Integrating energy's human dimensions into transition planning

Clark A. Miller

Director, Center for Energy & Society
Sustainability Director, Quantum Energy and Sustainable Solar Technologies (QESST)
Photovoltaics Engineering Research Center







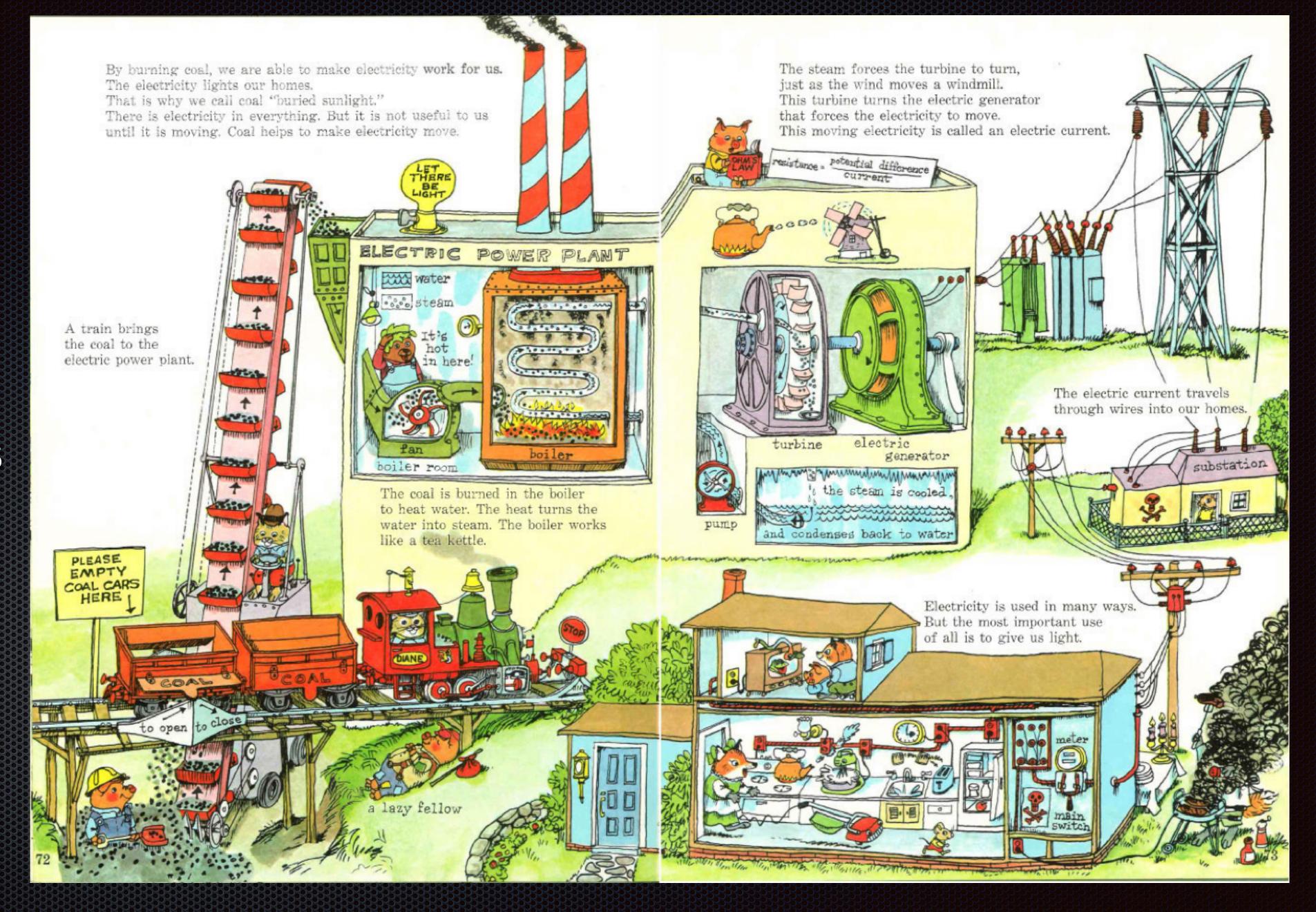
People

permeate

energy systems.

Energy transitions

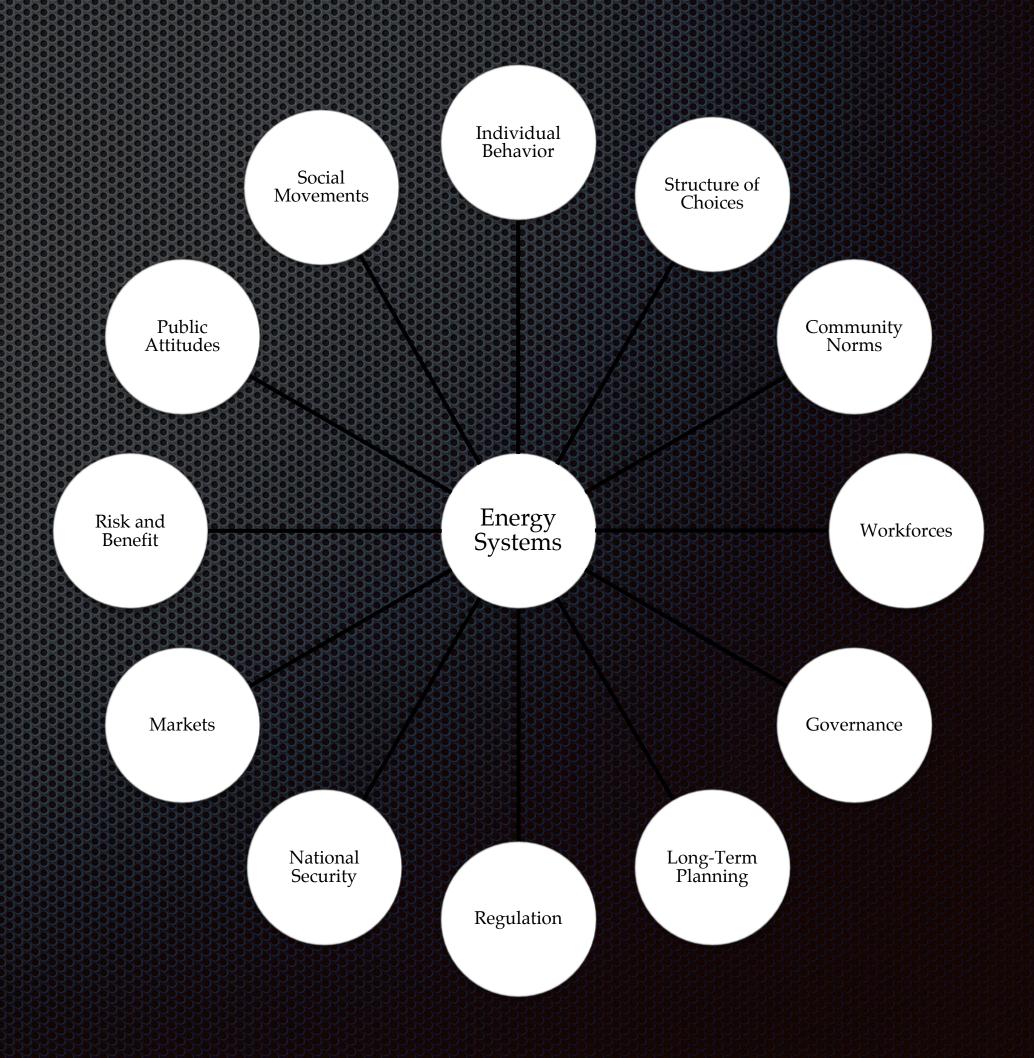
penetrate every
facet of
human-energy
interactions.



Richard Scarry, What do people do all day? Unabridged edition, 1968.

Put simply, changes in energy systems are reciprocally linked to changes in human systems

- As drivers and as outcomes
- Among communities of producers, consumers, and users
- For workers, managers, supply chains, and stockholders
- At scales from the individual to the community to the nation to the globe
- Directly and indirectly, through markets, societies, and environments



"The world's energy system is at a crossroads. Current global trends in energy supply and consumption are patently unsustainable—environmentally, economically, socially."

-International Energy Agency

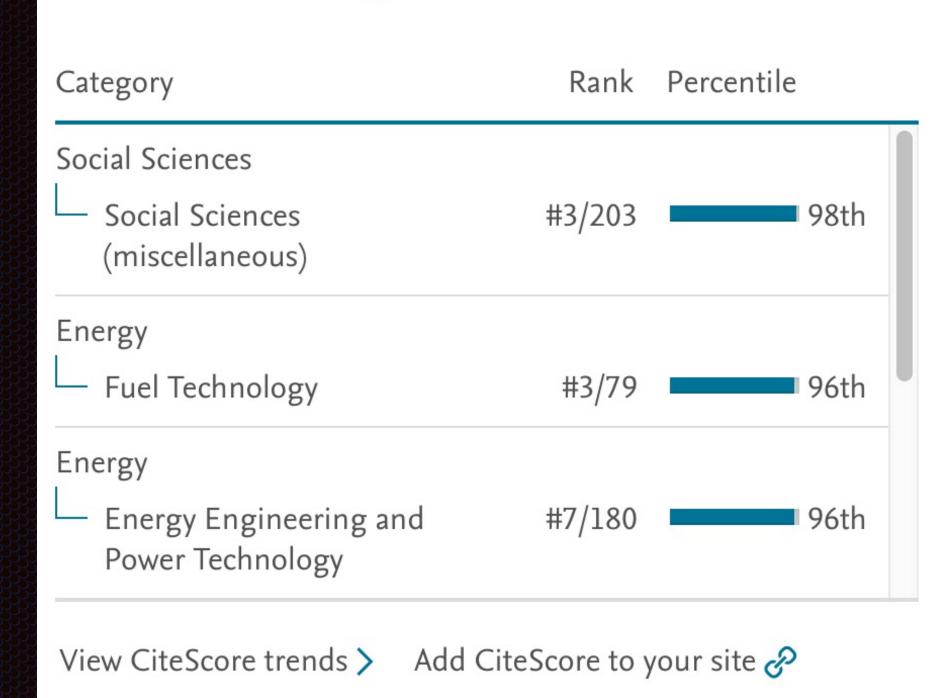
Today, energy's human dimensions are exploding in every facet of energy transitions

- Rapid shifts in the geographies and technologies of oil and gas production
- The introduction of renewable generation into the global energy mix
- The prospective of shifts from gasoline to battery-powered vehicles and from individual drivership to ride-sharing robots
- The rise of inexpensive distributed energy technologies
- The voracious demand for energy in the information technology sector
- Introduction of smart energy management tools, systems, and homes

The scale and impact of research on the human dimensions of energy transitions is growing rapidly









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Forum on Energy Transitions

13,000 views 328 citations

Social scientists and humanists are examining the **social** drivers, dynamics, and outcomes of energy transitions

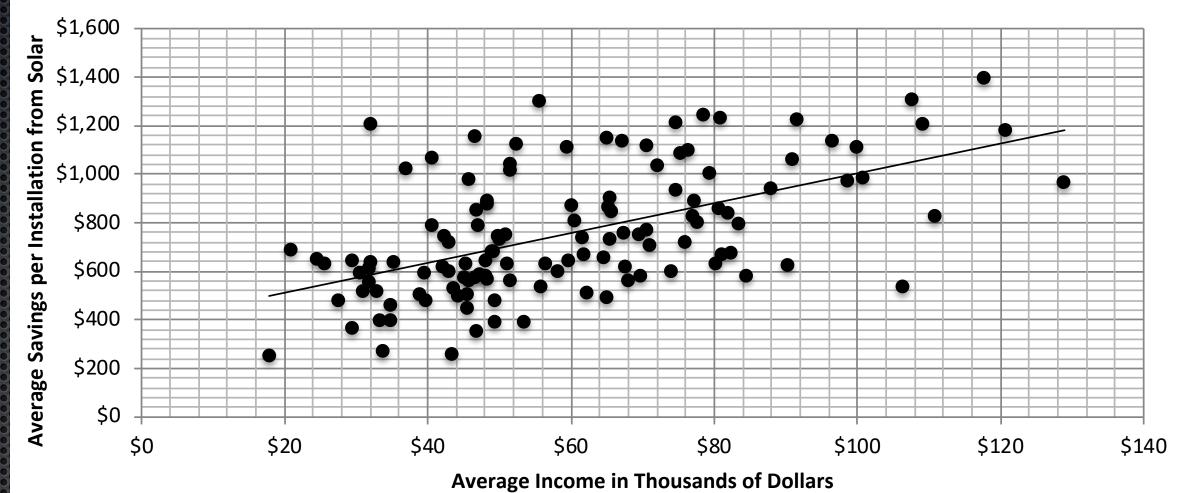
- Economics, psychology, and sociology of shifting markets, behaviors, and inequalities
- Geographies of changing energy landscapes and patterns of socio-economic vulnerability
- Ethnographies of energy cultures, indigenous energy politics, justice, and human rights
- Geopolitical analyses of energy, power, and security
- Tools for effective communication of consumer opportunities and societal risks
- Strategies for managing and governing energy and industrial transitions

Key insight for energy innovation:

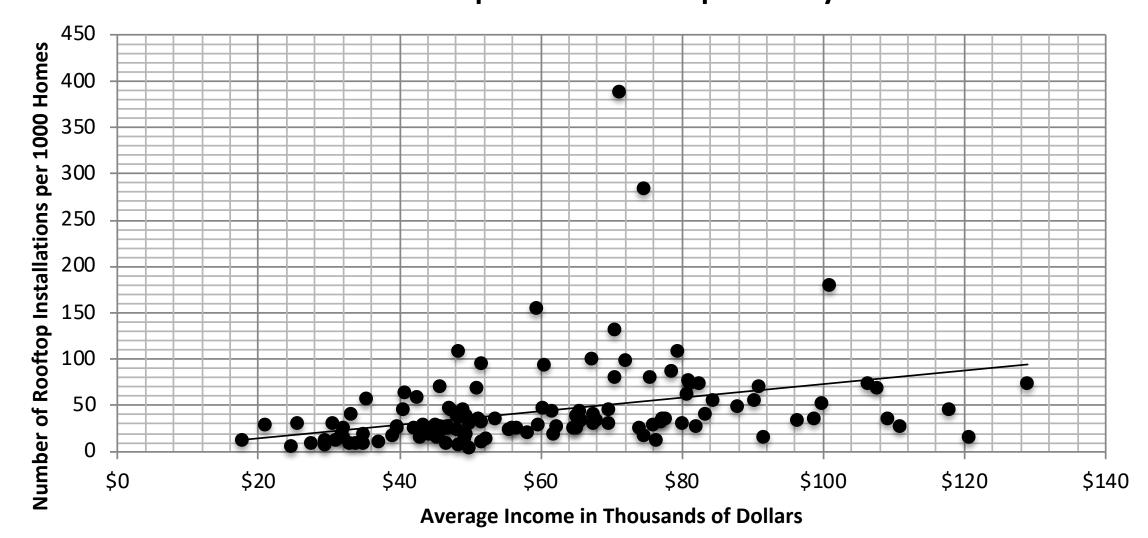
The social, economic, and political **design** of energy projects has significant implications for many facets of energy transitions.

(Hint: solar vs. solar is just as important as solar vs. coal)

Average Annual Savings from Each Rooftop Solar System Installed for Each Zip Code in Maricopa County



Number of Rooftop Solar Installations per 1000 Homes for each Zip Code in Maricopa County



4 pivotal questions for transition planning

1. Who is vulnerable to energy transitions?

- How will energy transitions alter the costs of or access to energy services?
- Who will bear the burdens and risks of new energy regimes? How will these be distributed within and across groups? Where are these concentrated?
- Will energy transitions exacerbate existing social, economic, or political inequalities or insecurities?
- How do infrastructure risks (e.g., to economic or environmental change) translate into socio-economic risks?
- How can we act proactively to minimize social and economic dislocation from large-scale energy change?

2. How can the societal return on investment of energy transitions be maximized?

- How can human societies make the most of the \$40 trillion the IEA estimates will need to spend to meet future energy needs sustainably?
- How can energy innovation be designed to achieve social goals, e.g., eradicating poverty, improving health and wellbeing, and enhancing thriving?
- Can thoughtful employment, procurement, ownership, and revenue sharing models expand local reinvestment from energy innovation?
- Can the energy sector reverse current patterns and become a force for reducing global inequalities and improving human rights and democracy?

3. How can the human **complexities** of energy transitions be managed effectively?

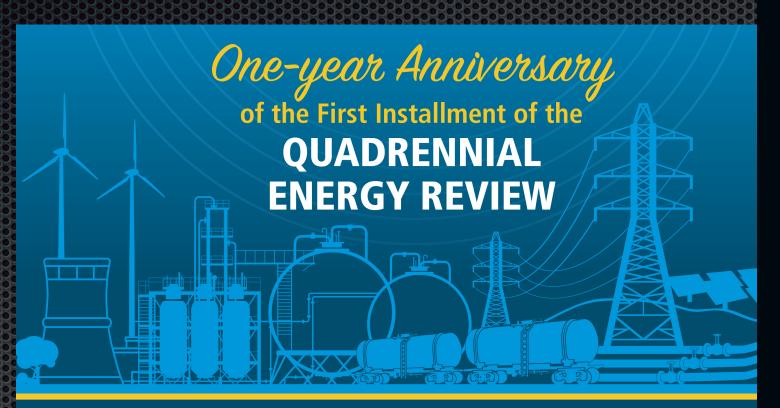
- How can the human dimensions of energy systems be better visualized and modeled?
- What kinds of transition policies, management strategies, and regulatory frameworks work best to accomplish which goals, under what circumstances? Are there lessons from the governance of other complex technological transitions? Are there lessons from history?
- What kinds of innovative business models would enable utilities to become active, strategic leaders of energy transition planning? Can new approaches to integrated resource planning help open up planning to more diverse stakeholders?
- How can cities facilitate energy transition planning across energy sectors (electricity, fuel, transport), policy domains (land use, tax, economic development, energy), and stakeholder groups (utilities, business, industry, publics)?
- How can publics be empowered as partners in energy transitions management?

4. What kinds of **future cities** and **societies** will be enabled and created through energy innovation?

- How can people be included into the foresight tools and scenarios used to imagine and plan for energy futures?
- What will energy transitions mean for how people live, work, and play?
- ➤ What will the late-21st-century equivalents look like of cities built for cars, petro-states, and 24/7/365 always-on, always-lit cultures?
- Will sustainable energy transitions provide meaningful solutions for the 3+ billion people currently living with inadequate energy systems?

Gaps exist in research to answer all of these questions.

Especially in the synthesis of what we know and don't know.



On April 21, 2015, the first installment of the Quadrennial Energy Review (QER) proposed 63 policy recommendations to inform the most pressing issues facing energy transportation, storage, and distribution.

46%

OF THE QER RECOMMENDATIONS MANAGED BY EXECUTIVE AGENCIES ARE COMPLETE OR BEING IMPLEMENTED ON SCHEDULE.

One of the greatest legislative accomplishments: authorization to raise

\$2 BILLION

IN FUNDING TO MODERNIZE THE STRATEGIC PETROLEUM RESERVE



Public Support for the QER

the Bipartisan Budget Act (BBA) of 2015.

HELPED INFORM FEDERAL LAWS, including

Fixing America's Surface Transportation (FAST) A



The QER process engaged a broad range of stakeholders across the Nation. These engagements ince 13 formal public stakeholder meetings and numerous technical workshops.

state and national ener organizations provided public statements of support for the QER.

The QER received widespread international attention. Over **30 countries** as well as the European Union were briefed on its findings.



















America's Energy Future

TECHNOLOGY AND TRANSFORMATION

NATIONAL ACADEMY OF SCIENCES NATIONAL ACADEMY OF ENGINEERING NATIONAL RESEARCH COUNCIL OF THE NATIONAL ACADEMIES No federal agency, philanthropic foundation, or energy company has systematically sought answers to these questions?

This is a significant oversight that exposes the US economy and democracy to potentially critical future risks.

Social questions are critical for energy transition planning in disaster aftermaths

In Puerto Rico, for example:

- Prior to Hurricane María, islanders exported \$3 billion per year to buy carbon, significantly exacerbating poverty, debt, and inequality yet, no change is likely under current policies
- No planning was done to consider sustainable post-disaster options for energy system reconstruction or short-term, emergency power provision
- The longest energy outage in US history is likely to decimate the island's economy
- According to the island's utility, 100s of communities may never be reconnected to the grid, yet no planning is being done for an "outside-in" plan to supplement grid reconstruction
- Major decisions about future energy systems, such as privatization, are being taken with little to no meaningful analysis of their implications for the people and economy of the island.
- Social and political unrest over energy policy is growing rapidly.





Thank you.

Clark A. Miller

Director, Center for Energy & Society
Sustainability Director, Quantum Energy and Sustainable Solar
Technologies Engineering Research Center
Associate Director for Faculty, School for the Future of Innovation in Society

PO Box 875603
Tempe, AZ 85287-5603
480-646-2663
clark.miller@asu.edu