hot summer on the way.

People anywhere soon habituate to almost anything. But the heat and blackouts will ensure that TEPCO's 27 million customers keep thinking about the reasons it cannot supply enough of an essential commodity, power, in a crisis and afterwards. Nor will people forget its chariness with the facts, another essential item in a crisis. The lack of openness has already led PM Kan Naoto to openly vent his outrage at being kept in the dark. One can only imagine the coming flood of Diet debate, commissions of inquiry, and revelations in the press. This background will make it even harder for voters to be blank out all the images of children being checked for radiation. These scenes are already becoming powerful symbols in Japanese politics, disseminated through social media by ordinary citizens and the country's anti-nuclear groups. Nor will seared memories soon subside, of broadcast emergency warnings to evacuate while holding something, anything over your mouth if you are outdoors. And consider the unforgettable, roiling panic at then being urged to stay inside possibly damaged buildings, airtight as possible from the radiation outside, at a time of repeated and very large aftershocks. There were very good reasons the Japanese Emperor took the unprecedented act of making an emergency public address.

The threat of radiation is a profoundly fearful thing anywhere, but has a special resonance in Japan. This is the only country ever to be attacked with nuclear weapons and has a deeply embedded social memory of fallout and what it does to the body. The larger, mainstream political culture, while concerned about nuclear risks, has hitherto tended to view outright anti-nuclear activists and rhetoric as somewhat raucous. But the sheer scale of this crisis will almost certainly expand anti-nuclear sentiment to a very strong veto role in policymaking.

Power Politics, Post-Crisis

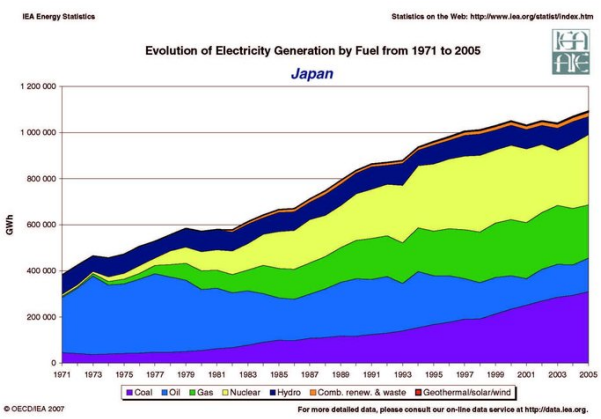
The biggest policy choice to be made is what to replace the damaged power generation capacity with. TEPCO will try to obfuscate what has happened, just as it has been doing throughout this crisis. One potent indicator of its style was seen in the fact that its first strategy was to save its nuclear assets even at the enormous risk of full meltdown. Only PM Kan's direct order forced it to turn to corrosive but cooling seawater. Then it sought to hand off control over the problem to the government and military. The Kan cabinet nixed that gambit. Presumably they realized that taking the radioactive baton from TEPCO would effectively make them the face of the crisis, with the utility fading from view in the public mind.

TEPCO is now sending top executives to press conferences, where they face fusillades of angry interrogation while making the routine abject apologies and deep, formal bows. There will surely be resignations down the line.

The company is sure to try a variety of strategies to maintain its enormous monopoly. Assuming the crisis ends without a total catastrophe, TEPCO will almost certainly seek to get as many of its nuclear plants back online and as much of its plans back underway. It will seek to salvage what it can from the damaged plants. Getting anything in Fukushima back online would seem out of the question. But these are not, in the least, normal times. One possible strategy might exploit public and industry dismay at blackouts, idled factories and sweltering summertime offices to allow the company, captive regulators, and readily manipulable politicians to rush a return of some capacity. At the very least, they will try softening up opposition through guarantees of more robust reactors. The global nuclear industry has already started stressing that the accident resulted from the difficulty of gaining approval for new and (allegedly) safer reactors, as the units in Fukushima are about 40 years old. This tendentious line of argument is also emerging from some Japanese talking heads, even as the nuclear crisis remains in full swing. Let us be clear: the cause of this crisis is not ageing reactors, but rather systemically centralized power and rewards and the regulatory, fiscal and financial institutions that encourage the power elite to diffuse risks and ignore their implications.

TEPCO will be desperate to keep the nuclear-centred energy policy on track, and continue ramping up capacity towards that 2100 target of 60 percent of total energy supply. But as we have seen, the constraints posed by the present will likely be ineluctable. The company effectively painted itself into a corner when it decided that the weak back-up systems in Fukushima were enough. Complacent in a collusive regime, it opted to overlook the tail risk that a very big event might leave it unable to satisfy demand. Reactors take many years to build even at the best of times, and now they are destined to take longer still. It will

take time to tighten safety and reassure the public's nuclear fears in the wake of the crisis. Power demand will not wait in the interim. It will either be satisfied or go elsewhere, taking with it Japan's ability to grow out of this crisis and its already huge burden of public debt.



Surely TEPCO will deploy all the thermal-fired capacity it has on hand, at maximum operating rates. Being on a 50 Hz standard, it is unable to draw on significant surplus power from the other regional monopolies west of it, which run on a 60 Hz standard. Only a gigawatt trickle of power can flow through the transformers. Not surprisingly, international fossil-fuel markets are already salivating at the prospect of even higher prices. In Australia, for example, the bottom has fallen out of uranium stocks, but coal and gas interests are riding a powerful updraft. Yet savvy analysts, including experts at the International Energy Association, worry about the real and potential infrastructural and other limits to satisfying the tsunami of new thermal-use fossil-fuel demand coming from Japan. Prices will almost certainly increase through this year, making TEPCO's power not only intermittent but also increasingly costly. Keep in mind that Japan's power prices are already among the highest in the industrialized world.

And still there is that fundamental, inescapable problem of deficient generation capacity. TEPCO will certainly plead that natural gas is a useful bridge to a low-carbon future, and that it can quickly ramp up capacity. As of March 2010, TEPCO had 25.8 gigawatts of gas-fired generating assets. Encouraged by exuberant American talk of an "energy revolution" through shale gas, they have been looking at increasing this capacity as a secondary source after nuclear power. Never mind strong evidence that the alleged revolution in natural gas is a bubble as well as an environmental nightmare (albeit less spectacular than nuclear, at present). One big problem here is that large, gas-fired capacity takes a few years to build -- less time than nuclear plants, to be sure, but still not fast enough to address imminent shortages. Moreover, gas-fired capacity is, like its nuclear counterpart, the kind of unsustainable and centralized power generation that readily lends itself to reproducing the dominance of the large utilities and their division of the country into 10 separate fiefs. Conventional power thus recycles and reinforces the political and economic power that led to the crisis in the first place.

Japan as Shockwave Rider

So, long dismissed as a dwindling has-been, Japan is once again a shockwave rider, slingshot into a future that we all face. And we are all turning Japanese, on the energy front, even if not propelled by earthquakes along with nuclear nightmares made by collusive old boys intent on pursuing a plan. Still the world's third richest country, with the third largest electricity market, Japan possesses abundant human, financial and technical resources to devote to this power crisis. Wall Street's derivatives and skewed priorities cannot influence Japan's public finances, so it will fund - as it sees fit - the costly recovery from the earthquake and tsunami and all manner of aftershocks. There is no question that new power generating capacity of some type will be installed. A crucial question for Japanese politics is what kind of generating capacity that should be and how it should be integrated into the national grid. Indeed, the need to reconstruct some part of the grid opens the possibility of doing it "smart." The utilities have been working behind the scenes these past two years to block the installation of truly smart grids and smart cities. This is because they (quite rationally) fear the potential of losing their dominance to distributed power. So the power aspect of reconstruction is critical for determining the shape of post-crisis Japanese society: the nature of its energy supply, its power grid and the political economy of the new order.

In short, conventional energy, including gas and nuclear, and the conventional "dumb" grid, means centralized generating capacity that reproduces the market dominance of the electrical utilities. TEPCO and its allies will certainly try to shepherd the reconstruction in that familiar direction. They will argue that business as usual is the only feasible means to get the power network back to levels required for economic growth and the continuing electrification of so many consumer and business activities. It is only rational for them to argue their self-interest. But only fools would mistake this argument for the general interest, especially now, and throw yet more precious fiscal resources their way.

The Sustainable Option

There are other choices. One is to recognize that the centralized system focused on nuclear power is too costly and dangerous and proceed from there. Highly complex, centralized systems per se are inherently and disastrously vulnerable to shocks, something as true of financial regimes and supply chains as it is of power generation and transmission. A smart alternative, in power, is to do as Germany and a host of other countries and regions are doing. They prioritize sustainable energy and distribute increasing amounts of small-scale generating capacity among the myriad rooftops, yards, rivers and open fields of households, small businesses, farmers, local communities, and others. This strategy not only spreads the wealth and political influence created by a growing energy economy; it also bolsters the generating network because so much of it is thus far removed from the concentrated shock of an earthquake and tsunami. Natural disasters do not hit everywhere at once.

The power elite, here in Japan as well as overseas, deride renewables as costly, unreliable and impossible to scale up fast enough to meet needs. But the empirical record, and above all the earthquake/tsunami of 2011, reveals that to be self-serving rhetoric. We desperately need to think beyond those cheap slogans. It becoming clearer by the day that incumbent energy interests are the ones whose prices are climbing and whose capacity is slow to scale. By contrast, the costs of green power are dropping rapidly while its generating capacity is diffusing faster than fossil-fuel-fired plant.

For example, the March 17 release of "Clean Energy Trends 2011" indicates that the global solar market grew from USD 2.5 billion in 2000 to USD 71.2 billion in 2010 and that wind power went from USD 4 billion to USD 60.5 billion over the same period. To be sure, these figures are still a small fraction of the markets for oil, coal, and natural gas. But what the numbers show is that renewables are increasingly rapidly and have demonstrated their ability to scale up. And keep in mind that these rapid rates of growth were achieved without especially powerful, crisis-driven policy. Nor did renewables enjoy the truly massive financial flows, so evident in the shale-gas bubble, and the state finance, so marked of nuclear, that the conventional energy sectors can readily tap. Wind and solar's remarkable rates of growth were also recorded prior to the onset of incredible instability in the Middle East/North Africa, Japan's crisis, and other multiplying shocks to the energy status quo and the assumptions that underlie it.

And as the February 2010 edition of Global Finance pointed out, in a cover story titled "Paying for the Green Revolution," "hundreds of billions of investment dollars, if not trillions, from pension funds, private equity investors, sovereign wealth funds and hedge funds are waiting on the sidelines" while energy interest groups fight to shape public policy. Global Finance portrayed policies like the "feed-in tariff" (or in the US, "clean contracts") as especially key to opening the road to green. This backdrop of latent financial power waiting in the wings for a strong policy signal is especially true of Japan. Banks have remained shy of lending, save to the state, even two decades after the 1980s bubble's collapse. Borrowers for new business also remain scant, keeping domestic consumption low and thus maintaining Japan's excessive reliance on exports. But green energy policy, at the core of a smart reconstruction, could finally drive a big and sustainable boom in Japan's domestic economy.

There is indeed significant evidence that the global energy economy is at a very critical turning point, as financial flows are following smart policy. The September 2010 Renewable Global Status Report shows that the USD 30 billion invested in renewable energy capacity and manufacturing plants in 2004 had expanded to USD 150 billion by 2009. It also shows that 2009 was the second year running in which "more money was invested in new renewable energy capacity than in new fossil fuel capacity." Reflecting their robust policies, Germany and China were the investment leaders (at about USD 25-30 billion each), with the US a distant third (at just over USD 15 billion) followed by Italy and Spain (roughly USD 4-5 billion each). Unfortunately, Japan does not even make the list.

Moreover, among the wind, solar, biomass, geothermal and other renewable technologies already in place, several are now competitive even with coal, the

cheapest, dirtiest and most common means of producing electricity. The declining costs of renewables are in large measure thanks to the feed-in tariff (or "FIT"). The FIT at present fosters 75 percent of global solar and 50 percent of global wind in no fewer than 85 national and subnational jurisdictions. The UN, the IEA, Deutsche Bank and a range of other organizations and agencies have determined the FIT to be the most effective and efficient means of diffusing renewable power. In Germany, where renewables have tripled over the past decade and provide about 17% of electricity, the FIT costs German households about 3 Euros per month (roughly the price of a loaf of bread). The FIT essentially guarantees the renewable producer a stable market and a stable price for the product. This temporary assistance to renewable energy production is designed to, and does, lead to price declines per kilowatt-hour for renewable energy sources. That result is a sharp contrast to the tax incentives and other subsidies enjoyed by the conventional energy sector, which appear to have bought little more than price increases. Add in the fact that nearly two-thirds of anthropogenic greenhouse gas emissions come from burning fossil fuels, and it is clear that not only Japan needs to shift - fast - away from perverse energy policies.

In fact, Japan adopted a FIT on November 1 of 2009. But this was a deliberately constrained, housebroken version that the power elite hastily drafted and passed during the 2009 election campaign. The power elite moved at light speed, relative to the pace of Japanese bureaucratic politics, in order to pre-empt the threat of a German-style comprehensive FIT, applying to all renewables. Yet even the hobbled policy support they designed, a FIT that applies only to solar and with plenty of restrictions, saw the solar market take off last year after long being eclipsed by the Germans and then the Chinese. And the momentum has spread to other renewable power sources. Japan's farmers, local communities, construction firms and other interests are turning towards geothermal, wind, biogas and other power generation to enhance income, local energy security, and their capacity to contribute in the fight against carbon emissions and climate change. Added into the bargain from sustainable energy choices are reduced dependence on unstable and increasingly costly foreign sources as well as none of the risks of nuclear power.

Japan's FIT is slated to be extended to geothermal, wind, small hydro, and biogas from April of 2012, with a host of restrictions and other limitations that the power elite forced over the objections of experts, local communities and other interests that sought a robust, comprehensive FIT. This crisis affords an opportunity to revisit that just-made decision, stripping the FIT of the imposed handicaps and unleashing it as soon as possible.

Another area for smart, constructive policymaking in this crisis is Japan's compulsory target for renewable energy. This policy is internationally known as a "renewable portfolio standard," or RPS. In the 2009 campaign, the now-governing Democrats promised to increase Japan's RPS-mandated use of renewable energy to 10 percent by 2020. This goal was to supersede the current compulsory target of merely 1.63 percent of power by 2014, which appears to be the lowest RPS among the developed countries that have adopted such incentives. Even most American states have much more ambitious RPS goals. California's RPS requires its utilities to reach 33 percent renewables by 2020. It should come as no surprise that the German target is higher yet, at 50 percent by 2030. Less well known perhaps is the fact that Scotland is committed to 80 percent by 2020. And China's official goal is to generate 16 percent of all energy (again, not just electricity) via renewables by 2020, with a very recent commitment to an astounding 500 gigawatts of renewables by 2020.
Japan's current RPS target is thus very low. In fact, it is so low that it is actually less than the utilities' extant renewable generating capacity. As a result, the electrical utilities simply "bank" the excess of renewable energy production and apply it to their obligations. The effect, quite deliberate, is to further erode incentives for expanding the provision of electricity via renewable sources.
Safety is another incentive for Japan to use this crisis to vault to the front ranks of the ongoing shift to more distributed power. Simply put, distributed and renewable electrical generating capacity would be far safer than the existing plant, and not just the radioactive assets in Fukushima. Some people find wind-farms unsightly or worry that a geothermal generating plant will suck up all the hot water for their hot springs. These kinds of arguments have been prominent in Japan's public debate, such as it is, over sustainable power versus the status quo. Executives and other spokesmen for Japan's utilities trot them out at every opportunity. They can be expected to argue even more vociferously in the coming months that renewable energy seems good in theory but is intermittent, of low energy density, and expensive. Here again, they deliberately disregard - hoping their listeners will too - the successes in Germany, Denmark and elsewhere. They disregard, too, the fact the US Navy - now deployed in force off Japan's coast - is committed to securing 50 percent of its energy needs from renewables by 2020.

And note well that the US Navy is not looking to more nuclear power, notwithstanding the nuclear industry's growing buzz about "mini-nukes" and pebble-bed reactors. Rather, the Navy is explicitly committed to geothermal, wind, solar, waves and second-generation biofuels. More generally, all arms of the US military are invested in renewables at their bases and installations. They are also making smart grids and micro-grids their backbone infrastructure, to reduce vulnerability to natural disasters and other events. They should be learning from Japan rather than the other way around.

The point here is hardly to laud the American military as tree-huggers (or "geo-greens," as Thomas Friedman would have it), but rather to highlight the pace and scale of the green revolution that is already underway. Nicholas Stern, the author of the October 2006 "Stern Review on the Economics of Climate Change," now refers to the above developments as an industrial revolution, one China is leading. China's incentives have in fact become so robust that it has leapt to the top of Ernst & Young's quarterly "Renewable Energy Attractiveness Index". China is considerably outpacing all competitors, including aggressive US states such as California. Japan is at 15th place, just ahead of Poland and one point behind an Australia that possesses splendid renewable-energy potential but is dominated by coal.

Clearly, Japan has enormous potential and incentives to move up the ranks in the race to lead this revolution. It has hitherto been handicapped by the oppressive weight of its power elite. But now it would seem to find itself forced to choose between continued reliance on the power elite, with all the attendant risks, or opting for a sustainable future. Japan cannot have both, for fiscal reasons as well as the fact that its competitiveness in renewable power and smart-grid/smart-city projects has been held back by a power elite that instinctively seeks to reproduce its dominance within the evolving political economy. Renewable energy and related technologies are core parts of a rapidly growing business sector that Japan's own Nikkei BP Cleantech Institute's assessments suggest could be worth YEN 3100 trillion by 2030 [Nikkei BP]. Japan needs to grow sustainably, and grow distributed power quickly. It therefore needs smart energy policy as well as a strong (one might say "shocking") dose of deregulation and competition for the power elite.

Conclusion

Japan is experiencing our collective energy crisis in an especially poignant and concentrated form. It has the human, financial and material resources to respond effectively and creatively. Lacking conventional energy resources, and having lost a significant share of the nuclear power it sought to foster in their place, Japan has enormous incentives to move fast and effectively. Japan's DPJ government was deflected from its 2009 election promise of a truly green new deal, due to the overwhelming clout of the power elite and their allies. But Japan's energy politics are now suddenly very fluid, and open to movement in sustainable directions. This still unfolding catastrophe is already the ultimate "teachable moment," and one can only hope that the tragic opportunity of reconstructing the power sector is done equitably and sustainably. Whatever choices Japan makes, its example in this vital sphere will not only be a lesson for us all, but will shape our own power costs and opportunities.

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