WHAT HAS CHANGED, OR NOT, IN ENERGY REGULATION OVER 5 DECADES?

Introduction to Municipal and State Energy Forum Conversation

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THE ANSWER ACCORDING TO AI

FIVE DECADES OF ENERGY REGULATION: TRANSFORMATIONS, CONTINUITIES, AND THEIR IMPACT

EXAMINING CHANGES AND LASTING EFFECTS ON ENERGY POLICIES

MEETING PROGRAM

- Historical Overview of Energy Regulation
- Significant Changes in Energy Regulation Over Five Decades
- Continuities and Persistent Features in Energy Regulation
- Impacts and Implications of Regulatory Evolution

CONCLUSION

Energy regulation over the past five decades reflects a dynamic interplay of transformation and continuity, shaping the sector's evolution and setting the stage for future progress.

Dynamic Energy Regulation

Energy regulation has evolved dynamically over five decades, balancing change and stability in the sector.

Transformation and Continuity

The sector experienced significant transformation while maintaining essential regulatory continuity to ensure stability.

Future Progress

This regulatory evolution lays a foundation for continued innovation and progress in the energy industry.

THE ANSWER ACCORDING TO GERRY...

...who remembers energy regulation 50 years ago

EVOLVING NEED FOR INTEGRATIVE ENERGY REGULATION

Energy Regulation

Energy regulation has evolved **incrementally at the state level** over five decades, **from a narrow focus on cost recovery to broader concerns including grid planning, permitting and operations**, **with larger states creating regulatory capacities well beyond utility rate-setting.**

Transformation, Responsibility and Alignment

The sector experienced significant transformation while **energy utilities and state regulatory agencies took on additional responsibilities assigned via laws that incrementally adjust energy policies and programs to align them with state environmental and other goals.**

Impediments to Future Progress

Timely renewable decarbonization requires integrative decisions but is undermined by a process of "regulatory capture", which can result in utility plans and operations that are misaligned with public goals and energy customer expectations.

CALIFORNIA'S LEGISLATIVE/REGULATORY PATH TO CLEAN ENERGY - 1

- 1967 – California Air Resources Board established
- 1971 – CARB automotive NOx standards
- 1974 – Warren-Alquist Act – establishes California Energy Commission with resp. for power plant licensing and efficiency/renewables development
- 1978 – No new nuclear power without permanent storage
- 1977 – Building and appliance efficiency standards created with updates every three years
- 1982 – IOU rates of return decoupled from volumes; utility efficiency incentive programs established

CALIFORNIA'S LEGISLATIVE/REGULATORY PATH TO CLEAN ENERGY - 2

- 1991 – CARB establishes specifications and properties of reformulated, low emission gasoline.
- 1996 – PUC recommends electricity deregulation plan.
- 1997 – SB 90 deregulates IOUs and creates Public Interest Energy Research (PIER) program.
- 2003 – The CPUC and the CEC establish "the Loading Order" following 2001 deliverability crisis. Deliver on new demand with 1) Efficiency and Demand Response, 2) Renewables, and 3) Clean Fossil Generation and Distributed Generation.
- 2003 – Renewables Portfolio Standard enacted.
- 2005 – PUC orders $2.2B, 3-year Efficiency Procurement for IOUs

US ENERGY POLICY ADJUSTMENTS - 1

1975 - 1990

- PURPA implementation
- Natural gas deregulation
- Regulatory response to Three Mile Island and Chernobyl nuclear accidents
- State energy efficiency incentives and standards
- (Unregulated off-grid solar electricity markets)

1990 - 2000

- Electricity supply deregulation
- Independent system operators and regional transmission operators
- Solar electricity net energy metering legislation

US ENERGY POLICY ADJUSTMENTS- 2

2000 - 2010

- State renewable portfolio standard legislation
- California rooftop solar incentives
- State energy efficiency standards and incentives

2010 - 2025

- Renewable energy tax credit legislation
- Implementation of energy and climate legislation by state PUCs
- Public awareness of climate change
- State community solar legislation
- (Renewable equipment manufacturing in China)

MAJOR SHIFTS

1975

- **US is Net Oil Importer**
- Delivered electricity prices dominated by **generation** costs
- State and local regulation of **delivered energy price**
- **On-going shift toward domestic sources**, e.g., coal and nuclear electricity and subsidized domestic oil and gas
- **Nuclear and coal** at economic parity

2025

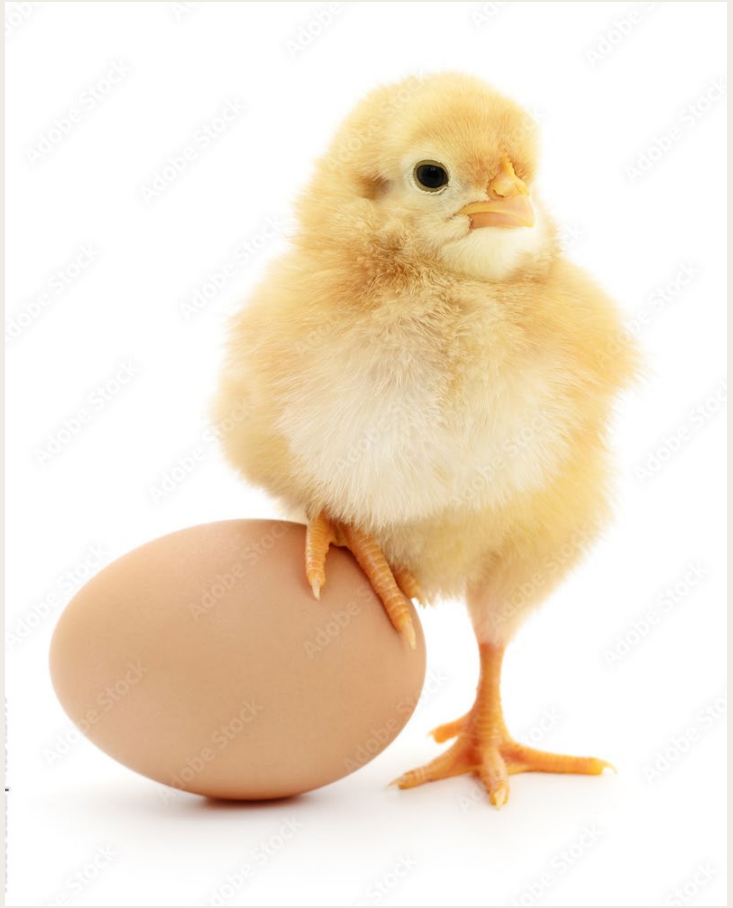
- **US is Net Oil, Gas & Coal Exporter**
- Delivered electricity prices dominated by electricity **transport** costs
- State and local regulation of **energy transport price**
- **Policy instability** regarding subsidized renewable electricity vs. subsidized domestic oil and natural gas
- **Renewable and natural gas** at economic parity

WHAT HAS NOT CHANGED

- Political processes at local, state and national levels have not changed fundamentally.
- While, thanks to the US Supreme Court, fossil fuel industries have unprecedented political influence at national and state levels, their influence is more than balanced at city and county levels by public social and inter-generational concerns that result in clean energy investments, advocacy and energy/climate-conscious behaviors.

(While it is important that renewable energy industries gain influence at national and state levels, decarbonization critically and increasingly depends on local action, so, it is equally or more important that locally active renewable industries gain influence regarding local goal setting and local energy and climate awareness.)

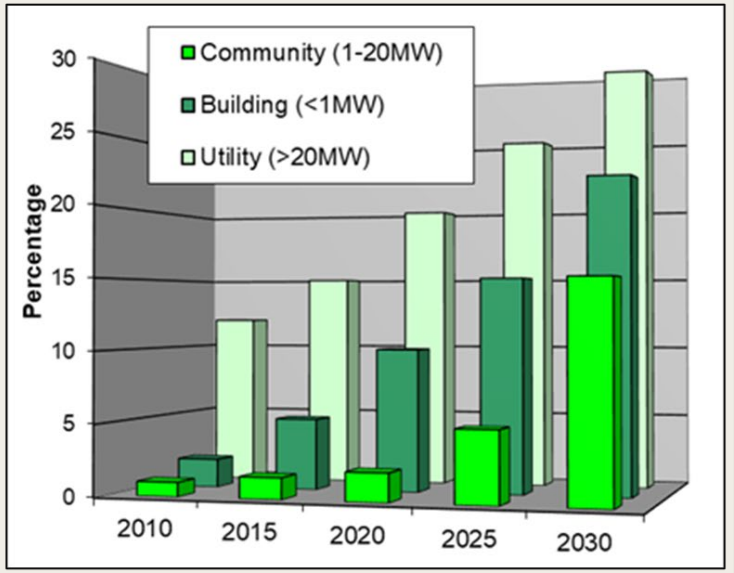
ACCELERATING SOLAR DECARBONIZATION RELIES ON SYNERGIES BETWEEN DECARBONIZATION AND DECENTRALIZATION



SOLAR DECARBONIZATION

Integrated Renewable Energy Systems Network
www.iresn.org

Gerald Braun



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https://www.researchgate.net/publication/397223354_SOLAR_DECARBONIZATION

UTILITY SOLAR DECARBONIZATION

The US is not on track to decarbonize its electricity use in the current century, to say nothing of eliminating its direct fossil fuel use. Nor is California whose per capita consumption is half the national average. The US currently consumes more than 4000 GWh of electricity annually. Roughly 2500 GW of solar capacity would be required to produce this amount, even ignoring electricity demand growth and battery and other losses. Full building and transportation electrification would potentially double or triple electricity consumption. **Assuming the current rate of annual capacity increases and current rates of electricity demand growth, full renewable decarbonization of electricity use in the US would require roughly a century even if building and transportation electrification were assumed not to continue and the inevitable need for power plant retirements and replacements is ignored.** Acceleration of utility scale renewable power plant deployment may be possible, but further deployment may also be slowed or delayed by suspension or termination of renewable tax credits.

ROOFTOP AND COMMUNITY SOLAR DECARBONIZATION

Local action and investment is crucial to solar decarbonization speed and scale in the US. Solar decarbonization will be enabled by US electric utilities and grid operators to an extent consistent with their legislated business models and investor expectations. **To the extent that deployment of rooftop, community and other decentralized solar supply capacities are subject to utility dominated state electricity rate regulation processes, solar decarbonization will proceed far too slowly in the US.** So, in the US it is essential that solar decarbonization also be enabled by 1) consumer and community adoption of products and systems, e.g., solar arrays and vehicle batteries, that are conveniently inter-operable with one another, and by 2) economically integrative local decision making and shared values of environmental and social responsibility.

LOCAL ENERGY AND CLIMATE ACTION

Solar and battery power plant deployment has been expanding in some US states, thanks to Federal tax credits and manufacturing scale economies. **But because transformation of existing electricity supply and delivery networks is inherently slow and constrained by the pace of utility energy transport infrastructure investment, timely solar decarbonization in the US will not be possible without local action.**

What makes local action possible? While corporations are, necessarily, guided primarily by financial strategies and goals, people and communities are also guided by shared values that include environmental and social responsibility. Even though national action can be undermined by climate denial, local energy action is enabled in many states by climate and environmental awareness.

IMPEDIMENTS TO ACTION

Fossil fuel politics determine the scope and pace of solar decarbonization in countries that rely on fossil fuel exports. Solar energy production statistics show that solar decarbonization is gaining traction in economically robust democracies that currently rely on fossil fuel imports. Politics, not technology and economics, will determine the process and progress of solar decarbonization in most democracies, as is becoming clear in the US.

The US is a major user and exporter of coal, oil and "natural" gas. Two decades ago, corporations were empowered by its Supreme Court to exercise political rights once reserved to citizens. **Now, large US fossil fuel producers can legally spend unlimited amounts of money to restrict solar decarbonization progress in favor of continued fossil fuel dependence. Meanwhile, "regulatory capture" empowers state regulated electricity transport companies to redirect economic rewards of local solar investment to their broader customer base.**

ELECTRIC VEHICLES, MICROGRIDS AND MICRO-MUNICIPALIZATION

Electric vehicles are the keystone among global solar decarbonization economic enablers. Rooftop solar and community solar in the US is becoming more economically, environmentally and climate effective as citizens and communities exploit electric vehicles and solar charging. Fortunately, the global automotive industry is relatively independent of regulatory controls that apply to energy transport. It can produce and maintain vehicles that enable economically efficient on-site integration of local and on-site solar and vehicle-based battery storage capacities. So, **vehicle-based battery storage is becoming a key enabler of local solar decarbonization globally**.

Local investment in microgrids, operating independently of utility grids can also enable solar decarbonization, at least until electric utilities begin proactively integrating electricity distribution assets with locally owned solar supply and battery storage. Micro-municipalization may be an option in states that, like California, require that all new residential buildings have rooftop solar.