



Integrated Resources Network

“Change does create winners and losers. For climate change losers, the result is tangible, i.e. an existential emergency. The larger emergency escalates as more and more people and communities find themselves in the loser column. It becomes a patchwork of local emergencies. The most feasible, and also most timely, response will be a patchwork of decarbonization action, locally and democratically determined.”

Mid 2016 Report – Cities, Micro-grids and The Climate Emergency

The Patchwork Project

Energy folks like to speak of grids, systems, supply chains, etc. Energy systems on which industrial civilizations have come to rely are a fabric woven of threads interlaced vertically and horizontally. The energy fabric enfolds our buildings, vehicles and vital services, including food and water supply. We would be unwise to unravel the fabric in order to replace the threads. Better to view it as a backing on which to stitch patches that can



quickly cover it and at the same time make it more humanistic and resilient. This urgently needed effort could thus be termed “The Patchwork Project”.

The paragraphs below touch on some types and purposes of patches we need to be cutting and stitching together. Every local patch will look similar to others from a distance, but quite different up close. Some bigger, some smaller, ala mega-cities, villages. But patch we must, and time is getting short. Ominously, the planet does not appear to be waiting for our emergent half-serious, partial-solution promises to be kept.

Are they even serious? Typical time horizons for state and national goals, ranging from 2030 to 2050, are well beyond the remaining career or planning horizon of any incumbent national politician or legislature. Easy promises to make, and no sign of realistic implementation plans. Set a goal, clear your conscience and get back to getting re-elected.

This approach isn't going to cut it as warming impacts begin to really bite. Our hope has to be in the patches. That they will fit. That they will stick. That they will

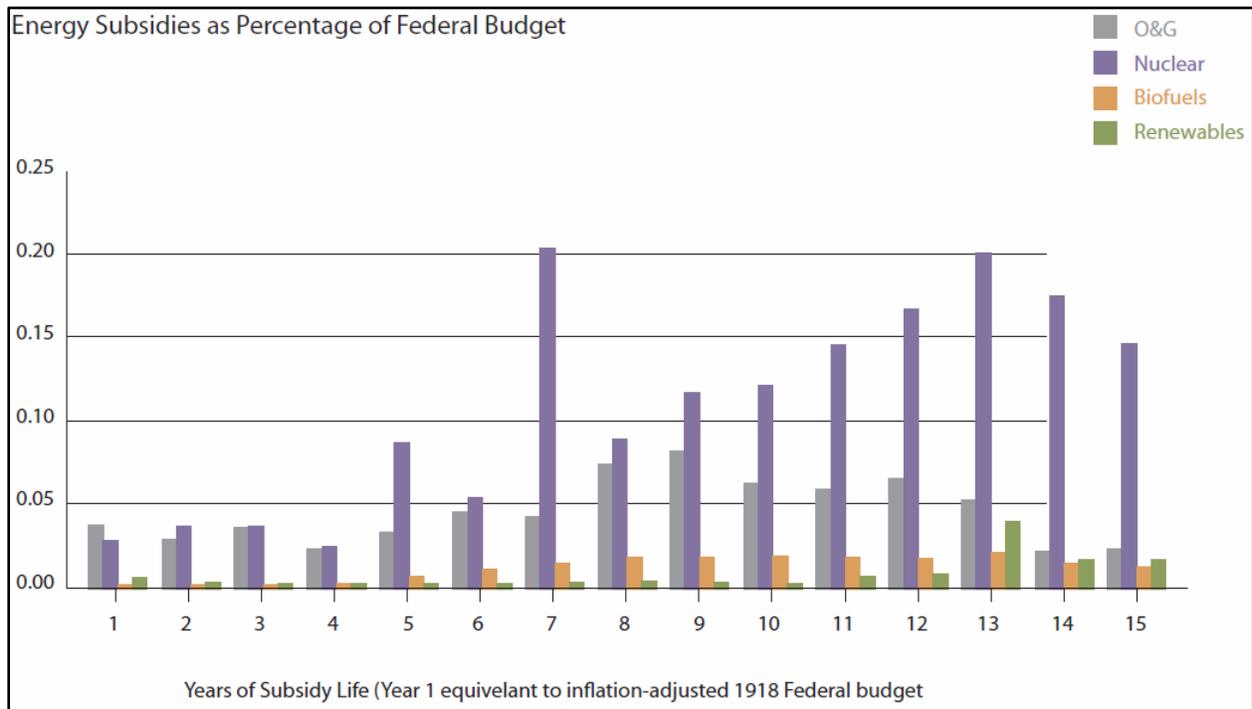
somehow add up to more decarbonization over the next decade than the cumulative carbonization the human experiment unintentionally accomplished over the past three.

The following paragraphs will take a look at some specific patches. First, let's clear away some old mythology that distracts from timely and sensible patchwork. Specifically...

Renewable Energy Subsidies

They are relatively new and making a lot more difference in some states than in others. Are they an unprecedented budget buster?

[Stan Hazelroth](#) did some digging into the relative scale of and timing of energy sector subsidies. All energy sources are subsidized, albeit haphazardly, and in retrospect in some cases over-generously. [Stan's article](#) concludes that "renewables now offer better prices than fuel based generation resources, especially if subsidies for both are extinguished completely". Timing and design matter a lot. Renewable power incentives in 2009 economic stimulus legislation were a game changer, especially for "utility scale" renewable power. Now, timely and appropriate incentives can turbo-charge inherently even faster-moving local clean energy resource deployment.



Community Choice Energy

In 2015, Davis, California decided to offer electricity supply choice, aka [community choice energy](#), to its residents and businesses. The question was how best to do it. A [consultant study](#) showed that collaboration between Davis and Yolo County would achieve the best result. Both jurisdictions approved the approach in March, with a target for initial service starting in May/June 2016.

A CCE's right to purchase electricity on behalf of the communities it serves also creates unprecedented opportunities for more rational, cost-effective solar and other decentralized energy deployment and economic optimization. For example, rooftop solar is economically viable in Davis. 25% of Davis' single family homeowners already have opted for it in spite of rules that lead to smaller and therefore economically sub-optimal rooftop systems.

Under these net energy metering rules, rooftop systems may not be sized to produce more than the recent annual historical electricity usage of the home under the roof. Any "[net positive energy](#)" produced annually as a result of efficiency investments is credited by the local grid owner at less than half its actual market value, thus reinforcing downward pressure on system size.

Among the consequences, as climate conscious home-owners with rooftop solar arrays invest in heating systems and vehicles that substitute electricity for natural gas and petroleum, they effectively increase share of their electricity use powered by grid electricity and decrease the share powered by solar.



Visualization of recently announced solar micro-grid for the port of Los Angeles http://www.pv-magazine.com/news/details/beitrag/port-of-los-angeles-unveils-27-million-solarstorage-microgrid-project_100025584/#axzz4Fp3MhXOu

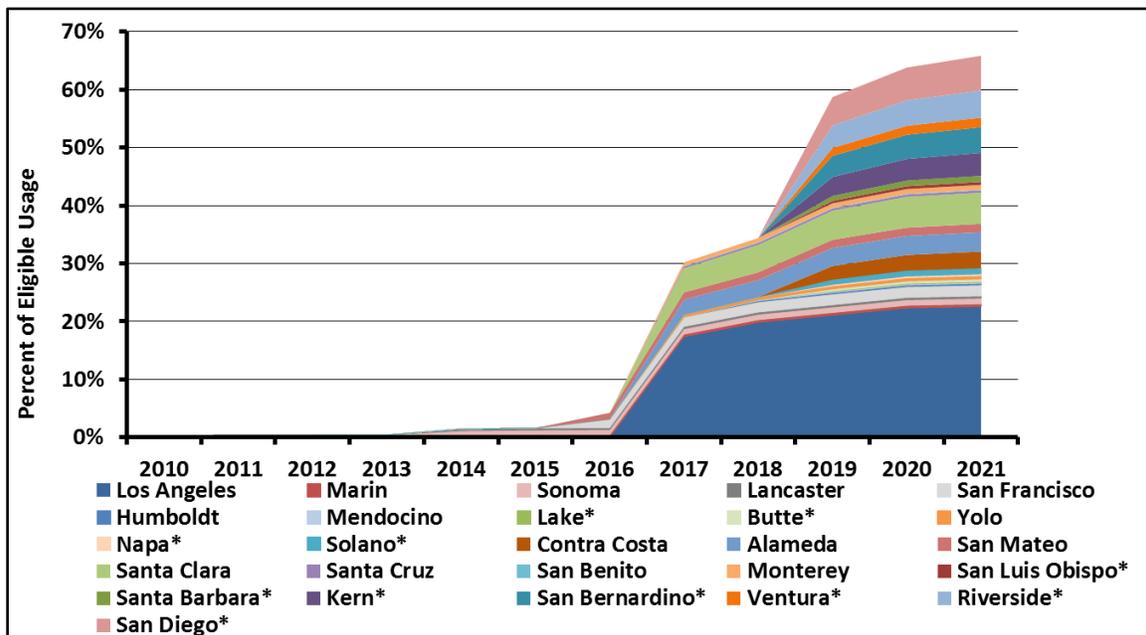
CCEs in California are solving this problem by paying market-based prices for solar electricity produced “behind the meter” to the extent of any production that exceeds annual usage. Longer term, exercising their right to purchase electricity, they can serve as partners in the development of solar micro-grids that enable local ownership of energy infrastructure and local use of the electricity they produce.

The emergence of CCE service is an historic break-through. It makes local climate action possible. As an example, for years, Davis, its elected representatives and its solar project owners and developers worked to get state legislation passed that would allocate a small share of electricity purchases by state regulated utilities for climate friendly community solar programs.

The law that eventually passed didn’t actually require local production for local use as originally envisioned by its advocates. Utility implementation plan were offered that called for solar customers to pay so called “green tariffs” for solar power produced in projects that could be located anywhere in the utilities’ service territories.

Related tariffs were proposed that would include costs of privately financed projects, plus the utility’s costs of owning and operating the regional grid, plus hefty “exit fees” described below that essentially penalize electricity customers for choosing not to use comparable amounts of electricity being purchased by the utility through existing contracts.

The Climate Protection Campaign’s April, 2016 [Business of Local Energy Conference](#) highlighted an on-going sea change in the rate of CCE exploration and formation in California.



Source: Ezra Beeman, Energeia

The chart above shows that the CCE share of California electricity supply is still small but could increase dramatically by 2021. CCE formation processes are underway all across California.

How will CCEs evolve, and will there be effective collaboration between CCEs and grid owners and operators? The answer to this question will determine how quickly California can shift from reliance on slowly evolving utility supply portfolios to new, locally sourced supply portfolios consistent with faster and more locally integrated climate action.

The Exit Fee Dilemma

Utility contractual obligations to independent generation project owners must be honored and/or renegotiated. California allows its incumbent for profit utilities to impose “exit fees” on electricity users who switch to [community choice energy](#) service. In northern California, these fees now add 25% to the cost of newly purchased renewable electricity.

Not surprisingly, these surcharges have come under fire from cities and counties across the state because they create an inherently unstable economic foundation for community investments in providing energy service. Conflicts and trade-offs among important societal values, e.g. equity, innovation, the state’s climate action goals, etc., demand resolution. Unfortunately, they do not lend themselves to integrative resolution via “quasi-judicial” processes of traditional utility economic regulation.

One scenario for resolution that fits the current regulatory paradigm would be a protracted collaboration between the California Public Utilities Commission (CPUC) and California’s energy utilities to “oversee” the on-going creation and planning of CCE service. However, in this approach there is an inherent conflict between utilities’ financial motivation to create new centralized assets on which the utilities can “earn” a return, and the potential fast track, locally accountable, CCE-enabled deployment of customer and third party financed decentralized energy resources (DERs) that attract local investment and create local jobs.

The conflict and potential for collaboration between grid asset owners and communities creates an urgent need for integrative policy attention.

Why? Because strategically deployed and properly integrated DERs can obviate the need for additional grid capacities at all levels, especially high voltage bulk transmission infrastructure.

New transmission lines take up to a decade to plan, permit and deploy. Transmission infrastructure in general has demonstrated vulnerabilities, e.g. cyber- and physical attacks. In the face of plummeting costs of DERs, it is also at risk of becoming an under-utilized or even stranded economic asset.

Independent transmission operators have their hands full ensuring market and infrastructure stability in the face of these contingencies. In parallel, the CPUC has its hands full charting a societally beneficial future for corporate monopolies that currently have little short term financial incentive to innovate, i.e. to plan and manage assets according to their highest value in a likely DER driven energy future.

Legislative action will likely be needed to balance legitimate financial interests of utility managers and increasingly compelling interests of local jurisdictions in economic and infrastructure resiliency.

Smart Cities

[IRESN](#) and [CADER](#) participated in the June, 2016 [Smart Cities Innovation Summit](#). It was organized around ways cities can use information technology and the internet to improve public services and find more intelligent ways to manage resources. Threading through the program and the parallel product and services expo was the theme of an "Internet of Things", defined as "a proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data."

The event spanned topics that are typically addressed separately according to subject matter: energy, lighting, water, public safety, networks, sensors, resilience, mobility, and governance. One take-away is that public sector innovation has many dimensions and will thrive on diversity and mutual learning among diverse cities and communities.

Strategic questions facing cities increasingly revolve around data. The usual and natural questions are being reversed. For example, instead of asking for help with a specific problem, they can now say to independent analysts: "If I gave you access to databases that include a huge and exploding amount of data, what could you tell me that would help me do a better job planning and managing municipal resources?" In other words, how can real time data from diverse sources and operations be processed to provide better service at lower cost?"

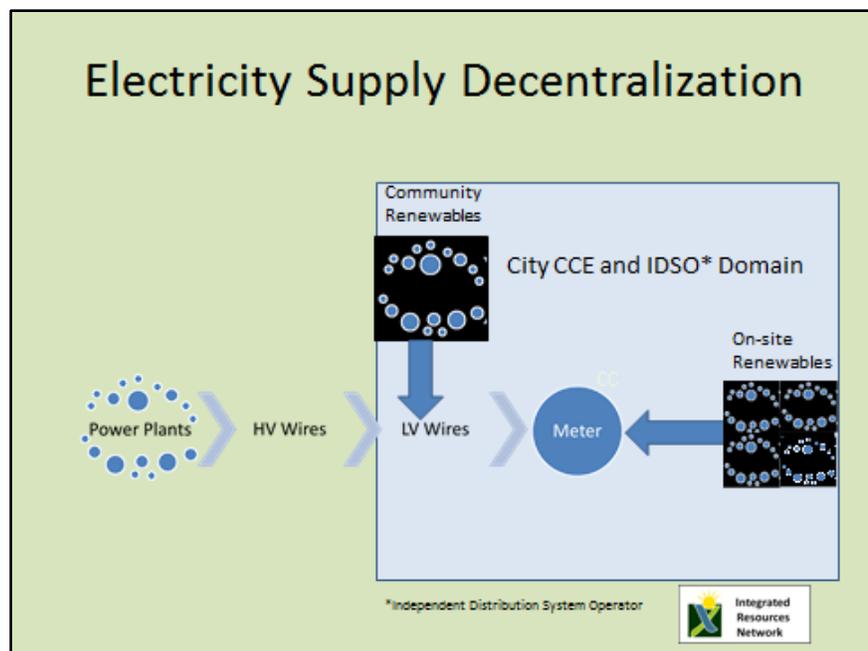
Answers generated so far are exciting. Please take a look at the [program](#). Consider attending a future Summit.

A couple of panels in the 2016 Summit's energy track were especially rich in content and insight.

The Sustainable Energy Communities Panel included a report on [New York's smart energy communities](#), including those participating in its "[New York Prize](#)" micro-grid program. The program's design recognizes what the DavisFREE project (discussed below) revealed, i.e. that each local energy profile is different. This means the best micro-grid applications for a particular community can be determined in an initial, relatively inexpensive scoping phase.

A report from Chicago on [Commonwealth Edison's Sustainable Community Pilot](#) suggests that innovation pathways exist for big regional utilities, to the extent they are willing to allow grid management capabilities to be applied more broadly, e.g. to smart water metering and smart street lighting.

[Cambridge, Massachusetts' Building Energy Use Disclosure Ordinance](#) requires larger buildings to annually report energy use, water use, and basic property information through the U.S EPA ENERGY STAR's Portfolio Manager tool. Approximately 60% of towns in [Connecticut's Clean Energy Communities Program](#) have benchmarked their municipal buildings.



The Integrated Energy Solutions for Communities Panel included a presentation by Dr. Jayant Kumar (GE Grid Solutions). Dr. Kumar described a [micro-grid retrofit at the Philadelphia Navy Yard](#) that enabled deployment of distributed energy resources, including multiple types of on-site generation, significant energy efficiency (EE) measures, plus demand response services provided by energy customers. Steve Pullins (Hitachi Americas ESD) reviewed Hitachi's experience supporting NY Prize micro-grid projects. He noted that community micro-grids are significantly more complex than campus micro-grids from a regulatory and relationship perspective.

Larisa Dobriansky (General MicroGrids) reviewed [international consensus principles of sustainable urban design](#). She believes that "the smart micro-grid is likely to

become the energizing utility spine around which future sustainable growth will occur in communities around the world". Larisa also summarized a [sustainable urban design case study for Jodhpur, India](#).

Gerry Braun (IRESN) outlined a [scenario for energy sector decentralization](#) that integrates community choice, independent local grid operation, and solar micro-grids to accelerate local carbon footprint reductions.

DavisFREE

The above discussion of community choice warned of an emerging conflict pitting utilities and local jurisdictions against one another. A project initiated in Davis, California three years ago points instead to opportunities for unprecedented collaboration between cities and energy utilities. The project, entitled [Davis Future Renewable Energy and Efficiency, aka DavisFREE](#), mined city databases for permitting and housing statistics that could be used in tailoring net zero retrofit programs to individual neighborhoods. In parallel, information in utility databases was used to analyze trends in energy usage and on-site solar deployment. The [final project report](#) was released by the California Energy Commission in April, 2016.

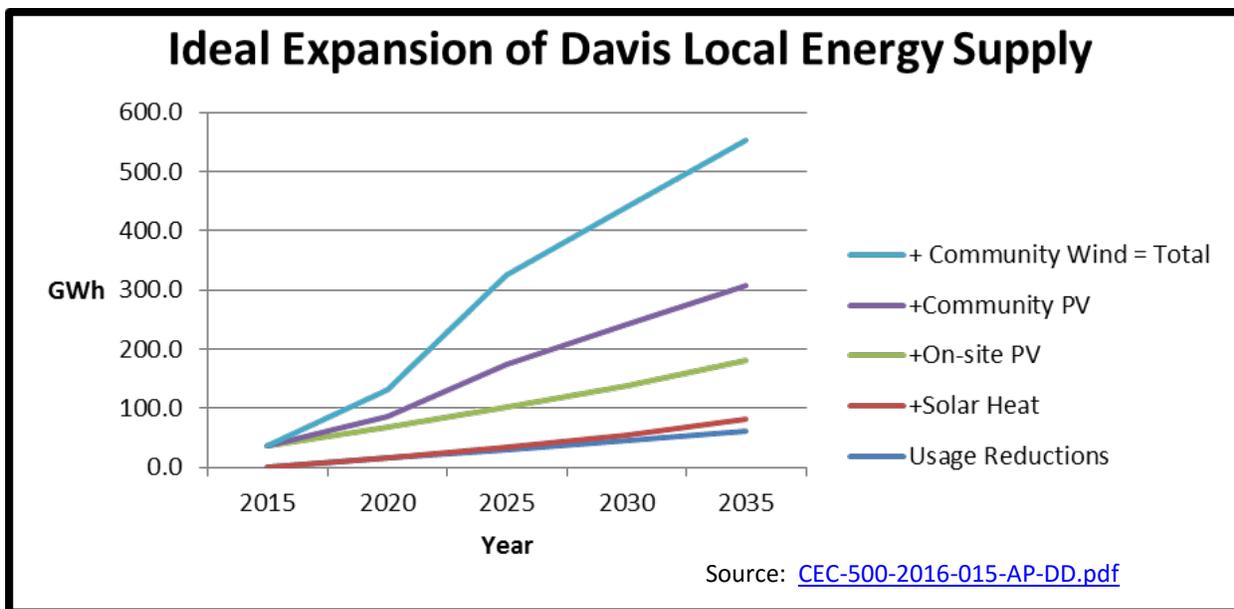
Davis is a settled, low-growth community that is bounded by zoned prime agricultural lands. It therefore cannot expect community-scale zero net carbon and energy goals to be strongly influenced through new high-performance building construction. Rather, Davis must focus on available energy retrofit opportunities for existing building stock. They will dwarf the impacts of net zero new construction in the years to come.

Significant renewable energy capacity (on-site solar thermal water heating and photovoltaics) can be employed almost immediately. Indeed, in the past four years, the percentage of single family homes in Davis served by rooftop solar electricity arrays increased from 10% to 25%, on the way to a target of 50% by 2020. Meanwhile, through programs offered by a local community choice energy service, incremental "deep" energy efficiency improvements can proceed using the [Near Zero Energy Neighborhood Volume Marketing Approach](#) developed by [BIRA Energy](#) and applied to Davis building stock under DavisFREE. Likewise, community choice will open a pathway for development of local community-scale renewable energy systems that will offset utility grid energy usage for groups of residents or businesses that, for whatever reason, are not able, or prefer not to, install on-site generation.

The success of California's "efficiency first" policy is largely dependent on what incumbent utilities offer in terms of incentives and programs, and therefore essentially places and keeps one community on the same limited track as every

other community. Davis intends to move more aggressively forward with renewable energy as its best path to achieving net zero carbon goals.

The DavisFREE project evaluated alternative electricity service scenarios as well as scenarios for substitution of electricity for heating and powering vehicles and substitution of solar heat for natural gas. Likewise, the project evaluated the potential of electricity storage in resident-owned vehicles to be employed in demand response and load shifting in order to minimize electricity imports from the regional grid. The related “integrated energy analysis” is covered in a [separate report](#). It shows that the level of zero carbon local electricity production enabled by community choice could, within twenty years, meet the community’s entire energy requirement, including the bulk of its transportation usage.



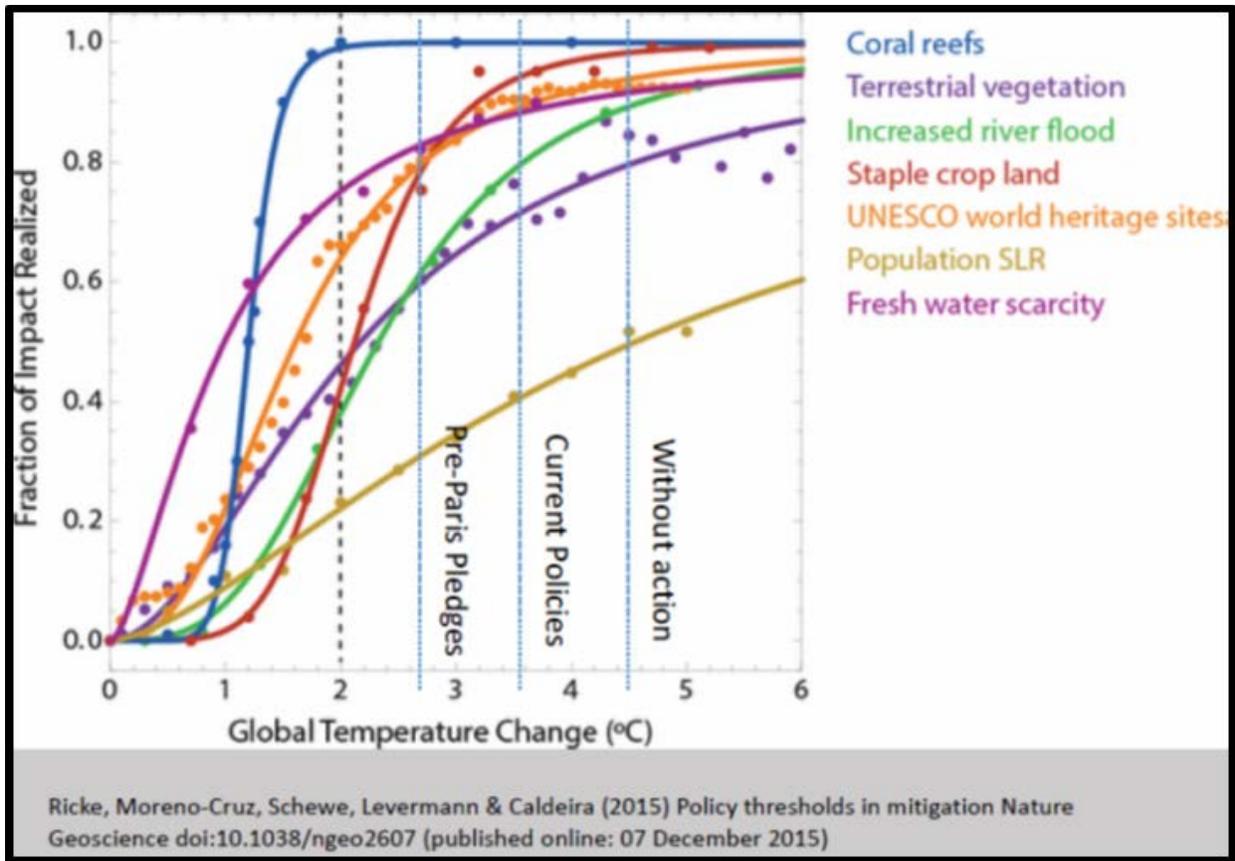
In summary, DavisFREE investigated a pragmatic approach to the development of community-based renewable energy resources as well as building-integrated, cost-effective renewable energy technology options that can be owned and operated by individual homeowners, businesses, and institutions.

The Climate Emergency

Terrorist attacks in Paris. Climate talks in Paris. Which got saturation level media coverage? The terrorist attacks, of course. They were about life and death.

And yet, so were the climate talks. A lot more lives. A lot more deaths. Just not good fodder for action movies and the daily news cycle.

What I know about the Paris conference I learned from colleagues who participated.



First, the bad news. The preceding chart shows climate change impacts (general categories) as a function of temperature change (currently three quarters of a degree C vs. pre-industrial global average temperature). 2°C is a consensus limit initially adopted by Europe, which if achieved, is expected to forestall the most extreme impacts such as mass extinctions. However, 4.5°C will be reached if there is no further mitigation, 3.5°C if only current policies remain in effect, 2.75°C if pre-Paris pledges are honored. In other words, much has been left undecided, and the clock is ticking. Most impacts, including population displacement due to sea level rise are already occurring. Even if the consensus limit is not reached, coral reefs apparently cannot be saved.

Should be a wake-up call, eh?

The good news? Unanimous agreement among 195 UN members to try to keep global average temperature within 2 degrees centigrade of pre-industrial levels, and try to keep it within 1.5 degrees in deference to island nations impacted by any significant sea level rise (SLR).¹

¹ In the US, mayors of 21 Florida cities called on presidential debate moderators to ask candidates how they would deal with rising sea levels caused by climate change.

Good enough? Heavens, no. Arguably what we have here, to borrow historian Barbara Tuchman's term and the title of one of her books, is another "March of Folly", but this time on a global scale, i.e. defined as "the recurring pursuit by governments of policies contrary to their own interests, self-destructive acts carried out despite the availability of a recognized and feasible alternative, the impotence of reason in the face of greed, selfish ambition and moral cowardice".

Maybe that's a bit strong. We'll see how our children and grandchildren feel about it in a couple decades.

For powerful national governments, climate change does not loom as a matter of life and death. Not yet, even though it is already a matter of life and death for many communities and people. Climate-driven death tolls increase every year. Community collapse is happening. Populations are migrating. But the direct causes - floods, wars, droughts - mask the indirect and fundamental causes, i.e. localized climatic shifts that upset fragile ecosystems and economies. The upsets will be increasingly numerous, and, thanks to globalization, their secondary and tertiary impacts will reach everywhere.

The situation is already basically unstable.

If we recognize that for some, it is already an emergency, i.e. locally if not globally, perhaps the emergencies to come can be addressed by better local preparation. This is a reason the term "resilience" is suddenly so popular. If our communities are resilient, they will be ok. Right? Every community for itself. May the strong survive.

Well, maybe. If we prepare for an emergency in the right way, we can reduce the risk. A doubly effective way to prepare locally for climate related emergencies on the horizon would be to break consumption habits that lead to climate change. At some point, these habits will become prohibitively expensive, if only because globalization feeds on consumption. The dominos of collapsing local and regional economies, and related consumption, will inevitably change the globalization game in a fundamental way.

At a minimum let's start using the accurate terminology. "Emergency", not innocuous-sounding "change". Change creates winners and losers. For climate change losers, the result is tangible, i.e. an existential emergency. Emergencies have happy endings only if the response is good and quick enough. The larger emergency escalates as more and more people and communities find themselves in the loser column.

The big climate emergency is a patchwork of local emergencies. The only apparent feasible and also timely response is a patchwork of decarbonization action, local

and democratically determined. Appropriately, the “patchwork project” envisioned above (and discussed in more detailed [here](#)) is a hopeful response to the patchwork of local climate related emergencies we have every reason to expect...and are already seeing in places like Syria.

Decarbonization, decentralization, and democratization are the three imperatives of timely climate action. They are inter-dependent. Time is no longer on our side. At this time decarbonization is stalled for lack of decentralization. Centralized infrastructure has enormous inertia and can't change fast enough. Decentralization is stalled due to undemocratic governance. Money consistently votes against it. Democratization is impossible where people have to migrate because they can no longer find water and food and where there is no help from centralized institutions. The wars that result solve nothing.

This is the climate emergency, and the alarms are sounding. Our present unevenly shared wealth is but a fragile shield. Let us each do what we can where we are.

Gerry Braun

Integrated Resources Network

gbraun@iresn.org

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