TRANSFORMATION OF ENERGY SYSTEMS AND THE PUBLIC

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Much recent discussion worldwide has centered on the need for rapid deployment of new energy technologies although this debate as yet has been narrow and limited. A key issue in the embrace of any new technology will certainly involve questions of public acceptance. Whether it is a “second renaissance for nuclear power,” a major dash to embrace hydraulic fracturing and natural gas, or the emerging prospects for renewable energies like wind and solar power, little is still known about how diverse publics across the globe will respond to the advent of these new energy sources. Complicating all this is a growing debate about old energy sources, and the extent to which a fossil-fuel based energy system should be central to the world economy and its incompatibility with international efforts to address climate change. An enhanced understanding of the issues involved in public acceptance will be central to any international progress.

In the midst of a global economic downturn and rampant unemployment in a number of countries, the vision of new technologies beckons. The nuclear dream appears in a new guise—the “second nuclear renaissance” of a safer and more acceptable technology, and the prospect of decentralized nuclear reactors operating at a community or neighborhood scale. Searching for a bridge to an energy system that has moved beyond fossil fuels, fracking has burst upon the energy arena as a salvation with abundant supply and an energy source with potential to reduce greenhouse gas emission by roughly 50 percent as compared to coal. Meanwhile,

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renewable energy sources—especially wind and solar energy—continue to be touted as long-term solutions for achieving a low-carbon economy as the new German national energy policy has indicated. Accordingly the race is on to assure that the needed technology will be there. Even in the midst of financial austerity.

Not all of these new energy ventures are technically new technologies, however. Some are new applications of existing or old technologies. Windmills have abounded for several centuries. Fracking involves different processes for liberating natural gas from shale formations but established technologies have largely been the instruments of capturing the new energy source. Even the exploration of decentralized nuclear plants has largely drawn upon existing technology but oriented new deployment at a different scale.

Accordingly, issues surrounding public acceptance are not simply about the adoption of new and unfamiliar technology, but also new and unfamiliar applications of familiar technology. Uncertainty plays a major role in how technology adopters and various policies respond to what are likely unfamiliar risks, and uncertainty plays a major role in public response. Lack of experience inevitably contributes to large and multiple uncertainties in the appearance of these new technologies and new applications. New deployments occur while data are often scarce. While modeling is an intrinsic part of characterizing new benefits and risks, the models are often early in development and model parameters still rudimentary and incomplete. Even what may be termed “deep uncertainty” --- the limited knowledge of the basic phenomena --- may often more of a major problem. Underlying these various issues is a focus on developing the needed technology or application and not whether the social dimensions of what is at heart a social-technical system is in place to support rapid and effective diffusion of some new energy pathway. Clearly, system approaches are needed that integrate potential risks and benefits across multiple sectors and stakeholders (Ram 2011).

No problem is more stark, troublesome, and problematic than that of public acceptance. We know from past risk studies that there is often a marked divergence between expert scientific assessment and public perceptions. At one time, it was
often believed that publics were ignorant and the gap could best be narrowed by more education, still a favorite solution of many experts. Yet subsequent studies have revealed quite conclusively that publics are not irrational—they can rank risks, for example, in an orderly and consistent manner (Slovic et al., 1979, 1980). But it is also clear that publics assess technologies and applications in a very different manner than experts do—they consider, for example, ethical issues that may be involved, the trustworthiness of managers, and the adequacy with which they have been consulted and decisions made.

Uncertainty and complexity of new energy technologies greatly complicate the risk issues. Siting is where the rubber meets the road in the deployment of new facilities, energy or otherwise. So we have discovered, sometimes to our pain, that there may be benign and supportive attitudes at a general level toward renewable energy facilities, such as wind, solar, geothermal and biomass facilities, but when location and actual local development begin, it is not unusual for new concerns to surface. In overly simplistic and often misleading terms, this is often referred to as the so-called “NIMBY” syndrome—people object to any risk as long as it is in their backyard rather than someone else’s. This is, in fact, often a well-honed means of “blaming the victim.” And so, if there were deficiencies in the risk communication or public participation processes, blame is not shifted to the manager or the process but remains on the “victims.”

**Stakeholder Involvement**

Everywhere the call is out for “stakeholder” involvement as a means for improving public acceptance and developmental decisions, particularly those involving complex technology, uncertain risks, and conflicting values. So various reports of the National Research Council (NRC) in the United States have highlighted stakeholder participation as a central element in a well-orchestrated policy of seeking public acceptance for new policy or technology solutions. Stern and Fineberg (1996), for example, in their influential report *Understanding Risk*, give a prominent place to deliberative processes which they see as central for “developing
the understanding required to inform decisions”. These views have been reaffirmed and expanded in the NRC’s recent reports on *Science and Decisions* (2009) and *Public Participation in Environmental Assessment and Decision Making* (2008). Internationally, major assessments of global environmental risks, such as those of the Intergovernmental Panel on Climate Change and the Millennium Ecosystem Assessment, have recognized widespread stakeholder participation as essential for addressing world-wide environmental threats, new and old. Even in remote villages in China, India, and sub-Saharan Africa, the call is out for greater local involvement in decisions made at higher levels of government that affect local peoples’ lives and their human security. There is great faith that broader public participation will increase public acceptance and make ongoing decisions better informed and more sensitive to local conditions, limit the power of elite interests, and assure greater implementation of needed projects and development.

The stakeholder involvement imperative abounds with allusions to democratic ideals and principles and the good things assumed to result from such exercises. Implicit throughout is the notion that broad public involvement is the principal route to improved decision making, especially where the risks are controversial and disputed. Outcomes to be expected, it is claimed, include increased trust in experts and decision makers, greater consensus among publics and between science and politics, reductions in conflict and controversy, greater public acceptance of preferred solutions, and increased ease in implementation. In this light, it is not surprising that public involvement is becoming routinized and a standard component of risk deliberations, while a host of consulting institutions have emerged to provide the analytic support that environmental managers require and, of course, to exploit a new lucrative opportunity.

**Beyond Stakeholder Involvement**

But the impediments to transforming energy systems and deploying new technologies are formidable, pervasive, and often underestimated, and go well beyond stakeholder involvement issues. Perhaps it is not surprising that there exists
an expectation that there will be ready acceptance of new energy technologies. After all, people increasingly point to the historical embrace of coal technologies in the U.S. where mountaintops were casually removed, or in China where air pollution threatens human health and environmental damage to lakes and streams is widespread. But it is now well known that there may be historical differences as well, given changing attitudes across countries to technology. New and unfamiliar risks often involve perceptions of dread and severity and cause high concern over the risk among publics. These issues reflect a basic tendency of laypeople to assess risks using a different, and often broader, framework than do experts. As a result, risks newly appearing in the mix of energy options may generate concerns that are not likely to be easily assuaged by information and assurances from experts and managers.

**Social Trust**

Further complicating this impediment is the long-term decline in social trust in many societies. Social trust provides the essential lubricant for the concert of changes required, especially the base of supporting public values needed for the wrenching changes that adoption of new energy technology may sometime involve. Where trust is in short supply, needed institutions, behavior, cost and price adjustments, and social value change may be difficult to achieve.

Social trust is a complex concept and certainly multidimensional in its nature—competence, predictability and caring all enter in and are sometimes in consonance and at other times in conflict (Kasperson, 2004). For example, early release of risk information is certainly essential to provide evidence of a manager’s openness and caring. But if the provided information is found in subsequent studies to be flawed and/or misleading, then distrust rather than trust is likely to be the result. Those at risk need to believe in the high scientific quality of analyses and managers (Siegrist et al., 2007). So the manager’s interactions with stakeholders and particularly risk-bearers are always fraught with potential risk to social trust.

Where does social trust come from? It is often assumed that if a manager behaves in a trustworthy fashion, that greater social trust will be the result. But this
may not be the case (Flynn and Løfstedt, 1999). While personal experience with particular institutions or managers can be a driver of greater social trust or distrust, the long-term erosion of social trust in many societies makes clear that trust is build and lost systemically. There is much evidence that new energy technology in many countries, for example, will need to proceed under conditions of high distrust. Indeed, trust in corporations is at an all-time low in many countries. There is little reason to believe that substantially greater social trust will soon appear in many countries, whatever the urgency of energy security and global climate change.

Complicating the paucity of social trust are the ethical and equity issues that arise in the adoption of new energy technologies. Energy technologies are not value neutral; all have varying combinations of distributional and generational issues. Often these issues remain implicit and are not openly discussed. Geothermal energy carries localized risks but benefits occur over broader regions. Fracking has similar distributional disjunctures but may entail generational issues as well. To the extent that solar and wind technologies contribute to reducing climate change, the benefits are global in nature as well as national. These issues need to be explicitly raised and addressed—they are not matters of technology innovation and robust engineering systems --- and the public processes that are used to address them are very important.

This highlights the problem of determining “acceptable” or “tolerable” risk. It is too often assumed that judging whether the risk is too much and must be reduced is a matter of science. It is not. From experience and comparative analysis it is well established that such issues always involve public values. We also know that the acceptability of risk varies with the magnitude of perceived benefits (Starr, 1969) and whether the risks the voluntary or involuntary (Slovic et al, 1979). Again, the process of assessing public values will be critical and requires a sustained commitment.

Given the array of challenges facing efforts to win greater public acceptance and to draw social science thinking into the process, it is clear that major efforts in capacity-building in most countries are needed. Previously, little social science
expertise has existed to address risk assessment and public acceptance processes. Accordingly, public acceptance is often seen as primarily an outreach effort to be undertaken by advertising and public relations (PR) officials. The major government entities at all levels of government in most countries tend to be staffed by engineers, biophysical scientists, and lawyers. That has been the makeup of many governments over the past several decades and is unlikely to change soon, since the hiring process tends to reproduce existing expertise. Accordingly, understanding how people and social institutions behave in a social-technical system is essential. What we do know is that the most difficult problems in the deployment of new solutions and technologies are rooted in social issues and public acceptance and are unlikely to change anytime soon.

The process issues referred to in many of these problems highlight issues of collaboration, stakeholder participation, and risk communication. Elsewhere we have described the overall process as the “social amplification of risk” (Pidgeon et al., 2003). Identifying an alternative decision process may be an effective means for moving forward effectively. Public acceptance is a key issue in transforming the energy systems toward an alternative vision and requires as much attention as developing the needed technology. So here we list major steps that are needed if countries are to achieve energy technology transformations and a flow of new innovations:

- early efforts through surveys, interviews, and focus groups to define a baseline of public concerns and public perceptions of risks;

- a national commitment to an alternative energy future, with supporting justification in climate change and energy security (American Academy of Arts and Sciences, 2011);

- collaborative approaches to assessment and decision-making, particularly in a context of meager social trust. If social trust is low, empowerment of those communities host the facility and bear the risks is essential;
• closely related is the recognition that public acceptance of new energy facilities at particular sites will require a consent-based approach rather than the imposition of risk by decisions made by others (as the cooperative development of wind power in Denmark shows);

• important in this process will be active public involvement in the monitoring of facility performance and impacts on the community and local ecology. If risks prove to have been underestimated and facility performance fails to meet regulatory standards, provisions should be provided by which local officials can petition for or effect closure of the facility;

• evaluation, jointly arranged by the developer and the host community, should be ongoing through the stages of site development—planning, construction, operation, and decommissioning. This evaluation should involve serious peer review, as designed by experts, regulators, and state and local officials. Evaluation should be seen as a key element in mid-course corrections and adaptive management.

• Building greater social science capability in risk management issues is a pressing need that requires extraordinary measures. Long-term initiatives should be put in place to building a capability now lacking in government and private agencies in many countries at all levels.

While there is no assured process for success in public acceptance, and greater stakeholder participation does not guarantee better decision (Dietz and Stern, 2008), meeting existing regulatory requirements by no means carries promise for the adoption of new energy technologies and applications. Probabilities for success improve greatly with serious early attention to and investment in achieving public acceptance.
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REFERENCES


