VALLEY CLEAN ENERGY ALLIANCE
COMMUNITY ADVISORY COMMITTEE

Staff Report - Item 8

TO: Community Advisory Committee

FROM: Alisa Lembke, Board Clerk/Administrative Analyst

SUBJECT: Introduction to Community Resiliency (Informational)

DATE: November 10, 2021

This staff report transmits for your information and review draft "Resilient Community Vision" provided by CAC Member Lorenzo Kristov. He will present further information in a slide presentation at the meeting.

Attachment:

1. Draft Resilient Community Vision

Resilient Community:
A concept and vision for community action, city planning and state policy for the 21st century

Introduction

Resilience for a community or a city is the ability to maintain essential quality of life functions and services for its residents when a severe disruptive event or sequence of events occurs. We mostly tend to think of a disruptive event as a sudden occurrence, like an extreme weather or environmental calamity such as a hurricane or widespread fire. But resilience is also needed to withstand disruptions that unfold over time, like the erosion of local jobs and tax revenues a city could experience due to a gradual loss of viable local businesses or the decline of a major local employer. This paper considers both types of disruptions in identifying elements of a resilient community. Resilience thinking for the 21st century needs to consider risks of economic and political volatility as well as climate and ecosystem instability.

Resilience is fundamentally a local capacity. No matter how widespread a disruption's impacts may be, people will always have to deal with immediate, on-the-ground impacts that affect lives and infrastructure in their local areas. Nevertheless, strategies and policies for building resilient communities must be both bottom-up and top-down. This vision therefore describes elements of resilience in a sequence of six concentric layers, from the individual family or building through the local government level up to the level of state policy. Local governments are varied and unequal in their ability to implement resilience measures, so state policy actions are needed to promote resilient communities, for example by investing in local capacity to implement resilience projects, facilitating knowledge sharing and replication of successful projects, and ensuring that no communities are left behind in building greater resilience.

The elements of the vision offered here are illustrative ideas based on some current practices for building resilient communities, but are not the last word. This paper is intended to stimulate a broader conversation about what resilience means and the reasons why it is important, and an exploration of strategies and policies we can undertake for building resilience at each level of our social and economic systems. The next section envisions a resilient community in the year 2030, as if the elements of resilience at each level have been implemented. Such is the nature of a vision: it offers a picture of the desirable destination, setting aside for later discussions the strategies, decisions and actions needed to get us there. The last section explains some key concepts and technical definitions that comprise this vision.

Envisioning a Resilient Community in Concentric Layers

The concept of resilient community draws heavily on biological and ecological models, the ways nature designs complex adaptive systems, such as complex organisms like ourselves as well as ecosystems consisting of hundreds of species. One of nature's core system design principles is hierarchical structure, whereby functional integrity is maintained at multiple levels of the system. Thus the resilient community vision starts with resilience at the level of a single household or

building, then moves up to the small group of neighbors that comprise a residential block or small apartment complex, then a larger neighborhood of perhaps a couple hundred households, then to an entire city. The city is a key level of the resilience hierarchy because city government is typically responsible for providing essential services like water, sewer, waste management, safety, emergency response, and more. The city or county level is also where planning occurs (development, land use, transportation, building codes, etc.), and several of the strategies for strengthening resilience need to be taken on as planning elements. Continuing up the resilience hierarchy, the next level is the county or multi-county region, followed by the entire state. We could continue further to consider the national, inter-national and planetary levels, but this paper stops at the state level. State government is the logical locus of responsibility for strengthening resilience in all communities across the state through policies and programs to correct for local economic and resource disadvantages and promote environmental and economic justice.

The individual household or building level

At this level the focus is on energy, water, waste and design. There are many models available for detailed exploration; this is just a basic list of key features.

1. Each building minimizes its energy consumption (with energy efficiency retrofits, or requirements and codes applied to new construction), with passive means including insulation, solar panels, thermal and battery storage, electric vehicle charging, smart appliances and automated energy management systems.
2. Each building's resource use is configured within the context of the surrounding buildings and community. For example, a family's decision to install solar panels will consider the overall pattern of solar exposure and shade trees in the local area.
3. Rooftop solar systems are sized to maximize use of available solar radiation rather than limited to the needs of the building. Excess solar production is stored on-site or in community-level storage facilities, or exported to neighboring buildings; thus "zero net energy" (ZNE) is a community-level rather than individual-building principle, to avoid conflicting incentives for rooftop PV versus shade trees.
4. Each building performs all its necessary functions without using fossil fuels of any kind. Natural gas service is discontinued as all energy uses are electrified, and fire risk is reduced as a result.
5. Each building is part of a micro-grid or is wired to be "micro-grid ready." (The defining feature of a micro-grid is the ability to disconnect from the bulk electric system and operate as an electrical island, and then reconnect and resume grid operation at a later time; see definitions at the end of this paper.)
6. Each building has smart electric vehicle charging that works in concert with energy storage to maximize local use of renewable energy production, and can be coordinated with other charging stations in the neighborhood to smooth demand on the electric grid.
7. Each building minimizes the amount of solid waste that is removed from the premises, e.g., by composting either on premises or within the neighborhood.
8. Each building captures and uses grey water on the premises.

9. Each building captures and retains a substantial amount of rain and storm water, for on-site infiltration and irrigation.
10. New residential construction incorporates street-facing porches and other architectural and landscape features to facilitate block-level interactions.
11. All buildings incorporate landscaping features designed for low water usage, locally native plants, and minimal production of green waste.

The block level

A block is approximately 6-12 houses or housing units on both sides of a residential block or cul-de-sac. The emphasis at this level is to develop a very local sense of community and interdependence, both for practical purposes like sharing food, tools, child care, etc., and for intangibles like a feeling of greater security.

12. Everybody knows everybody by name, which house they live in, the names of their children and pets. They pay attention to comings and goings, provide mutual help as needed, and notice and welcome strangers appearing on the block.
13. Each block has shared green spaces, benches and areas for hanging out outside and conversing on warm evenings.
14. Residents on each block share a garden space, chicken coop or small fruit orchard, and share produce from their personal gardens.

The neighborhood level

The neighborhood is approximately 100-300 houses or units of a residential complex, though there are no set guidelines and each neighborhood will have to determine the most sensible way to define its boundaries. A neighborhood will have public gathering spaces and commercial businesses and services in addition to the residences. The emphasis at this level is to develop a collective “sense of place” or neighborhood identity, to which all residents and businesses contribute by participating in neighborhood-based activities and improvement projects.

15. Each neighborhood has a small team of residents (approx. 4-10 people) who coordinate events, activities, and projects to enhance quality of life in the neighborhood. These teams do not do everything, however; they are organizers and facilitators, but several dozen people or more come out for community meetings and help conduct events and projects. Events enjoy wide participation by neighborhood residents and businesses, as well as visitors from other neighborhoods.
16. A city-wide program has facilitated the identification and formation of the neighborhood teams and provides ongoing support to disseminate ideas and information, as well as grant funding opportunities for projects.
17. Each neighborhood holds monthly pot-luck gatherings at a regular date and time each month, at rotating locations at different people’s houses, or in public spaces when weather allows.
18. Each neighborhood has both outside and inside gathering spaces for meetings and events. Neighbors may have designated a special “green heart” of the neighborhood, a primary gathering space for major events like seasonal bazaars and celebrations.

19. Each neighborhood has been designed for walkability and frequent interaction – wide sidewalks, street-side green spaces, traffic calming measures, benches and gathering areas.
20. Each neighborhood has been designed to maximize local capture and infiltration of storm water.
21. Each neighborhood has a shade tree plan to ensure proper care of trees in dry seasons and removal and replacement of dying trees to maintain desired shade cover.
22. Each neighborhood has little free libraries, tool-sharing, a free-cycle facility and vehicle-sharing arrangements.
23. There is an email list-serve or other communication vehicles that include all residents, for announcements, requests for assistance, etc.
24. There is a directory of the occupations and shareable skills of all residents to facilitate provision of services among residents; i.e., a local economy to exchange some portion of essential goods and services, mediated by a locally-managed accounting system.
25. Each neighborhood has several local businesses, such as grocery or general store, restaurants or cafes, a laundry, repair services and workshops.
26. Each neighborhood has one or more community gardens, chicken coops, local energy facilities (e.g., solar + storage), and organic waste is fully utilized locally rather than picked up and transported elsewhere.

The city level

The emphasis at this level is on all the normal functions of a city government, i.e., provision of essential municipal services, planning, engaging community participation in governance, adoption of longer-term goals and implementation of ordinances, programs and project plans to enhance the quality of life in the city. The city level is also where government and citizens come together to address serious concerns such as homelessness, health care access, mobility, local business conditions, restorative justice, coordination and joint planning with any major resident institutions such as a university campus, etc.

27. The city's net carbon footprint (transportation, buildings and energy) has been reduced to zero, and the city is a net exporter of carbon free energy during summer months.
28. The city's databases are rich, well managed and easily accessed for purposes of planning and operation of services provided by the city and in partnerships with other entities. The city has active data sharing agreements with privately-owned utilities and other local infrastructure owners, resulting in more efficient and economical siting and integrated operation of facilities and systems.
29. Through a community choice energy program the city has implemented local renewable generation and energy storage systems, energy efficiency programs, electric vehicle charging stations, and other initiatives to electrify transportation, buildings, commercial and agricultural activities. Several of these have involved collaboration with the electric distribution utility.

30. The city has implemented, in collaboration with the electric utility, a city-wide fiber-optic network that serves to provide high-speed internet service to the entire city while also modernizing the utility's electric distribution grid to reliably operate with diverse local energy facilities.
31. The city has implemented a zero-waste program; solid waste removed from the city is minimal; waste removed from individual premises is used within the city for its nutrient, energy and material content.
32. A central downtown core is closed to private motor vehicles, except for designated routes for commercial deliveries and mobility services for individuals.
33. The city has established a city-wide uber-like mobility service that is municipal or coop-owned and operated (e.g., Ride Austin); this eliminates the need for residents to drive personal vehicles to access city businesses and services.
34. Buildings in the downtown core are generally multiple stories tall with commercial spaces on ground and 2nd floors and residential units on upper floors. Many city residents both live and work in the core area.
35. The city has implemented strategies for keeping wealth generated by the community within the community, to minimize the wealth and income that flow out to absentee investors.
36. The city has a local community bank, or participates in such a bank at the county or multi-county level, that is dedicated to meeting the financial needs of local businesses and residents.
37. The city has collaborated with the electric distribution utility to plan and install electric vehicle rapid-charging stations at key locations. Electricity rates encourage workplace vehicle charging so that a large share of daytime solar energy production is used locally.
38. Municipal services have been designed and are operated as a whole system to take advantage of synergies and interconnections among services. This "convergence" model includes water supply, wastewater and solid waste management, telecommunications, safety and security, fire protection, energy, local transportation, local media and public spaces.
39. The city, in collaboration with the county and several neighboring cities, has eliminated homelessness by providing safe and adequate housing for all, combined with meaningful work and education opportunities, medical and mental health care.
40. The city is ringed by locally owned and operated small farms, which supply a significant proportion of locally consumed food. Food procurement by the city, the school system, and other government functions relies primarily on local producers.

The county or multi-county level

The focus at this level is twofold: first, to recognize when concerns facing a city are actually concerns for a broader geographic area and are best addressed through an inter-government collaborative approach, and second, to find opportunities for synergies and efficiencies by creating shared programs or infrastructure for activities normally specified for the city level. Joint Powers Agencies (JPAs) are useful structures for such activities.

41. Local jurisdictions in the area collaborate to support local regenerative agriculture, e.g., through "slow money" investment/lending groups, procurement of local food for schools, hospitals and municipal needs, and economic incentives that encourage agricultural methods that regenerate healthy soil.
42. Local jurisdictions collaborate to minimize food waste, e.g., through collection and redistribution of "expired" and other food culled for non-health-related reasons.
43. The county or region has implemented a plan for preserving habitat diversity, including wooded areas and wildlife corridors.

The state level

The focus at this level is for the state government to formally recognize "resilient communities" as a central policy objective for the 21st century and to provide legislation to implement and fund activities and projects across the state to build resilience in all communities.

44. The Legislature and Governor have adopted "resilient communities" as a statewide policy goal, complementary to greenhouse gas reduction, fossil-fuel elimination and renewable energy, and have authorized and funded programs to strengthen local capacity and implement projects for local resilience and local energy throughout the state.
45. To further resilient communities, the state has established standards and scalable models for constructing nested systems of electric micro-grids in all local jurisdictions (see definitions below). Privately-owned electric utilities have become partners with local governments to implement such systems.
46. The state has established a state bank that serves businesses and local governments, to enable them to fund capital investments and public projects without having to rely on national financial markets and institutions.

Concepts, technical terms, and definitions

Resilience

Resilience is the ability of a system to maintain its intended functions and continue to provide services when severe disruptive events occur. In the context of a community or a city, we think of electric service, water supply, telecommunications, emergency and rescue services, shelter, food and medical services, safety and security. Resilience is fundamentally a local capability: no matter how geographically widespread a disruptive event may be, people in each affected locale have to deal with immediate, on-the-ground, possibly life-threatening impacts where they live.

Resilience also has a longer-term meaning. Some disruptions unfold over months or years – think of instances where a town's major employer moves overseas, or a region's industry such as coal mining comes into direct conflict with the health of crucial life-support systems of the earth. A resilient community is one that enables its members to sustain their lives and meet essential needs through local economic activities that provide necessary goods and services without having to rely totally on the diminishing wage-economy to purchase goods imported from other areas by large corporate enterprises. Think of local food production, medical care, building and housing trades, education, music and arts, transport services, etc.

Resilience must be designed at multiple concentric levels, with interactive relationships between the levels. In this document, the sequence of six concentric levels from lowest to highest is: household => block => neighborhood => city => county or multi-county region => statewide.

Resilience and sustainability. These are distinct and complementary concepts, much like the distinction between climate change adaptation and climate change mitigation. Resilience has an adaptive flavor to it, i.e., to strengthen local capability to deal with disruptive weather and other events more likely to occur in the coming decades due to ecosystem damage that has already set certain global forces of change in motion. Sustainability and mitigation are similar, in the sense of making permanent changes to human practices related to energy, agriculture, etc., so as to eliminate those practices that disrupt our ecosystems so we can stop making things worse and start to reverse the damage. Thus resilience entails getting ready for what's already begun happening and will likely get worse no matter how quickly we stop using fossil fuels, whereas sustainability means reformulating social and economic institutions and practices and individual behavior to live in harmony with the ecosystems that sustain life.

Some relevant principles

Zero waste means the amount of waste materials a city or county sends "away" to a landfill or to be exported to recycling commodity markets is as close to zero as possible. Instead, materials are used locally for their energy or nutrient content and as repurposed construction or other uses.

Zero net energy means the amount of energy a building or other end-use consumes over a given time period, typically a year, net of its own energy production, is zero. ZNE should be applied at level of neighborhood, campus, micro-grid or whole city, rather than the individual building, to take advantage of diversity of end-use patterns, solar radiation, etc.

Zero net carbon is a more powerful principle than zero net energy as it includes all activities that contribute to carbon emissions, not just those directly associated with energy. Net carbon analysis must also consider life-cycle emissions, not just emissions generated at the end-use level. Concrete is a good example. Production of concrete involves massive carbon emissions starting with the mining of limestone.

Electrification. Broad and deep reduction in greenhouse gas and other pollutant emissions requires that fossil-fuel-using functions be converted to using electricity, along with conversion of the electric system to renewable energy. This includes electrification of transportation, buildings, and agricultural, commercial and industrial activities. What electrification proponents often fail to acknowledge is that most such conversion efforts will need to be addressed in the context of city and county planning efforts, and will have impacts on the electricity grid at the level of the local distribution systems. Electrification will therefore require partnerships between local governments and electric distribution utilities.

Convergence. Modern advances in communication and control technologies for complex systems enables formerly separate municipal services to be "converged" – designed and managed as elements of a whole system. For example, a common communications network can provide real-time operational information for water supply, electric service, wastewater treatment, emergency services and high-speed internet access. The same network can also collect billing information for municipal services. Solid waste and wastewater streams can provide nutrient inputs for agriculture and energy input for producing electricity and fuels.

Localization. The deliberate process of strengthening local production of essential goods and provision of essential services, while reducing reliance on purchases of goods delivered over great distances and provided by corporate entities whose primary objective is to maximize profits for distant shareholders. Localization is at the core of community resilience to longer-term disruptions such as gradual degradation of ecosystems, decline of major employers, and the impacts of economic boom and bust cycles.

Micro-grids

A micro-grid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and that can disconnect from and re-connect to the grid to operate in either grid-connected or island mode.

Micro-grid ready means the building has installed control systems to enable it to interface as a single controllable entity with the larger electric grid, so that it can be incorporated into a micro-grid without requiring significant upgrades or retrofits.

A single-user micro-grid is an electrical unit that serves a single energy end-user, such as a single-family residence at the lower size range, to a university or medical center campus at the higher size range.

A multi-user micro-grid is an electrical unit that serves multiple energy end-users. An example is a community micro-grid that serves all the residences and businesses in a neighborhood, or a commercial or industrial park that serves multiple businesses.

Nested systems of micro-grids are arrangements of smaller micro-grids within larger micro-grids, designed to disconnect and operate in island mode at whatever level is needed for the given situation. Typically, the lowest level micro-grid would be an individual building such as a residence or a portion of a larger building. A city implementing a nested system of micro-grids for resilience could, for example, have individual micro-grids at the local hospital, fire station, police station, city hall, an emergency shelter, a pharmacy, one or more schools. At the next higher level, a micro-grid arrangement could be comprised of several of the above individual micro-grids plus all the residences and businesses within the same electrical area, with control systems that enable the entire area to function as a single entity at its connection point to the larger utility electric system.