The Limits of Efficiency: Policy Impacts and Implications for Sustainable Development

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This paper analyzes different definitions of efficiency in general, and energy efficiency in particular, their public policy effects, and their implications for realizing sustainable development. Efficiency serves goals such as reducing pollution and meeting energy needs more cost-effectively, but this paper argues that efficiency must be viewed more broadly as part of an overall goal of sustainable development. However, other efficiency advocates see it in different ways. Therefore, I distinguish narrow from broad efficiencies in an attempt to provide a gauge for accessing whether a particular policy position supports the developmental status quo or humanity's move toward more sustainable economies. These concepts are then used to analyze the goals and recommendations promoted in publications from two organizations, and three general policy areas that embrace the need for increased energy efficiency.

Introduction

Energy efficiency has become a mainstay of much contemporary energy policy discussion, including most of the presentations at this conference. Yet there has not been adequate discussion of the goals of energy efficiency, and what range of things that might be considered appropriate in meeting such goals. Clearly efficiency can mean different things to different people and organizations. Further, it is helpful to remember that efficiency is not desirable as an end unto itself. Rather, it is a means to other desirable ends, such as environmental protection and increased production in support of social equity. This paper suggests that the goal of sustainable development, which includes technical as well as environmental and social components in its definition of "sustainability," is a more comprehensive description of the goals most efficiency advocates seek.

Efficiency and Sustainable Development

Though still arguably ambiguous and in need of refinement, the concept of sustainable development is not without promise. The World Commission on Environment and Development (WCED) offers us a concise formulation of this emerging developmental position on which humanity can build. According to the WCED, "[sustainable development [is development that] seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future. Far from requiring the cessation of economic growth, it recognizes that the problems of poverty and underdevelopment cannot be solved unless we have a new era of growth in which developing countries play a large role and reap large benefits" (WCED 1987). In short, sustainable development is development that embraces three interlocking principles of distributive justice. The first principle is *intergenerational justice.* It requires that we ensure that present growth will not be achieved at the expense of future generations. The second is *interregional justice.* It requires that already developed countries ensure that developing countries get "their fair share of the [world's] resources required to sustain [their] growth." Finally, the principle of *intrasocietal justice* says that every human being must be given "the opportunity to fulfil their aspiration for a better life" (WCED 1987).

One common theme running through more cogent sustainable development arguments is the priority of increased technological efficiencies in addressing humanity's growing developmental concerns. In the area of energy, this means renewable energy driven technologies and technologies that require fewer fossil fuels to operate. Indeed, many supporters of sustainable development see increased energy efficiency as the main ingredient for realizing its goals. The WCED labels energy efficiency policies "the cutting edge" (WCED 1987). And, in the preface to a recent American Council for an Energy Efficiency Economy (ACE3) publication, Ralph Cavanaugh, of the Natural Resources Defense Council, agrees: "Energy

efficiency is quite simply the most powerful engine of environmental protection ever devised. " He then goes on to say: "It is our best hope for stabilizing the global climate, abating acid rain, retaining wild rivers and fending off a host of residual environmental insults" (Vine, Crawley, and Centolella 1991). Chandler, Geller, and Ledbetter's ACE3 publication *Energy Efficiency: A New Agenda,* though nationalist in scope, takes a similar position. It argues that energy efficiency translates into protection for the environment, stronger national security, and more jobs for U.S. citizens (Chandler et al. 1987). Indeed, Amory Lovins, perhaps the best known advocate of energy efficiency, estimates that the energy efficiency market will eventually reach a trillion dollars a year (Lovins 1991). With such economic potential, it is no surprise that the pursuit of more energy efficient technologies is becoming common place in the U.S. and abroad.

This paper argues that simply making humanity's current fossil fuel driven technologies more energy efficient will not be enough to address humanity's developmental concerns. Though such efforts are laudable, the social and environmental benefits resulting from these types of efficiency pursuits will surely be eclipsed by the proliferation of—albeit more efficient-fossil fuel driven technologies in the so called "developing" world. What is needed, therefore, is not more efficient versions of necessarily flawed technologies. Rather, we need a set of new technological designs and arrangements conditioned by cultural atmospheres that recognize that individual aspirations must be tempered by a respect for other individuals *and* nature. Blind pursuit of efficiency within our current social, cultural, and technological arrangements will only ensure that we continue to address adverse developmental side-effects incrementally, and as afterthoughts. Real change in our developmental pathway will require us to evaluate our efficiency pursuits not simply with respect to narrow, individual ends, but also with respect to broader, higher human ends. If we are to succeed in this endeavor, we need to come to grips with what I call the *ontological relativity of efficiency.*

The Ontological Relativity of Efficiency

Though almost everyone agrees that efficient actions are more desirable than inefficient ones, such judgments are highly contingent. By definition, the efficiency of any action is dependent on the evolving or developing material and ideological context in which the action takes place. This is the ontological relativity of efficiency. It holds whether the context considered is an individual, a home, a neighborhood, a nation, or an international community. When considering social and technological choices in support of developmental possibilities, the ontological relativity of efficiency takes on special meaning because different interpretations of efficiency lead to actions that hold vastly different implications for human development. Where the ontological contexts defining efficient action are conditioned by commonly held, non-domineering cultural goals and beliefs within a respected, autonomous, and vibrant natural environment, what I call *broader efficiencies are* realizable. Broad efficiencies are conditioned by a developmental philosophy that recognizes efficiency as a means to higher human ends and not an end unto itself. Evaluations of efficiency pursuits, therefore, occur as part of a larger analytic effort to assess the value of and opportunities for change in existing social and technological arrangements. Where these same social and technological arrangements are defined and conditioned by domineering ideologies and seemingly autonomous artificial progress, as happens under humanity's now dominant developmental paradigm, such broad efficiencies are but fortunate accidents.

Today, large but select segments of humanity have strategically positioned themselves within narrowly defined developmental contexts. These contexts are constructed such that these select segments can reap the benefits of today's domineering social and technological arrangements while shielding themselves from the adverse social and environmental side effects of their operation. Their definition of efficient action, therefore, is quite different than other segments of humanity. Effectively, the ontological view of these elites reduces the rest of humanity and nature to passive inputs to narrowly defined efficiency equations and leaves them subject to all resulting social and environmental consequences. In effect, according to philosopher Andrew Feenberg, both the capitalist and socialist elite has "established an inferiority from which to *act on* social reality, rather than *acting out* of a reality in which he is essentially engaged. Situated in this ideal social locus 'above' social processes, he 'positions' himself advantageously with respect to the independent operations of 'things' into which his world is fragmented, including the human communities in which he works and lives. Capitalist [and Socialist bureaucratic] practice thus has a strategic aspect: it is based not on a substantive role within a given social group but rather on an external relationship to groups in general" (Feenberg 1991). In other words, these select segments are pushing humanity and nature down a technologically mediated developmental pathway that supports their narrow self-interests but which is incompatible with the goals of sustainable development. Under these developmental conditions, the pursuit of what I call *narrower efficiencies are* the norm. Narrow efficiencies are conditioned by a reductionistic stance that embraces efficiency as an end in itself. Within this view, efficiency analyses start with the assumption that existing social and technological arrangements are the best

"progress" has to offer. It seeks efficiency improvements at the margins and in isolation. Since existing technological arrangements go essentially unexamined, narrow efficiencies seldom involve the organizational responses to social and environmental concerns that are necessary if sustainable development is to be realized.

Efficiency and Developmental Philosophy

If we are to understand the difference between broad and narrow interpretations of efficiency, we must look at the developmental philosophy that conditions their ontological contexts. Narrower interpretations of efficiency are "positively" and "negatively" conditioned by a biologized mixture of nineteenth century theology, philosophy, economics, and evolutionary theory that is driving a gap between segments of humanity, and between humanity and nature. I call this ever widening gap the *Antinomy of Darwinian Rhetoric* (Kuennen 1993, 1994), where antinomy refers to the Hegelian notion of the ever widening gap between subject and object in modern culture.

One side of the antinomy absolutizes humanity's role as active subject in its own development. This ideological position fails to recognize that there are natural limits to all actions that must be respected. Called the *Ideology of Conquest,* it gives philosophical ground to status quo developmental theory (i.e., development via technologies and technological arrangements that seeks to dominate social and environmental processes). Under this position, all social and environmental problems stemming from developmental operations simply signal technical problems easily solved by increased human ingenuity. A good example of this position in action is the National Academy of Science (NAS), Committee on Science, Engineering, and Public Policy's response to the prospect of global climate change (NAS 1991). The other side of the antinomy absolutizes humanity's role as the passive object in the development process. This ideological position fails to recognize what the Ideology of Conquest takes to the extreme—that is, humanity has an active role to play in its development. Called the *Ideology of Adaptation,* it gives philosophical ground to many radical and neo-conservative environmental groups who, by default, give up control of the developmental process to either the natural environment or "natural" market forces. In other words, these positions either withdraw from the developmental process in search of more primitive existences, or they passively adapt to the technological arrangements that "inevitable progress" gives them. Those who advocate submission to the natural environment include various anti-anthropocentric environmental movements such as Deep Ecology and anti-development critics such as Wolfgang Sachs. Those who submit to the "natural" market forces include neo-Malthusians like Garrett Hardin and neo-conservative economists like Milton Friedman.

Broader interpretations of efficiency, on the other hand, are conditioned by a developmental philosophy that recognizes that humanity necessarily has *both an active and a passive* role to play in the construction of its world. This developmental philosophy is called the *Theory of Coadaptation,* or *Coadaptationist Position* (Kuennen 1993, 1994). It understands that the world is a closed system with natural limits that must be respected when making choices between developmental possibilities. This understanding of limits is particularly important when considering efficiency options. More often than not efficiency options involve technological choices that hold long term consequences for humanity and nature, and adverse consequences are not easily resolved. This is the position taken by advocates of sustainable development.

Broad Efficiency and Sustainable Development

If we are to realize the goals of sustainable development, we must look to develop and implement broader notions of efficiency into our social, cultural, and technological arrangements. Unfortunately, the development and implementation of such efficiencies are consistently frustrated by the developmental status quo. This is so because broader efficiency pursuits require individuals and organizations in power positions to remove their ideological blinders and call into question the very social structures and cultural norms that currently empower them. Further, many otherwise supporters of sustainable development ironically undermine its goals by lending unwitting support to the developmental status quo. Among those lending unwitting support are many of the strongest supporters of energy efficiency. In their favor, many of these "unwitting" energy efficiency advocates recognize that more efficient fossil fuels technologies are not cure-ails. Rather, they see them for what they are, temporary fixes that can buy time for humanity to develop "softer" energy options. But good intentions aside, the reality is that their loud and often unexamined call for energy efficiency not only sustains the developmental status quo, but runs the risk of foreclosing on the goals of sustainable development. Their tendency to emphasizing narrow efficiency improvements in existing systems, channels monetary and intellectual resources away from the pursuit of broader efficiency options that could be manifested through new, more socially and environmentally benign technological designs, and a restructuring of humanity's now domineering technological arrangements. This artificially limits humanity's potential for realizing the goals of sustainable development.

Feenberg labels the artificial limitation of human potential through domineering social and technological arrangements "suboptimization." In his words, "[t]hese unrealized potentialities appear as vast *suboptimizations,* systematic underemployment of major resources, *as judged from the standpoint of the next stage* of development. These suboptimizations are due to the restrictions placed on technical and human development by the dominant economic culture. Only the development of a new culture that shifts patterns of investment and consumption can shatter the economic premises of the existing civilization and yield a better way of life" (Feenberg 1991). Policies that embrace efficiency in broader terms play off this notion of suboptimization. Environmentally, they recognize the obvious need to include environmental externalities in efficiency calculations. Economically, they recognize the need to take into account the "lability of economic culture" when entertaining efficiency choices. That is, they recognize the need to see the possibility y that more significant efficiency gains can be realized if we link "the ideals and interests of the underlying population in a more or less innovative standard of welfare" (Feenberg 1991). Finally, morally, they recognize the need for policies that "reconceptualize efficiency in the framework of normative choices" that speak to what it means to be human (Feenberg, personal correspondence, 1994). Only by viewing efficiency in such broad terms, can we begin to realize the sustainable developments possibilities—that is, new cultures situated in more vibrant natural environment, where human beings no longer find themselves alienated, and lead more fulfilling existences. A look at efficiency pursuits in action might give us better sense of the difference and between broad and narrow efficiencies, and the implications each hold for human development.

Efficiency and Public Policy

This section applies the concepts of broad and narrow efficiency to the goals and recommendations promoted in publications from two organizations, and to three general policy areas.

ACE3's Agenda

Chandler, Geller, and Ledbetter's ACE3 publication entitled *Energy Efficiency: A New Agenda* argues that the U.S. should aggressively seek increased development and use of more efficient fossil fuel technologies because, in the short term, they would allow us to protect our natural environment, strengthen our national security, and secure our economic future. In its favor, the *Agenda* says that the long term goal of more efficient fossil fuel technologies is to ease our "transition to renewable energy sources" (Chandler et al. 1988). But on closer examination, a question is raised as to whether this long term goal of the *Agenda is* compatible with its short term policies. After all, the *Agenda* argues for more "sulfur scrubbers and clean [coal] burning technologies" over renewable because "[renewable energy technologies are either too costly or can make only a small contribution to reducing... environmental problems over the next two decades" (Chandler et al. 1988). Statements like this beg the question: does the *Agenda's* notion of efficiency promise to bring humanity closer to sustainable development, or does it lead us further down our current domineering developmental pathway? I believe it is the latter, and a look at the underlying logic of the *Agenda* bears this out.

The logic behind the *Agenda is* appealing. Fossil fuel resources are finite and the continued use of them is environmentally undesirable. Energy policies that promote more efficient use of these resources can extend their life while lessening the adverse environmental impacts necessarily associated with the proliferation of the technologies that use them. Further, these narrow efficiency pursuits do not require us to rethink our current technological arrangements in any substantial way. Policy makers, therefore, like the sound of these arguments and are quick to embrace them, and organizations dedicated to maintaining status quo social, cultural, and technological arrangements are more than happy to hear them. The only problem is that such narrow calls for efficiency, though effective in the short run, run the real danger of permanently foreclosing on humanity's sustainable development options. A brief analysis of NAS's *Policy Implications of Greenhouse Warming–Synthesis Panel* emphasizes this point (NAS 1991).

NAS and Global Warming

NAS's *Synthesis Panel* offers a six-step policy position that represents a classic example of how narrow efficiency policies play to the developmental status quo. Step one, much like the *Agenda,* calls for the perfection of existing fossil fuel technologies. To be fair, NAS's *Synthesis Panel* does not rule out the pursuit of alternative energy technologies, but again, like the *Agenda,* it down plays their potential on the grounds that such "technologies are unable currently or in the near future to replace fossil fuels...". Research and development monies, it suggests, would be better spent pursuing, among other things, 'safe' nuclear power plants and more efficient coal and natural gas systems. Step two calls for new technologies that lessen the effects of global warming on human and natural systems. In other words, we should create domestic plant and animal species that can easily adapt climate changes, develop engineering technologies that ensure water supplies and secure coastal areas, and seek scientific techniques that guarantee diversity in nature. Step three argues for new climatic monitoring devices and enhanced knowledge of weather patterns. In step four, we are to seek knowledge improvements that enable us to identify

"adaptations that will be needed in the future" as global warming increases. Step five requires the development geoengineering options as contingencies in the event that "other efforts to restrain greenhouse gas emission fail. " These include geoengineering techniques that can screen out incoming solar radiation, alter cloud patterns, and create of CO2 absorbing bioorganisms. Finally, step six calls for the U.S. to take the lead in these endeavors (NAS 1991).

The *Synthesis Panel's* logic is clearly informed by Darwinian Rhetoric. It implies that humanity's dominant technological arrangements, though flawed, are still perfectible. Though increasing, the adverse side-effects of our developmental operations can be contained through marginal efficiency improvements in existing technological arrangements without major social, cultural, and technological disruptions. Since the *Synthesis Panel* mentions renewable only in passing, I infer that the panel does not view energy efficiency as a stop gap measure that buys time for a transition to non-domineering renewable. Rather, energy efficiency is designed to buy time for science and engineering to gain the knowledge necessary to create technologies that will allow humanity—specifically, elites in the U. S., and perhaps the rest of the developed world—to adapt to the increasingly adverse side-effects of continued fossil fuel use. According to the *Synthesis Panel,* humanity does not need to change its dominant social, cultural, and technological arrangements in any significant way because we will eventually develop the ability to alter the earth's natural processes and neutralize the side-effects of our domineering technological arrangements. Embedded in this line of argument is the understanding that "safe" nuclear reactors will be on board to fill our energy needs if we fail to develop non-domineering technologies before our fossil fuel resources run dry. Energy efficiency for the *Synthesis Panel,* therefore, reduces to a means for maintaining the developmental status quo.

U.S. Transportation

The U.S. transportation system offers perhaps the most obvious example of how broad efficiency pursuits differ from narrow ones. The adverse social and environmental side-effects of private, fossil fuel driven transportation devices are given. Even so, the U.S. remains committed its current transportation system. Entire cities have been, and are still being transformed and countless miles of country side have been, and continue to be overturned to preserve its dominant place in U.S. culture. The private transportation device, it seems, has coopted the organizational value of free movement and has transformed U.S. society into a rigid structure designed to meet its specific needs. The hegemonic control of Darwinian Rhetoric so mystifies this technology's role in our development that all too many of us are now incapable of recognizing that alternative transportation systems are still possible. This is not so with the broad efficiency and the Coadationist Position.

In simple terms, broad efficiency recognizes that the answer to the question of easy geographical movement does not have to be fulfilled via polluting devices such as fossil fueled automobiles. Such needs can be more efficiently satisfied via less domineering technological designs. The point is that efficient movement can take the form of mass transit, electric cars, home based work via computer networks, and/or urban designs that bring feet back into vogue. These forms of transportation seek to meet many human goals at once, instead of trying to meet each individually. This is the key to broader notions of efficiency. In broad terms, problems associated with a fossil fuel driven transportation system are not addressed through more "efficient" versions of existing technological structures. Simply increasing fuel economies of automobiles will net humanity nothing if the "more efficient" models are embraced in large numbers by developing countries such as China and India. To effect energy resources and the environment quality, increased energy efficiency in transportation must be viewed from, and addressed as an organizational and cultural issue. Similar questions arise when considering narrow efficiency pursuits in utility demand side management and renewable energy.

Demand Side Management

When considering efficiency pursuits such as utility DSM, legitimate questions can be raised as to whether DSM constitutes environmentally responsible energy policy, or simply reduces to a means for utilities to profit on the down side of the long term fossil fuel supply curve. This dual character of DSM is not trivial. One side defines DSM in broad terms, the other more narrowly, and each leads humanity into different futures. When taken as a broad efficiency pursuit, DSM represents a means for easing humanity's transition to a non-domineering, renewable energy future by incorporating broader social and environmental goals into our current energy system. When taken narrowly, DSM becomes a means for prolonging the life of a domineering, rigid, highly centralized power system, and leaves humanity vulnerable to the nuclear option as fossil fuels run out.

For example, the logic of narrow efficiency is being followed in DSM pursuits when utilities concentrate their DSM activities in the area new home construction. These sales promotion programs not only tend to de-legitimize DSM as an efficiency pursuit, but they also go against the goals of sustainable development. By catering to middle and upper market segments at the expense of the lower

income segment, these programs go against the goal of intrasocietal justice. By focusing on market expansion, these programs perpetuate the domineering power systems, while denying the need to conserve fossil fuels for future generations and use by developing countries. As such, they violate the goals of intergenerational and interregional justice. Thus, from an organizational or societal standpoint, DSM programs that focus on new home construction are often counterproductive and non-sustainable.

On the other hand, when utilities put their DSM efforts in areas such as low income weatherization and appliance programs, or seek to make a direct connection between DSM and non-domineering renewable energy sources such photovoltaic technologies, utilities are clearly taking a broader view of efficiency. Low income weatherization programs not only reduce the energy burden of those most in need, but they produce jobs, reduce system demand, and result in environmental benefits as well. These effects are in keeping with the multiple goals of sustainable development. Further, when utilities combine DSM programs with renewable energy technologies, they are clearly exploring avenues to sustainable futures. But as we shall see in the next section, not all links between efficiency and renewable energy are equally desirable. Rather, renewable energy technologies, like all other technologies, must be evaluated with respect to higher human ends.

Renewable Energy

The choice to move to renewable energy based societies in the hope of realizing sustainable development is not a simple one. Not all renewable energy technologies support sustainable development's goals. Rather, renewable energy technologies such as large scale hydro and nuclear are as domineering, rigid, and authoritarian as the fossil fuel technologies they seek to replace. This problematic character of renewable energy must be taken into account at every juncture if we are to ensure that we are moving along sustainable development's pathway. Blind pursuit of renewable threatens sustainable development in that it could very well give our domineering technological and social structure a perpetual energy machine on which to maintain its hegemony. Renewable only make sense when they are combined with policies designed to bring about the non-domineering technological and cultural transformations that are a necessary condition for realizing the goals of sustainable development.

The dual character of renewable energy is too often overlooked in renewable discussions. Even Johansson, Kelly, Reddy, and Williams, editors of the seminal work *Renewable Energy: Sources for Fuels and Electricity*, fail to grasp, or fail to make clear, this point. Though they recognize that the goals "of sustainable development cannot be realized without major changes in the world's energy system," they ironically go on to offer over 1000 pages of highly technical arguments that imply that these "major changes" can take place with relatively little disruption in our current social, technological, cultural arrangements (Johansson et al. 1993). But, on the face of it, this cannot be so. If renewable are pursued within a narrow efficiency framework, they will simply be incorporated into our domineering technological arrangements. To be legitimately sustainable, we simply cannot think of them as replacements for existing fossil fuel technologies within an unchanging society. Rather, they must be viewed as part a new set of socially beneficial and environmentally benign social, cultural, and technological arrangements. This will require renewable policies that not only embrace new technologies but ones that seek to redefine and redirect our self-interested cultural values. We cannot simply look at society as it exists and ask how renewable can be designed to fit in. Rather, we must look at the goals of sustainable development and ask how society can be transformed so renewable can meet our energy needs. This was pretty much Lovins' point more than fifteen years when he argued for humanity to take "soft energy path" (Lovins 1977). This point still holds true today.

Conclusion

This paper has raised questions concerning different definitions of efficiency and the implications they hold for realizing the goals of sustainable development. Its discussion of the ontological relativity of efficiency and its connection with developmental philosophy has underlined the problematic character of efficiency by showing that not all efficiency pursuits are equally desirable. Rather, efficiency pursuits conditioned by narrow self-interests are more often than not counter-productive and inefficient from a societal or organizational point of view. On the other hand, efficiency pursuits conditioned by broadly held social goals promise humanity higher efficiencies and a means for moving to more sustainable societies. For those energy efficiency advocates who see energy efficiency as a transitional tool for realizing sustainable development, the task at hand is clear. We must step back and critically ask ourselves if the policies we advocate bring us closer to sustainability, or simply maintain the status quo.

Acknowledgments

I would like to thank Willett Kempton for his support, encouragement, and thoughtful comments on earlier drafts of this paper.

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