### 1NC – K

The plan masquerades as benign environmentalism, but this advocacy method is a technology of power that papers over the dangers of nuclear power and creates a permanent state of exception to protect a perpetually endangered source of energy that’s been labeled socially indispensable. This is a logic of hostage-taking that demands we accept the threat of a carbon lobby that could be worse to us if we refuse a dangerous and exploitative form of power generation – this confluence of power results in a truth regime controlled by the nuclear lobby that is materialized through violence on a global scale

Kaur 11

(Raminder, Senior Lecturer in Anthropology at the University of Sussex, “A ‘nuclear renaissance’, climate change and the state of exception,” Australian Journal of Anthropological Studies 22.2 p. 273-277, http://www.dianuke.org/a-%E2%80%98nuclear-renaissance%E2%80%99-climate-change-and-the-state-of-exception/, DS)

Increasingly, nation-states such as China, France, Russia, Britain and India are promoting the nuclear option: first, as the main large-scale solution to developing economies, growing populations and increasing demands for a consumer-led lifestyle, and secondly, to tend to environmental concerns of global warming and climate change.1 India’s Prime Minister, Manmohan Singh, speaking at a conference of atomic scientists in Delhi, for instance, announced a hundredfold increase to 470,000 megawatts of energy that could come from Indian nuclear power stations by 2,050. He said, ‘This will sharply reduce our dependence on fossil fuels and will be a major contribution to global efforts to combat climate change, adding that Asia was seeing a huge spurt in ‘nuclear plant building’ for these reasons (Ramesh 2009)’. The Fukushima nuclear reactor disaster of March 2011 has, for the time being at least, dented some nation-state’s nuclear power programmes. However, in India, the government has declared that it has commissioned further safety checks whilst continuing its nuclear development as before. Whilst the ‘carbon lobby’, including the fossil-fuels industries, stand to gain by undermining the validity of global warming, it appears that the ‘nuclear lobby’ benefits enormously from the growing body of evidence for human-based global warming. This situation has led to a significant nuclear renaissance with the promotion of nuclear power as ‘clean and green energy’. John Ritch, Director General of the World Nuclear Association, goes so far as to describe the need to embrace nuclear power as a ‘global and environmental imperative’, for ‘Humankind cannot conceivably achieve a global clean-energy revolution without a huge expansion of nuclear power’ (Ritch nd). To similar ends, India’s Union Minister of State for Environment and Forests, Jairam Ramesh, remarked, ‘It is paradoxical that environmentalists are against nuclear energy’ (Deshpande 2009). With a subtle sleight of hand, nuclear industries are able to promote themselves as environmentally beneficial whilst continuing business-as-usual at an expansive rate. Such global and national views on climate change are threatening to monopolise the entire environmentalist terrain where issues to do with uranium and thorium mining, the ecological costs of nuclear power plant construction, maintenance, operation and decommissioning, the release of water coolant and the transport and storage of radioactive waste are held as subsidiary considerations to the threat of climate change. Basing much of my evidence in India, I note how the conjunction of nuclear power and climate change has lodged itself in the public imagination and is consequently in a powerful position, creating a ‘truth regime’ favoured both by the nuclear lobby and those defenders of climate change who want more energy without restructuration of market-influenced economies or changes in consumerist lifestyle. The urgency of climate change discourses further empowers what I call the ‘nuclear state of exception’ which, in turn, lends credence to the veracity of human-centric global warming. THE NUCLEAR STATE OF EXCEPTION Although Giorgio Agamben’s (2005) work on the normalisation of exceptional state practice has been much cited, it would appear that Robert Jungk anticipated some of his main axioms. Jungk outlines how the extraordinary, as it pertains to the state’s possession of nuclear weapons and the development of atomic industries since the mid-1940s, became the ordinary (Jungk 1979: 58). When associated with nuclear weapons, the state operates under the guise of a paradigm of security which promises ‘peace’ in terms of a nuclear deterrence to other countries and also legitimates the excesses of state conduct whilst abrogating citizens’ rights in the name of ‘national security’. Jungk adds that, in fact, state authoritarianism applied to all nation-states with nuclear industries: ‘Nuclear power was first used to make weapons of total destruction for use against military enemies, but today it even imperils citizens in their own country, because there is no fundamental difference between atoms for peace and atoms for war’ (Jungk 1979: vii). The inevitable spread of technological know-how through a range of international networks and the effects of the US’ ‘atoms for peace’ program in the 1950s led to a greater number of nations constructing institutions for civilian nuclear power, a development that was later realised to enable uranium enrichment for the manufacture of weapons. Because of the indeterminacy between atoms for peace and atoms for war, the nuclear industries began to play a key part in several nations’ security policies, both externally with reference to other states and also internally with reference to objectors and suspected anti-national contingents. Jungk notes ‘the important social role of nuclear energy in the decline of the constitutional state into the authoritarian nuclear state’ by focussing on a range of indicators, including a report published by the American National Advisory Committee on Criminal Justice in 1977 which suggested that: in view of the ‘high vulnerability of technical civilization’, emergency legislation should be introduced making it possible temporarily to ignore constitutional safeguards without previous congressional debate or consultation with the Supreme Court. (1979: 135) The bio-techno-political mode of governance encapsulates subjects into its folds such that it becomes a ‘technical civilisation’—a civilisation that, although promising favourable aspects of modernity to the populace and development for the country, is also to be accompanied by several risks to human and environmental safety that propel states, including democracies further towards authoritarianism. ‘Big science’— that is, science that is centralised or at least circumscribed by the state—and the bureaucracies surrounding it play a critical part in the normalisation of the state of exception, and the exercise of even more power over their citizens. Jungk elaborates on the routinisation of nuclear state violence, epistemological, juridical and physical: Such measures will be justified, not as temporary measures made necessary by an exceptional emergency … but by the necessity of providing permanent protection for a perpetually endangered central source of energy that is regarded as indispensable. A nuclear industry means a permanent state of emergency justified by a permanent threat. (1979: 135) This permanent state of emergency with respect to anything nuclear applies to restrictions on citizens’ freedom, the surveillance and criminalisation of critics and campaigners, the justification of the mobilisation of thousands of policemen and sometimes military to deal with peaceful demonstrators against nuclear power, and a hegemony on ‘truth-claims’ where the nuclear industries are held as the solution to growing power needs whilst advancing themselves as climate change environmentalists. In this way, power structures and lifestyles need not be altered where nuclear power becomes, ironically, a powerful mascot of ‘clean and green’ energy. In India, the capitalist modality of the nuclear state was exacerbated by the ratification of the Indo-US civilian nuclear agreement in 2008, a bilateral accord which enables those countries in the Nuclear Suppliers Group to provide material and technology for India’s civilian nuclear operations even though it is not a signatory to the Nuclear non-Proliferation Treaty. This has led to an expansion of the nuclear industries in the country where the limited indigenous resources of uranium could then be siphoned into the nuclear weapons industries. The imposition of the nuclear state hand-in-hand with multinational corporations in regions such as Koodankulam in Tamil Nadu (with the Russian nuclear company, Atomstroyexport), Haripur in West Bengal (with the Russian company, Rosatom) or Jaitapur in Maharashtra (with the French company, Areva), without due consultation with residents around the proposed nuclear power plants, has prompted S. P. Udayakumar (2009) to recall an earlier history of colonisation describing the contemporary scenario as an instance of ‘nucolonisation (nuclear + colonisation)’. The Indian nuclear state, with its especial mooring in central government, has conducted environmental enquiries primarily for itself—and this so in only a summary fashion. In a context where the Ministry of Environment and Forests can override the need for an Environmental Impact Assessment (EIA) report for the first two nuclear reactors at Koodankulam in 2001, saying that the decision was first made in the 1980s before the EIA Notification Act (1994); or where the Supreme Court of India can dismiss a petition against the construction of these reactors simply by saying: ‘There is no reason as to why this court should sit in appeal over the Governmental decision relating to a policy matter more so, when crores of rupees having (sic) been invested’ (cited in Goyal 2002), then there is a strong basis upon which to consider the Indian state as a whole as a nuclearised state—that is, a state wherein matters relating to nuclear issues are given inordinate leeway across the board. The nuclear enclave consisting of scientists, bureaucrats and politicians, is both the exception to and the rule that underpins the rest of state practice. So even though we may be talking about a domain of distinct governmental practice and political technology as encapsulated by the notion of a nuclear state, it is evident that its influence spreads beyond the nuclear domain in a discourse of nuclearisation through state-related stratagems which have become increasingly authoritarian and defence-orientated since the late 1990s. In a nutshell, discourses about the urgency of climate change, global warming, nuclear power and defence have converged in a draconian and oppressive manner that now parades itself as the necessary norm for the nation. Despite their particularities, machinations of the Indian nuclear state are also notable elsewhere. Joseph Masco elaborates on the ‘national-security state’ in the USA (2006: 14). Tony Hall comments upon the ‘defence-dominated, well-cushioned (nuclear) industry’ in the United Kingdom (1996: 10). And on the recent issue of the construction of more nuclear power stations in Britain, David Ockwell observes that a public hearing was only undertaken for ‘instrumental reasons (i.e. it was a legal requirement), as demonstrated by a public statement by then prime minister Tony Blair that the consultation ‘won’t affect the policy at all’ (2008: 264). These narratives are familiar across the board where a nuclear renaissance is apparent. But critics continue to dispute the hijacking of environmentalism by the state and argue that if climate change is the problem, then nuclear power is by no means a solution. Moreover, the half-life of radioactive waste cannot be brushed away in a misplaced vindication of the saying, ‘out of sight, out of mind’.

Nuclear power produces an authoritarianism that results in mismanagement, nuclear waste, accidents and structural violence against the communities that have to host the reactors for the good and health of society writ large – the plan calcifies the nuclear renaissance through market interventions that save the nuclear and fossil fuel industries – that produces systematized catastrophe and environmental destruction

Byrne and Toly 2006

(John, Noah, \*Professor of Energy and Climate Policy at the University of Delaware, Director of the Center for Energy and Environmental Policy, \*\*Associate professor of urban studies and politics and international relations at Wheaton College, “Energy as a Social Project: Recovering a Discourse,” in Transforming Power: Energy, Environment, and Society in Conflict ed. John Byrne, Noah Toly, Leigh Glover, available online at http://seedconsortium.pbworks.com/w/file/fetch/45925604/Byrne\_etal.pdf, DS)

A second mega-energy idea has been advanced since the 1950s—the nuclear energy project. Born at a time in U.S. history when there were no pressing supply problems, nuclear power’s advocates promised an inexhaustible source of Giant Power. Along with hydropower, nuclear energy has been conceived as a non-fossil technical fix for the conventional energy regime. But nuclear energy has proven to be among the most potent examples of technological authoritarianism (Byrne and Hoffman, 1988, 1992, 1996) inherent in the techno-fixes of the conventional energy regime. On April 26, 1986, nuclear dreams were interrupted by a hard dose of reality—the accident at Chernobyl’s No. 4 Reactor, with a radioactive release more than ten times that of the atomic bomb dropped on Hiroshima (Medvedev, 1992). Both human and non-human impacts of this greatest of technological disasters have been well-documented (Medvedev, 1992). The Chernobyl explosion and numerous near-accidents, other technical failures, and extraordinary costoverruns caused interest in nuclear energy to wane during the 1980s and 1990s. Notwithstanding a crippling past, the nuclear lobby has engineered a resurgence of interest through a raft of technological fixes that purport to prevent future calamitous failures while capitalizing on the supposed environmentally sound qualities of nuclear power. Huber and Mills, for example, title one of their chapters “Saving the Planet with Coal and Uranium” (2005: 156 - 171). A spokesperson for the Electric Power Research Institute has recently suggested that new pebble-bed modular reactors are “walk-away safe—if something goes wrong, the operators can go out for coffee while they figure out what to do” (quoted in Silberman, 2001). Such claims are eerily reminiscent of pre-Chernobyl comparisons between the safety of nuclear power plants and that of chocolate factories (The Economist, 1986). Huber and Mills go even further, claiming nuclear power will exceed the original source of solar power—the sun (2005: 180): “Our two-century march from coal to steam engine to electricity to laser will…culminate in a nuclear furnace that burns the same fuel, and shines as bright as the sun itself. And then we will invent something else that burns even brighter.” Critics, however, note that even if such technical advances can provide for accident-free generation of electricity, there are significant remaining social implications of nuclear power, including its potential for terrorist exploitation and the troubling history of connections between military and civilian uses of the technology (Bergeron, 2002; Bergeron and Zimmerman, 2006). As well, the life-cycle of nuclear energy development produces risks that continuously challenge its social viability. To realize a nuclear energy-based future, massive amounts of uranium must be extracted. This effort would ineluctably jeopardize vulnerable communities since a considerable amount of uranium is found on indigenous lands. For example, Australia has large seams of uranium, producing nearly one-quarter of the world’s supply, with many mines located on Aboriginal lands (Uranium Information Center, 2005).12 Even after the uranium is secured and electricity is generated, the project’s adverse social impacts continue. Wastes with half-lives of lethal threat to any form of life in the range of 100,000 to 200,000 years have to be buried and completely mistake-free management regimes need to be operated for this length of time—longer than human existence, itself. Epochal imagination of this kind may be regarded by technologists as reasonable, but the sanity of such a proposal on social grounds is surely suspect (Byrne and Hoffman, 1996). Immaterial techniques Repair of the existing regime is not limited to efforts to secure increasing conventional supplies. Also popular are immaterial techniques emerging from the field of economics and elsewhere that offer policy reforms as the means to overcome current problems. Electricity liberalization exemplifies this approach. Here, inefficiencies in the generation and distribution of electricity in the conventional energy regime are targeted for remedy by the substitution of market dynamics for regulatory logic. Purported inefficiencies are identified, in large part, as the result of regulations that have distorted market prices either by subsidizing unjustifiable investments or by guaranteeing rates of return for compliant energy companies. Proponents of liberalization promise greater and more reliable energy supplies with the removal of regulationinduced market distortions (Pollitt, 1995; World Bank, 1993, 2003, 2004a). Environmental concerns with the prevailing energy order can also be used to support liberalized market strategies. For example, while Huber and Mills (2005: 157) suggest that increased use of hydrocarbons is actually the preferred solution to the problem of climate change, arguing that, “for the foreseeable future, the best (and only practical) policy for limiting the buildup of carbon dioxide in the air is to burn more hydrocarbons—not fewer,”13 others suggest the superiority of immaterial techniques such as the commercialization of the atmospheric commons. Thus, David Victor (2005) attributes the collapse of the Kyoto Protocol to a failure to embrace the economic superiority of emissions trading and other market-oriented mechanisms and calls for conventional energy’s collision with climate to be addressed by a healthy dose of competitive marketing of carbon-reducing options. The outcome of a trading regime to reduce carbon will almost certainly be life-extensions for the fossil fuels and nuclear energy since it would ‘offset’ the carbon problems of the former and embrace the idea of the cost-effectiveness of the latter to avoid carbon emissions.14 Such solutions also attempt to mediate the increasing risk that accompanies techno-fixes of the conventional energy regime. The current phase of industrialization is replete with efforts to harmonize market and technological logics in a way that leaves the large-scale centralized energy system intact despite its tendencies to breed significant potential social and environmental crises (Byrne et al, 2002: 287; see also Beck, 1992). Progress [has] necessitated commitments to advancing knowledge and its application, along with the distinctive threats that only modernity could augur. Societies are obliged to place their faith in experts, technocratic systems, and management institutions, in the expectation that these offer social and environmental protection. At the same time, catastrophe-scale mistakes are inevitable.…Those least equipped to ‘model’ their problems become the ‘lab mice’ as human intelligence works out management schemes.... Conventional techno-fixes to increase energy supplies cannot remove risks, nor can market economics, but together they seek to convince society that abandonment of the modern energy project is nonetheless unwarranted. The search for harmonized market-style policies to strengthen the energy status quo in the face of its mounting challenges reflects the growing political power of energy neoliberalism in an era of economic globalization (Dubash, 2002; Dubash and Williams, 2006). The two processes build a complimentary, if circular, politics in support of conventional energy: the logic is that global economic development requires energy use, which can only be properly planned if international capitalist institutions can be assured that the lubricant of globalization, namely, the unfettered power of markets, is established by enforceable policy (Byrne et al., 2004). Correspondingly, resulting carbon emissions can only eventually be abated if economic globalization is protected so that international capitalist institutions find it profitable to begin to lower carbon emissions and/or sequester them.15 Consumers and producers, rather than citizens, are judged to be the proper signatories to the social contract because these participants, without the stain of politics, can find rational answers to our problems. In sum, conventionalists counsel against preconceiving the social and environmental requirements for an energy transition, preferring a continuation of the existing energy regime that promises to deliver a “reasonable,” “practical” future consistent with its past. Scheer (2002: 137) describes the erroneous assumption in such reasoning: “The need for fossil energy is a practical constraint that society must respect, for better or worse; whereas proposals for a swift and immediate reorientation...are denounced as irresponsible.” An orderly transition is thus forecast from the current energy status quo of fossil fuel and nuclear energy dominance to a new energy status quo with possibly less carbon, but surely with giant-sized fossil and nuclear energy systems in wide use.

The alternative is to vote negative to reject the 1AC.

We should not save the priesthood of nuclear power. You should reject the scientist as a philosopher king or as insulated by an elite academic shroud – instead, remand nuclear expertism to its place and break up the ossification of an epistemology of rule that dispossesses the authoritarian nuclear complex of science and reclaims it for the people.

Thorpe and Welsh 2008

(Charles and Ian, *Anarchist Studies*, Volume 16, Number 1, “Beyond Primitivism: Toward a Twenty-First Century Anarchist Theory and Praxis for Science”, <http://theanarchistlibrary.org/library/charles-thorpe-and-ian-welsh-beyond-primitivism-toward-a-twenty-first-century-anarchist-theory>, [CL])

The authoritarian and ecologically destructive juggernaut of state-supported big science and technology in the twentieth century understandably fostered a deep pessimism and suspicion towards science and technology among many in the green, anarchist, and libertarian left milieu. This reaction has been crystallized in the “anti-civilization” primitivist anarchism of John Zerzan. In opposition to this drift towards primitivism, this paper argues that a vision of a liberatory and participative science and technology was an essential element of classical anarchism and that this vision remains vital to the development of liberatory political theory and praxis today. The paper suggests that an anarchist model of science and technology is implicit in the knowledge-producing and organizing activities of new social movements and is exemplified in recent developments in world, regional, and local social forums. Introduction This article develops an anarchist political theory of science and technology that highlights the latent forms of anarchist praxis present within a diverse range of social movement engagements with contemporary techno-science. We argue that there is a marked congruence between contemporary social movement engagement and the key concepts and principles underpinning anarchist writing on science and technology from the nineteenth century onwards. By exploring the tensions and ambivalences in established anarchist approaches towards science (cf. Restivo 1994) we demonstrate that classical nineteenth-century anarchism emphasised the centrality of socially accountable science within libertarian thinking. Elements of this tradition are discernible in the emphasis on liberatory technics by twentieth-century writers such as Lewis Mumford, Murray Bookchin, and Paul Goodman. This later work on liberatory technics developed during a period dominated by state-sponsored big science. The twenty-first century, however, is dominated by neo-liberal ascendancy characterised by the early transfer of “near market” science to the private sector. This transition to a neo-liberal era requires clarification of, and debate on, the relationship of anarchism to science. Further, such debate must address the global movement milieu in which traditionally conceived social movements combine with network movement actors to form an antagonistic and proactive social force emphasising autonomy. Important features of this movement milieu are unqualified opposition to: the alignment of capitalist and state forces through global institutions such as the World Bank and IMF; the military sequestration of public corporate scientific research and development (R&D) budgets; the imposition of “market solutions” across all areas of “public provision” and the pursuit of modernisation agendas which simultaneously degrade ecological and human integrity. Global social movements also challenge the prevailing cognitive order by defining key knowledge stakes regarded as vital to “the other worlds that are possible”. The recognition and respect for difference is a central part of these linked political and epistemological objectives raising significant challenges for conceptions of science based on universal laws. Key questions explored here are what does the philosophical and political tradition of anarchism have to contribute to such contemporary challenges to dominant social-epistemic orders and is there a theory of science embedded in anarchist political thought that is relevant and applicable to contemporary struggles? Given the continuing importance of science to modern states and the neo-liberal “global knowledge economy”, a critical anarchist theory of science and technology needs to overcome the limitations within various forms of “primitivism” exemplified by the writings of John Zerzan (1996). Zerzan’s criticisms of alienation in modern life and of the nihilism of contemporary technological culture are trenchant. But, from this critique, Zerzan leads his readers to a quasi-religious ideal of a return to a wild Eden (cf. Aufheben, 1995). Primitivism neglects the anarchist intellectual tradition examined here. Rather than a return to simpler technics, we argue that the ideas and the epistemic practices of contemporary social movements constitute the basis for non-totalising forms of scientific knowledge and scientific practices resonating with anarchist emphases on decentralisation, horizontal structures, and diversity. This emergent anarchist or proto-anarchist politics of science and technology is necessary to transcend the limits of contemporary state-corporate science which has reached a “plateau” (Mumford 1934/1972) encountering “paradigm limits”, which can only be transcended through alternative epistemic practices consistent with the autonomous self-organization of society.

We deliberately re-emphasise the potential for the socially shaped and negotiated “democratic technics” advanced by Mumford (1964). As Bookchin argued, resistance to authoritarian science and technology makes the formulation of an alternative liberatory conceptualization of science a critical political task. Indeed, whilst many contemporary social struggles are perceived as against established science, they also contain liberatory promise and alternative epistemic practices and priorities. Such struggles hold out the promise of a liberatory science with an affinity toward anarchist modes of self-organization as an increasingly diverse range of citizens learn to combine observational, recording, and analytical capacities constituting a potential for proactive grassroots initiatives. An anarchistic organization of science requires such decentralized, network-ordered and bottom-up cognitive and material structures consistent with the political of anarchist(ic) social freedom.

Science, Statist Modernity and Oppositional Movements

Our contemporary focus combined with the use of anarchist theory from the nineteenth and twentieth centuries makes a concise account of key state-science-society relations important for purposes of clarity. This section not only identifies key analytical objectives but also offers some explanation for the retreat from anarchist accounts of liberatory science and technology into primitivism. The centuries-old relationship between science and the military and political power of the state (Carroll 2006, Bennet and Johnston 1996) was transformed with the scientization of warfare during the twentieth century. Unprecedented levels of state funding of science, combined with large bureaucratic establishments, marked a transition to big science (Galison & Hevly 1992). Big science is widely theorised as part of a “military-industrial complex” and best known for the atomic bomb and large-scale civilian nuclear power programmes; and it requires cadres of technocratic experts to administer complex systems. The “success” of the US Manhattan project in building an atomic bomb (Welsh, 2000; Thorpe, 2004, 2006) and the subsequent application of general systems theory within post-war military nuclear projects were central in consolidating and aligning politics and science around a shared belief in technocratic solutions to problems of both technical and social order. Faith in the institutional ability of science to ensure progress by producing technical and social order, the use of scientific prowess as a measure of state legitimacy and the importance of technology as a strategic state resource resulted in a period of “peak modernity” (Welsh 2000). The commitment to large-scale techno-scientific approaches was not confined to the West but found forms of expression within Soviet Communism. Despite ideological differences and clear distinguishing features such as Lysenkoism, the commitment to national techno-scientific projects in the US and the USSR had many similarities. In both West and East nuclear techno-science agendas in particular were pursued irrespective of local opposition, general population risks, and scientific uncertainty by utilising secrecy and surveillance techniques combined with high profile symbolic declarations of national prominence and world leadership. The associated practices included denying any significant risks from the atmospheric testing of nuclear weapons and asserting the categorical safety of nuclear reactors, whilst at the same time injecting unknowing citizens with plutonium to assess the actual health effects (Welsome, 1999). The sciences most closely intertwined with the military-industrial complex were characterized by increasing technological dependence upon the state as the scale, complexity, and cost of the necessary apparatus increased exponentially. Science became deeply embedded within the state-military nexus as an expression of a hierarchical social order extending far into the fabric of civil society. The rise of corporate big science — often in partnership with state big science projects — grew in the post-war era. In the late twentieth century the ascendancy of neo-liberalism resulted in the transfer of “near market science” to the public sector and “free market competition” replaced ideological competition. Neo-liberal ascendancy consolidated state sponsorship of computing and bio-technology within the knowledge economy whilst the cost of pursuing big science physics agendas like nuclear fusion required multi-state partnerships. A free market/multi-state phase shift reconfiguring techno-science has taken place whilst residual examples of multi-state big science persist. Near market sciences, like human genetic engineering, thus carry both technical and social risks through the exercise of individual market choices raising the prospect of “neo-liberal eugenics” (Habermas 2003). Simultaneously, state legal and security resources are used to protect companies and research facilities linking environmental activism with terrorism (Welsh 2007) as global trade agreements structure and secure global markets for GM crops. Critical commentary on the associated science and technics in all but this most recent phase shift are well established within the anarchist canon. Lewis Mumford captured the essential features of the centralised high-modern state and large-scale complex technological systems with his notions of “authoritarian technics” and “the megamachine” (Mumford 1964). Deeply affected by the use of the atomic bomb, Mumford argued that democratic culture was being eroded by the development of socio-technological systems embedding authoritarian relations of command and control and the rise of centralised global power over life and death (Mumford 1953). The existence of nuclear weapons states led by men able to unleash devastation threatening centuries of human civilization called for an urgent re-ordering of relations between science and society. Mumford’s central guide to this re-ordering was the evaluation of all scientific and technical developments in terms of the potential to enhance life and human welfare and “the restoration of the organic, the human and the personal to a central place in economics” (Mumford 1954: 290). Mumford’s emphasis upon agency in the face of the megamachine deserves re-examination within the contemporary milieu where the totalising accounts of science and technology as technique, such as those of Jacques Ellul, tend to dominate. Ellul’s notion of “autonomous technique” (Ellul 1965) and its centrality to what he saw — after Nietzsche — as that “coldest of all cold monsters”, the modern state (Ellul 1988: 2) are important. However, the influential focus on autonomous technique as the precursor of “autonomous technology” (Winner 1978 ) pre-empts the potential for social shaping of techno-science, neglecting the ways in which social actors reject, subvert and hybridise techniques vital to state-corporate initiatives (Welsh 2000: 26–27). The techno-scientific projects of peak modernity drew on cultural narratives of rational progress which simultaneously legitimised state authority. State-centric attempts to mobilise modernity stalled in the latter part of the twentieth century as the associated narratives were increasingly undercut and challenged by new social movements, confronted by technological disasters such as Chernobyl and Three Mile Island. The increased public awareness of risk, and the fiscal burden that continued support for big science imposed on states. The decline of the nuclear industry in Britain and the US in the latter decades of the twentieth century vividly illustrates the erosion of legitimacy of narratives and forms of peak modernity. Welsh (2000) has demonstrated how the epistemic issues underpinning this process were initially formalised by citizens at a local level during the 1950s before accumulating sufficient social force to counter official pronouncements and thereby making social acceptability a central feature of science policy. Rather than the universal acceptance of technique and the imposition of autonomous technology it is important not to lose sight of science and technology as socially contested and socially constructed enterprises. The process of contestation and construction is continuous and iterative in practise and difficult to divide up into distinct phases. Zygmunt Bauman, for example, has argued that the collapse of the USSR represented “the end of modernity, because what collapsed was the most decisive attempt to make modernity work” (Bauman 1992: 222). Whilst the end of the Cold War also threatened to undermine the legitimacy of the American military-industrial complex and associated big science projects, pronouncements of the death of modernity were premature. Modernity was in effect reinvented in the guise of neo-liberal market efficiency and rationality recasting state alignment with techno-science. The pursuit of post-Cold War American hegemony beginning with the first Gulf War in 1990 and the post 9/11 “war on terror” have seen the construction of new “grand narratives” and renewed state support for science as a component of the military-industrial complex, with projects from the missile shield to “total information awareness”. In the European Union, the bio-society was initially defined as “the conscious management of self-organizing systems for sustenance and enrichment of human life and purposes” and vital to the knowledge economy (Green & Griffith-Jones 1984:9). The mapping of the human genome in 2000 implicitly extends the potential for management and efficiency to human life itself (Welsh 2007a). The contemporary situation is thus characterised both by the attempt to re-legitimise techno-scientific state projects of “peak modernity”, such as nuclear power, and promote emergent market forms of techno-science. The accompanying grand narratives simultaneously support state power and the efficacy of the market. The failure of these new grand narratives (whether the export of “democracy”, or biotech visions of progress associated with GMOs) to become hegemonic owes much to the challenges posed by social movements. The scientific and technocratic claims of neo-liberalism in economics, development, R&D, and wider social policy domains have been increasingly challenged and contested by established and emergent collective actors. From trades unions to a third generation of social movements of advancing a non-representational politics prioritising direct interest representation and action there are few areas of the so-called Washington consensus that have not been challenged (Chesters & Welsh 2006, Notes from Nowhere 2003). Whilst the vitality of this movement of movements is attributed to the “new anarchists” (Graeber 2002) and actively addressed within contemporary anarchist debates (e.g. Welsh & Purkis 2003, Chesters 2003) the contemporary relationship between anarchism and techno-science receives little attention. We aim to redress this by showing how the key concepts and analytical concerns of Mikhail Bakunin and Peter Kropotkin relate to the work of twentieth-century writers emphasising the liberatory potential of science and technology and by examining contemporary examples of engagements with techno-science.

Bakunin’s Critique of the “Savants” Bakunin’s most systematic sociology of knowledge appears in his 1871 essay God and the State (Bakunin 1970). The essay presents a classic critique of religion as ideology and alienation, exposing the function of religion in pacifying society, mystifying social relations, and legitimating domination by elites. However, what makes God and the State as intellectually original, and provides its chief continuing relevance is Bakunin’s analysis of science and the relationship between science and the revolutionary project of anarchism. The primary targets of Bakunin’s critique of science were Auguste Comte and Karl Marx, both of whom Bakunin saw as constructing blueprints for the government of society by “scientific” elites (or as Bakunin labelled them, “savants”). The idea of scientists as a “new priesthood” put forward by Comte as a programme for social and political reform was adopted as a critical term by Bakunin. The idea of a scientific priesthood for Bakunin epitomized the potential for science to become a force of hierarchy and reaction. Bakunin saw similar authoritarian and reactionary potential in Marx’s notion of “scientific socialism”, particularly when combined with the notion of the dictatorship of the proletariat. This combination, Bakunin argued, would tend towards the dictatorship of intellectuals and bureaucrats, justified as acting on behalf of the proletariat. These were not just critiques of the particular political programmes of Comte and Marx, but more broadly applicable formulations of a “new class theory”, i.e., a theory of the potential for intellectuals and knowledge elites to constitute themselves as a new dominant class (King and Szelenyi 2004, esp. 21–34). We would suggest that Bakunin’s critique of government-by-science and his political scepticism regarding expert authority can be applied not only to Comtean and Marxian social engineering, but also to the ways in which the natural sciences have frequently been partnered with the state in the government of both natural and social orders. Bakunin celebrates science as a humanizing force expressive of humanity’s break with its animal origins, and indeed a rebellious force overturning traditional and religious preconceptions (Bakunin 1970: 20–21). Yet he suggests that over time, science has tended to become routinized and incorporated into structures of power: a process akin to Max Weber’s “routinization of charisma”. The revolutionary prophet of science gives way to the institutionalized member of a new scientific priesthood. Bakunin made a distinction between the absolute laws of nature discovered by science and the laws of government: the former being descriptive, the latter prescriptive (cf. Morris 1993: 130–131). Laws of nature, he suggested, encompassed not only causal regularities of Newtonian physics, but also regularities of human behaviour and patterns of history (although the “science of history” was in its infancy). Nevertheless, Bakunin rejected any role for scientists as philosopher kings, as a Baconian-Comtean “learned academy”, or as Marxist scientific party intellectuals, handing down directives to the masses based on knowledge of these natural and social regularities (Bakunin 1970: 30–31). In rejecting these institutionalizations of scientific authority, he provided the key insights of his political theory of science. Bakunin asserts that there is a difference between accepting a fact of nature based on one’s individual reason and sense experience, and accepting it on the basis of deference to the authority of the expert. But his critique is more complex and sophisticated than just the liberal empiricist idea that individuals should trust experience over authority. He recognized that it is not always possible to rely on one’s own senses and that there therefore exists a cognitive division of labour. So his writing acknowledges the “authority” of a variety of “savants” or experts whilst emphasising that the acceptance of this authority is an act of individual rationality, not subordination (Bakunin 1970: 33). The key distinction is between being “an authority” and being “in authority” (Friedman 1990: 76–80). The scientific thinker is legitimately “an authority” in their field, but the Comtean idea of the “new priesthood” illegitimately seeks to place scientific intellectuals “in authority” as rulers of society. Bakunin argues that any attempt to translate scientific knowledge into governmental omniscience faces insuperable barriers. These are firstly limits on the knowledge of any individual. There can be no “universal man”, no genuine polymath (Bakunin 1970: 34). The growth and increasing complexity of the stock of knowledge makes us increasingly interdependent, fostering mutual aid. But even more fundamentally for Bakunin, it is one thing to know abstract science, but it is another thing to apply that science to life. This distinction between science and life is the key axis around which Bakunin’s epistemology and sociology of science and his defence of freedom against the dominance of experts turns (Knowles 2002: 10–11). Science is abstract and general, but life is concrete and particular. For Bakunin, “[s]cience comprehends the thought of the reality, not reality itself; the thought of life, not life. That is its limit, its only really insuperable limit” (Bakunin 1970: 54). All knowledge is mediated through human perceptual and interpretative faculties, introducing an inescapable element of contingency. The ordering of the world into categories involves a process of abstraction. Such abstraction is necessary for the generation of knowledge, but we ought not to think that our abstract acounts of reality can capture the complexity of reality itself (Bakunin 1970: 54–55). For Bakunin, this gulf between science and life means that the technocratic ideal of a society legislated for and ordered by savants would be unworkable (as well as being tyrannical). The Comtean ideal of a system of government based on a universal science of sociology runs into the problem of the inherent limits of abstract social science faced with the particularity of individuals within society: Positive science, recognizing its absolute inability to conceive real individuals and interest itself in their lot, must definitely and absolutely renounce all claim to the government of societies; for if it should meddle therein, it would only sacrifice continually the living men whom it ignores to the abstractions which constitute the object of its legitimate preoccupations (Bakunin 1970: 60–61). Individual freedom eludes the determinism of scientific law precisely because of the particularity and concreteness of the individual which escapes abstraction. The complexity and richness of the concrete and particular life always escapes scientific description: “Life,” Bakunin writes, “is wholly fugitive and temporary, but also wholly palpitating with reality and individuality, sensibility, sufferings, joys, aspirations, needs, and passions” (Bakunin 1970: 55). All science, whether natural or social, is inherently limited by its abstractness. However, Bakunin suggests that the scientific intellectual is wedded to abstractness, indeed that the very mark of such an intellectual is the fetishism of abstract knowledge. This fetishism can involve the confusion of description for reality, in the assumption that life is just as it is described by science. It can involve also the privileging of abstract knowledge over concrete life. For this reason, Bakunin describes scientific intellectuals, alongside theologians, as “priests of abstractions” (Bakunin 1970: 59–60). He suggests that the scientific intellectual posits abstact or codified knowledge as superior to concrete life in a similar manner to the fetishism of religious doctrine or of a transcendent divine order. The fetishism of abstract knowledge constitutes a social group of intellectuals, a new priesthood, outside and above concrete life. Science has been ‘constituted outside of life, it is represented by a privileged body; and...it has posited itself as an absolute and final object of all human development” (Bakunin 1970: 60). The prioritisation of abstract knowledge over concrete life tends towards the governance of the concrete, particular, and quotidian by the representatives of abstraction. Further, Bakunin suggests that where the gap between scientific abstract ideas and reality becomes apparent, the scientific priesthood attempts to mould reality in the image of the abstract idea. As science feels its “vital impotence” (Bakunin 1970: 55) in the face of the intractable complexity of life, it seeks to discipline life (social life and nature) to fit its abstract models. Hence, the scientific will to knowledge becomes a will to power. Science becomes, therefore, “the perpetual immolation of life, fugitive, temporary, but real, on the altar of eternal abstractions” (Bakunin 1970: 57). For Bakunin, vivisection, as a literal sacrifice of life, embodied this tendency. Whilst Bakunin thought it “well nigh certain that a savant would not dare to treat a man today as he treats a rabbit”, he suggested that if science was denied access to “the bodies of individuals, they will ask nothing better than to perform [experiments] on the social body” Bakunin’s use of experiments “on the social body” was aimed at Comtean and Marxian schemes to reorder society according to a social scientific model. However, a 21st century perspective extends the scope of the idea with critical science studies scholars in India using the term “vivisectionism” to refer to the Western project of dominating nature through science and technology in combination with a colonial arrogance, as exemplified in the Bhopal disaster (Nandy, 1988). The big science ambitions of democratic states have resulted in experiments on citizens such as injecting human subjects with doses of plutonium and ordering soldiers to march towards atomic mushroom clouds akin to those which Bakunin thought even the savant would eschew (Welcome, 1999; Moreno, 2000). Experiments on the social body have been conducted by both social and natural scientists. High-risk, complex technological systems such as nuclear power stations are always “real-world experiments” since theoretical laboratory-based models can neither adequately predict the complex interactions of their components with the subjectivity of human operators nor the behaviour of radionuclides in open environments. Significant reactor accidents at Windscale in 1957, Three Mile Island in 1979, and Chernobyl in 1986 all involved gaps in scientific and/or technical knowledge, combined with operator actions or errors, underlining the way in which modern techno-science routinely jeopardises the natural and social world (Krolin and Weingart, 1987; Weingart, 1991, Welsh 2000). The introduction of genetically modified organisms into open ecological systems is similarly an experiment conducted in and with the real natural and social world (Levidow 2007). Further, Bakunin’s idea of attempts to subjugate life to abstract ideas could be applied to the techno-scientific re-engineering of nature. The reduction of ecological complexity to monoculture in agricultural biotechnology, which reaches its apotheosis in cloning (Bowring 2003), brings to mind Bakunin’s statement that “every time that scientific men, emerging from their abstract world, mingle with living creation in the real world, all that they propose or create is poor, ridiculously abstract, bloodless and lifeless, still-born.” (Bakunin 1970: 55). Whether intended or not, a powerful and strikingly contemporary ecological message can be found in Bakunin’s conception of “life”, just as it can be found also in Kropotkin’s Mutual Aid (1902). This dominatory aspect of modern science, for Bakunin, derived from its hierarchical organization and relationship to the broader society. In that sense, Bakunin was describing what Bookchin termed an “epistemology of rule” — structures of thought or “mentalities” that are patterned after and reinforce “lines of command and obedience” (Bookchin 1982: 89). The separateness of science from life and the quest of science to master life, derive, Bakunin suggests, from the position of science in a structure of social hierarchy and domination. The impulse toward the domination of life is driven by the existence of science as a privileged class or professional monopoly, with institutionalized interests in maintainig hierarchy and power (Bakunin 1970: 63).

Toward a Liberatory Science

Bakunin called for “the revolt of life against science, or rather against the government of science” (Bakunin 1970: 59, emphases in original). But he explained that what he meant was “not to destroy science — that would be high treason to humanity — but to remand it to its place” (Bakunin 1970: 59). Remanding science to its place means abolishing the hierarchical relationship between science and the life of society. Against the monopolisation of scientific knowledge by a priestly hierarchy, Bakunin urged a Reformation of science targeting the established social institutions which simultaneously consolidate its power base and ossify its theories. The tension between recognizing science as “indispensable to the rational organization of society”, on the one hand, and strenuously avoiding government by science, on the other, can, Bakunin says, “be solved only in one way: by the liquidation of science as a moral being existing outside the life of all.” Instead, science “must be spread among the masses”. This social democratization of science, Bakunin suggests, will tend to break down the epistemic separation of knowledge from life: “it will become one in fact with the immediate and real life of all individuals.” Through this process of democratization, science can begin to play its genuine historical role as “the property of everybody”, science can “represent society’s collective consciousness” (Bakunin 1970: 62). But is Bakunin’s conception of a democratized science and the dissolution of the divide between science and life merely utopian fantasy? Bakunin suggested that rebelling bourgeois students could act as “fraternal instructors of the people” (Bakunin 1970: 64). Yet, characteristically, he left the detail of an anarchistic organization of science unspecified. The key concrete measure discussed is the extension of scientific education to the mass of the population and the development of an “integral education” breaking down the division between mental and manual work (Bakunin 1869). This is consistent with anarchist aversion to laying out blueprints and the desire to let emancipated people discover modes of association for themselves. Bakunin probably thought that a liberatory science would organically emerge from a society in which hierarchy had been dissolved. Yet, it is clear to us that the development of liberatory and participatory forms of science and technology cannot be projected idealistically into the future, but must develop simultaneously and hand-in-hand with any broader liberatory movement. As we go on to argue below, participatory forms are indeed discernible within contemporary social movement milieux. Whilst liberal thinkers such as the American philosopher John Dewey call for the dissemination of scientific knowledge, method, and habits throughout the polity, Bakunin’s vision was that science itself would be transformed in this process with radical democratization fundamentally reordering the epistemic values and goals of science and the relationship between theory and phenomena. So whereas liberal philosophers have frequently treated science as a model polity, for Bakunin, science and its epistemic values were to be modelled on (and thereby assimilated into) the ideal polity. The notion of the transformation of science in line with anarchist principles is also found in the work of Peter Kropotkin. As a naturalist [1], Kropotkin emphasized the role of scientific knowledge in providing an empirical and theoretical foundation for anarchist political ideas (Todes 1993, Morris 2002, 2003). To Kropotkin, the political ideal of mutual aid could be scientifically demonstrated to ba a fundamental principle of nature, in that way naturalizing the anarchist polity. He asserted that anarchism as a political movement was founded on scientific principles: “Anarchism is a world-concept based on a a mechanical explanation of all phenomena...its method of investigation is that of the exact natural sciences, and...every conclusion it comes to must be verified by the method by which every scientific conclusion must be verified” (Kropotkin 1976: 60). His rejection of metaphysics and the Hegelian and Marxist dialectic favored “natural-scientific method based on induction and deduction” (Kropotkin 1976: 62). Much of his discussion of science in “Modern Science and Anarchism” appears to be naive empiricism and hints at latter-day logical positivism (however, see Morris 2003). But in other ways, Kropotkin’s views on science can be seen to echo Bakunin’s. Kropotkin’s avowed privileging of the inductive method — building theory via the accumulation of empirical evidence and subjecting it to empirical verification — can be seen as equivalent to Bakunin’s prioritization of concrete life over abstract theory. So, while Kropotkin describes anarchism as following the scientific method, he also asserts that “the anarchist movement sprang up in response to the lessons of actual life and originated from the practical tendencies of events.” Anarchism was not an attempt to model politics and society on theory; rather, it “originated...from the demands of practical life” (Kropotkin 1976: 64,63). Interestingly, the inductive method also mirrors the structure of Kropotkin’s ideal political structure of anarchist federalism. Just as in an anarchist federation of communes, where primacy is given to the grassroots, in the cognitive structure of induction — the concrete grassroots of observation is privileged over the autocracy of high theory. Kropotkin could therefore be seen to be constructing a conception of science congruent with the political order of anarchism. It is also clear that Kropotkin shares Bakunin’s view that the professional monopoly of science by the “savants” has to be broken. So, despite his assertion of the close relationship between science and anarchism, Kropotkin emphasized that “[n]ot out of the universities...does anarchism come...anarchism was born among the people; and it will continue to be full of life and creative power only as long as it remains a thing of the people” (Kropotkin 1976: 57). Science was not born among the people: “most [men of science] either belong by descent to the possessing classes and are steeped in the prejudices of their class, or else are in the actual serivce of the government” (Kropotkin 1976: 57). But Kropotkin thought that science too had to become “a thing of the people”. In other words, the possessing classes had to be dispossessed of science. Like Bakunin, Kropotkin saw that the social extension of science required its epistemic transformation. Crucially, this would require and make possible the breakdown of the division between mental and manual labour, the “pretext” (Kropotkin 1998: 169), around which science was constructed in class society resulting in a fundamental distortion of the scientific ideal (Kropotkin 1927: 101). Whilst the early modern science of Galileo and Newton “did not despise manual work and handicraft” (Kropotkin 1998: 169), modern science becomes compromised through the class-based separation of science from manual labour and the related distinction between pure and applied science. Kropotkin therefore calls for the collective and popular organization of scientific work (Kropotkin 1998: 182; Smith, 1989). For Kropotkin, science should not be the property of an elite, but a participatory-democratic activity practised in common in free association. In this way, Kropotkin, like Bakunin, sought to root science in life, and in the common life of society. Bakunin’s critique of a science separate from life also finds more recent echo in Murray Bookchin’s The Ecology of Freedom. Bakunin’s protest of life against a mechanized, hierarchical, and alienating science is ecologized by Bookchin. Bookchin puts forward an epistemology that privileges the concreteness of nature against abstractions of theory or reductionism in language reminiscent of Bakunin, Bookchin writes: “To recover the supremacy of the concrete — with its rich wealth of qualities, differentia and solidity — over and beyond a transcendental concept of science as method is to slap the face of an arrogant intellectualism with the ungloved hand of reality” (Bookchin 1982: 308). Bookchin’s presentation is even vaguer than Bakunin’s or Kropotkin’s when it comes to setting out what this new approach would actually entail. Presumably, Bookchin, with his influences from Hegel and Marx, would not accept a narrowly empiricist or inductivist account of science as just the accumulation of facts. His presentation in The Ecology of Freedom is somewhat allusive. Nevertheless, Bookchin sums up the essential purpose and spirit of the anarchist engagement with science when he asserts that the critique of existing science does not entail a flight to irrationalism: “Just as we can justifiably distinguish between an authoritarian and a libertarian technics, so too can we distinguish between authoritarian and libertarian modes of reason” (Bookchin 1982: 302–303). Bookchin has little to say about how this liberatory science would be organised, although it is fair to assume that the breaking down of professional monopoly is a requisite for him also, following from his firm rejection of any “environmentalistic technocracy” (Bookchin 1982: 314). Sociologist of science Brian Martin has set out more concrete and practical proposals for achieving an anarchistic approach to science. He has made practical proposals for activists to confront, challenge, and debunk expert testimony (Martin 1991) and has gone some way to setting out an “anarchist science policy” aimed precisely at rescuing science from “professional monopoly”. Like Bakunin and Kropotkin, Martin is optimistic about the possibility of a science collectivized, popularised, and distributed as a common “self-managing” social activity. Martin’s work emphasises the significance of social movement actors as social forces constitutive of a peoples science, capable of challenging technocratic legitimations of state agencies. His work thus highlights the importance of the interaction between such actors and the prevailing institutional structures of science (Martin 1979, 1980, 1994).

### AT: Permutation

The permutation fails to break epistemic paradigm limits or to remand scientific expertism

Welsh 2000

(Welsh Lecturer in the School of Social Sciences at Cardiff 2000 Ian Mobilizing Modernity: The Nuclear Moment p 18-19)

The inclusion of scientists within the dominant political elites of the UK produced some significant tensions and departures from previous practices. The scientist or boffin was a mysterious figure combining both the promise of great advance and the risk of uncomfortable discovery. In either mode scientific discourse was arcane to politicians and civil servants with a classical education. In terms of the UK nuclear project one of the farthest reaching, though unintended, consequences for science and technology policy derived from the class divide both within the nuclear project and between it and the wider scientific research and development community. The differing cultural capital of various groups within the nuclear enterprise also played a major role in shaping public responses. The effortless upper-class superiority of the highest echelons of nuclear science, centred on Oxford and Cambridge, accentuated the gulf between public and expert already entrenched by scientific discourse. In an attempt to give expression to this social and technical alienation I used the term 'social distance' in earlier work (Welsh 1988). Social distance was first used within the British sociology of 'race' to denote the impact of insertion into an 'alien' culture (Patterson 1965:20). In the sense developed here the notion of alien culture has a double meaning. It applies to scientists encountering the alien culture of public demands for accountability and acceptability and it also applies to sections of the public confronted by the alien assumption of their dependence upon experts (see Chs. 3 and 7). Social distance is thus an affective term for the social and political relations between specifically constituted publics and bodies of scientific expertise. The term is particularly useful in drawing attention to the way in which assumed social superiority structures relations between science and public and relations between sciences over several decades. 9 The struggle for dominance between sciences and between political ideologies which reached its peak in the post-war years effectively shaped the knowledge base of high or late modernity. This is a complex claim which becomes clearer when it is thought of in terms of the institutional distribution and orientation of scientific research and development pursued with significant state assistance. Concerns which became embedded within the prevailing institutional effort and ethos of peak modernity became part of a prevailing programme. The social assumptions underlying this programme were dominated by faith in rational science, expertise and technical progress. In turn the distribution of both research and development and regulatory efforts reflects a combination of extant knowledge and socially and culturally negotiated objectives. The resulting institutional structures both codify and sediment these concerns by enmeshing them within bureaucracies. Two main consequences follow from this. First, the prevailing distribution of regulatory effort inevitably produces lacunae into which ambiguous risk categories fall. Second, risks which are not acknowledged anywhere within the prevailing regulatory structure are simply not considered.

From the nuclear moment on the concentration on goal orientated science produced a distribution of both basic and applied knowledge acquisition with a very particular anatomy. The political and scientific emphasis on control and domination within discrete spheres of activity resulted in the neglect of synergistic effects, an area where Beck is particularly convincing. As scientific and technical development led into domains where empirical methods could not be applied, such as in the assessment of nuclear reactor safety, reliance on computer modelling and systems analysis increased. As risk assessments became based on computer models the output became more and more dependent upon the robustness of the input assumptions. In place of absolute measures came scenario modelling where a range of consequences reflecting a range of assumptions provided the basis of policy choices. The presentation of such outputs as knowledge by practitioners and the subsequent failure of models to approximate to events has played an important part in the erosion of public and political trust in experts and expert systems. As is well known, the boundary between expert knowledge and expert opinion became increasingly permeable, even indistinguishable.

Extinction y’all

Lendman 11

(MARCH 13, 2011 Stephen Lendman BA from Harvard University. Two years of US Army service followed, then an MBA from the Wharton School at the University of Pennsylvania “Nuclear Meltdown in Japan” http://sjlendman.blogspot.com/2011/03/nuclear-meltdown-in-japan.html)

For years, Helen Caldicott warned it's coming. In her 1978 book, "Nuclear Madness," she said: ¶ "As a physician, I contend that nuclear technology threatens life on our planet with extinction. If present trends continue, the air we breathe, the food we eat, and the water we drink will soon be contaminated with enough radioactive pollutants to pose a potential health hazard far greater than any plague humanity has ever experienced."¶ More below on the inevitable dangers from commercial nuclear power proliferation, besides added military ones.¶ On March 11, New York Times writer Martin Fackler headlined, "Powerful Quake and Tsunami Devastate Northern Japan," saying:¶ "The 8.9-magnitude earthquake (Japan's strongest ever) set off a devastating tsunami that sent walls of water (six meters high) washing over coastal cities in the north." According to Japan's Meteorological Survey, it was 9.0.¶ The Sendai port city and other areas experienced heavy damage. "Thousands of homes were destroyed, many roads were impassable, trains and buses (stopped) running, and power and cellphones remained down. On Saturday morning, the JR rail company" reported three trains missing. Many passengers are unaccounted for.¶ Striking at 2:46PM Tokyo time, it caused vast destruction, shook city skyscrapers, buckled highways, ignited fires, terrified millions, annihilated areas near Sendai, possibly killed thousands, and caused a nuclear meltdown, its potential catastrophic effects far exceeding quake and tsunami devastation, almost minor by comparison under a worst case scenario.¶ On March 12, Times writer Matthew Wald headlined, "Explosion Seen at Damaged Japan Nuclear Plant," saying:¶ "Japanese officials (ordered evacuations) for people living near two nuclear power plants whose cooling systems broke down," releasing radioactive material, perhaps in far greater amounts than reported.¶ NHK television and Jiji said the 40-year old Fukushima plant's outer structure housing the reactor "appeared to have blown off, which could suggest the containment building had already been breached." Japan's nuclear regulating agency said radioactive levels inside were 1,000 times above normal.¶ Reuters said the 1995 Kobe quake caused $100 billion in damage, up to then the most costly ever natural disaster. This time, from quake and tsunami damage alone, that figure will be dwarfed. Moreover, under a worst case core meltdown, all bets are off as the entire region and beyond will be threatened with permanent contamination, making the most affected areas unsafe to live in.¶ On March 12, Stratfor Global Intelligence issued a "Red Alert: Nuclear Meltdown at Quake-Damaged Japanese Plant," saying:¶ Fukushima Daiichi "nuclear power plant in Okuma, Japan, appears to have caused a reactor meltdown." Stratfor downplayed its seriousness, adding that such an event "does not necessarily mean a nuclear disaster," that already may have happened - the ultimate nightmare short of nuclear winter.¶ According to Stratfor, "(A)s long as the reactor core, which is specifically designed to contain high levels of heat, pressure and radiation, remains intact, the melted fuel can be dealt with. If the (core's) breached but the containment facility built around (it) remains intact, the melted fuel can be....entombed within specialized concrete" as at Chernobyl in 1986. ¶ In fact, that disaster killed nearly one million people worldwide from nuclear radiation exposure. In their book titled, "Chernobyl: Consequences of the Catastrophe for People and the Environment," Alexey Yablokov, Vassily Nesterenko and Alexey Nesterenko said:¶ "For the past 23 years, it has been clear that there is a danger greater than nuclear weapons concealed within nuclear power. Emissions from this one reactor exceeded a hundred-fold the radioactive contamination of the bombs dropped on Hiroshima and Nagasaki."¶ "No citizen of any country can be assured that he or she can be protected from radioactive contamination. One nuclear reactor can pollute half the globe. Chernobyl fallout covers the entire Northern Hemisphere."¶ Stratfor explained that if Fukushima's floor cracked, "it is highly likely that the melting fuel will burn through (its) containment system and enter the ground. This has never happened before," at least not reported. If now occurring, "containment goes from being merely dangerous, time consuming and expensive to nearly impossible," making the quake, aftershocks, and tsunamis seem mild by comparison. Potentially, millions of lives will be jeopardized.¶ Japanese officials said Fukushima's reactor container wasn't breached. Stratfor and others said it was, making the potential calamity far worse than reported. Japan's Nuclear and Industrial Safety Agency (NISA) said the explosion at Fukushima's Saiichi No. 1 facility could only have been caused by a core meltdown. In fact, 3 or more reactors are affected or at risk. Events are fluid and developing, but remain very serious. The possibility of an extreme catastrophe can't be discounted.¶ Moreover, independent nuclear safety analyst John Large told Al Jazeera that by venting radioactive steam from the inner reactor to the outer dome, a reaction may have occurred, causing the explosion. ¶ "When I look at the size of the explosion," he said, "it is my opinion that there could be a very large leak (because) fuel continues to generate heat." ¶ Already, Fukushima way exceeds Three Mile Island that experienced a partial core meltdown in Unit 2. Finally it was brought under control, but coverup and denial concealed full details until much later.¶ According to anti-nuclear activist Harvey Wasserman, Japan's quake fallout may cause nuclear disaster, saying: ¶ "This is a very serious situation. If the cooling system fails (apparently it has at two or more plants), the super-heated radioactive fuel rods will melt, and (if so) you could conceivably have an explosion," that, in fact, occurred.¶ As a result, massive radiation releases may follow, impacting the entire region. "It could be, literally, an apocalyptic event. The reactor could blow." If so, Russia, China, Korea and most parts of Western Asia will be affected. Many thousands will die, potentially millions under a worse case scenario, including far outside East Asia. ¶ Moreover, at least five reactors are at risk. Already, a 20-mile wide radius was evacuated. What happened in Japan can occur anywhere. Yet Obama's proposed budget includes $36 billion for new reactors, a shocking disregard for global safety.¶ Calling Fukushima an "apocalyptic event," Wasserman said "(t)hese nuclear plants have to be shut," let alone budget billions for new ones. It's unthinkable, he said. If a similar disaster struck California, nuclear fallout would affect all America, Canada, Mexico, Central America, and parts of South America.¶ Nuclear Power: A Technology from Hell¶ Nuclear expert Helen Caldicott agrees, telling this writer by phone that a potential regional catastrophe is unfolding. Over 30 years ago, she warned of its inevitability. Her 2006 book titled, "Nuclear Power is Not the Answer" explained that contrary to government and industry propaganda, even during normal operations, nuclear power generation causes significant discharges of greenhouse gas emissions, as well as hundreds of thousands of curies of deadly radioactive gases and other radioactive elements into the environment every year. ¶

Politics of nuclear secrecy magnifies the internal link: redaction and data restriction makes safety impossible

Wald 7

(Matthew, NYT, “Secrecy at Nuclear Agency Is Criticized by Lawmakers”, 7.6.2007, <http://www.nytimes.com/2007/07/06/us/06nuke.html?_r=0>, [CL])

WASHINGTON, July 5 — A factory that makes uranium fuel for nuclear reactors had a spill so bad it kept the plant closed for seven months last year and became one of only three events in all of 2006 serious enough for the Nuclear Regulatory Commission to include in an annual report to Congress. After an investigation, the commission changed the terms of the factory’s license and said the public had 20 days to request a hearing on the changes. But no member of the public ever did. In fact, no member of the public could find out about the changes. The document describing them, including the notice of hearing rights for anyone who felt adversely affected, was stamped “official use only,” meaning that it was not publicly accessible. “Official use only” is a category below “Secret.” Documents in that category are not technically classified but are kept from the public. The agency would not even have told Congress which factory was involved were it not for the efforts of Gregory B. Jaczko, one of the five commissioners. Mr. Jaczko identified the company, Nuclear Fuel Services of Erwin, Tenn., in a memorandum that became part of the public record. His memorandum said other public documents would allow an informed person to deduce that the factory belonged to Nuclear Fuel Services. Such secrecy by the Nuclear Regulatory Commission is now coming under attack by influential members of Congress. These lawmakers argue that the agency is withholding numerous documents about nuclear facilities in the name of national security, but that many withheld documents are not sensitive. The lawmakers say the agency must rebalance its penchant for secrecy with the public’s right to participate in the licensing process and its right to know about potential hazards. Additional details of the 2006 event are coming to light now because of a letter sent Tuesday to the nuclear agency by the House Energy and Commerce Committee. The committee chairman, Representative John D. Dingell, and the chairman of the oversight subcommittee, Representative Bart Stupak, both Democrats of Michigan, say the commission “went far beyond” the need to protect security information by keeping documents about Nuclear Fuel Services, a private company, from the public. The agency, the congressmen said, “has removed hundreds of otherwise innocuous documents relating to the N.F.S. plant from public view.” Mr. Jaczko, in a telephone interview, said, “Ultimately, we regulate on behalf of the public, and it’s important for them to have a role.” He said he thought other information about Nuclear Fuel Services that should be public had been marked “official use only.” With a resurgence of nuclear plant construction expected after a 30-year hiatus, agency officials say frequently that they are trying to strike a balance between winning public confidence by regulating openly and protecting sensitive information. A commission spokesman, Scott Burnell, said the “official use only” designation was under review. As laid out by the commission’s report to Congress and other sources, the event at the Nuclear Fuel Service factory was discovered when a supervisor saw a yellow liquid dribbling under a door and into a hallway. Workers had previously described a yellow liquid in a “glove box,” a sealed container with gloves built into the sides to allow a technician to manipulate objects inside, but managers had decided it was ordinary uranium. In fact, it was highly enriched uranium that had been declared surplus from the weapons inventory of the Energy Department and sent to the plant to be diluted to a strength appropriate for a civilian reactor. In a puddle, the uranium is not particularly hazardous, but if it formed a more spherical shape, the commission says, it could become a “critical mass,” a quantity and shape of nuclear fuel sufficient to sustain a chain reaction, in this case outside a reactor. According to the letter sent by the lawmakers, the puddle, containing about nine gallons, reached to within four feet of an elevator pit. Had it flowed into the pit and reached a depth of several inches, it would have been in a shape that might have supported a chain reaction. The letter from the congressmen says the agency’s report suggests “that it was merely a matter of luck that a criticality accident did not occur.” If the material had gone critical, “it is likely that at least one worker would have received an exposure high enough to cause acute health effects or death,” the commission said. A company spokesman, Tony Treadway, said the elevator was better described as a dumbwaiter. Generally, the Nuclear Regulatory Commission does describe nuclear incidents and changes in licenses. But in 2004, according to the committee’s letter, the Office of Naval Reactors, part of the Energy Department, reached an agreement with the commission that any correspondence with Nuclear Fuel Services would be marked “official use only.” The plant makes submarine fuel. The memorandum that declared such correspondence to be “official use only” was itself designated “official use only.”

Secrecy means the permutation would get rolled back

Albuquerque Journal 5

(“NRC Secrecy Could Be Nuke Plant’s Undoing”, 1.11.05, <http://www.nuclearactive.org/docs/LES011105.html>, [CL])

The Nuclear Regulatory Commission's decision to withhold a wide range of safety information related to a proposed uranium enrichment plant in southeastern New Mexico could prove to be a two-edged sword. Citing concerns that terrorists could use the information, the NRC has clamped down on information it will release to the public. That's the same public Louisiana Energy Services (LES) is trying to convince that its nuclear fuel plant will be safe. But the NRC is using an enormous umbrella to cover what it deems terrorist-friendly information -- including items as eclectic as earthquake probability. Oddly, some LES information now being withheld -- including worst-case accident scenarios -- is already in the public domain, having been distributed in September in a 480-page Draft Environmental Impact Statement. Newer versions of the document have been prodigiously redacted, even though an earlier draft was posted on the Internet. The state Environment Department, already at odds with the NRC over its refusal to consider state regulators' questions about health and safety issues at the planned plant, has just raised a new hurdle to state acceptance of the facility. Nobody wants to aid terrorists. But unless the NRC makes available enough information for state officials and watchdog groups to make informed decisions on hosting the LES plant, New Mexico must err on the side of caution and -- like two states before it -- say thanks, but no thanks.

Permutation causes price spikes and runaway warming

Madsen et al 9

(Travis Madsen and Tony Dutzik of Frontier Group,  Bernadette Del Chiaro and Rob Sargent of Environment America Research and Policy Center, Generating Failure, Environment America, November,<http://www.environmentamericacenter.org/sites/environment/files/reports/Generating-Failure~-~--Environment-America~-~--Web.pdf>, [CL])

Choosing to build new reactors would divert¶ resources from more cost-effective strategies.¶ Building 100 new nuclear reactors could have an¶ up-front cost on the order of $600 billion (with¶ a possible range of $250 billion to $1 trillion).""˜¶ Investing this money in reactor deployment¶ would foreclose opportunities to pursue cheaper¶ and faster options.¶ New nuclear reactors would be far more costly¶ than other forms of emission-free electricity.¶ Even the most optimistic estimates for the¶ average cost of power from a new nuclear reactor¶ are 300 percent higher than the cost of energy¶ efficiency or the cost of co-firing biomass in an¶ existing power plant, and well above renewable¶ technologies like wind power. Moreover, any¶ new nuclear reactors won't be operational until¶ well into the next decade, whereas clean energy¶ sources can be deployed now.¶ The cost advantages that clean energy has over¶ nuclear power are to become even more¶ pronounced over time, while we wait for the nuclear¶ industry to finish its first new reactor to¶ Moodys Investor Service, ". \_.nuclear generation has¶ a fixed design where construction costs are rising¶ rapidly; while other renewable technologies are still¶ experiencing significant advancements in terms of¶ energy conversion efficiency and cost reductions”¶ Building 1 00 New Nuclear Reactors¶ Would Divert Resources from¶ Cheaper and More Effective Solutions¶ If both nuclear power and clean energy¶ technologies such as renewable energy and¶ energy efficiency improvements can reduce global¶ warming pollution, why can't we just pursue both¶ paths - reducing emissions now through clean¶ energy and in the future with nuclear?¶ In a world of unlimited resources, such a path¶ would be conceivable. But in the real world of¶ public policy, governments must make choices¶ about how to allocate limited resources. Moreover;¶ to retain public support for efforts to reduce global¶ warming pollution, government will need to¶ demonstrate that it is acting in ways that minimize¶ the costs of emission reductions and deliver the¶ greatest benefit for the smallest expenditure.¶ Recent estimates for the up-front cost of building¶ a new nuclear reactor suggest that building 100 of¶ them could require an up-front investment on the¶ order of $600 billion.'3"¶ However, the capital cost of a new nuclear plant is¶ only part of the full story. Any up-front investment¶ in nuclear power would lock in additional¶ expenditures across decades. Once a plant is¶ built, the price of the electricity it generates will¶ reflect the ongoing need to pay off debt; the¶ cost of operating and maintaining the plant; the¶ cost of fueling the plant with uranium; the cost¶ of decommissioning the plant and disposing¶ of the waste; and the cost of transmitting and¶ distributing the electricity to consumers. I- for 100¶ reactors, these costs would add up to additional¶ trillions over a period of decades.¶ An investment in energy efficiency would deliver¶ vastly superior results. Investing in energy¶ efficiency actually pays us back with ongoing¶ savings on electricity bills. Efficiency measures¶ are almost always cheaper even than operating¶ existing power plants. For example, analysts¶ at the consulting firm McKinsey & Company¶ estimate that investing $520 billion in energy¶ efficiency measures would eliminate $1.2 trillion¶ in waste from the U.S. economy, saving citizens¶ and businesses nearly $700 billion (in net¶ present value terms)."˜3' In other words, energy¶ efficiency could provide the same level of impact¶ as building 160 nuclear reactors in the next ten¶ years - at net savings.""˜Â°¶ An investment in renewable sources of power¶ can deliver carbon-free electricity for much¶ less cost than nuclear power. Many types of¶ renewable energy have the advantage of zero¶ fuel costs, since wind and sunlight and the¶ earth's heat are free. Other types of clean¶ energy, such as solar photovoltaic panels, have¶ the advantage of being located near where the¶ energy will be used, minimizing the cost of¶ transmitting and distributing electricity. And¶ these technologies require no special waste¶ handling or decommissioning.¶ Compared to clean energy solutions, nuclear¶ power is extremely expensive. The total extra¶ cost to the U.S. economy of building 100 new¶ nuclear reactors, above and beyond a least-cost¶ clean energy approach, could fall in the range of¶ $1.9 to $4.4 trillion over the entire lifetime of the¶ reactors.""¶ Cost Estimates for Nuclear Power Continue to Rise¶ In 2003, experts at the Massachusetts Institute of¶ Technology and Harvard concluded that "today,¶ nuclear power is not an economically competitive¶ choice” The researchers predicted that without¶ subsidies and financial support for the nuclear¶ industry, "nuclear power faces stagnation and¶ declinef'"3 The U.S. Congress responded by¶ streamlining the permitting process at the Nuclear¶ Regulatory Commission and authorizing billions¶ in new subsidies through the 2005 Energy Policy¶ Act. However; in 2009, the MIT researchers¶ took another look at the nuclear industry and¶ found that despite the new support, "increased¶ deployment of nuclear power has been slow both¶ in the United States and globally ...""¶ High costs are a major obstacle in the way of¶ building new reactors. In the past decade, cost¶ estimates for new nuclear power plants have¶ only escalated.¶ In the early 2000s, nuclear industry executives¶ estimated that construction costs for building a¶ new nuclear reactor could approach $1,500 per kW¶ of power generating capacity, plus finance costs."5¶ They said the lower costs would make nuclear¶ power competitive with coal and natural gas.¶ However, these early estimates have turned out¶ to be overly optimistic. Recent estimates for the¶ average cost of electricity from a new nuclear¶ plant over its entire lifetime are four times higher¶ than this initial projection that promoters of a¶ "nuclear renaissance" put forward in the early¶ part of the decade. ""˜¶ No nuclear companies have signed a contract¶ guaranteeing a price for a new nuclear reactor.¶ When Canada asked for guaranteed cost bids¶ to build two new reactors, the results blew far¶ past expectations. The only company willing to¶ guarantee its work quoted a price of $26 billion¶ to build two new reactors - or $10,800 per kW -¶ more than seven times higher than cost estimates¶ from early in the decade."7 Areva offered its¶ technology for $23 billion - or $7,400 per kW¶ - but its bid was deemed non-compliant, likely¶ because it would not guarantee the price.""¶ Both of these quotes were more than double the¶ threshold for competitiveness."¶ Nuclear Reactors Tend to Run Aground on¶ Skyrocketing Construction Costs¶ and escalating bids for new nuclear reactor¶ projects should not be a surprise. Nuclear reactor¶ construction projects in the U.S. have regularly¶ run aground on skyrocketing construction costs.¶ Of 75 nuclear reactors completed between 1966¶ and 1986, the average reactor cost more than¶ triple its original construction budget."Â° Later-¶ built reactors came in as much as 1,200 percent¶ over budget?"¶ Economists commonly expect that new products¶ and technologies become cheaper over time,¶ as companies gain experience and develop¶ economies of scale. However, in the case of the¶ last generation of nuclear power in the United¶ States, the opposite proved to be true. The first¶ nuclear reactors ever built were among the least¶ expensive, while costs spiraled wildly out of control¶ in the final decades of reactor construction. (See¶ Figure 8.) For plants beginning operation in the¶ late 1970s and onward, inflation-adjusted capital¶ costs escalated from just under $2,000 per kW to¶ more than $10,000 per kW (in 2004 dollars)."˜5'¶ Seen through the lens of history, nuclear industry¶ predictions that new designs and modular¶ construction techniques will bring costs down¶ appear overconfident.L" Developing new nuclear¶ power plants will likely remain prone to high cost¶ "surprises"and increased financial risk for power¶ companies and their customers."˜55 Due to the large¶ amount of money required to build an individual¶ reactor, the investment ratings firm Moody's calls¶ nuclear construction a "bet the farm risk" for a¶ typical utility."¶ Nuclear Power Is More¶ Costly than Other Forms of¶ Emission-Free Electricity¶ Power from a new nuclear reactor would be¶ more costly than other forms of emission-free¶ electricity. Recent estimates for the average cost¶ of electricity from a new nuclear power plant over¶ its entire lifetime range from a low of 8 cents to¶ a high of 30 cents per kilowatt-hour (kWh), with¶ the bulk of estimates falling between 12 and 20¶ cents per k\X/h."˜5' For many of these estimates,¶ add another 2 cents per k\X/h to transmit and¶ distribute the electricity from the nuclear plant to¶ the customer.¶ Vast amounts of clean energy are available - now¶ - at far less cost."˜5"¶ Energy from a new nuclear reactor would be¶ two to six times more expensive than saving¶ electricity through efficiency - including¶ utility and consumer investment. Across¶ the country, the average utility cost of saved¶ energy is 2.5 cents per kWh, three to four¶ times cheaper than building any kind of¶ new power plant."˜5Â° Including consumer¶ contributions to efficiency measures, the¶ average total resource cost of efficiency is¶ around 4.6 cents per kWh. Analyses of¶ future energy efficiency potential typically¶ find vast available resources with average¶ utility lifetime costs of around 4 cents per¶ kWh in the residential sector and 2 cents per¶ kWh or less in the commercial and industrial¶ sectors.""˜ Moreover, as the scale and scope¶ of energy efficiency programs increase, they¶ tend to become even more cost effective"¶ Combined heat and power and recycled¶ energy technologies are also extremely cost-¶ effective sources of electricity. Recycled¶ energy technologies can generate electricity¶ for about 3 cents per kWh."3 Combined cycle¶ industrial heat and power installations can¶ generally produce power for 4.5 to 5.5 cents¶ per kWh, including credit for the value of¶ useful heat that the generators also produce.""˜¶ And smaller building-scale CHP technology¶ can deliver electricity for less than 6 cents per¶ kWh, again counting the value of the useful¶ heat also produced by the generator."5¶ Energy efficiency, distributed solar power,¶ and combined heat and power have the added¶ advantage of saving or generating energy near¶ where it will be used, avoiding transmission¶ and distribution costs. In addition, saving or¶ generating energy locally minimizes electricity¶ losses that can occur while transporting¶ electricity from a distant power plant.¶ Large potential supplies of clean energy from¶ wind, solar, biomass and geothermal sources are¶ also available - now - at costs well below estimates¶ for new nuclear power. For example:¶ ' America's entire electricity needs could be met¶ by the wind blowing across the Great Plains or¶ the sunlight falling on a 100 mile square patch¶ of the desert Southwest, or a tiny fraction of¶ the natural heat just beneath the surface of¶ the earth anywhere across the country"˜"¶ Diverse, locally-based resources are available¶ in every state. Even the southeastern United¶ States has enough biomass, wind, and low-¶ impact hydroelectric resources to meet 25¶ percent of its electricity needs within the next¶ two decades."7¶ The U.S. Department of Energy (DOE)¶ estimates that wind energy resources across¶ the U.S. as a whole could produce more than¶ 1.5 million G average household just 50 cents per month¶ more compared to sticking with coal- and¶ gas-fired power - and excluding the benefits¶ of cleaner air and conserved water."˜7Â°¶ The California Public Utilities Commission¶ estimates that in the western United States:¶ l7l¶ 0 Nearly 200,000 GWh per year of renewable¶ electricity could be delivered locally for 9¶ cents per kWh or less;¶ Â° An additional 200,000 GWh per year of¶ renewable electricity could be locally¶ delivered at costs of 10 cents per k\X/h or¶ less; and¶ 0 Well over 500,000 GWh per year of¶ additional renewable electricity could be¶ delivered locally at a cost of 12 cents per¶ kWh or less.¶ Wh per year for between 6 and¶ 10 cents per kWh (2006 dollars)."'" (This¶ price includes estimated transmission costs,¶ assuming that the existing grid has 10 percent¶ spare capacity that could be used for wind, and¶ that appropriate planning will allow new lines¶ to be constructed as needed.) This amount¶ of wind would be the energy equivalent of¶ 190 nuclear reactors."Â° DOE estimates that¶ generating 20 percent of America's electricity¶ supply with wind by 2030 would cost the¶ Electricity from these renewable resources - the¶ energy equivalent of more than 1 10 nuclear reactors¶ - would be available at 8 to 12 cents per kWh¶ delivered, half to two-thirds of a mid-range estimate¶ for the cost of power from a new nuclear power¶ plant.m Developing U.S. renewable energy and¶ energy efficiency resources could save Americans¶ more than $200 billion on energy bills by 2020.173¶ Per Dollar Spent, Clean Energy¶ Is More Effective at Preventing¶ Pollution than New Nuclear Power¶ In at least the next six years, new nuclear power¶ cannot be obtained in the United States at any¶ price. However, many other energy technologies¶ are available now that can deliver cost-effective¶ reductions in pollution. Recent estimates for¶ the cost of a new nuclear power plant place it¶ well above many alternatives, including energy¶ efficiency, combined heat and power, wind power¶ (on land and off shore), biomass, landfill gas,¶ geothermal, some types of solar thermal power¶ and natural gas combined cycle power!"¶ Research done for the California Energy¶ Commission (CEC) in 2009 provides a relatively¶ recent, apples-to-apples comparison of the¶ estimated costs of different generation technologies¶ with an in-service date of 2018, a decent guess as¶ to when the first nuclear reactors might become¶ available."˜75 The estimates are partially specific to¶ western states, and include the effects of some tax¶ and incentive policies now authorized through that¶ year (but not the renewable energy production tax¶ credit, which is currently set to expire by 2013).¶ These factors aside, the research gives a general¶ idea of how generation technologies stack up.¶ Many additional studies, using different starting¶ assumptions, support the conclusion that energy¶ efficiency and many forms of renewable power are¶ expected to be substantially more cost-effective¶ than nuclear power."˜7"˜¶ The CEC figures also exclude solutions like energy¶ efficiency, biomass co-firing and combined heat¶ and power, so this report draws on other sources¶ to include them. Finally, this report does not¶ consider possible intermediate solutions such as¶ replacing coal-fired power with greater utilization¶ of existing natural gas-fired power plants, which¶ are also likely to be more cost-effective ways to¶ prevent carbon emissions than building new¶ nuclear plants.¶ In 2018, the CEC projects that new nuclear power¶ will be more costly than most other forms of low-¶ emission electricity, whether financed by a public¶ utility, an investor-owned utility, or a merchant¶ generator. Under investor-owned utility¶ financing, per dollar spent (over the lifetime of¶ the technology), energy efficiency would be five¶ times more effective at preventing global warming¶ pollution, and combined heat and power (in¶ which a power plant generates both electricity¶ and heat for a building or industrial application)¶ would be greater than three times more effective.¶ (See Figure 9.) Even without the benefit of¶ the production tax credit in 2018, biomass,¶ geothermal and land-based wind energy will be¶ more than twice as effective, and offshore wind¶ will be on the order of 40 percent more effective.¶ Under merchant financing terms, nuclear fares¶ even more poorly, with CEC expecting both solar¶ thermal and solar photovoltaic power to be more¶ cost-effective ways to reduce pollution.¶ By 2018, solar photovoltaic power should be¶ comparable to a new nuclear reactor in terms of¶ its per-dollar ability to prevent global warming¶ pollution. However, solar power is falling in price¶ far faster than any other generation technology.¶ Solar prices have fallen by more than 80 percent¶ since 1980.179 And prices continue to decline as¶ public policies encourage growth in capacity¶ for solar panel manufacturing, distribution¶ and installation.""' Recent cost improvement is¶ apparent in utility decisions to build nearly 1,000¶ MW of large-scale solar photovoltaic power¶ plants in Florida and California - 10 times bigger¶ than any now in service across the world.""¶ In fact, recent analysis by the investment firm¶ Lazard implies that thin-film solar photovoltaic¶ and solar thermal power technologies, with¶ existing incentives, are already competitive with¶ and even ahead of nuclear power."" Lazard also¶ highlights biomass co-firing - in which an existing¶ coal-fired power plant replaces up to 15 percent¶ of its typical fuel with plant matter - and landfill¶ gas as additional cost-effective options."¶ The fact that clean energy is more cost-effective than¶ new nuclear reactors is reflected in the conclusion¶ of a recent report by the European Renewable¶ Energy Council, the German Aerospace Center and¶ Greenpeace, which shows that currently available¶ clean energy technology could be deployed in¶ the United States to deliver massive reductions¶ in global warming pollution - at half the cost¶ and with twice the job creation as an equivalent¶ amount of nuclear and coal-fired power. Similarly,¶ the non-profit Nuclear Policy Research Institute¶ and the Institute for Energy and Environmental¶ Research have published a report demonstrating¶ how the United States can create an economy with¶ zero emissions of global warming carbon dioxide¶ pollution within 30 to 50 years at a reasonable cost,¶ without nuclear power""¶ What Could an Equivalent Capital¶ Investment in Clean Energy Achieve?¶ Investing $600 billion could potentially get us 100¶ new nuclear reactors by 2030. Alternatively, if we¶ invested that money in clean energy solutions,¶ we could get the double the impact, without the¶ drag on the economy that the high cost of nuclear¶ power would impose.¶ At an optimistic reactor cost forecast used¶ by the Energy Information Administration of¶ around $2,500 per kW of capacity (see page¶ 22), building 100 new reactors would cost $250¶ billion up-front. Investing that same amount¶ of capital in energy efficiency could reduce¶ America's electricity consumption by about 12¶ percent below the reference case by 2030.185¶ This level of investment in energy efficiency¶ would deliver emission reductions equal to¶ building 100 new nuclear reactors by 2030, but¶ unlike nuclear, pollution prevented through¶ efficiency would come at net savings, since¶ energy efficiency is so much more cost-effective¶ than building new reactors.¶ Should the highest cost forecasts for nuclear¶ power come true, building 100 new reactors could¶ cost $1 trillion. This level of investment in clean¶ energy solutions could yield as much electricity¶ as more than 270 new nuclear reactors in the¶ year 2030."˜"9 This package of clean energy would¶ reduce three times as much pollution as nuclear¶ through 2030, for far less total cost.

Perm can’t solve the link, the nuclear renaissance is dying now – permutation would overcome market resistance and crush renewables

Kelly-Detwiler 13

(Peter, Forbes, “New Centralized Nuclear Plants: Still an Investment Worth Making?”, 1.15.13, <http://www.forbes.com/sites/peterdetwiler/2013/01/15/new-centralized-nuclear-plants-still-an-investment-worth-making/>, [CL])

Just a few years ago, the US nuclear renaissance seemed at hand. It probably shouldn’t have been. Cost overruns from Finland to France to the US were already becoming manifest, government guarantees were in doubt, and shale gas drillers were beginning to punch holes into the ground with abandon. Then came Fukushima. The latter proved a somewhat astonishing reminder of forgotten lessons about nuclear power risks, unique to that technology: A failure of one power plant in an isolated location can create a contagion in countries far away, and even where somewhat different variants of that technology are in use. Just as Three Mile Island put the kaibosh on nuclear power in the US for decades, Fukushima appears to have done the same for Japan and Germany, at a minimum. It certainly did not help public opinion, and at a minimum, the effect of Fukushima will likely be to increase permitting and associated regulatory costs. By contrast, when a gas-fired plant in Connecticut exploded during construction a few years ago, it didn’t affect the public perception of other gas plants. But Fukushima and nuclear power is another story. The stakes are so much bigger.¶ Even without Fukushima, the verdict on large centralized US nukes is probably in, for the following reasons:¶ 1) They take too long: In the ten years it can take to build a nuclear plant, the world can change considerably (look at what has happened with natural gas prices and the costs of solar since some of these investments were first proposed). The energy world is changing very quickly, which poses a significant risk for thirty to forty year investments.¶ 2) They are among the most expensive and capital-intensive investments in the world; they cost many billions of dollars, and they are too frequently prone to crippling multi-billion dollar cost overruns and delays. In May 2008, the US Congressional Budget Office found that the actual cost of building 75 of America’s earlier nuclear plants involved an average 207% overrun, soaring from $938 to $2,959 per kilowatt.¶ 3) And once the investments commence, they are all-or-nothing. You can’t pull out without losing your entire investment. For those with longer memories, WPPS and Shoreham represent $2.25 bn (1983) and $6 bn (1989) wasted investments in which nothing was gained and ratepayers and bondholders lost a good deal.¶ Some recent investments in centralized nuclear plants in other countries highlight and echo these lessons.¶ Electricite de France’s Flamanville plant has seen its budget explode from 3.3 to 6 bn (July 2011) to 8 bn Euros ($10.5 bn) as of last December, with a delay of four years over original targets. EDF in part blames stricter post-Fukushima regulations for part of the overrun). To the north, Finland’s Olkiluoto – being constructed by Areva – has seen delays of nearly five years, and enormous cost overruns. The original turnkey cost of 3.0 bn Euros has skyrocketed beyond all fears, increasing at least 250%. Just last month, Areva’s CEO conceded “We estimate that the costs of Olkiluoto are near those of Flamanville.”¶ In the US, recent experience doesn’t look much better: Progress Energy (now Duke) first announced the 2,200 MW Levy nuclear project in 2006, with an estimated price tag of $4 to $6 bn and an online date of 2016. The cost estimated increased to $17 bn in 2008. This year, Progress announced the project would cost $24 billion and come online in 2024. The Levy plant currently has a debt in excess of $1.1 bn for which customers had already paid $545 million through 2011. As of now, the utility plans to proceed, with the Executive VP for Power Generation stating ”We’ve made a decision to build Levy…I’m confident in the schedule and numbers.”¶ In Georgia, Vogtle Units 3 and 4 (owned jointly by a number of utilities, including Georgia Power) appear in somewhat better shape, but issues have cropped up there as well. Customers currently pay $10 per month in advance to cover financing associated with the two 1,117 MW units. Georgia Power is allowed by legislation to recover $1.7 bn in financing costs of its estimated $6.1 bn portion of the $14 bn plant during the construction period. However, there have already been some cost problems, and Georgia Power is disputing its responsibility to pay $425 million of overruns resulting from delays in licensing approvals. Total cost excesses to all partners total $875 mn. The two units were expected to come online in 2016 and 2017, but in a Georgia PSC meeting in December, an independent monitor noted that expected delays of fifteen months are largely as a result of poor paperwork related to stringent design rules and quality assurance. Those delays will likely continue to cost more money.¶ Unfortunately, these experiences are not outliers. From 2007 to 2010, the NRC received 18 nuclear applications ( of which only twelve are still active). Of these, the consulting outfit Analysis Group reported that for eight plants where they were able to obtain two or more comparable cost estimate, 7 are over budget (including Levy and Vogtle), with updated numbers “often double or triple initial estimates.” This is consistent with an MIT study estimating ‘overnight’ costs nearly doubling from 2002 to 2007. As utilities management consultant Stephen Maloney was quoted in the Analysis Group study “No one has ever built a contemporary reactor to contemporary standards, so no one has the experience to state with confidence what it will cost. We see cost escalations as companies coming up the learning curve.”¶ Last August, Exelon abandoned plans to construct two facilities in Texas, blaming low natural gas prices. Two months later, Dominion Resources announced that it would shut down its existing Kewaunee station in Wisconsin as a consequence of low gas prices and a lack of buyers. The latter move was particularly eye-opening: building a nuclear plant is supposed to be the expensive part, while operation is expected to be relatively cheap.¶ So it appears that the nuclear renaissance may be largely over before it started. And yet, many projects have not yet been canceled, with utilities and ratepayers accepting ever more risk in order to rescue sunk costs. In many cases, these costs have soared or will soar into the billions. As risk management expert Russell Walker of the Kellogg School of Management is quoted as saying in the Tampa Bay Times “When the stakes get higher, it gets harder for organizations to walk away…this happens a lot. It’s the same problem a gambler has: If I play a little longer, it’ll come around.”¶ With low natural gas prices, efficient combined cycled turbines, more efficient renewables and a host of more efficient end-use technologies, that’s a bet fewer and fewer seem willing to take. Unfortunately for ratepayers at some utilities, they are at the table whether they like it or not…

### AT: Management Good

The authoritarian bargain only produces coopted neoliberal movements that practice a politics of supply-side corporatism – flips the internal link

Barry 12

(John Barry, Reader Politics @ Queen’s University (Belfast) [*The Politics of Actually Existing Unsustainability* p. 204-207)

BEYOND THE 'SCARCITY' PRINCIPLE: TOWARDS AN ECONOMY OF SUSTAINABLE DESIRE That a post-growth economy is one characterized by 'abundance', pleasure, and desire, is not something that is immediately obvious or self-evident. Unfortunately it is ascetic notions of less unsustainable lifestyles, and the deliberate misrepresentation of a sustainable society in terms of sacrifice, loss, regress, and totalitarianism, that tend to dominate discussions. Against these negative portrayals, I here argue that a post-growth green economy can be an economy of pleasure. Situated between the affluenza of modern consumerism and the puritanical self-denial of some visions of a sustainable economy lies what could be called an economy of sustainable desire.17 A reason for so characterizing a post-growth economy based on green political economic principles is to directly challenge and offer an alternative to what Steigler terms the 'libidinal economy of capitalism' (Steigler, 2008). To Steigler, 'Capitalism needs to control conduct and in order to achieve this, it develops techniques of capture or captation' (Steigler, 2008: 12). To counter this, strategies to 'release' people from this consumer discipline are therefore required. One strategy to counter this consumer-driven capitalist economy of unsustainable desire, it is proposed here to replace it with an economy of sustainable desire. Rejecting the disciplining notion of neoclassical economics which makes 'scarcity' the organizing principle for the economy, an economy of sustainable desire is characterized by abundance and possibilities for pleasurable, life affirming living. This economy of desire harks back and is explicitly built on the arguments greens and others made in the 1960s onwards to the effect that consumerist culture was not only not appreciably adding to human well-being and quality of life, but in many areas was positively detrimental to human well-being. An economy of abundance is based on the very simple notion that

pleasure, life-affirming experiences and practices, do not have any necessary connection with either individualized and/or maximizing material consumption. The best things in life do turn out to be free after all in that it is meaningful relation~ between people not possessions or income, that are the major determinate of human flourishing. The subjectivities created in and through these post-material forms of pleasurable living are necessarily different from the passive consumer subjectivities created by an increasingly obsolete carbon-fuelled consumer capitalism. It also begins from the (rather obvious) contention that 'scarcity', much like 'abundance', is socially created and politically negotiated, that is, neither are 'given' but both are 'created'.18 As Xenos succinctly notes, 'The simple fact of finitude of anything does not necessarily constitute a scarcity of that thing' (Xenos, 2010: 32). What 'transforms' finitude into 'scarcity' (and associated issues of rarity, price, use-value, possession, allocation, distributive mechanism, and desire) are social relations, how human beings 'see', relate to, and 'value' that which is finite. For the ancient Greeks (and contemporary greens) the problem in politics was not 'scarcity' in the sense of finitude and what orthodox economists would call 'limited supply', but rather the proliferation of desire beyond the satisfaction of need. Hence, the solution of the ancients was to limit desire and acquisitiveness, not to 'overcome' scarcity as it was for modernity (Xenos, 2010: 33).19 The modern economic mobilization of a power/knowledge discourse of 'scarcity' is vital to understanding both contemporary orthodox economics and modern capitalism. As Illich reminds us, 'Economics always implies the assumption of scarcity. What is not scarce cannot be subject to economic control. ... Scarcity .. . now seems to affect all values of public concern' (Illich, 1980: 123; emphasis added). Within modernity more generally, and under capitalism in particular, we find a similar situation in regards to scarcity as we did in relation to inequality as discussed above. That is, capitalism seeks not to eradicate scarcity in the sense of abolishing it as a concept (as the ancient Greeks did). Rather, it seeks to institutionalize scarcity as a permanent condition, as a 'management tool' to create and govern docile bodies (Sahlins, 1972: 4). It is the permanency of scarcity as Xenos points out that explains the paradox of highly affluent societies (the most materially affluent societies ever seen), also being characterized by the discipline and presence of 'general scarcity'. 20 'Scarcity' (and related ideas of maximization, efficiency, productivity, inequalities as incentives, zero-sum games etc.) has to be created and maintained for it to have its disciplining power as deployed through orthodox economic policies and internalized forms of 'commonsense' economic thinking and acting. For Deleuze and Guattari, 'Lack is created, planned and organized in and through social production ... It is never primary; production is never organized on the basis of pre-existing need or lack. ... The deliberate creation of lack as a function of market economy is the art of the dominant class. This involves deliberately organizing wants and needs amid an abundance of production; making all desire teeter and fall victim to the great fear of not having one's needs satisfied' (Deleuze and Guattari, 2004: 29-30; emphasis added). This fixation on scarcity is one of the main reasons orthodox economics and public policies based on it are skewed towards 'supply side' solutions (Goodin, 1983). Take the energy debate. The orthodox approach is to present this as largely an issue of the security of supply of low-carbon energy with support for nuclear power justified on the grounds that renewable sources of energy leave a dangerous 'energy gap', as the UK government energy report in chapter 3 demonstrated. Nowhere in this narrative is the simple point made that perhaps the issue is not so much a shortage of supply but an excess demand that is, we may be using too much energy rather than not having enough energy. While there is usually some obligatory reference to 'energy efficiency' and 'energy conservation' as important, this framing of the public policy debate over energy futures does not include a space for reducing consumption or considering 'energy descent' as a possible and viable option (Barry and Ellis, 2010). This way of framing the debate would at one stroke enable us to see 'energy scarcity' for what it in fact is-an artificially and asymmetrically created 'gap' based on locking society into a perpetual struggle with exponential rising energy demand. The latter is viewed as 'given' and therefore depoliticized, and so we are presented with a 'Malthusian' situation of energy demand always outstripping (or better still 'threatening' to outstrip) energy production, which 'must' keep up. In short, in the energy debate as elsewhere, the idea of scarcity as the organizing principle of industrial capitalism has to be manufactured and constantly reproduced. Simply put, not to do so would undermine the imperative for continual expansion and economic growth.21 The opposite of scarcity is not material abundance and productivity, as the neoclassical dogma has it. Rather, as Zadak has suggested in his book, An Economics of Utopia, it is 'a liberation from the constraints imposed on our understanding by social, political, and other factors' (Zadak, 1993: 239). And I would suggest, going back to the concepts of sufficiency and 'redundancy' outlined in previous chapters, that these concepts are central in any liberation from the discipline of 'scarcity'. Sufficiency, making 'enough' rather than 'more and more' a central feature of economic activity, does not, as some might suggest, imply a diminution of desire and pleasure. They denote other desires and other ways of meeting and satisfying our desires. And notions of sufficiency and enough-ness, redundancy, sub-optimality, and so on are consistent with a claim that regular and temporary withdrawals from fulfilling desires, such as fasting, frugality (Cato, 2004), voluntary simplicity (Alexander, 2011), refusing to consume and buy and instead making or doing it oneself or with others, public holidays and festivals and other rituals of nonconsumption (Astyk, 2008: 33), or simply slowing down (Berressem, 2009), can actually serve to liberate desire, and in so doing create a new post-scarcity, sustainable economy of desire.

### AT: Renaissance

Trends indicate 1% decrease per year – nuclear contribution through 2020 is locked in

Dittmar 9

(Michael, CERN Physicist (most advanced practical physics project ever) , Particle physics at ETH Zurich, <http://www.theoildrum.com/node/5929>)

In this first article, nuclear energy and its place in today's world energy mix are reviewed. As significant new constructions in the nuclear power cycle, including uranium mines, enrichment facilities, and power plants, require at least a 5-10 year construction time, the maximum possible contribution of the nuclear power sector up until almost 2020 is already knownand presented in this report.¶ It should become clear from the facts presented in the following sections of this article that the nuclear energy situation is far from being in theoften claimed "nuclear renaissance phase." In fact, even without considering the impact ofthe 2008/9 world financial chaos**,** it seemsalready now very difficult to stop the slow nuclear phase-out, with an annual decrease of about 1%, that has been observed during the past few years.