Resilience, Energy Resilience, & Local Energy Systems

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Resiliency Concepts

Resilience (general) => **The ability of a system to continue to provide its intended functions & services when a system disruption occurs**

1. Provide uninterrupted service with minimal reduction in service quality
2. Minimize the duration & population impacted by any service interruption

Community resilience depends on basic essential services =>

– Immediate: Water supply; food supply; medical care; shelter; wastewater

– Long-term: Economic stability; public health; housing; security

Many essential services depend on Energy =>

– Mobility; communication; space heating/cooling; food preservation; lighting

Energy Resilience requires local energy resources =>

– **Ensure continuity of energy services during utility grid outages**

– Invest in local energy resources & systems that can "island" from the grid

Today's challenges require local energy solutions

Sustainability & Decarbonization => **Energy systems a major contributor**

- Emissions result from human energy use, shaped by local arrangements
- City Planning => zoning; land use; housing; building codes; mobility services; economic development; public space; habitat; urban forestry

Resilience => **Maintain essential electric service when the grid fails**

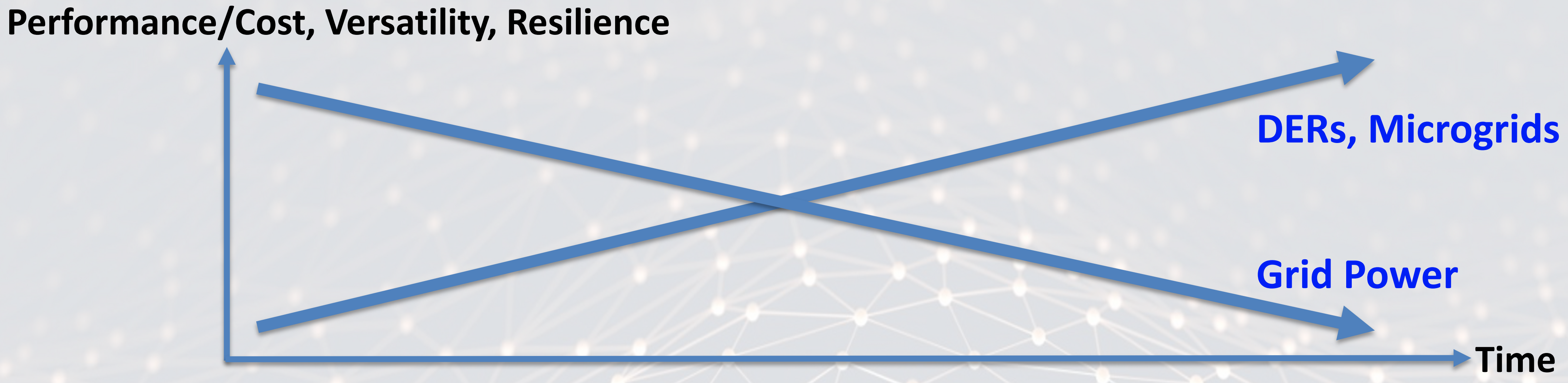
- Carbon-free microgrids to power critical services & resilience centers

Energy Justice => **Democratize energy asset ownership & operation**

- Energy is a key social determinant of health, not just a commodity
- Local energy supply businesses build local wealth & economic resilience
- Mitigate historic harms & strengthen vulnerable neighborhoods

20th century electricity system structure is not conducive to local energy

Local energy is cost-effective & competes with the grid



Electricity service can be a locally owned & operated enterprise

- Policies to suppress DER* adoption raise incentives for grid defection
- Grid defection by affluent customers will worsen energy inequities

* DER ≡ local or "distributed" energy resources of all types

Needed => An electric distribution network & local energy markets that

- Unlock the full value of local energy resources
- Compensate non-utility investment in local renewable energy supply

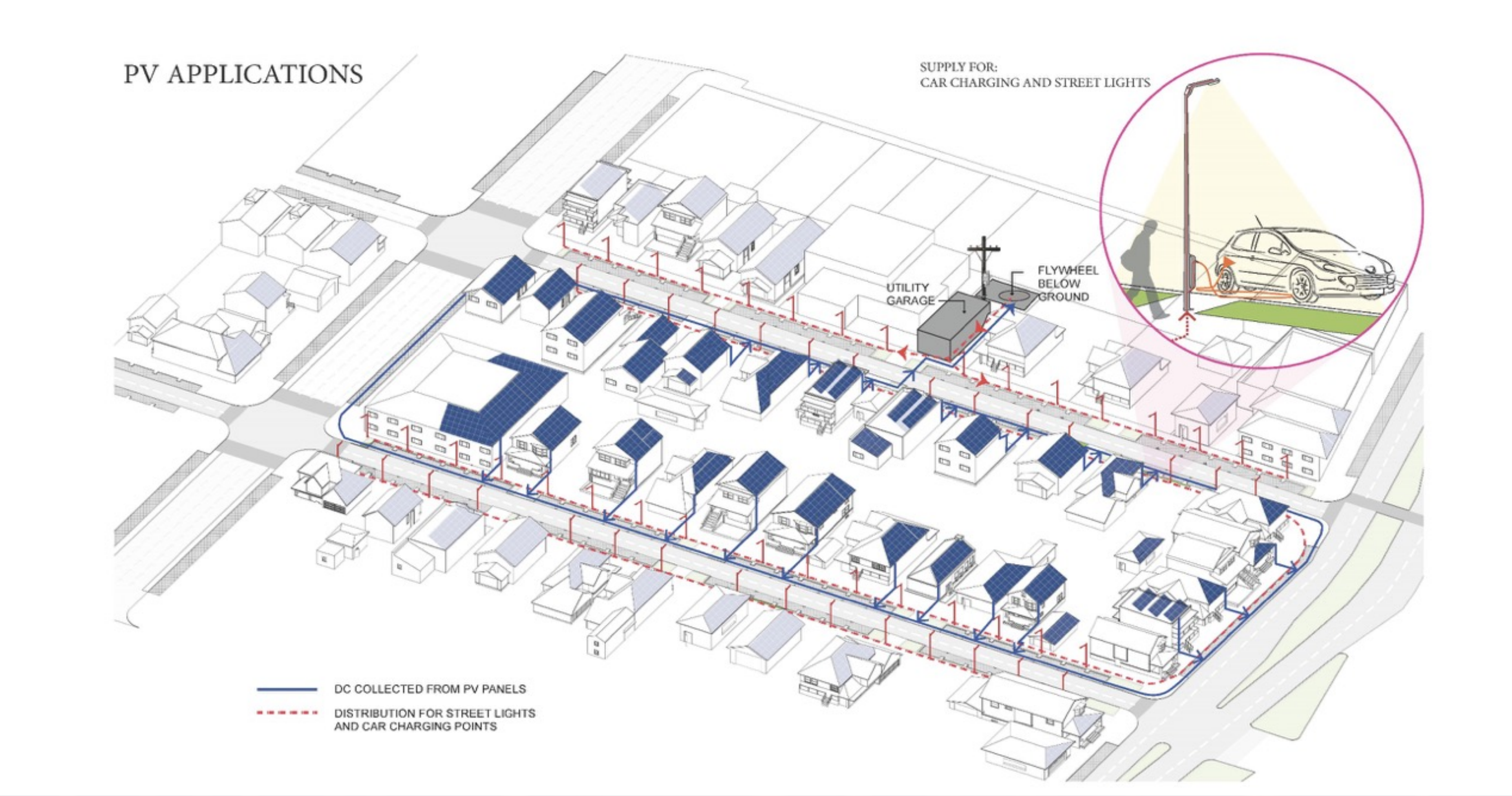
Some local energy possibilities

- **Compensate customers** to over-size rooftop solar+battery systems & provide energy to their neighborhoods.
- **Enable locally-owned co-ops & non-profits** to supply electricity & electric vehicle charging as integral components of the local economy.
- **Deploy municipal electrification projects** — public mobility fleets & school buses, powered by publicly-owned local renewable energy resources.
- **Retrofit neighborhood "resilience centers"** to provide emergency shelter, warmth, cooling, food, medical care, phone/internet service, & zero utility bills.
- **Build local energy planning capability** to integrate local power production with tree canopy, land use, public space, stormwater capture, etc. at neighborhood level.
- **Create multi-customer "community" microgrids** that can operate 24x365 & provide uninterrupted electric service to an entire neighborhood during grid outages.

Oakland EcoBlock: retrofit model for urban neighborhoods

Community microgrid serves all customers on the block; integrated with broadband, EV charging, grey water, stormwater capture, food production, …

- Shared rooftop solar
- Shared energy storage (flywheel + battery)
- Dynamic load management
- Shared EVs & charging
- Microgrid controls for seamless islanding
- Single interconnection point to the utility grid
- CEC-funded demo project by UC Berkeley & Berkeley Lab
- **Existing laws & regulations kill commercial viability, reduce benefits & prevent replication**



Bottom-up planning for a local energy future

Bottom-up planning to optimize distribution-connected supply

- **Start from local energy needs & priorities** => granular demand forecast for a neighborhood, subdivision, city district of, tribal community, campus, rural town
- **Plan supply using a "local first" principle** =>
  - On-site on customer premises (behind the meter)
  - **Community-level shared resources (front of meter)**
  - Design assets to maximize production & supply surrounding community
- **Maximize PV + storage systems on the built environment** — warehouses, shopping malls, schools, parking lots, irrigation canals, etc. — <u>ignored in planning processes</u>
  - NREL (2016) rooftop potential: https://www.nrel.gov/docs/fy16osti/65298.pdf
  - California 74% annual electricity consumption; US average 39%
  - No land-use conflicts; no transmission needed; supports community microgrid
- **Then plan transmission system & wholesale market to meet residual demand**

Policies for a local energy transition - 1

Enable "multi-property" or "community" microgrids (CMG) to be financially viable, without depending on grants & subsidies

CA Legislation directed CPUC to "commercialize" microgrids (sb 1339 – 2018)

- Enable CMG to be financially viable businesses based on earned energy revenues
- **Allow CMG to operate 24x365 as a single controllable entity — to serve internal customers from internal supply all year round**

Instead, CPUC rules bring CMG under total IOU monopoly control

- PG&E's "Community Microgrid Enablement Tariff" (CMET) => MG can operate **ONLY** during grid outages; can island **ONLY** at IOU discretion; **ONLY** IOU can operate it
- **Assumes CMG have no value except as power backup for internal customers**
- **Result => CMG will only be viable with large grants or public/ratepayer funding**

Policies for a local energy transition - 2

Democratize ownership of electricity assets & allow local electricity supply businesses

- Communities can build wealth by owning & operating productive energy assets
- **DER technologies available today** enable neighborhoods to have their own electricity systems — but they're blocked by monopoly control of distribution
- Compensate customers to maximize solar+storage installations & supply neighbors

Authorize local energy transactions within the distribution system

- **Physical reality** => Power injected into local distribution flows to serve local load, with no backflow onto the transmission system
- **Regulatory fiction** => Power injected into distribution flows up to the ISO, & then comes back down to serve customers
- **Result** => Local resource pays ISO participation costs while customers pay for transmission service they don't use => unfair cost burden on local energy

Policies for a local energy transition - 3

Reform the distribution utility as an "Open Access DSO"

- **Vision =>** An **open-access, participatory distribution network** to enable all DERs to engage in economic transactions for energy & grid services
- **Open Access DSO is the distribution counterpart of the ISO for transmission**
- **DSO has three core functions**
  - Operate & plan a reliable distribution network
  - Administer local markets for customers & DERs to transact energy & grid services
  - Coordinate with ISO at Transmission-Distribution interfaces
- **Open Access regulatory framework**
  - DSO performs natural monopoly functions only — network & market operation — & does not engage in competitive arenas
  - DSO is compensated on performance, not capital investment

Thank you

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