# Modern Public Power: A Robust Path to Community Energy

## The Spark Community Utility (SCU) Roadmap Overview

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# Executive Summary

California cities face critical energy challenges: escalating electricity costs, frequent infrastructure failures, climate change pressures, and limitations in traditional utility models. The Spark Community Utility (SCU) offers a groundbreaking, community-driven approach to overcome these issues, combining local governance with flexibility, scalability, and reduced risk through incremental growth and opt-in customer participation.

**Key Strategic Benefits:**

- **Incremental, Low-Risk Deployment:** Start small, scale at the community's pace.
- **Local Control & Governance:** City-led decision-making free from CPUC oversight.
- **Improved Resilience:** Microgrids and local generation protect critical infrastructure during outages.
- **Economic Growth:** Investments in local energy infrastructure stimulate job creation and retain local capital.
- **Accelerated Climate Action:** Direct local implementation of renewable and clean energy solutions.
- **Affordability & Equity:** Eliminate shareholder dividends and reduce reliance on costly incumbent utilities, providing lower, more stable energy rates.

**How the SCU Model Differs Fundamentally**:

| | Traditional Municipalization | Community Choice Aggregators (CCA) | Spark Community Utility (SCU) |
|---|---|---|---|
| **Infrastructure Ownership** | Takes over existing IOU assets | No infrastructure ownership | Builds new, independent local infrastructure |
| **Participation** | Mandatory citywide takeover | Opt-out model for customers | Opt-in only; incremental adoption |
| **Regulatory Oversight** | CPUC involved in asset acquisition | CPUC regulates grid delivery, local control limited | Full local control; minimal CPUC involvement |
| **Financial Risk** | High upfront costs, legal battles | Low financial risk, limited local infrastructure | Moderate, incremental investments |
| **Speed of Implementation** | Slow, contentious legal processes | Quick startup, no local infrastructure | Rapid initial deployment, incremental scaling |

**Strategic Takeaways:**

- **SCU operates alongside existing utilities**, avoiding the costly and contentious takeover processes associated with traditional municipalization.
- **Local governance ensures rapid, community-aligned decision-making**, bypassing traditional regulatory bottlenecks.
- **Incremental, demand-driven growth reduces financial and operational risks**, allowing cities to start small and expand based on proven success.

The SCU model is not theoretical; proven examples from communities across the U.S., such as Ann Arbor's Sustainable Energy Utility and California's Blue Lake Rancheria microgrid, showcase tangible successes. By adopting the SCU approach, California cities can swiftly achieve greater energy resilience, economic sustainability, and climate action leadership. This roadmap provides an in-depth strategic overview for decision makers—transforming today's energy challenges into sustainable, locally controlled opportunities.

The SCU model can leverage proven software-defined energy distribution architectures already being deployed in European municipalities. Technologies like EnergyNet 📎 —which uses intelligent Energy Routers to dynamically manage power flows between sources and loads—provide the technical foundation for peer-to-peer energy sharing, resilient microgrid operations, and incremental infrastructure expansion. By adopting these open-standard architectures rather than developing proprietary systems, California SCUs can accelerate deployment timelines, reduce technical risk, and benefit from ongoing global innovation in distributed energy management.

Chapter 1

# Electric Utility Fundamentals

By understanding the fundamentals – why utilities are regulated monopolies, how the grid operates, what legal tools cities have, and why meaningful change has been so hard – this chapter of the roadmap equips city administrators and other stakeholders with a solid foundation of knowledge about electric utilities; how they're organized, what they do, who they serve, and how they're governed. Those with experience in energy and utility domains may feel they only need to scan this chapter. With this context in place, the discussion will then turn to how an SCU provides a **new framework for partnership and governance** that aligns the utility sector with local and statewide public goals. The tone throughout is **realistic yet optimistic**: the hurdles are high, but with open-minded consideration of models like the SCU strategy, cities will find a way to break through the status quo and achieve reliable, affordable, and green energy for their communities.

## Utility Monopolies and the Obligation to Serve

Electric utilities in the U.S. historically developed as **regulated monopolies**. This structure emerged because electricity distribution was thought to be a *natural monopoly*: that is, most efficient when one company builds and maintains the network of poles and wires, rather than duplicating infrastructure in the same streets📎. In exchange for being granted an exclusive service territory, these investor-owned utilities (IOUs) accepted a **legal "obligation to serve"** – a duty to provide reliable electric service to all customers in their area at reasonable rates📎. Early policymakers granted monopoly status to ensure universal access to power and avoid wasteful competition, while regulating the utility's prices and profits to protect consumers 📎📎. This arrangement helped electrify cities and rural areas throughout the 20th century under a predictable framework: the utility would build and operate the grid, and in return they're required to serve everyone and meet certain standards of reliability and fairness.

| CA Utility Organization Comparison | | |
|---|---|---|
| **Details** | Investor-Owned Utility | Traditional Muni |
| % CA Customers Served | 75—80% | 15—20% |
| Locally Franchised | ✔ | ✔ |
| Requires Ballot or Legislative Campaign | ✔ | |
| Lead Regulator | CPUC | Local |
| CEC Oversight | ✔ | ✔ |
| CPUC Oversight | ✔ | ✔ |
| CAISO Oversight | ✔ | ✔ |
| Rate & Service Regulation | CPUC | Local |
| Obligation To Serve | ✔ | ✔ |
| Certificate of Public Convenience and Necessity | ✔ | ✔ |
| Resource Adequacy (RA) Goals | ✔ | ✔ |
| Uses IOU Distribution Infrastructure | ✔ | |
| Profit Model | For Profit | Non-Profit |
| Municipal Bond Financing Possible | | ✔ |
| Incremental Customer Conversion | N/A | |
| Constitutionally Protected | ✔ | ✔ |
| CCA Partnership Potential | ✔ | ✔ |
| Involves Municipalization | | ✔ |
| Customers Opt-In To Services | | |
| On-Bill Energy Financing Capable | | ✔ |
| Improves Community Resilience | | ✔ |
| Enhances Local Economic Development | | ✔ |

## Regulatory Oversight: Federal, State, and Local Roles

Although private utilities were granted monopoly territories, they don’t operate unchecked – **government regulators are mandated to oversee their activities.**

| Government | Regulator | Purview |
|---|---|---|
| Federal | FERC | Oversight of wholesale markets and interstate transmission |
| California | CPUC | Oversight of rates, safety, and service quality |
| California | CAISO | Grid reliability, statewide load balancing, transmission coordination |
| California | CEC | Energy policy, planning, and infrastructure |
| City/County/JPA | Municipal | Franchise authority, local oversight, advocacy, and municipal formation |

Investor-Owned Utility Governance

## Federal Energy Regulatory Commission (FERC)

At the federal level, the Federal Energy Regulatory Commission (FERC) regulates components of the electric system crossing state boundaries or involving wholesale power markets. FERC responsibilities include:

- Oversight of interstate electricity transmission.
- Regulation of wholesale power transactions between utilities.
- Approval of regional transmission grid operations and pricing structures.
- Enforcement of reliability standards for the bulk power system.

## California Public Utilities Commission (CPUC)

At the state level, the California Public Utilities Commission (CPUC) regulates Investor-Owned Utilities (IOUs). The CPUC:

- Approves rates charged to customers.
- Sets standards ensuring safe, reliable service aligned with public interest.
- Reviews and authorizes utility investments in infrastructure, including power lines, plants, and wildfire safety measures.
- Mandates utility procurement of cleaner energy to achieve state climate goals.
- Oversees service quality, imposing penalties for outages or safety lapses.

## California Independent System Operator (CAISO)

CAISO, regulated by FERC, coordinates electricity transmission and ensures grid reliability across California. CAISO's responsibilities include:

- Balancing statewide electric loads and generation resources.
- Coordinating interconnection of new generation.
- Managing investments in transmission infrastructure to deliver power reliably.
- Collaborating with CPUC to represent California ratepayer interests in FERC proceedings.

### California Energy Commission (CEC)

CEC plays a crucial regulatory role in overseeing the state's energy policy, planning, and infrastructure. CEC focuses on broader **energy planning, resource development, and efficiency standards** that impact utilities and electricity providers across California. CEC's responsibilities include:

- Statewide Energy Planning & Policy Implementation
- Power Plant Permitting & Siting Authority
- Renewable Energy Oversight & Compliance
- Energy Efficiency & Building Standards
- Electric Demand Forecasting & Resource Adequacy Support
- Funding & Grants for Clean Energy Development
- Electric Vehicle (EV) Infrastructure & Grid Integration

### Local Government Authority

Local governments hold significant roles within California's regulatory framework, particularly in managing utilities' presence within their jurisdiction. Local responsibilities include:

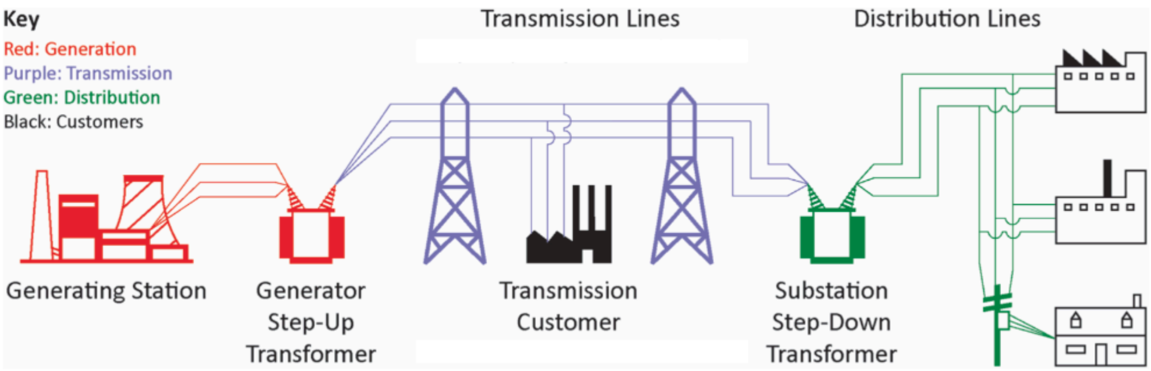
- Granting franchise rights to utilities for use of public streets and rights-of-way.
- Setting terms and conditions through franchise agreements, including fees utilities must pay.
- Advocacy and oversight on behalf of residents in state regulatory proceedings, particularly concerning rates and safety.
- Establishing municipal utilities or community choice aggregators (CCAs) to directly manage local energy procurement and infrastructure.
- Coordinating local emergency preparedness and resilience efforts, especially related to critical infrastructure during outages or emergencies.

Together, federal, state, and local regulatory bodies create a comprehensive oversight system that ensures electricity services are delivered safely, reliably, and affordably, aligning with community priorities and public interests.

## The Electric Grid: Transmission, Distribution, and Maintaining Stability

When you flip a light switch, a vast **electric grid** springs into action to deliver power instantly. The grid has two primary components: **transmission** and **distribution**. **Transmission lines** are high-voltage wires that carry electricity over long distances – they are the freeways of the grid, moving bulk power from power plants to local areas. In California, transmission lines (typically 115 kV and above) move electricity across the state and region, managed by entities like

CAISO and overseen by FERC. **Distribution lines**, by contrast, are the lower-voltage poles and underground cables that branch out through city streets to bring power to homes, businesses, and streetlights. Distribution is the "last mile" of delivery, operated by the local utility (such as PG&E or a municipal utility) and regulated by the state (CPUC for IOUs, and state statutes and local government bodies for munis).




Macro-Grid Schematic

One fundamental challenge of the grid is that **electricity cannot be easily stored in large quantities**, so it must be generated and consumed in balance at every moment📎. Grid operators maintain stability by **dispatching power plants in real-time** to match supply with demand. For example, as people turn on air conditioners on a hot afternoon, grid controllers increase generation from available plants to keep the system's frequency at 60 Hz. They also maintain **spinning reserve** generators ready to kick in if a major plant or line suddenly fails📎. This careful balancing act keeps the lights on and prevents blackouts. In practical terms, **grid stability is maintained through constant monitoring and fast control**: utilities and grid operators coordinate via computerized control centers to adjust power flows, and automatic protection systems isolate problems to avoid wider outages. Additionally, **balancing authorities** (like CAISO or Los Angeles Department of Water and Power for their area) oversee reliability within their regions, coordinating with neighboring areas so that power can be imported or exported as needed to maintain the balance📎📎. All of these mechanisms ensure that even though the grid is a huge machine with millions of customers, it operates smoothly as an integrated, stable system. City officials should understand that local distribution is just one part of this larger grid, and changes or stresses in one area (like a power plant outage or a surge in demand) can have wider effects if not properly managed.

## Emerging Distribution Architectures: Software-Defined Energy Networks

While traditional grid architecture relies on centralized, synchronous AC distribution with real-time balancing requirements, emerging models like EnergyNet 📎 demonstrate that software-defined, DC-based distribution can provide superior resilience and flexibility. Pioneered in Sweden through projects in Lund and Örebro 📎, these architectures use Energy Routers—intelligent power electronics devices that dynamically route electricity between multiple sources and loads—creating microgrids that can operate independently or connected to the main grid through digitally-controlled "firewall" boundaries. This approach, which treats energy more like data packets than continuous flow, aligns with California's need for resilient, distributed infrastructure that can withstand wildfires, outages, and other disruptions while supporting high renewable penetration.

## Municipal Rights and Responsibilities in the Regulatory Framework

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Municipal Levers of Electric Utilities

- **Franchise Authority**: Cities grant utilities rights to public streets and collect franchise fees supporting local services.
- **Advocacy Role**: Cities represent residents in regulatory proceedings or legislative debates on regulation and rates.
- **Local Energy Initiatives**: Cities may pursue CCAs or municipal utilities to control energy procurement and infrastructure.

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Cities and counties that lie within the service territory of one of the state's three IOUs, despite not regulating utility rates, have important **rights and roles** when it comes to electricity. In California, municipalities have the authority to **grant franchises** to utilities for use of public streets and rights-of-way📎. This means that an IOU, like PG&E in Northern California, must obtain permission from the city to install and maintain poles, wires, and gas pipelines under city streets. These **franchise agreements** give the utility an indeterminate or fixed-term right to operate in the city, typically in exchange for paying a **franchise fee** to the city (often a percentage of the utility's revenue in that area)📎. Under state law (the Franchise Act of 1937), if a city grants a franchise, it can require the utility to relocate its facilities at the utility's expense to accommodate public works projects (e.g. moving power lines for a road widening)📎. In this way, the city exercises its **police powers** to manage its streets and ensure utility equipment does not hinder public projects or safety.

Beyond franchises, **municipal governments try to represent the interests of their residents** in various forums. Cities can participate in CPUC proceedings or legislative debates that affect utility service and rates. For example, a city may file comments or intervene in a CPUC case about a utility's requested rate increase or wildfire safety plan, to advocate for local concerns (though the CPUC makes the final decision). Many California cities also band together through organizations (such as the League of Cities or joint powers authorities) to have a stronger voice in state energy policy. **Municipalities are responsible for local preparedness and coordination** with utilities as well. In emergencies like storms or wildfires, city agencies (police, fire, public works) coordinate closely with the utility on power restoration, public safety power shutoffs, and critical facility support. Cities often negotiate **priority restoration** for key infrastructure (hospitals, water pumps, etc.) and advocate with the utility for community resilience plans.

Importantly, **cities have the right under California law to establish their own electric utilities** or to procure power on behalf of their residents. The California Constitution explicitly authorizes cities to provide utility services, including electricity 📎. This means cities can choose to form a **municipal utility** (a type of publicly owned utility) and take over electric service for their area, though doing so is a complex process (explored more below). In recent years, some cities have also exercised the option to create **Community Choice Aggregators (CCAs)** – these are not full utilities, but local programs that allow cities or counties to purchase electricity (often from cleaner sources) for their residents while the incumbent utility continues to handle delivery over the wires. CCAs, enabled by state law, have become a popular tool in California for municipalities to advance renewable energy goals without taking over the IOU's distribution grid. However, even with CCAs, the IOU still owns and operates the distribution equipment, so the city's authority is limited to buying power and setting generation rates, not controlling the infrastructure.

In summary, **municipal officials have several levers** in the electric sector:

- **Franchise authority** – to permit and set conditions for utility use of local rights-of-way, and to collect fees that can support city services 📎.
- **Advocacy and oversight** – to watchdog utility activities, intervene in state regulatory processes, and push for better service or projects that benefit the community.
- **Local energy initiatives** – to pursue alternatives like CCAs or even form a municipal utility, in order to gain more control over energy sources and policies.

With these rights come **responsibilities**: cities must ensure that any utility operating in their area (whether IOU or municipal) upholds safety, reliability, and the needs of the community. Even something as simple as coordinating street tree trimming with power line clearance involves city-utility cooperation. Understanding this framework empowers city administrators to effectively navigate and influence the utility landscape for the benefit of their constituents.

# IOUs & POUs: Investor-Owned and Publicly Owned Utilities

Not all utilities are the same. It's crucial to distinguish between **Investor-Owned Utilities (IOUs)** and **Publicly Owned Utilities (POUs)**, as cities may interact with both types.

- **Investor-Owned Utilities (IOUs)** are private, for-profit companies owned by shareholders. California's big three electric IOUs – Pacific Gas & Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E) – are examples. They operate as regulated monopolies in assigned service territories and **their goal is to earn a return for investors**. As monopolies, IOUs' rates and policies are overseen by the CPUC (state regulators) rather than by local governments. They finance their operations through investor capital and ratepayer revenue, and any profits are distributed to shareholders as dividends. Because they are profit-driven, IOUs prioritize shareholder returns, though the regulatory compact is supposed to ensure they also meet public obligations of service quality and sufficient and efficient infrastructure investment.

- **Publicly Owned Utilities (POUs)** are **not-for-profit, community-owned entities** that provide electricity. There are several forms of POUs in California, including **municipal utilities** (city-run departments like Los Angeles DWP or Anaheim Public Utilities), **public utility districts** (independent local agencies, often covering areas outside city limits), **municipal utility districts** (like Sacramento's SMUD, formed under its own state law), **irrigation districts** (which have the option of providing electric service), and **electric cooperatives** (owned by their customer-members, more common in rural areas). What they share is local or public ownership and governance. POUs are typically governed by **local elected officials** – for a city utility, this could be the city council or a utility board appointed by the council or mayor, or elected by residents. Because of this governance structure, POUs are **accountable directly to the community**. If residents are unhappy with rates or service, they can appeal to their local board or vote in new decision-makers, rather than appealing to the state commission (whose offices are in San Francisco).

**Regulation of POUs** works differently than it does for IOUs: POUs generally are **not subject to CPUC regulation of rates or investments**. Instead, they set their own rates through a public process at the local level. California law requires POU rates to be based on **cost-of-service** and prohibits profit margins, meaning rates should only cover the utility's costs of providing power plus necessary reserves📎. In fact, because they do not pay dividends, or state or federal taxes, and can often finance projects with tax-exempt bonds, **POUs tend to have lower electric rates** – about 15–40% lower on average than IOUs in California📎. For example, the Sacramento Municipal Utility District (SMUD) and Los Angeles DWP historically have had rates below those of PG&E or SCE, partly due to these cost advantages and local control. That said, POUs must still comply with many of the same state and federal laws (such as renewable energy mandates, air quality rules, and reliability standards), and they coordinate with state agencies (CEC, CARB) and grid operators (like balancing authorities) even without CPUC oversight📎📎.

Structurally, an IOU is a corporation with a CEO and shareholders, whereas a municipal POU might be a city department or a stand-alone utility authority. The **financial incentives differ** as well: an IOU's incentive under regulation is to invest in infrastructure, since they earn a regulated 10% return on equity📎. A POU's incentive is to keep costs low and quality high, since there are no external shareholders – effectively the customers *are* the stakeholders. The key difference lies in **local control and accountability**. City administrators should recognize that if they are served by an IOU (like most California cities are), decisions about rates, maintenance, and energy procurement are made by a distant company and state regulators. In contrast, if served by a municipal utility or district, those decisions are made locally, offering more direct input for the community but also placing responsibility on the local agency to perform well.

## Franchise Agreements: City–Utility Contracts for Access and Service

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Key Terms of Franchise Agreement

- **Exclusive Access**: Clarifies whether monopoly rights for utility are exclusive.
- **Term**: Typically long-term (20-50 years); determines stability and flexibility.
- **Franchise Fees**: Payments from utilities to cities, commonly 2% of gross revenues.
- **Relocation & Infrastructure Costs**: Utility obligations to relocate equipment at own expense for public works.
- **City Rights**: Includes audit authority, enforcement clauses, renegotiation provisions, and innovative partnership conditions (e.g., EV charging commitments).

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A primary interface between a city and an electric utility (especially an IOU) is the **franchise agreement**. This is essentially a contract (usually established by city ordinance) that grants the utility permission to use public property – such as streets, alleys, and other rights-of-way – to install and operate the poles, wires, conduits, and other equipment needed to deliver electricity. In California, state law provides the framework for these franchises (Public Utilities Code §§6001-6302). Key points about franchise agreements include:

- **Exclusive Access**: In some cases, the franchise gives the utility the **exclusive right** to provide electric service using the city's rights-of-way. This exclusivity aligns with the utility's state-granted monopoly for that service territory. The agreement often clarifies that it is in lieu of any other rights or franchises; a utility cannot operate in the public streets without such consent.

- **Term**: Franchise agreements commonly have long durations. Historically, many were for **30, 40, or 50-year terms** (for example, a number of California city franchises granted in the 1950s ran for 50 years, expiring around 2000-2010). Some franchises are even "indeterminate," lasting until revoked or replaced 📎. Long terms provide stability for the utility to invest in infrastructure, but they also mean cities are locked in for decades. Recently, some cities have sought shorter terms or updated conditions upon renewal, especially as energy landscapes change.

- **Franchise Fees**: The utility pays the city for the privilege of using public land. In California, two common fee structures exist – the **Broughton Act** formula (a percentage of gross receipts, traditionally around 2%) or negotiated fees (often higher percentages or surcharges on bills). For instance, a city might receive around 2% of the revenue the utility earns within city limits as an annual payment 📎. These fees typically go into the city's general fund to support services. They can amount to substantial revenue for a city, especially a large one. (As a note, when customers switch to a CCA for generation, the franchise fee on the delivery portion remains; some disputes have arisen about fees on the power portion, but generally the utility continues to pay on its distribution revenue.)

- **Utility Obligations**: Franchise agreements often spell out obligations of the utility to the city, beyond just paying fees. A key obligation is to **relocate infrastructure on request**. By law and franchise terms, if the city needs to, say, widen a road or build a new sewer line, and a power pole or underground electric line is in the way, the utility must move its equipment at its own cost to accommodate the project (though those costs are then passed on to ratepayers) 📎 📎. This prevents utilities from blocking civic improvements. Franchises may also require the utility to meet certain standards for street repairs (when they dig up a road to lay a line, they must restore it), indemnify the city against lawsuits from utility work, and coordinate on emergency response. In some cases, franchises have provisions about **undergrounding** (converting overhead lines to underground) – e.g. the utility might agree to spend a certain amount on undergrounding each year in the city, or the city, IOU and other non-electrical utilities may share costs, especially if other utilities' lines are to be undergrounded at the same time, using the same trenching, such as telephone or broadband internet wires.

- **City Rights**: The city usually retains the right to audit the utility's books related to franchise fee calculations, to ensure it's getting the correct payments. The city also often reserves rights to enforce the franchise terms and, if seriously breached, to revoke the franchise (though revocation is rare and complicated in practice). When a franchise expires, the city can use that moment as leverage to negotiate new terms or potentially consider other options (such as municipalization or changing providers), but in practice, the incumbent IOU's state-granted service area remains intact unless the city actively ousts it.

Franchise agreements thus **formalize the city-utility relationship**. They don't give the city control over rates or the utility's resource choices – those remain under CPUC jurisdiction for IOUs – but they **do give the city some bargaining power and oversight regarding the utility's physical presence and operations in the community**. **A city manager or attorney should be aware of their franchise's renewal date and terms.** For example, San Diego recently faced a franchise renewal with SDG&E in 2021 and debated whether to demand better terms or even to municipalize; ultimately, they renewed for 20 years but with increased fees and some stronger enforcement clauses. A franchise agreement can include *innovative terms*, like commitments for the utility to collaborate on climate action (some cities have started to negotiate for things like EV charging infrastructure or data sharing as part of renegotiated franchise agreements). In essence, the franchise is one of the few tools a city has to influence an IOU's behavior locally: it can't set the rates, but it can set the ground rules for using city property and make sure the utility contributes to the community.

## Charter Cities, Home Rule, and Creating a Municipal Utility

Cities in California come in two forms: **general law cities** (following the state's general municipal code) and **charter cities** (operating under their own city charter with more home-rule powers in municipal affairs). This distinction can play a role in utilities. **Charter cities** often have broader authority to legislate on local matters, which could include how to manage utilities, as long as it doesn't conflict with state law on matters of statewide concern. For example, a charter city might have provisions in its charter regarding franchising or operating utilities. The City of Los Angeles, a charter city, directly owns and operates the Los Angeles Department of Water and Power (LADWP) under authority granted by its charter. However, **even general law cities are permitted under state law to get into the electric utility business** – the state Constitution and statutes allow any city to form a municipal utility or join a public power district📎. In practice, charter city status might make the process a bit easier in terms of local governance because the city doesn't need additional permission from the state to undertake a utility venture, since it's within their home-rule scope, but **the major hurdles to creating a city-owned utility are financial, legal, and political rather than the city's legal status**.

So how can a city create a **municipally owned utility** (MOU)? There are a few different paths:

1. **Forming a City Department or Utility Authority**: The city can decide to establish its own electric utility enterprise. This may require a public vote to authorize the city to incur debt to buy or build the system (bond measures) and sometimes a vote to actually form the utility, especially if required by city charter or state law (for example, some city charters mandate a vote before the city can start providing a new utility service). The city would then negotiate to purchase the existing distribution network from the incumbent IOU. This is the most direct form of municipalization – essentially **buying the grid** that serves the city and taking over service.

2. **Joining or Creating a Public Utility District (PUD) or Municipal Utility District (MUD)**: California law provides mechanisms for regions to form independent utility districts (e.g., SMUD was formed by a vote under the Municipal Utility District Act). A city or group of cities can pursue this if a broader regional utility might make sense. This also requires public votes and typically the **use of eminent domain to acquire the incumbent's assets** in the area.The formation process is done through a Local Agency Formation Commission (LAFCO)📎 process if it involves only unincorporated county territory or multiple jurisdictions.

3. **"Spot" or "Targetted" Municipalization**: In some cases, a city might start a small municipal utility just for new development areas or city facilities (leaving most of the city still served by the IOU). This can be simpler because the city can build new wires in an undeveloped area it controls (like a new subdivision or an industrial park) without immediately displacing the IOU elsewhere📎. Over time, the city utility could expand. This approach avoids the big upfront cost of buying existing distribution infrastructure, but it requires that there are new areas to serve (which may not be the case in a fully built-out city).

Regardless of the path, some **key steps and terms** are involved in creating a municipal utility:

- **Feasibility Study**: Almost always, the process begins with a study to assess if a city-run utility is economically viable and what it would cost to make it operational📎. This includes valuing the existing distribution system that may need to be purchased from the IOU, projecting operating costs, and comparing the city's potential rates to the incumbent's rates. It also examines reliability, staffing, power supply options, and legal barriers. For example, San Francisco, San Jose, and other cities have commissioned such studies in recent years.

- **Asset Acquisition and Just Compensation**: If the city wants to take over the wires, poles, substations and meters, it needs to pay **fair market value** for those assets. Sometimes the incumbent utility is willing to negotiate a sale. Far too often, they are not interested in selling, so the city may have to pursue eminent domain (a forced buyout through the courts). This can become a major legal battle over the **valuation** of the utility's property. The utility will argue for a high value (including future profits lost, etc.), while the city will argue to pay a reasonable replacement cost. For instance, San Francisco offered $2.5 billion to PG&E for the city's grid, but PG&E rejected it as too low 📎. Now San Francisco is petitioning state regulators to help determine a fair price 📎. **These negotiations or court proceedings can take years.** "Stranded costs" might also be an issue – the incumbent might claim compensation for investments made on behalf of customers that it will no longer serve.

- **Regulatory Approval**: In California, a municipal utility can be formed by a city without needing CPUC permission to operate (since CPUC doesn't regulate city utilities). However, **if the city is taking over service from an IOU, the CPUC will get involved to modify the IOU's service territory and remove those customers from the IOU's responsibility**. In situations like this, the CPUC would need to approve the transfer of service or at least confirm that the IOU is relieved of its obligation in that area. Practically, this usually follows the outcome of negotiations or eminent domain – once a purchase is settled, the CPUC signs off on the change. If eminent domain is litigated, CPUC administrative law judges (ALJ) determine the outcome. (Court decisions often favor the IOU's interests.) In parallel, **FERC** might need to approve transfers of any wholesale contracts or transmission arrangements (and if the city utility will use the transmission system, it will become an entity under FERC's purview for those transactions). These are complex and difficult to navigate regulatory steps once a decision to municipalize is made.

- **Franchise and Transition Agreements**: During and after a takeover, the city and IOU typically have to agree on how to handle the **transition** to avoid service disruption. Sometimes, as part of a settlement, an IOU might continue operating the grid for a period under contract while the city ramps up its own utility operations. Or the city might immediately take over operations and hire many of the former IOU employees. Assets like customer data, billing systems, and maintenance records need to be handed over. These details can be worked out in a transition services agreement. Additionally, if only part of a city is municipalizing or if facilities are intermingled, there might be **franchise-like agreements post-municipalization**: for example, the city might allow the IOU to keep some lines that transit through the city to reach other areas, or the IOU might deliver power to the city utility at certain interconnection points. All these terms must be negotiated to ensure clarity on responsibilities.

Becoming a municipal utility has traditionally been a heavy lift. Only a few California cities have done it in modern times (most POUs in the state were established many decades ago). For city leaders, it's important to know that this is *possible* and legally supported – the California constitution's grant of plenary power to cities over municipal affairs is a strong basis, and statutes provide mechanisms to form utilities📎. **Charter cities** may feel they have a bit more self-determination in this area (since they can cite their charter powers to embark on providing utilities), but ultimately **any city will have to navigate the financial and regulatory gauntlet** to create its own electric utility. This leads to the next issue: why so few have succeeded recently, and what stands in the way.

# The Municipalization Challenge: Regulatory Logjam and IOU Resistance

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Significant municipalization obstacles

- **IOU Opposition:** IOUs vigorously resist municipalization through lobbying, political influence, and substantial legal resources, often resulting in lengthy legal battles.
- **Complex Procedures:** The traditional municipalization process has involved navigating complicated regulatory processes, feasibility studies, public votes, and eminent domain actions, potentially spanning years or decades.
- **Political and Legislative Barriers:** IOUs can influence legislation or political decisions, increasing the difficulty of achieving voter support or regulatory approval.
- **Union Opposition**: Electrical labor unions, which wield political influence and can shape public opinion, have historically opposed municipal utility formation.
- **Financial Risks:** Municipalization involves high upfront costs and uncertain financial outcomes, with IOUs often highlighting these uncertainties to discourage municipal efforts.

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Even though cities have the right to form their own utilities, in practice it has proven **extremely difficult to break away from an incumbent IOU**. There is often a *regulatory and legal logjam* that can stymie municipalization efforts for years. A combination of factors contributes to this:

- **Incumbent Utility Opposition**: IOUs generally fight hard to retain their territory. They have significant financial resources and political influence, and they often deploy both against municipalization drives. For example, **PG&E has a long history of opposing public power efforts in California.** In 2002, PG&E spent about $2.7 million to defeat a San Francisco ballot measure (Prop D) that would have expanded the city's public power services📎. In the late 2000s, when several communities started exploring municipal utilities or community choice, PG&E reported spending $11 million in one year specifically to oppose such efforts and related legislation📎. In 2010, PG&E went so far as to put a statewide initiative (Proposition 16) on the ballot – dubiously titled the "Taxpayers Right to Vote Act" – which would have required a supermajority 2/3 public vote for any new municipal utility or expansion of public electric service. PG&E poured **$46 million** into promoting Prop 16📎, which was widely seen as an attempt to erect higher barriers for communities considering public power. (Voters ultimately defeated Prop 16, but the scale of that campaign underscored how far an IOU might go to protect its monopoly.) In Marin County, officials who tried to form a public power agency in the mid-2000s described the experience of facing PG&E's lobbying and tactics as "horrible and vicious," warning that a city must be prepared for a **"very, very rough experience"** when challenging an IOU's territory📎.

- **Procedural and Legal Hurdles**: The process of municipalization has traditionally required jumping through many hoops – each of which can be a cause for delay or dispute. Feasibility studies can take a year or more. If formation requires a public vote, the measure might fail if the utility's campaign messaging convinces voters it's too risky or expensive. If eminent domain is used, the court process to determine a fair price can drag on for years, especially if the utility contests every aspect. For instance, the City of Boulder, Colorado (outside California, but an illustrative case) spent nearly a decade and over $20 million in legal and consulting costs trying to form its own utility, due to protracted fights with its incumbent electric utility (Xcel Energy) over asset valuation and separation logistics. Multiple ballot measures, court cases, and regulatory hearings were held. Ultimately, Boulder reached a settlement in 2020 to halt municipalization in exchange for concessions on clean energy from Xcel – highlighting how even a determined city can be worn down by a drawn-out process. In California, if a city were to go to the CPUC to get approval for condemning a utility's assets or removing an area from an IOU's service territory, that proceeding could become contentious (though the CPUC's jurisdiction in an eminent domain action by a city is limited, the IOU could raise issues to delay it). **In short, the incumbent has used the complexity of the process as a weapon**, making it so costly and time-consuming that city leaders or voters can lose patience.

- **Political and Legislative Barriers**: Beyond Prop 16-type attempts, even local politics can create barriers. In San Diego recently, a citizens' group "Public Power San Diego" gathered signatures to put a municipal utility initiative on the ballot. Rather than allowing voters to decide, the San Diego City Council in 2022 opted to decline placing it on the ballot (citing legal flaws and premature timing)📎. That decision was made amid heavy lobbying; SDG&E had established a political action committee to oppose the effort and funded studies projecting astronomical costs for a city takeover📎. In this case, the normal democratic route to consider public power (a ballot measure) was short-circuited, illustrating how incumbent influence can shape outcomes even at the city government level. State legislation can also hinder new municipal utilities – for example, some states have laws requiring an exiting municipality to compensate the IOU for not just assets but also future lost revenues, making the cost prohibitive. While California doesn't have that specific law (thanks in part to Prop 16's defeat), the absence of state policies facilitating municipalization means the default approach has been an uphill battle. There is effectively **no state-level support structure** to make the process easier for cities.

- **Union & Workforce Resistance:** In addition to IOU opposition, cities must also anticipate potential resistance from electrical labor unions, which have historically opposed municipal utility formation. Unions fear losing existing collective bargaining agreements, benefits, and guaranteed large-scale capital spending by incumbent IOUs. Because unions wield political influence and can shape public opinion, their opposition often dovetails with IOUs' anti-municipalization campaigns. Cities considering a municipal utility or an SCU model should engage unions early, exploring options like project labor agreements, workforce transition plans, or commitments to match prevailing wage standards to mitigate labor concerns.

- **Financial Risks and Uncertainties**: Creating a utility has been a huge financial undertaking, and IOUs have capitalized on this uncertainty. They argue that cities underestimate the true costs and complexities of running an electric utility. When San Francisco made its $2.5 billion offer for PG&E's infrastructure, PG&E's leadership claimed the city **"underestimated substantial costs"** and warned that if the sale happened, customer rates would actually rise📎. IOUs often commission studies (as SDG&E did) to show that a buyout would cost far more than the city thinks once you add in all the assets, separation costs, and startup expenses📎. These analyses, of course, aim to discourage city officials and the public by highlighting worst-case scenarios. There is also the reality that a city needs access to capital (issuing bonds) and must maintain reliable operations from day one of taking over – not a trivial challenge. The **fear of the unknown** can sway public opinion: it's easy for opponents to run ads asking "Do you want your city government running your electricity and potentially raising your taxes or risking blackouts?" Unless there is a major crisis motivating change (as happened when Winter Park, FL faced terrible reliability and finally voted to municipalize in 2005, or when PG&E's bankruptcy and wildfire failures pushed San Francisco to consider drastic action), the public may shy away from the perceived gamble of a new city utility. IOUs leverage this fear with professional campaigns, contributing to the logjam.

Given these dynamics, it's not surprising that **successful municipalizations have been rare** in recent decades. One notable California example was the tiny City of Hercules, which in the early 2000s wrested a portion of its area from PG&E to form a municipal utility – but even that cautionary tale ended poorly, with Hercules' venture struggling financially and eventually folding back into the IOU system after losing millions (partly due to mismanagement)📎. Most other attempts in California (San Francisco, Davis, San Diego, Marin County, etc.) have either been stymied or redirected into less drastic measures like Community Choice Aggregation. The *status quo* thus heavily favors the incumbent utilities, effectively amounting to what many call **"regulatory capture"** – where the regulatory and political system is so aligned with or influenced by the utilities' interests that alternative models face a nearly insurmountable barrier.

## Impacts on City Climate Goals, Economic Development, and Electric Rates

Why do these arcane regulatory battles matter? Because the difficulty in reforming the utility model **directly affects cities' abilities to achieve their goals** in areas like climate action, economic development, affordability, and sustained economic justice.

Take **climate and clean energy goals**. Hundreds of cities, including many in California, have adopted ambitious targets for renewable energy and greenhouse gas reduction – some aiming for 100% clean electricity or carbon neutrality by specific dates. If the local electric utility is not aligned with those goals, it can be frustratingly slow or resistant to change. IOUs answer to the CPUC and shareholders, and historically they have moved at the pace of state mandates (e.g., Renewables Portfolio Standard requirements) rather than the urgency some cities would prefer. A California city that wants all its power carbon-free by 2030, for instance, might find its IOU is only willing to do the required minimum—to be 60% renewable by 2030 under state law. This gap led cities like Boulder to try to form a municipal utility – specifically to procure cleaner power faster. In California, many cities turned to CCAs as a workaround, allowing them to choose a cleaner power mix for their residents. However, not every aspect can be addressed by CCA; for example, **accelerating the decarbonization of the grid also requires policies that encourage distributed solar, energy storage, and allowing electric vehicles to both charge from and discharge to the grid**. An IOU may not support such policies if they conflict with the utility's business incentives or operational preferences.

Another issue is **innovation and flexibility**. City-led climate initiatives often include things like setting up microgrids for resilience, installing solar plus battery systems on critical facilities, or leveraging demand response programs to reduce peak loads. These require utility cooperation. IOUs, being large organizations with established protocols, can be slow to approve or implement such localized innovations. Some city officials have encountered utility pushback on projects like community solar or neighborhood microgrids, especially if they challenge the traditional top-down grid model or if they are seen by the IOU as endangering the dominance they've enjoyed during the last century. As one energy expert observed, **utilities are used to "being king" of the grid and often find it "offputting" if others (like a city or community project) want to operate on "their" grid; they "don't want to change" if the rules don't reward it and if it's not profitable for them**📎**.** This mindset is a form of inertia that can thwart city efforts to modernize and green the energy supply at the local level. In a captured regulatory environment, even well-intentioned state policies might not filter down to bold on-the-ground action if the utility isn't fully on board.

Now consider **economic development and infrastructure for growth**. Cities need reliable, adequate power infrastructure to attract and support businesses and housing. If the utility's grid isn't keeping up – say the transformers in an area are maxed out, or new service hookups take too long – that directly hurts development. Cities like San Jose have complained that PG&E's slow pace of upgrading distribution systems has delayed new construction projects and could jeopardize tech industry expansions that require robust power supply. In fact, San Jose officials explored creating a city utility primarily because they were concerned that **the IOU was not delivering infrastructure fast enough to meet the city's aggressive growth plans** 📎. In response, PG&E acknowledged the city's concerns and pledged to accelerate grid upgrades, noting that San Jose's goals for housing and new jobs demand more timely investment in substations and power lines 📎. This example shows the leverage that even the **threat** of municipalization can have – it lit a fire under the IOU to improve performance. But not every city has that leverage or has the resources to go as far down the municipalization road. Under the current model, a city can't force an IOU to invest in a particular neighborhood's capacity or reliability beyond asking the CPUC to order it, which is a slow bureaucratic process. A city-run utility, on the other hand, could directly bond for and build the infrastructure needed to attract a new high-tech campus or to ensure a new housing development has solar and battery backups. **Economic opportunities can be lost or delayed when the electricity provider isn't responsive to local needs**.

**A significant factor negatively influencing economic development is the ongoing leakage of local dollars through IOU dividend payments.** When residents and businesses pay monthly bills to a for-profit utility, a meaningful portion of that revenue is channeled to investors—often located across the country and even internationally—rather than being recycled in the local economy. Over time, this outflow of capital materially hampers the community's ability to reinvest in local infrastructure, schools, businesses, and clean-energy initiatives. By contrast, under a publicly owned or community-focused utility model, the funds that would otherwise leave as dividends can remain within the region, supporting new projects, lowering rates, and stimulating job growth. Especially for cities aspiring to boost resilience, reduce carbon emissions, and expand equitable economic opportunities, retaining more of each energy dollar locally is a powerful lever for sustained local prosperity.

Finally, there's the question of **electric rates and affordability** for residents and businesses. California's IOU electric rates are among the highest in the nation, due to a combination of factors (aging infrastructure, wildfire mitigation costs, transmission investments, shareholder dividends, etc.). High utility costs can be a burden on low-income households and a competitiveness issue for businesses. Cities have limited ability to directly reduce rates under IOU service – they can advocate for discounts or programs, but they cannot set the rates. Municipal utilities, by contrast, often have lower rates and can tailor rate programs to community priorities (for example, Pasadena's municipal utility offers special economic development rates to attract businesses, and LADWP has various subsidy programs funded through its revenues). As noted earlier, **publicly owned utilities on average charge roughly 15-40% less than IOUs for power** 📎. keeping more money in residents' pockets. They do this by eliminating shareholder dividends and accessing lower-cost financing, among other efficiencies. When IOUs fight to block municipal utilities, they are in essence preventing communities from accessing those potential savings. Over the long term, this **affects affordability** and the cost of living or doing business in the city. It's a classic case of monopoly vs competition: the monopoly simply does not have the same pressure to cut costs or innovate pricing.

Moreover, some climate goals align with cost control – for instance, improving energy efficiency and local solar can reduce bills. A city might want to aggressively roll out building energy retrofit programs or local solar incentives, but if the IOU's rate structures (like high fixed charges or slow meter interconnection approvals) aren't supportive, the impact is blunted. When the regulatory environment is captured by incumbent interests, it can result in **higher costs and fewer options** for consumers than otherwise possible. We see this in controversies like the *exit fees* charged by IOUs to customers who leave for CCAs – these fees, approved by the CPUC under IOU pressure to ensure they recover certain costs, make it harder for the local CCA to deliver immediate savings. All of these nuances play into whether cities can achieve their vision of affordable, sustainable energy.

In summary, the current landscape – dominated by large IOUs with entrenched monopolies – often leaves cities feeling hamstrung in pursuing ambitious climate programs, in ensuring the power grid supports their economic growth, and in guaranteeing that electricity remains affordable for all. This is not to say IOUs can't be partners; many are working on clean energy and reliability too. But the **mismatch in accountability** (IOUs answer to state regulators and investors, not to cities and their constituents) means city priorities often take a back seat. Recognizing these limitations sets the stage for considering new models that might better align electric service with local objectives.

## Paving the Way for Solutions – Enter the SCU Model

The challenges outlined above call for **innovative solutions**. City leaders increasingly realize that if the traditional utility framework can't deliver the results their communities need – whether it's rapid decarbonization, resilient infrastructure, or fair rates – then new approaches must be explored. One such approach is the **Spark Community Utility (SCU) model**, which will be introduced in the next section.

*(At this point, you might be asking: what is an SCU?)* The SCU model is a bold concept designed to overcome the barriers we've discussed. In essence, it aims to combine the benefits of local, public accountability with the scale and resources of a utility, **without getting stuck in the current regulatory logjam**. Think of it as reimagining the utility paradigm to empower communities. The details of SCU will be covered shortly, but as a preview, this model could offer cities a new pathway to gain influence or control over electrical service **in**

**collaboration with state authorities and possibly other cities**, sidestepping some of the pitfalls that single-city municipalization efforts face.

By understanding the fundamentals – why utilities are regulated monopolies, how the grid operates, what legal tools cities have, and why change has been so hard – city administrators are now equipped with a solid foundation. With this context, the discussion can now turn to how an SCU might provide a **new framework for partnership and governance** that aligns the utility sector with local and statewide public goals. The tone going forward remains **realistic yet optimistic**: the hurdles are high, but with open-minded consideration of models like the SCU, cities may find a way to break through the status quo and achieve reliable, affordable, and green energy for their communities.

Chapter 2

# Modern Public Power

The Spark Community Utility (SCU) model offers California city leaders a **bold yet feasible path to transform their local energy landscape to gain greater control over their energy future one step at a time**. By leveraging the unique regulatory freedoms in California, SCUs can deliver cleaner, more reliable, and community-centric energy services. By learning and adapting through incremental energy-related product offerings, an SCU can scale from early innovations into a comprehensive, municipal energy solution that delivers multiple benefits: cleaner power, enhanced resilience, local investment, and empowered consumers. With an open-minded approach and a focus on practical pilot projects, cities, developers and other local leaders can craft SCU initiatives that align with their local goals, confident that a flexible, incremental approach can lead to transformative outcomes. The SCU is not just a theoretical idea; it's a customizable framework that cities can start working on *today* to achieve their sustainability and resilience goals within the existing energy ecosystem📎. The message is clear: **begin now, start small, and build on success – a Spark Community Utility can evolve into a cornerstone of your community's infrastructure**📎. With patience and strategic scaling, today's opt-in microgrid or solar program could become tomorrow's citywide clean energy utility.

## Introducing the SCU Municipalization Model

The **SCU** is a new model for local public energy service, evolved from Ann Arbor, Michigan's **Sustainable Energy Utility (SEU)** but tailored to California's landscape. Like Ann Arbor's SEU, the SCU is an **opt-in, supplemental community-owned utility** that operates in parallel to the incumbent investor-owned utility (IOU)📎. It aims to give communities more control over their energy sources without fully displacing the existing grid. Ann Arbor's SEU was overwhelmingly approved by voters (79% voted in favor in Nov. 2024) and is currently moving toward implementation📎. The SEU will begin operations by installing rooftop solar panels and battery systems for participating homes and businesses, gradually building out neighborhood microgrids as more customers join📎📎. This real-world progress in Ann Arbor has informed the SCU's design for California, demonstrating that a parallel, community-owned utility is both **legally feasible and publicly popular**.

**Michigan vs. California Context:** The SCU model accounts for key differences between Michigan and California. In Michigan, communities like Ann Arbor had no option for influencing their power supply apart from the monopoly utility (DTE Energy) – community choice aggregation (CCA) was not authorized without new state legislation📎 📎. Ann Arbor's SEU arose as a practical solution after other paths (like persuading DTE to go greener or attempting full municipalization) proved unrealistic📎. In California, by contrast, CCAs already let cities procure cleaner electricity, but **reliability and local infrastructure** remain challenges under IOU distribution. California's frequent wildfire-driven outages and **public safety power shutoffs** have created urgency for local resilience solutions that go beyond what CCAs or IOUs currently offer. The SCU model is thus uniquely designed for California's regulatory environment and climate realities: it leverages **California's existing laws and local government powers** to create a city-run utility service focused on distributed energy and resilience, complementing (not replacing) the IOUs and CCAs. In short, SCU is an evolution of Ann Arbor's SEU – carrying forward the idea of a community-owned, opt-in clean energy utility – but adapted to **California's regulatory framework, market structure, and urgent needs for clean, affordable, and reliable power**.

# Key Features of the SCU Model

**Parallel, Opt-In Structure:** An SCU functions alongside the incumbent utility rather than replacing it. Participation is entirely voluntary – only customers who choose to opt in will be served by the SCU's programs and power supply📎. This is unlike a traditional municipal utility, which replaces the incumbent and serves all customers by default. The SCU's parallel design means residents and businesses gain a new option for energy services **without** being forced to switch. Those who join can receive **power from two providers**: the SCU (for local renewable supply and services) and the IOU/CCA (for any remaining needs), each billing for its portion of service📎.

**SCU power is generated locally and tracked by a customer's SCU meter, just as IOU-provided power is accounted for by the customer's IOU meter.** However, power drawn from the IOU is strictly for that customer's own use **and does not flow back through the SCU meter and across SCU lines to other premises.** This choice-based model expands consumer options and **allows incremental growth** based on demand.

**Independence from IOU Distribution Assets:** A defining feature of SCUs is that they do not rely on IOUs' distribution poles and wires. Instead, an SCU develops its own local energy infrastructure – for example, by installing solar panels and batteries on rooftops, laying dedicated microgrid lines in a neighborhood, or connecting new developments to separate SCU-owned substations. While this approach "duplicates" some infrastructure, which has traditionally been avoided in power systems📎, the benefit is that the community can build a more resilient and cleaner network on its own terms. By operating independent of IOU distribution, SCUs **avoid the regulatory constraints and costs** of using IOU wires (such as high grid access fees or limitations on third-party energy sharing). This independence has broad implications:

- *Regulatory:* The SCU's local wires are governed by the community, not the CPUC, which gives the city flexibility to innovate.
- *Financial:* Freed from paying IOU delivery charges or shareholder dividends, an SCU can redirect revenue into local infrastructure. Over time, as local generation expands, the community buys less power from the IOU, saving money 📎. SCUs also can tap into lower-cost public financing or grants for infrastructure that IOUs might not pursue.
- *Engineering:* SCUs can design **modern microgrids** and undergrounded lines for reliability, integrate battery storage at key nodes, and right-size the system to community needs. The focus is on **distributed energy resources (DERs)** located near consumers, which reduces reliance on long transmission lines.
- *Technical Architecture Options*: SCUs can leverage proven **software-defined distribution architectures** like EnergyNet 📎, already being deployed in European municipalities. These systems use Energy Routers with DC backplanes to eliminate conversion losses (improving efficiency by 5-10%), enable peer-to-peer energy sharing through open protocols, and provide galvanic separation that prevents disturbances from cascading between local microgrids and the main grid. The modular nature of these systems (typically 50-80 ports per standard telecom rack) allows incremental capacity additions matching customer growth.
- *Community:* Because the infrastructure is community-owned, there is greater accountability to local needs – for example, prioritizing critical facilities—like fire stations, shelters, and hospitals—for backup power or placing solar installations in ways that also provide community benefits—like shaded parking or resilience hubs).

| CA Utility Organization Comparison | | | |
|---|---|---|---|
| **Details** | Investor-Owned Utility | Traditional Muni | SCU |
| % CA Customers Served | 75—80% | 15—20% | 0% |
| Locally Franchised | ✔ | ✔ | ✔ |
| Requires Ballot or Legislative Campaign | ✔ | | |
| Lead Regulator | CPUC | Local | Local |
| CEC Oversight | ✔ | ✔ | ✔ |
| CPUC Oversight | ✔ | ✔ | |
| CAISO Oversight | ✔ | ✔ | |
| Rate & Service Regulation | CPUC | Local | Local |
| Obligation To Serve | ✔ | ✔ | |
| Certificate of Public Convenience and Necessity | ✔ | ✔ | |
| Resource Adequacy (RA) Goals | ✔ | ✔ | |
| Uses IOU Distribution Infrastructure | ✔ | | |
| Uses Software-Defined Distribution (e.g., EnergyNet) | | | ✔ |
| Profit Model | For Profit | Non-Profit | Non-Profit |
| Municipal Bond Financing Possible | | ✔ | ✔ |
| Incremental Customer Conversion | N/A | | ✔ |
| Constitutionally Protected | ✔ | ✔ | ✔ |
| CCA Partnership Potential | ✔ | ✔ | ✔ |
| Involves Municipalization | | ✔ | ✔ |
| Customers Opt-In To Services | | | ✔ |
| On-Bill Energy Financing Capable | | ✔ | ✔ |
| Improves Community Resilience | | ✔ | ✔ |
| Enhances Local Economic Development | | ✔ | ✔ |

It's important to note that SCUs would **gradually build out their own distribution network**. They might start by linking a few buildings in a microgrid or by developing infrastructure in a new housing development, then expand as more participants opt in. This incremental approach means the SCU isn't stringing new lines citywide overnight – it's growing organically, driven by customer interest and specific project opportunities.

**Incremental, Demand-Driven Growth:** The SCU model emphasizes starting small, proving viability, and scaling up based on demand. Because only those who opt in are served, the SCU can launch with a **modest initial customer base** and infrastructure that matches that scale. This reduces the upfront investment and risk. For example, Ann Arbor will wait to launch its SEU until it has about 20 MW worth of subscribers (roughly 1,000 homes or a couple of large institutions), ensuring enough revenue to support operations from day one📎. A California SCU could similarly set a subscription threshold or start with pilot installations that have guaranteed off-takers (such as city facilities or willing large customers). By growing in response to community demand, SCUs avoid the classic problem of a huge sunk cost before revenues materialize. Instead, each new project (residential rooftop solar, a solar neighborhood microgrid, a battery at a school, etc.) brings its own customers and revenue stream, steadily **building the utility's portfolio**. This demand-driven expansion not only instills financial discipline but also allows the community to **learn and adjust** as the SCU scales, incorporating new technologies or business models over time.

**Broad Range of Energy Services:** Unlike a conventional utility that mainly delivers kilowatt-hours, an SCU is conceived as a **full-spectrum energy service provider**. Because it is community-centric, it can bundle many offerings to advance local sustainability and resilience goals. Key services an SCU might offer include:

- **Local Renewable Electricity Supply:** Installation and operation of distributed generation like rooftop solar, community solar gardens, or small wind and geothermal systems. The SCU supplies 100% renewable energy to its subscribers from these local sources📎, helping cities hit climate targets.
- **Neighborhood Microgrids:** Building and managing microgrids that can connect multiple customers (homes, businesses, critical sites) on a local circuit. These microgrids enable customers to **share energy** (e.g., excess solar) with neighbors, can operate independent of the wider grid ("islanded"), or if connected to the grid, can keep running during grid outages📎. This creates resilience against blackouts – a particularly valuable service in fire-prone regions or during heat waves.
- **Resilience Hubs and Backup Power:** Developing resilience hubs (community centers with reliable backup power and resources) and providing backup power systems (battery storage, generators) for key infrastructure. An SCU could ensure that libraries, emergency shelters, and hospitals remain powered during emergencies by using its local DERs and storage.

- **Demand Response Programs:** Managing smart appliances, thermostats, and EV chargers among SCU participants to reduce peak demand or provide grid services. Because the SCU controls its own customer interface and possibly some infrastructure, it can more directly coordinate demand response events or optimize energy use across its network.

- **Energy Efficiency and Electrification:** Running robust programs to retrofit homes and businesses – EV chargers, fuel switching, or upgrading insulation, HVAC, lighting, and appliances to cut energy waste📎. An SCU, as a city entity, can seamlessly integrate efficiency upgrades with its supply offerings, even financing them and recouping costs on the utility bill. It can also promote electrification (switching from gas heating or gasoline cars to electric heat pumps and EVs) by offering incentives or on-bill financing for such upgrades📎, all while reducing its customers' total energy costs.

- **EV Charging Infrastructure:** Installing and operating EV charging stations as part of the utility's services. An SCU could provide neighborhood charging hubs or curbside chargers, powered by local green energy, and use smart charging to balance load on the microgrid. This expands electric vehicle adoption by addressing the charging needs within communities.

- **Innovative Heating/Cooling Solutions:** For instance, **networked geothermal** systems that distribute ground-source heating/cooling to multiple buildings📎. An SCU could build and run these systems (essentially a shared thermal utility) to decarbonize heating. Waste heat recovery, district energy, or even community-scale heat pump networks could fall under an SCU's umbrella.

In short, an SCU is not just about delivering electricity; it's about **orchestrating a local clean energy ecosystem**. This comprehensive approach can yield synergistic benefits – for example, combining solar, batteries, and efficiency improvements yields deeper cost savings and emissions cuts than any one measure alone📎. It also increases customer engagement, as people see the SCU as a one-stop shop for their energy needs (solar, backup power, weatherization, EV charging, etc.) rather than dealing with separate programs from different entities.

**Innovative Billing and Customer Experience:** A practical but crucial feature of the SCU model is operating its own billing and customer management system, rather than piggybacking on the incumbent utility's billing. This might seem technical, but it has far-reaching implications. By running its own billing, an SCU can **design more flexible rate structures and service bundles**. For example, the SCU could offer a single combined bill for a suite of services – such as an "Energy-as-a-Service" package that includes a flat monthly rate for a solar + battery system, unlimited EV charging at city stations, and free energy audits. It could implement time-of-use pricing, rewards for conservation, or community solar credits in ways that the IOU's billing system might not accommodate. Ann Arbor identified setting up a billing system as a key startup task for the SEU📎, precisely to enable this flexibility. The separate billing also reinforces the parallel nature of the model: customers would receive one bill from the SCU for the services they opt into, and another from the IOU/CCA for any remaining electricity from the traditional grid📎. While that means two bills, it allows the SCU's bill to be **highly customized and transparent**, showing participants exactly what local projects and programs they are funding. Over time, if the SCU's offerings are reducing the customer's overall energy-related costs (for instance, cheaper solar energy or lower outage costs), this will be reflected on the SCU bill, building trust and buy-in. Moreover, controlling its own billing and data gives the SCU direct relationships with customers, enabling better customer service and the ability to rapidly pilot new offerings (like a peak-time rebate or a community solar subscription) without needing approval from an outside entity. In essence, **billing autonomy** is what gives the SCU the agility of a startup with the accountability of a public service.

**Equity-Centered Service Design:** The SCU model enables cities to prioritize equity and environmental justice through targeted, community-informed investments designed to directly benefit historically underserved neighborhoods. When focusing early deployments of solar, storage, and resilience infrastructure in disadvantaged communities, SCUs can proactively address disparities in reliability, energy affordability, and environmental health. Special attention is given in the SCU model to ensuring that financing tools, such as on-bill financing and targeted subsidies, make clean energy improvements accessible to lower-income households and small businesses, ensuring equitable participation and meaningful community empowerment from the outset.

## Technical Implementation Framework: The EnergyNet Model

SCUs benefit from adopting proven technical architectures rather than developing proprietary systems. The EnergyNet 📎 framework, successfully demonstrated in Sweden's Lund and Örebro projects 📎, offers several advantages for SCU implementation:

**Modular Scalability**: Energy Routers can start with as few as 10-20 ports serving a proto-microgrid, expanding to hundreds of ports as the SCU grows. Each 1U rack module (approximately 1.75 inches) can support 1-4 bidirectional power connections, allowing precise capacity matching to demand.

**Near-Real-Time Operation**: Unlike traditional grids requiring instantaneous balancing, EnergyNet's buffered approach using local storage allows "some power is better than no power" operations during disruptions—directly supporting SCU's tiered resilience model (VOR123) 📎.

**Open Standards**: The Energy Protocol (EP) is open-source, avoiding vendor lock-in and enabling competitive procurement—critical for public agencies. California SCUs could contribute to and benefit from ongoing protocol development.

**Proven Deployment Path**: Swedish municipalities have demonstrated that "Freedom Cables"—dedicated parallel infrastructure—can be deployed alongside incumbent utility assets without regulatory conflict, a model directly applicable under California's franchise law framework.

# Regulatory Positioning and Implementation Feasibility

One of the most compelling aspects of the SCU model is that it can be implemented **under California's current regulatory framework** – no new state laws, ballot initiatives, or CPUC rule changes are required to get started📎. This is by design: SCUs leverage powers that California cities and counties already have, avoiding the long political battles that often accompany utility reform. Below is an overview of how SCUs navigate the regulatory landscape and why they are feasible to implement now:

- **Local Government Authority:** In California, municipalities (especially charter cities) have significant authority over "municipal affairs," which can include providing utility services. Dozens of cities already operate their own electric utilities or water utilities. An SCU can be established by a city council ordinance or resolution – much like forming a traditional municipal utility – using the city's existing legal powers to create a public enterprise. Importantly, because the SCU would **not seize or replace the existing IOU's infrastructure**, it does not trigger the onerous state processes of earlier municipalization campaigns (such as eminent domain or a CPUC-sanctioned service territory transfer). Essentially, a city can decide to offer *supplemental* energy services to willing customers, just as it might offer municipal broadband or run a public transit system, without needing permission from state regulators. This was evidenced in Ann Arbor, where a legal task force confirmed the SEU model was allowed under Michigan law and did not require state legislative changes📎. In California, the state constitution and "home-rule" provisions are even stronger – meaning a city can create an SCU through its own legislative process, especially if it's a charter city.

- **No CPUC Approval Needed for Launch:** A critical point is that **an SCU is not regulated by the California Public Utilities Commission (CPUC)** in the way IOUs are. CPUC jurisdiction covers investor-owned utilities and certain aspects of grid interconnection, but publicly owned utilities run by cities are exempt from CPUC rate regulation and oversight. Since an SCU is **governed locally (by a city, county, or joint**

**powers authority)**, it falls outside CPUC's direct authority 📎. This means that a local government can green-light an SCU without a formal CPUC certification. However, this doesn't mean an SCU operates in a vacuum: it still must adhere to safety standards and must coordinate with the wider grid if it has a grid connection. For instance, if an SCU connects its local microgrid to the transmission grid at a point of interconnection, it will need an interconnection agreement and must follow established technical standards (which are FERC/CPUC rules) for that connection. Additionally, if the SCU procures power from the wholesale market or wants to participate in state programs (like resource adequacy or net metering), it will interact with state and regional entities like the California Independent System Operator (CAISO) and CPUC in those specific arenas. But these choices are left to the SCU's to decide. **The key is that the formation and core operations of the SCU do not require CPUC approval** – the city can move forward on its own authority, cutting through a lot of red tape.

- **Utilizing Existing Rights-of-Way and Franchises:** Implementing an SCU can require using streets and public rights-of-way to install new wires, pipes (for geothermal), or other infrastructure. Fortunately, cities already control these spaces. Most cities have franchise agreements with IOUs granting permission to use the streets for power lines. Many of these franchises are non-exclusive or set to expire, which opens the door for cities to use their rights-of-way for their own utility lines or to license additional providers. In a number of California charter cities, the franchise agreement with the IOU **does not grant an exclusive perpetual monopoly**, meaning the city can legally allow a second utility (the SCU) to lay infrastructure as well. For example, the City of San Jose's recent steps to create a municipal utility for new developments demonstrate a city exercising control over who serves certain areas 📎 📎. The SCU model would similarly rely on local right-of-way authority to build community solar installations on city land, run microgrid cables across property lines, or attach equipment to municipal facilities. Since the SCU's projects are within the city's jurisdiction, they typically don't need state-level site permits that a big power plant or transmission line might require. This greatly streamlines implementation.

- **Interaction with CAISO and the Wholesale Market:** If an SCU grows to supply significant electricity (beyond just behind-the-meter generation), it may add a point of interconnection to engage with the CAISO market for buying or selling power. For instance, an SCU might buy renewable energy credits or wholesale power at night to supplement its solar or battery storage, or it might aggregate surplus solar from rooftops and sell it into the grid. In such cases, the SCU would register as a market participant (either as a municipal utility or through a scheduling coordinator) with CAISO. This is feasible and many CCAs and municipal utilities already do it within existing rules – and don't require new legislation, just the establishment of the SCU as an entity that can interact with the grid marketplace (something any municipal utility like LADWP or SMUD already does routinely).

- **Anticipated Challenges from IOUs and Regulators:** While the law may be on the side of local governments forming SCUs, incumbent IOUs are likely to **scrutinize and resist** these efforts. IOUs could raise concerns about safety (having two sets of wires in a neighborhood), fairness (they might argue SCU customers still rely on the grid as backup without paying what the IOU argues is a fair share), or legality (challenging whether the city is overstepping into regulated utility territory—which it's not). We can expect IOUs to lobby the CPUC or Legislature to impose new restrictions if SCUs start gaining momentum. Additionally, utility worker unions might oppose SCUs if they fear job losses or see it as undermining the IOU; for example, in San Jose, the IBEW union spoke out against the city's utility proposal alongside PG&E 📎. City administrators should be prepared for **political and legal pushback**, and have a solid legal basis for the SCU (which, as noted, exists under current law) and a strong public narrative about community benefits. It's worth noting that even if IOUs object, their leverage is limited as no laws are being broken – a city that carefully structures its SCU within legal bounds can proceed. Regulators like the CPUC may also pose questions, but since they lack direct authority over municipal ventures, their role might be more advisory. In implementation, coordination with the IOU may still be necessary for safety (e.g., anti-islanding protections if a microgrid reconnects to the grid) and possibly for purchasing standby power. Cities might consider **memorandums of understanding (MOUs)** with IOUs to clarify how parallel operations will work. However, if such cooperation isn't forthcoming, SCUs can design systems to minimize reliance on the IOU (e.g., single-meter rooftop solar and storage, near-complete islanding during outages, etc.). In summary, **the SCU model is legally viable now**, but the road to implementation will require navigating incumbent interests – something city leaders can manage with stakeholder engagement, public support (as Ann Arbor demonstrated), and robust planning.

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## Legal and Regulatory Foundation: Defining Local Autonomy

Clearly understanding municipal regulatory autonomy is essential for the successful implementation of an SCU. California's constitution and statutes grant cities—particularly charter cities—significant home-rule powers over local municipal affairs, explicitly including the right to establish and manage public utility services. To remove ambiguity and clarify the legal and regulatory foundations of the SCU model, the following explains the extent of local regulatory powers.

**SCU Regulatory Autonomy:**
Spark Community Utilities, as municipally governed entities, fall under local governance rather than the jurisdiction of the California Public Utilities Commission (CPUC). **Article XI, Section**

**9(a) of the California Constitution** explicitly grants cities authority to establish, regulate, and manage municipal utility services independent of CPUC rate regulation. Under this legal framework, SCUs retain autonomy in:

- Rate-setting
- Billing practices
- Defining service offerings
- Infrastructure planning and development

However, once SCU-controlled infrastructure includes a substation with a transmission-level point of interconnection (which is typically in the SCU's later growth phases), the SCU must comply with CPUC rules, including:

- Grid interconnection agreements
  - Rule 21 (Interconnection of DERs)
  - General Order 95
  - General Order 128
- Transmission-level interface requirements
  - General Order 131-D
  - General Order 166

If an SCU chooses to become a Load Serving Entity (LSE), the SCU must comply with CPUC rules, including:

- Wholesale energy transactions
  - Resource Adequacy (RA) Program
  - Renewable Portfolio Standard (RPS) Compliance

**Clarifying Regulatory Boundaries:**

To ensure seamless and conflict-free coexistence with incumbent IOUs, SCUs should:

- Operate independently but comply with existing technical interconnection standards, including IEEE 1547 and established anti-islanding protocols.
- Maintain clear physical and administrative separation from IOU distribution assets, particularly when utilizing city-owned property or public rights-of-way for infrastructure deployment.

An SCU remains outside CPUC oversight, provided these boundaries are consistently maintained.

**Relevant Legal Precedents:**

Insights from recent municipalization attempts inform SCU strategies:

- **San Francisco vs. PG&E (2019-2020)**: This case highlighted complexities around asset valuation and CPUC involvement in eminent domain proceedings. The SCU model circumvents these issues entirely by not requiring asset acquisitions.

- **San Diego's 2022 Municipalization Attempt:** The City Council rejected placing municipalization on the ballot, citing legal and financial uncertainties. SCU's incremental, opt-in nature significantly mitigates these risks.
- **Boulder, CO (2010-2020):** Boulder's protracted municipalization process underscored financial and legal difficulties inherent in traditional approaches, reinforcing the advantages of the SCU's phased rollout strategy.

**Practical Regulatory Guidelines:**
Cities implementing SCUs should consider proactively establishing:
- Memorandums of Understanding (MOUs) with incumbent IOUs clearly outlining mutual roles, responsibilities, safety protocols, emergency management coordination, and distinct billing systems.
- Early engagement strategies with CPUC, CAISO, and IOU stakeholders to preemptively address potential regulatory concerns or confusion, even though direct regulatory authority over the SCU remains limited.

**Summary of Regulatory Autonomy:**
In summary, the SCU model leverages California's robust municipal home-rule authority, clearly distinguishing local governance autonomy from state regulatory oversight. While SCUs remain exempt from CPUC rate-setting regulations, compliance with relevant state and federal safety, environmental, and reliability standards remains mandatory, ensuring operational clarity and community benefit.

## SCUs, CCAs, and Other Utility Models

| Utility Models | Investor-Owned Utility | Traditional Muni | Spark Community Utility | CCA |
|---|---|---|---|---|
| Governance | Private, regulated | Public (city council) | Public (city council) | Public (regional board) |
| Customer Participation | Mandatory, no opt-out | Mandatory, no opt-out | Opt-in | Opt-out |
| Infrastructure Ownership | IOU | City-owned | Community-owned | IOU-owned |
| Regulatory Body | CPUC, FERC | Local, CEC | Local | CPUC, CAISO |

Comparison of CA Utility Models

It's important for city administrators to understand how **SCUs differ from – and can complement – existing models like Community Choice Aggregators (CCAs)**, as well as traditional municipal utilities or co-ops. Below is a comparison in key areas:

- **Governance and Ownership:** CCAs are typically joint powers authorities or city-run programs that procure energy on behalf of residents; they do not own distribution infrastructure. SCUs, on the other hand, would be **owned and operated by the city (or county) as a utility enterprise**, closer to a municipal utility model in ownership. The governance of an SCU is local (city council or a city-appointed board oversees it), ensuring decisions align with community priorities. CCAs have governing boards too (often composed of local elected officials), but their scope is limited to power procurement and programs, not wires-on-poles operations. Both are publicly accountable, but an SCU has a more direct service-provider role (with crews, assets, etc.) like a city water department, whereas a CCA is more like a buying cooperative for energy.

- **Customer Participation:** CCAs operate on an **opt-out** basis – they automatically enroll virtually all customers in a city/region, who then must opt-out if they prefer the incumbent utility's supply. This gives CCAs a broad reach quickly (often capturing 90%+ of customers). SCUs, in contrast, use an **opt-in** enrollment. Customers must actively choose to sign up for SCU services, which likely means initial participation will be a subset of the community (those most enthusiastic or in need of the offerings). Over time, SCU participation could grow, but it may never reach 100% unless the city eventually decides to transition to a full municipal utility. Importantly, SCU customers can still remain CCA/IOU customers for the portion of their electricity not provided by the SCU. In practice, an **SCU and a CCA can serve the same customer**. For example, a household might get 30% of its electricity from its own rooftop solar installed by the SCU (and pay the SCU for that), while the other 70% of its power comes from the CCA via the IOU grid (and is billed through the IOU). This collaborative scenario means the **SCU doesn't have to "steal" customers** from a CCA or IOU – it's providing additional services that the CCA/IOU framework isn't delivering, like on-site generation, fuel-switching, lower unit-costs, or increased reliability.

- **Service Scope:** The **service offerings of SCUs are broader and more infrastructure-focused** than those of CCAs. CCAs mainly buy and schedule electricity supply, and perhaps run rebate programs or invest in large renewable projects. They do not typically involve themselves in distribution-level projects on customer premises (beyond maybe facilitating solar installs via third parties). SCUs, by design, are hands-on with local energy systems – building microgrids, owning solar arrays, deploying batteries, etc. In that sense, SCUs resemble a municipal utility's scope, except they operate in parallel to an IOU. Another way to put it: CCAs address the **"energy supply mix and cost"** (what power is bought and at what price), whereas SCUs address **"energy delivery, cleanliness, and resilience at the local level"** (how and where power is generated and delivered within the community). Both aim to increase renewable usage and potentially lower costs, but via different mechanisms. There are also **electric cooperatives** and other models (like private **Energy Service Providers** in direct access markets), but those either don't have the public ownership element (ESPs are for-profit and can't build public infrastructure easily) or they are not usually urban-focused (co-ops serve rural areas, often completely replacing IOUs in their territory). The SCU is unique in combining public ownership, local physical projects, and a side-by-side presence with an IOU.

- **Regulatory and Financial Structure:** CCAs work within the existing IOU billing and grid system. The IOU still charges CCA customers delivery fees and maintains the grid, and the CCA charges for generation on the same bill. SCUs break out of that model – an SCU **runs its own operations and must sustain itself on the revenues from its subscribers**. Financially, CCAs have relatively low overhead (no wires to maintain) and focus on power contracts; SCUs will have capital-intensive projects (solar panels, wires, batteries to finance and maintain). However, SCUs can also capture revenue streams CCAs cannot, such as distribution charges or fees for premium resilience services. An SCU might charge a connection fee for a microgrid or lease battery systems to customers – activities outside a CCA's purview. From a regulatory standpoint, CCAs are creatures of state legislation (AB 117 in California) and must comply with CPUC rulings on resource adequacy, PCIA charges (fees paid to IOUs for legacy power contracts), etc. An SCU, as a municipal utility, may not pay PCIA exit fees because it's not exiting load from the IOU in the same way – its customers still use the IOU for some power. If anything, SCU might be considered a form of distributed energy provider, much like "solar lease" providers. Being outside the CCA/IOU supply system gives SCUs more freedom to innovate on tariffs and investments.

- **Collaboration vs. Competition:** Far from being competitors, SCUs and CCAs can develop a **complementary relationship**. A city with a CCA can use the SCU to fulfill objectives the CCA cannot easily meet. For instance, the CCA could focus on wholesale renewable procurement to keep rates low and green (getting to 100% renewable electricity on the grid mix), while the SCU focuses on building out local reliability assets (so that when the grid goes down, essential loads stay powered by SCU microgrids). The CCA might even purchase output from SCU-owned projects or contract with the SCU to provide demand response capacity, integrating it into the wider portfolio. Additionally, the governance bodies of the CCA and SCU could coordinate on strategy – since both are public/not-for-profit, there's an opportunity to align their missions. For example, **the SCU could serve as an implementation arm for the CCA's local energy programs**: if a CCA has funds for, say, battery incentives, it could channel those through the SCU which actually installs and operates the batteries for customers. In communities without a CCA, an SCU could play both roles – but in most cases, the expectation is SCUs will **augment** the CCA framework, not replace it.

It's also worth noting that an SCU could collaborate with the IOU as well: for instance, an SCU might reduce strain on the IOU's grid by taking over service to new high-demand projects (like a new housing subdivision), which the IOU might otherwise struggle to quickly interconnect. By handling that locally, the SCU helps the IOU avoid upgrades, and in return the IOU might agree to supply backup power at reasonable cost when needed. In sum, **city administrators should see CCAs and SCUs as tools in the toolkit** – CCAs tackle energy sourcing and rate competitiveness on a broad scale, while SCUs tackle local infrastructure, resilience, and innovative services. Both aim to empower the community with cleaner, more affordable energy, and with careful planning they can reinforce each other's success.

## Technical Architecture: Fundamental Differences

While the governance and participation models distinguish SCUs from other utility structures, the underlying technical architecture represents an even more fundamental divergence. Traditional utility distribution relies on century-old AC synchronous technology optimized for one-way power flow from central plants to consumers. SCUs can instead leverage modern software-defined architectures that treat energy more like data—dynamically routable, bufferable, and manageable through intelligent control systems.

The table below compares the technical capabilities across California's primary electric service models. Note how the SCU architecture, particularly when implemented with software-defined systems like EnergyNet, combines the local control benefits of municipal utilities with technological capabilities that neither IOUs nor CCAs can deliver within their current frameworks.

| Characteristic | Traditional IOU | CCA + IOU | SCU |
|---|---|---|---|
| **Core Architecture** | Centralized AC, radial feeders, synchronous | Centralized AC (IOU wires), wholesale procurement (CCA) | Decentralized DC microgrids with AC interconnection |
| **Distribution Technology** | AC poles/wires, transformers, substations | Same as IOU (shared infrastructure) | Energy Routers, DC backplane, software-defined routing |
| **Control Philosophy** | Centralized SCADA/ADMS, top-down | Split: CPUC regulated distribution, CCA procurement | Distributed control via EROS/EP, bottom-up |
| **Grid Connection** | Always connected, real-time balanced | Always connected via IOU | Galvanically isolated, can island or connect |
| **Energy Flow** | Unidirectional (primarily), rigid | Unidirectional via IOU infrastructure | Bidirectional, dynamically routed, peer-to-peer capable |

| Characteristic | Traditional IOU | CCA + IOU | SCU |
|---|---|---|---|
| **Efficiency Metrics** | ~93-95% distribution efficiency | Same as IOU for delivery | ~96-98% (DC-native, fewer conversions) |
| **Typical Line Losses** | 4-6% average | 4-6% (IOU infrastructure) | 2-3% (shorter distances, DC transmission) |
| **DER Integration Efficiency** | Multiple AC/DC conversions required | Same as IOU | Direct DC coupling (5-10% efficiency gain) |
| **Resilience - Outage Response** | Binary (on/off), cascading failures possible | Same as IOU | Tiered (VOR123), graceful degradation |
| **Backup Power Duration** | None inherent (customer-owned generators) | None from CCA, IOU dependent | Designed-in via storage (hours to days) |
| **Recovery Time** | Hours to weeks depending on damage | Same as IOU | Minutes for islanding, automatic reallocation |
| **Single Point of Failure** | Substation, major feeders | Same as IOU | None (modular, redundant architecture) |
| **Initial Deployment Scale** | Entire service territory | Entire city/county for procurement | Single building to neighborhood (10-100 customers) |
| **Expansion Method** | Major capital projects, long planning cycles | Administrative only (no infrastructure) | Modular (add ports/routers as needed) |
| **Time to Add Capacity** | 2-5 years (substations, feeders) | N/A (no infrastructure) | 2-6 months (rack modules) |
| **Minimum Viable Size** | ~10,000 customers for efficiency | ~5,000 customers | ~20-50 customers per microgrid |
| **Customer Flexibility** | Mandatory service, no choice | Opt-out for generation only | Full opt-in, tiered service levels |
| **Service Customization** | One-size-fits-all rates/reliability | Generation mix choice only | Tiered resilience, peer trading, custom packages |
| **Billing Structure** | Single bill, regulated rates | Single bill, two line items | Separate SCU bill, flexible pricing |
| **Local Control** | None (CPUC regulated) | Procurement only (board governance) | Full local control (municipal governance) |
| **Innovation Speed** | Slow (regulatory approval required) | Limited to procurement strategies | Rapid (software updates, local decisions) |

| Characteristic | Traditional IOU | CCA + IOU | SCU |
|---|---|---|---|
| Capital Requirements | Very high ($1000s per customer) | Low (admin only, ~$10-50/customer) | Moderate, scalable (~$500-1500/customer) |
| Operational Model | Regulated monopoly, guaranteed ROI | Non-profit procurement | Municipal enterprise, cost-of-service |
| Regulatory Burden | Full CPUC oversight | CPUC for some elements, local for procurement | Minimal initially, scales with size |

Technical Architecture Comparison of California Electric Service Models

The technical advantages shown in this comparison translate directly to customer benefits:

- **Efficiency gains** of 5-10% mean lower costs and reduced environmental impact
- **Resilience features** provide tangible value during California's increasing wildfire and PSPS events
- **Modular scalability** allows communities to start small and grow based on actual demand
- **Service customization** enables each customer to choose their preferred balance of cost, reliability, and sustainability

This architectural distinction explains why SCUs can deliver services that IOUs structurally cannot—peer-to-peer energy trading, tiered resilience guarantees, and true energy independence for those who want it—while CCAs remain limited to procurement decisions within the existing technical framework. The following sections detail how SCUs can incrementally build these technical capabilities, starting with simple behind-the-meter installations and evolving toward sophisticated microgrid networks.

# A Simpler Path than Traditional Municipalization

One of the driving forces behind the SCU model is the desire to **avoid the pitfalls of full municipalization.** Historically, attempts to convert an IOU's service area into a city-run municipal utility have been long, expensive, and often unsuccessful endeavors. SCU offers a radically different (and simpler) path to public power. Here's how the SCU model compares to the traditional municipalization process:

- **No Need for Eminent Domain or IOU Asset Acquisition:** In a conventional municipalization, the city must acquire the incumbent utility's distribution assets (poles, wires, transformers, etc.) within its jurisdiction – usually through purchase or eminent domain. This leads to protracted legal battles over asset valuation, sometimes costing hundreds of millions or billions of dollars, and can take a decade or more to resolve.

SCUs sidestep this completely. Because the SCU builds **new, parallel infrastructure on an as-needed basis**, there is no wholesale takeover of IOU property. The SCU doesn't need to "buy out" the existing distribution grid. This not only saves enormous cost but also avoids the inevitable court fights when an IOU resists selling. For example, studies estimated a full municipal takeover in Ann Arbor could cost upwards of $1 billion and take years📎, a price tag that helped motivate the search for alternatives. SCUs avoid these front-loaded costs and complexities; infrastructure investment is gradual and targeted, not an all-or-nothing proposition.

- **No CPUC Approval to Replace an IOU:** To municipalize in California, a city often would need approval from the CPUC to serve as the electrical provider and remove the area from the IOU's service territory. This is a high bar, as the CPUC's mandate is to ensure reliable service and they often side with incumbent utilities in contested cases. With an SCU, **the IOU remains in place to provide base service**, so the city is not asking the CPUC to eliminate the IOU's obligation to serve. Thus, **no certificate of public convenience and necessity (CPCN) needs to be transferred or extinguished**. The city is simply adding a supplemental service. This approach stays "under the radar" of the most difficult regulatory approvals. Essentially, the city is not breaking the existing system, just building atop it.

- **Faster Timeline and Flexibility:** Traditional municipalization attempts frequently drag on for many years. As noted in an industry analysis, since 2000 only 11 out of 64 municipalization efforts in the U.S. have succeeded📎. High-profile cases like Boulder, Colorado spent nearly a decade in pursuit and over $30 million on legal and consulting fees, only to abandon the effort in 2020📎. In contrast, SCU projects can show tangible results in a short time frame. A city could, for instance, establish an SCU and within a year have a pilot microgrid up and running at a community center or a subdivision – delivering resilience and clean power to those customers. Because the SCU can start small, the initial "go/no-go" decision is not a monumental, risky leap but a manageable project. If the pilot succeeds, the city can expand the SCU's reach; if there are obstacles, the city can course-correct or scale back without having gambled its entire electrical system on the outcome. This flexibility is a stark contrast to the all-in nature of municipalization, where once you start down the path, you must either clinch a full takeover or end up back where you began (but poorer for the effort). The SCU's incremental progress can also build public confidence and political momentum in a way that long, behind-the-scenes legal battles do not.

- **Lower Political Hurdles:** Full municipalization often requires a citywide vote (to issue bonds or to change the city charter to form a utility). It can become a politically charged issue, with IOUs campaigning hard against it. By avoiding a yes/no referendum on taking over the utility, SCUs may dodge the most heated political opposition. Ann Arbor did choose to hold a ballot measure to authorize its SEU, but this was a policy **choice to ensure public buy-in**, not a state requirement📎. In California, a city might not need a vote to start an SCU unless required by its charter. Thus, the SCU path can be more of a steady policy program than a headline-grabbing political battle. This lower profile can actually make it easier to accomplish. It's akin to how **telecom deregulation** introduced competition quietly: rather than one big vote to "break up Ma Bell" by each city, new entrants just started offering service and gradually eroded the monopoly. SCUs introduce **competition in a monopoly utility space** in a similar gradual manner. Just as the breakup of the phone monopoly and the advent of cellular networks allowed multiple telecom providers to serve customers (giving consumers choice and spurring innovation), SCUs crack open the door for competitive energy solutions at the local level📎. The IOU remains, but it no longer has the only say – the city can demonstrate that another model can work, potentially encouraging the IOU to improve its own services in response.

- **Leverage Instead of Confrontation:** A subtle benefit of the SCU approach is that it can enhance the city's leverage with the incumbent IOU without immediate confrontation. In some cases historically, merely the credible threat of municipalization has led IOUs to offer concessions (like infrastructure upgrades or rate discounts) to appease the city. If a city starts an SCU, the IOU may realize it must become more responsive or risk the SCU growing and taking more of its load. For city administrators, this means even if your goal isn't to fully replace the IOU, having an SCU in place could be a bargaining chip to get better reliability or investment from the utility in the community. It's a **"carrot and stick"** dynamic – the city is constructively addressing needs via SCU (the carrot for residents is better service and lower costs), and the implicit stick is that the IOU might lose more customers if it doesn't step up its game. This competitive pressure has been absent in the power sector for a century, but SCUs introduce it in a controlled way, much like how the entry of competitive internet providers prodded cable companies to improve.

In summary, the SCU model offers a **pragmatic workaround to the obstacles that have stymied municipalization efforts in the past**. It bypasses the need to buy out the incumbent, avoids lengthy regulatory proceedings, and can be deployed in a modular fashion. For a city that has long wanted the benefits of a municipal utility (local control, greener power, cost savings) but has been deterred by the daunting process, SCU provides a much more accessible path. It's not an overnight replacement of the IOU, but it is a foothold into local power provision that can expand over time. City administrators can view it as **"municipalization in stages"** – starting with the easiest pieces (new infrastructure, opt-in customers) and maybe one day, if conditions allow, growing into a full municipal utility organically. But even if it never reaches 100% of the community, an SCU can deliver many of the same benefits as municipalization to those who participate, with far fewer headaches for the city.

## Evolving Service Tiers

While an SCU is by nature a public utility entity, it differs dramatically from both an IOU and a traditional municipal utility in how it can incrementally build out its services—and how those services themselves can be very different from the standard one-size-fits-all power model. Below, we walk through an SCU's possible evolving product tiers to illustrate how the model can start very simply and expand toward more advanced microgrids and, ultimately, broader participation in the macro grid.

| SCU Tiered Services Capabilities | | | | | Key: Enabled | ✔ |
|---|---|---|---|---|---|---|
| | | | | | Optional | X |
| **Services** | Energy Upgrades | Behind-the-Meter DER | Proto-Microgrid | Resilient Microgrid | Federated Microgrid | Substation Connected |
| IOU Meter & Service Connection | ✔ | ✔ | ✔ | ✔ | ✔ | |
| SCU Meter | | ✔ | ✔ | ✔ | ✔ | ✔ |
| Financing Via Monthly Billing | ✔ | ✔ | ✔ | ✔ | ✔ | ✔ |
| Energy Audit | X | | | | | |
| Efficiency Retrofit | X | | | | | |
| Fuel Switching | X | | | | | |
| EV Charger | X | | | | | |
| On-Site Solar | | ✔ | X | X | X | X |
| On-Site Storage | | X | X | X | X | X |
| SCU As-Available Power | | ✔ | ✔ | ✔ | ✔ | ✔ |
| Distribution Lines | | | ✔ | ✔ | ✔ | ✔ |
| Customer-Owned DER Resources | | | X | X | X | X |
| Optional SCU Resilience | | | ✔ | ✔ | ✔ | ✔ |
| SCU Premium Resilience (VOR123) | | | | ✔ | ✔ | ✔ |
| Possible Load Prioritization | | | | ✔ | ✔ | ✔ |

Example SCU Tiered Services Comparison

## 1. Energy Upgrades & On-Bill Financing

**Starting with offerings other than raw kWh**

As the SCU attracts an initial customer base, a logical first step is to **offer energy upgrades**—for example, comprehensive energy audits, efficiency retrofits, fuel-switching services (e.g., gas to electric heat pumps), and the installation of EV chargers. Because the SCU owns its billing system and operates outside traditional IOU constraints:

- It can **place capital costs on the SCU's balance sheet**, rather than requiring each participant to take out loans or pay upfront.
- Customers repay these upgrade costs **through monthly SCU bills**, which seamlessly bundle clean power or battery subscriptions with any financed measures.
- This structure lowers the barrier to entry for residents and businesses that need capital to make efficiency or electrification improvements.

Such **customer-centric financing** distinguishes an SCU from a typical IOU or even a standard municipal utility, as it capitalizes on the SCU's local focus and autonomy to meet specific community needs (e.g., building decarbonization or EV adoption).

## 2. Simple Behind-the-Meter DER Services

**Locally generated power without SCU distribution lines**

Many SCUs may begin by **offering rooftop solar** (and possibly batteries) to customers who opt in, exactly like third-party installers (e.g., Sunrun) have done for decades. These DER resources are located behind the IOU's meter, though the generation and usage of these power resources are tracked by the SCU meter. With this approach:

- **No new SCU distribution lines** are built initially; each home or business still maintains its IOU meter and connection.
- The SCU installs and owns the rooftop solar and/or battery, or contracts with the customer who sells power generated by a customer owned and operated system.
- A **separate SCU meter** tracks how much electricity the SCU-owned system generates and how much the customer consumes.
- **Customers still receive a bill from the IOU** (or from the IOU + CCA), but now also receive an **SCU bill** for the power the SCU equipment delivers (or alternatively combines these amounts into a single SCU-generated bill).
- Because everything is behind the IOU meter, the customer can draw any shortfall from the grid. The SCU has **no obligation to serve** and no resource adequacy requirements for this arrangement. It is purely an *opt-in "supplementary supply"* akin to a solar lease or PPA, except that it's offered by a **community-owned utility**, not a private developer.

During this early phase, an SCU relies chiefly on its own **independent billing system** to track and monetize energy generated on-site. This independence in billing, combined with the SCU's parallel, opt-in nature, is what enables novel financing, price structures, and potential bundling with other services—like EV charging station installations or optional battery add-ons.

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## 3. "Proto-Microgrids": Adding Local Distribution Lines

**Creating minimal microgrids for local power sharing**

Once an SCU has a **sizable concentration** of behind-the-meter assets in a neighborhood—or sees a strong interest in local energy sharing—another optional product tier might be to build or interconnect short distribution lines between multiple SCU customers. Essentially, the SCU can:

1. **Install local wires** (underground or overhead) that link consenting customers' premises.
2. Enable each property's SCU-owned or SCU-managed DERs (solar, batteries, etc.) to supply **other** SCU customers on an "as-available" basis.
3. Rely on *each* customer's individual IOU connection for any shortfall if local generation isn't sufficient.

This approach, sometimes called a **"proto-microgrid,"** means customers can share power directly without having to export and re-import through the IOU's distribution grid. However, these proto-microgrids:

- **Do not yet provide significant resilience** if the IOU grid goes down, because each property is still dependent on its individual IOU meter for backup.
- Typically do **not** include a direct connection from the SCU network to the broader transmission system (i.e., no SCU substation yet).
- Avoid any CPUC resource adequacy obligations, because the SCU isn't guaranteeing 100% coverage—it's supplying power "as available" from the local resource pool, supplemented by each site's IOU connection.

Despite being "minimal" in resilience terms, these proto-microgrids mark a big shift from behind-the-meter only. Customers gain the value of shared energy flows within the SCU network, creating local energy self-sufficiency and potential cost savings.

Implementation Note: At this tier, SCUs should consider deploying Energy Router architecture for the interconnection infrastructure. A single Energy Router could manage the proto-microgrid's energy flows, providing software-defined routing between participants while maintaining galvanic separation from each customer's IOU connection. Initial deployment might use a small 10-20 port configuration, expandable as the proto-microgrid grows.

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## 4. True Microgrids with Tiered Resilience (VOR123)

**Offering resilience subscriptions**

Building on proto-microgrids, an SCU can then **provision sufficient DER capacity and energy**

**storage** to deliver meaningful backup power. This is where **tiered value-of-resilience such as VOR123** 📎 pricing enters. In such microgrids:

- **Critical loads (Tier 1)** might be guaranteed power nearly 100% of the time (e.g., medical equipment, communications).
- **Priority loads (Tier 2)** receive power most of the time (80% or more).
- **Discretionary loads (Tier 3)** are served when there is surplus capacity.

SCU customers who desire high resilience for certain loads **pay a premium** (e.g., a 25% or 30% surcharge) for guaranteed backup. In return, the SCU invests in the needed solar + storage to meet those guarantees. The microgrid is still not necessarily connected to the macro grid via an SCU-owned substation; **each customer's separate IOU connection** remains for times when the SCU system can't supply enough power. Now, however, there's **real resilience** during wider outages because the SCU's microgrid can island locally—provided each site is physically interconnected through the SCU's distribution lines and designated critical circuits are managed.

The Energy Router's ability to dynamically prioritize loads through software control directly enables VOR123 implementation. During constrained conditions, the router's EROS (Energy Router Operating System) can automatically allocate available power according to subscription tiers, ensuring Tier 1 customers maintain service while gracefully degrading service to lower tiers.

By monetizing resilience through **structured, tiered subscriptions**, an SCU can finance more robust energy storage and microgrid controls. Customers get a flexible, cost-based way to choose their level of backup coverage, aligning well with local priorities and budget constraints.

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## 5. Multiple Independent Microgrids & "Federations"

**Linking neighborhoods or campuses**

In many SCU phased rollouts, separate microgrids might emerge in different parts of a city—each serving a campus, neighborhood, or commercial cluster. Over time, it can make sense for the SCU to **interconnect these distinct microgrids**, creating a **microgrid federation**:

- Federation members can share resources (e.g., if microgrid A has surplus solar at midday, it can dispatch some across new lines to microgrid B, which might, for example, have excess storage capacity).
- Each microgrid still has its own islanding capability, so if one experiences a local fault, the rest remain unaffected.
- The SCU can gradually unify controls and administration of all these microgrids under one operational umbrella—essentially operating a *mini-network* across the city.

Still, none of these microgrids or the federation as a whole **must** be connected to the macro grid via an SCU substation. Each individual microgrid can rely on participants' IOU connections for any shortfall, while local generation plus storage meets some or much of the load. The federation approach is flexible and scalable, letting an SCU expand in pockets rather than needing one massive, up-front network buildout.

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## 6. Substation Connection to the Macro Grid

**Becoming a more conventional grid participant**

Eventually, an SCU's growing federation of microgrids may justify adding a **dedicated substation** that ties the SCU-owned network directly into the transmission system (the "macro grid"). This major step:

- Potentially allows the SCU to **buy and sell power in the wholesale market** or arrange direct power imports/exports to balance local resources.
- Can enhance reliability further, because the SCU can pull from or feed the macro grid at strategic times—rather than each member site individually relying on IOU distribution lines.
- Involves **greater regulatory responsibilities**: if the SCU provides sole service to customers (i.e., a customer no longer has an IOU connection at all), it must meet resource adequacy requirements and coordinate with the CAISO or other system operators.

At this stage, the SCU's Energy Network Management System (ENMS) would coordinate multiple Energy Routers across the service territory, managing both internal energy flows and external market participation. The Energy Protocol Server (EP-Server) in each router would handle CAISO market integration and resource adequacy compliance, leveraging the same interfaces used by Swedish systems for Nord Pool market participation.

At this point, the SCU begins to **resemble a small municipal utility**—yet it reached that status incrementally, in a self-determined way. Because the SCU only undertakes this substation build when it's financially and technically justified, it avoids the pitfalls of a massive initial system takeover (as in traditional municipalization). Customers who want total independence from the IOU can finally get it—along with the SCU's new responsibility to ensure adequate capacity for them at all times.

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### Meeting (or Avoiding) Resource Adequacy Obligations

Under California rules, a provider that **guarantees a "full requirements" service** to customers—meaning it is the *only* energy supplier for those customers—bears obligations for resource adequacy (RA). In the SCU model, this arises **only** if and when the SCU invites certain customers to disconnect from the IOU entirely, relying exclusively on the SCU for their power:

1. **No RA needed** if customers are still connected to the IOU and the SCU is just "supplementing" or providing partial coverage.
2. **RA obligations start** once the SCU alone is on the hook for meeting a customer's entire demand.

This incremental, **choose-your-level** approach contrasts sharply with traditional utilities that serve all or nothing. By carefully deciding when to offer full service, the SCU can manage compliance obligations and costs. It might, for instance, keep only large commercial or institutional customers in a partial-supply arrangement (no RA obligations), while eventually offering full-service packages to select neighborhoods or smaller user groups that want to fully cut the IOU cord (or the other way around).

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## Why This Incremental Approach Matters

- **Community-Specific Design:** Because each city's demographics, geography, and energy goals vary, SCUs can scale at a pace and configuration that suits local realities—offering behind-the-meter DERs in one district, a proto-microgrid in another, and no distribution lines where it doesn't make sense.

- **Lower Financial & Regulatory Risk:** Rather than an all-at-once municipal takeover, SCUs minimize upfront costs and the potential for protracted legal battles with IOUs. They **grow organically** from simpler, voluntary services to complex, widely interconnected systems.

- **True Market Innovation:** The SCU's **opt-in** structure, **separate billing system**, and **lack of traditional utility constraints** create space for unique product mixes—like VOR123 tiered resilience subscriptions, on-bill financing for electrification, or microgrid "federations" that can remain off the macro grid until scaling warrants direct transmission access.

- **Local Autonomy & Accountability:** Each step, from single-site DER deployments through connecting microgrids to the macro grid, is locally governed. Customers understand exactly which services they're buying, how they pay, and what level of resilience or independence they get.

Overall, the SCU framework offers **unparalleled flexibility** for cities to chart a path that truly fits their community needs—whether they only want quick behind-the-meter improvements or aspire to a full-fledged "public power" network. By evolving through product tiers, an SCU keeps risk in check, fosters early successes, and builds political and customer support organically.

## Case Studies: Hypothetical and Real-World Applications

This section presents a series of case studies – both hypothetical scenarios and real-world examples – that illustrate how an SCU can evolve through incremental development. By examining these cases, city administrators and others can see the phased progression of an SCU from its initial service offerings (such as behind-the-meter solar or energy efficiency programs) to more advanced configurations like neighborhood microgrids and federations of multiple microgrids. Each example highlights a different stage in an SCU's evolution and demonstrates the model's flexibility. The following cases are tailored to various community contexts, showing how an SCU can start small, operate in parallel with the incumbent utility (opt-in participation), maintain independent billing, and gradually build out infrastructure and services over time. These case studies offer practical insights into launching pilot projects that can scale into full-fledged municipal energy solutions.

### **New Development:** Rooftop Solar to Neighborhood Microgrid

**Lessons Learned:**

- Starting small builds momentum: initial success with rooftop solar and storage lays groundwork for broader community engagement.
- Infrastructure staged growth reduces financial and political risks, making municipal energy solutions more feasible.
- Clearly demonstrating tangible resilience benefits early secures community buy-in and validates incremental investment.

In a **new residential development**, a city or developer can pilot an SCU by equipping homes with rooftop solar panels and battery storage from the outset. The SCU's initial service might be managing these behind-the-IOU-meter systems and offering participants an opt-in solar energy program. Homeowners receive bills from the SCU for the solar/storage service (separate from their normal utility bill), demonstrating the parallel opt-in model in action. This first phase focuses on **energy self-sufficiency at the building level**, reducing residents' reliance on the main grid and familiarizing the community with the SCU concept.

*Technical Implementation*: New developments offer ideal conditions for EnergyNet deployment, as underground "Freedom Cables" can be installed during initial construction at marginal cost. A development of 100 homes might deploy 2-3 Energy Routers in a distributed architecture, each managing 30-40 connection points. The DC-native design eliminates inverter losses between rooftop solar, battery storage, and EV charging, potentially improving system efficiency by 8-12% compared to AC microgrids.

As the development grows or more residents opt in, the SCU can **scale up to a neighborhood microgrid**. In phase two, the SCU interconnects individual solar + storage systems with common infrastructure – for instance, adding a community-scale battery or linking the homes on a dedicated circuit. This creates a microgrid that the SCU can operate in parallel with the main utility grid or islanded during outages. The neighborhood microgrid provides local balancing of supply and demand, peer-to-peer energy sharing, and backup power for all members. **Incremental infrastructure buildout** is key: the SCU doesn't have to construct a full network upfront, but can gradually add wiring, control systems, and additional generation as needed. Over time, as adjacent developments or phases of the project come online, the SCU could federate multiple neighborhood microgrids – connecting them for greater reliability and resource optimization. In a mature stage, the new development's SCU might oversee an integrated energy system serving thousands of homes, coordinating some combination of rooftop and community PV, community batteries, EV chargers, and smart appliances. This evolution from **behind-the-meter services to a full microgrid** demonstrates how an SCU can start with a single offering and expand into a comprehensive local utility. The key advantages – customer opt-in, independent SCU operations, and staged investments – allow the project to grow organically with community demand. City planners considering new housing projects can use this model to **"design in" an SCU from the beginning**, ensuring the neighborhood can eventually meet most of its energy needs internally while still remaining connected to the wider grid for support. For example, a master-planned community like Florida's *Babcock Ranch* – America's first solar-powered town – installed a large solar-plus-battery system to power homes and businesses from day one📎 📎. This proactive approach paid off in resilience: when a Category 4 hurricane struck, **no homes in Babcock Ranch lost power or internet connectivity**, thanks to its robust local energy system📎. Such real-world success lends confidence to the SCU model, showing that early investments in distributed solar and storage can provide reliable service even under extreme conditions.

## **Urban Resilience Zone:** Critical Facilities as a Launch Point

**Lessons Learned:**

- Prioritizing resilience for critical facilities strengthens community support by clearly demonstrating public benefits during emergencies.
- Clearly defined resilience tiers (critical, priority, discretionary loads) enable flexible and financially sustainable infrastructure investment.
- Successful initial deployment can lead naturally to expansion into neighboring residential and commercial areas.

In an **urban resilience zone**, the SCU journey begins by focusing on critical facilities in a city district. Many cities have areas with hospitals, emergency shelters, fire stations, food distribution centers, or other vital services clustered together. An SCU can pilot a microgrid here to ensure these essential loads are always powered. The initial SCU service might involve installing solar panels, battery energy storage, and backup generators at key sites and linking them with dedicated wiring. This forms a **multi-facility microgrid** that the SCU operates to keep critical infrastructure running during grid outages.

The SCU infrastructure for connecting these facilities would leverage software-defined energy routing technology, such as Energy Routers with galvanically-isolated ports, ensuring that electrical problems in one facility cannot cascade to others. During normal operations, the system's control software would optimize energy flows between facilities based on real-time generation, storage levels, and demand patterns. During grid outages, the system would automatically island and reallocate available resources according to predetermined subscription tiers, with hospitals and emergency services maintaining Tier 1 (guaranteed) status while administrative buildings might operate at Tier 2 or 3 levels.

For example, New York City's Hunts Point neighborhood in the Bronx is implementing a *tri-generation* community microgrid to supply its huge Food Distribution Center and nearby schools with reliable, dispatchable power 📎. In normal times, this system provides cheaper and cleaner energy (including electricity, heating, and cooling) to those facilities, and in emergencies it can island to protect a **critical component of the city's food supply** and serve as a community refuge. Hunts Point's project shows how a targeted microgrid can start by buffering crucial services and then be **ready to expand** – the design enables additional businesses and residents in the area to opt in over time as the infrastructure proves its worth.

After demonstrating success with critical loads, the SCU can **extend its reach to more customers in the zone**. Phase two might see the microgrid's boundary widen to include adjacent housing, apartments, or commercial buildings that volunteer to join the resilient network. The SCU could offer a *resilience subscription* or premium service to these customers, guaranteeing them power during emergencies via the microgrid (a concept already being tested in community microgrids) 📎 📎. With modular Energy Router architecture, expansion becomes straightforward – adding new 1U rack modules provides additional ports for new customers, while the Energy Protocol enables seamless integration of their resources into the existing microgrid's operation. Each new customer would still get primary power from the main grid but would pay the SCU a fee for backup power assurance, exemplifying the parallel opt-in model. Meanwhile, the SCU would incrementally build out the distribution links and control systems to connect these buildings into the microgrid cluster.

Over time, as more assets are interconnected, the urban SCU might manage a patchwork of island-capable blocks – essentially a **federation of microgrids** spanning the neighborhood. The software-defined architecture enables these separate microgrids to operate independently when needed or share resources when connected, with the Energy Network Management System (ENMS) coordinating operations across the entire network. What began as a few protected sites could evolve into a wider resilient zone covering an entire district or campus. Throughout this evolution, diverse services can be layered on: the SCU might add energy efficiency upgrades for participating buildings, install public EV charging hubs powered by the microgrid, or run demand response programs to optimize load. The result is a **city resilience hub** that grows outward, driven by community needs and willingness to opt in. This approach shows city leaders that they can start an SCU at a small scale (just the lifesaving facilities) and gradually broaden its benefits, all while working in tandem with the existing utility. The main grid remains in place for everyone, but those who require or value higher resilience get additional services from the SCU. The experience gained in managing the microgrid's independent billing and operations for a limited area can build the case for expanding municipal energy solutions citywide.

## **Suburban City Integration:** SCU and CCA Partnership

**Lessons Learned:**

- SCUs complement existing CCAs: integrating infrastructure resilience (microgrids) with regional clean energy sourcing accelerates community goals.
- Close alignment of SCU and CCA strategies magnifies impact—enabling faster decarbonization, resilience enhancement, and cost savings.
- Parallel, opt-in infrastructure reduces friction, allowing communities to incrementally build towards comprehensive energy independence.

For a **suburban city** that already participates in a CCA program, an SCU can complement the CCA's work by building local infrastructure and offering new services. CCAs typically procure renewable power for a region, while the incumbent utility still maintains the grid. An SCU can slot into this arrangement by owning or operating assets *within* the city (solar farms, batteries, microgrid controls, EV chargers) and serving interested customers locally. Crucially, this is done without dismantling the existing setup – it's a parallel, opt-in overlay. City residents and businesses continue to get their primary electricity supply through the CCA and utility, but the SCU provides **additional, value-added services** on a subscription or project basis.

Building on such a model, a suburban city's SCU could start by **developing a single microgrid or local generation project** that serves a particular area (for instance, a downtown commercial center or an industrial park) while the CCA continues its broader procurement for the whole city. Customers in that microgrid area might receive a separate SCU bill or tariff for the local energy, reflecting costs and benefits distinct from the standard utility bill. This independent billing ensures transparency and financial viability for the SCU portion. As the SCU demonstrates reliability and cost savings, the city can incrementally add more projects: perhaps a second microgrid at a high school campus, a city-owned solar farm feeding a community battery, or a network of solar-powered EV charging stations. Each project remains opt-in and modular – neighborhoods that want an SCU microgrid can form one, those that don't will simply stay fully on the main grid. Over time, these **modular microgrids** could interconnect or at least be centrally coordinated by the SCU, effectively forming a larger community-owned electric system piece by piece. Throughout this growth, the SCU and CCA work in tandem: the CCA ensures **clean power supply contracts**, while the SCU ensures that power is delivered locally in innovative ways (and can island during disruptions). This tandem approach offers *complementary benefits* – the community gets both the economic leverage of a CCA and the infrastructure innovation of an SCU. In practice, such arrangements can reduce strain on the main grid and improve reliability. By pursuing an SCU incrementally, a suburban city can slowly build out a parallel distribution network and suite of services *without* breaking away from the utility all at once. The end state might be a hybrid model where the municipality (through the SCU) owns significant local energy assets and maybe even some local wires, while the investor-owned utility still manages transmission and any parts of the distribution system not yet transitioned. This flexibility allows the city to **scale up its municipal energy involvement gradually**, based on proven successes and community interest, which is far more feasible than attempting a full municipal utility conversion overnight.

In 2016, the City of Menlo Park partnered with Peninsula Clean Energy (PCE), their regional CCA, to accelerate its clean energy transition and improve grid resilience. This collaboration leveraged the CCA's broader resources and the city's local infrastructure. This example highlights how a suburban city and a CCA can align their efforts for mutual benefit, from decarbonizing electricity supply to hardening critical facilities against outages.

For this suburban city, partnering with the CCA meant coordinating on multiple initiatives to align energy services and climate programs. Key collaboration actions included:

- **Integrated Clean Energy Supply:** The city opted to source electricity through the CCA, accessing a **100% carbon-free** power mix dominated by renewables and hydropower 📎. This joint power procurement immediately eliminated most carbon emissions from the city's electricity use.
- **Community Resilience Projects:** The city and CCA co-developed local **solar-plus-storage installations** to boost reliability. They equipped critical facilities (such as emergency shelters and community centers) with solar panels and battery backups, ensuring those sites stay powered during outages 📎. These community microgrids not only provide emergency power but also support the grid by shifting loads and supplying capacity to the CCA during normal operations.
- **Building Electrification Initiatives:** The partnership tackled emissions from buildings by promoting all-electric technologies. The CCA provided funding and expertise to help retrofit homes with electric appliances (with **$2 million earmarked for low-income households)** 📎 and offered technical assistance for the city to adopt **"reach codes"** requiring all-electric new construction 📎. This coordinated push began phasing out

natural gas use in both existing and future buildings, aligning local policy with the clean electricity now provided.

The city–CCA partnership yielded significant benefits for the community:

- **Reduced GHG Emissions:** By supplying **100% clean electricity**, the city cut its greenhouse gas emissions substantially – an **estimated 24,689 tons of $CO_2$** avoided in the first year of CCA service alone📎. This immediate drop in emissions demonstrated the impact of joint action.

- **Foundation for Climate Goals:** With its power sector now **decarbonized**, the city gained a strong foundation to pursue ambitious climate targets. It was able to commit to a **carbon-neutral by 2030** goal, leveraging the CCA's clean power as a stepping stone to decarbonize transportation and buildings next📎. The partnership thus accelerated the city's timeline for meeting state and local climate mandates.

- **Enhanced Energy Resilience:** Critical community facilities now have reliable backup power thanks to the solar+storage projects, improving emergency preparedness📎. City staff also gained hands-on experience in deploying and managing these advanced energy systems as a result of the collaboration📎. This capacity-building and infrastructure investment mean the city is better equipped to handle grid outages or public safety power shutoffs in the future.

Overall, this partnership illustrates how suburban communities can **pool local and regional resources** to achieve faster progress on clean energy. By working together on supply, infrastructure, and policy, the city and CCA accomplished outcomes neither could have delivered alone – from immediate emissions cuts to long-term resilience and sustainability gains. 📎📎

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## **Chartered City:** Selective Municipalization of Services

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**Lessons Learned:**

- Leveraging existing charter authority can significantly simplify regulatory barriers, expediting municipal energy service initiatives.
- Targeting specific geographic areas or services (e.g., EV charging, street lighting) enables focused investments with measurable outcomes.
- Demonstrating tangible benefits early strengthens cities' negotiating position in future franchise renewals or expansions.

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Charter cities – which have greater autonomy under state law – are particularly well-suited to explore **selective municipalization** through an SCU as a low-risk option. Instead of attempting to take over the entire electric grid of the city (a complex, expensive, and fraught endeavor), a charter city can use its franchise authority and local legislative powers to carve out specific services or geographic areas for the SCU to manage. For instance, a charter city could decide to municipalize the electric service in a new commercial district or a large upcoming housing development. The SCU would build and operate the distribution lines and substations in that area, while the rest of the city remains under the incumbent utility. This approach creates a *city-run micro-utility district*. The SCU's customers in the district get their electricity delivered by the city utility (and billed by the SCU), but they are still connected to the broader grid for redundancy. Because participation is based on location and new infrastructure, it remains a parallel opt-in model – existing customers elsewhere in the city are not affected or forced to switch. **Independent SCU billing** in the pilot area keeps finances separate and transparent. This kind of arrangement has been contemplated in California, where some communities frustrated with utility reliability have sought ways to improve service 📎.

Another selective approach is for the SCU to take charge of certain *services* rather than entire neighborhoods. For example, the SCU might operate all municipal EV charging stations, street lighting, or community solar installations as a separate utility service. A charter city can do this without regulatory pushback, since these are new or non-traditional utility services. Over time, these assets can form the backbone of a more expansive SCU. Consider a scenario where a charter city's SCU runs a network of solar-powered street lights and battery-backed community centers (micro resilience hubs). Initially, those are standalone systems with independent SCU management. As confidence and capabilities grow, the city could decide to interconnect them and maybe add a few adjacent private customers into the mix – evolving into a microgrid network. Each success builds political capital and operational know-how. Then, when the city's main utility franchise comes up for renewal, the city has leverage and experience: it can negotiate for a bigger role in distribution or even opt to not renew the franchise for a segment of the city and expand the SCU's territory. For instance, during Chicago's recent franchise negotiations with Commonwealth Edison, the city secured commitments for significant local clean energy investments and community programs 📎, showcasing how franchise agreements can advance municipal energy goals. A city in California might go a step further and stipulate that the SCU will assume service to certain new developments or critical circuits, creating a parallel municipal grid in those areas. **Incremental municipalization** in this way lets the city test the waters of running its own utility services, prove the SCU model on a small scale, and work out regulatory or technical challenges. If and when the city wants to expand the SCU, it can point to the pilot area's track record to justify the move. The ultimate vision could be a city where multiple pockets of SCU service (initially isolated) gradually expand and eventually merge, leading to a majority-municipal utility that is built piece by piece. For city officials, this path greatly reduces the risk compared to an all-or-nothing approach, and it exemplifies the SCU's flexibility to adapt to the city's strategic needs.

## **Small Towns & Tribal Communities:** Resilience from the Ground Up

**Lessons Learned:**

- Community-led energy solutions tailored to local needs generate strong buy-in and build capacity for long-term management.
- Prioritizing resilience and local renewable generation creates tangible, immediate improvements, particularly for underserved communities.
- Local governance ensures accountability and transparency, essential for sustaining community trust and participation over time.

In **small towns and tribal communities**, the SCU model often begins as a response to reliability and resilience needs. These communities are sometimes located at the edge of the grid or in areas prone to outages (due to storms, wildfires, or weak utility infrastructure). An SCU can take root by addressing a pressing local concern – for example, keeping the lights on at a critical facility or reducing high power costs. The initial phase might be as straightforward as installing a **community solar array with battery storage** to power a key facility like a fire station, clinic, or emergency shelter. The SCU (which could be franchised by a town government or tribal authority) can manage this system, providing resilient power to those facilities and possibly a few nearby buildings.

A notable real-world example is the Blue Lake Rancheria Tribe in northern California, which built a solar-powered microgrid in 2016 to supply its government offices, hotel, casino, and Red Cross shelter site. When a regional blackout hit after a 2022 earthquake, Blue Lake's microgrid kept the lights on and **became "an island of electrical activity," providing critical and potentially lifesaving support for local residents**📎. The tribe opened its facilities to the public – people charged medical devices, bought fuel and ice, and stayed connected thanks to the microgrid's power – a clear demonstration of community resilience enabled by an initial SCU-like project📎. Importantly, this microgrid was deployed behind the meter on tribal facilities, entirely under local control. The success of such a project demonstrates some of the benefits of the SCU approach and shows concretely how *independent, community-run infrastructure* can deliver reliability when the main grid fails.

Following early wins, a small town or tribe can **expand SCU services gradually**. Phase two might involve adding more generation or storage capacity to serve additional loads. In a town, the SCU could extend service from just the fire station to also cover the water treatment plant or a cluster of downtown businesses, creating a larger microgrid or a series of microgrids. In a tribal setting, an SCU might integrate more tribal buildings (like housing units, schools, or health clinics) into the microgrid network. This often means building new distribution links or control systems – effectively **incremental grid buildout** – all while maintaining opt-in participation (the SCU only serves those who choose or areas that the tribe/town governs). As technical and financial capacity grows, multiple microgrids in the community can be linked or coordinated as a “federation.” Blue Lake Rancheria, for instance, did not stop with one microgrid; it became a testing ground for *nested microgrids*. With support from the Department of Energy, the tribe is now collaborating with neighboring Yurok, Karuk, and Hoopa Valley tribes to connect several microgrids along a 26-mile corridor 📎. This project will create three nested, front-of-meter community microgrids on a single utility feeder, an arrangement that is still rare but seen as a **future direction for the electric grid** 📎. In fact, some experts envision an eventual “grid of connected microgrids,” and projects like this are pioneering that concept 📎. The evolution for Blue Lake’s model is clear: start with one resilient node, then expand stepwise into a regional network that benefits multiple communities.

Small towns are following a similar pattern. Take *Gonzales, California* – a farming town of about 9,000 people. Gonzales formed a local energy authority with plans to build a 35 MW **multi-customer microgrid** to independently supply power to its agricultural industrial park 📎. 📎. Though the development partnership created for the project failed, the goal was to improve reliability and support economic growth since the main utility’s delays and power shutoffs were hindering local businesses 📎. This industrial park microgrid, financed through a public-private partnership, was planned as the first stage of a broader community energy strategy. If it had performed well, Gonzales intended to **expand service from just industrial customers to residential neighborhoods**, aiming to become a largely self-sufficient community that could even sell power back to the regional grid 📎. In Gonzales’s case, the parallel grid infrastructure (initially just for one part of town) can incrementally spread to cover more of the town’s load. The city was effectively testing the SCU concept on a small scale and banking on scaling it later – a smart approach for a small municipality with limited resources. Both the tribal and small-town examples underline how **local needs will drive SCU adoption**: whether it’s keeping elders safe during outages or keeping businesses running despite utility failures, the SCU starts as a solution to a tangible problem. By solving that problem well, the SCU gains community support to broaden its scope. Over years, what began as a single microgrid or service can transform into a comprehensive municipal (or tribal) utility. The transition is gradual and adaptive, proving the model at each step – exactly the ethos of incremental development.

## Technical Partnerships and Knowledge Transfer

California SCUs can accelerate deployment by establishing partnerships with existing EnergyNet implementations. Key opportunities include:

**Swedish Municipal Collaboration**: Lund's April 2025 launch of the world's first operational EnergyNet system provides immediate learning opportunities. SCUs should consider formal knowledge-sharing agreements with Sveriges Allmännytta and participating municipalities.

**Open Source Development**: Contributing to the Energy Protocol's GitHub repository ensures California-specific requirements (CAISO integration, CCA interoperability, wildfire resilience modes) are incorporated into future versions.

**Equipment Procurement Consortiums**: Joint procurement with European municipalities could reduce Energy Router costs by 20-30% through volume purchasing, while ensuring multiple vendors develop compatible equipment.

**Pilot Project Coordination**: Aligning SCU pilot timelines with EnergyNet deployment phases enables real-time troubleshooting support and shared learning. The 12-18 month lag between Swedish and California deployments provides opportunity to incorporate lessons learned.

## Conclusions and Key Takeaways

**Pilot-Friendly Conditions:** From the above examples, we learn that ideal early adopters of the SCU model might be **charter cities with upcoming developments or infrastructure needs, cities with non-exclusive utility franchises, and communities with strong political commitment to clean energy.** These conditions reduce legal friction and provide immediate use-cases for the SCU to prove its value. A city that has recently experienced severe outages or public safety power shutoffs might also find community support for an SCU pilot is high – residents and local businesses will be eager for solutions and may readily opt in. Because SCUs are so novel, starting as a pilot or demonstration can be wise. City administrators should document and publicize the results (e.g., “this microgrid kept 50 homes powered during the last wildfire outage” or “our community solar project saved participants 30% on bills compared to PG&E”) to build momentum for scaling up. By sharing case study results with peer cities, each SCU pilot can pave the way for broader adoption across California.

These case studies collectively demonstrate the **flexibility and scalability of the SCU model**. An SCU can be tailored to a variety of community contexts – from dense cities to rural towns – and can start with something as simple as managing a few solar installations or as urgent as providing backup power to a fire station. The incremental development approach allows each SCU pilot to build momentum for the next phase: early-stage projects establish the *technical feasibility, financial viability, and public buy-in* that make larger expansions possible. A well-designed SCU pilot (be it a neighborhood solar program or a community microgrid for critical facilities) is not just an experiment, but rather the foundation of a **larger municipal energy solution** that unfolds over time. City administrators considering SCU initiatives should note that there is no one-size-fits-all design – and that’s a strength of the model. Each community can prioritize the services and infrastructure it needs most (clean energy, resiliency, economic development) and let the SCU grow organically from there. Crucially, an SCU operates in parallel to the existing utility, so cities can innovate **without waiting for permission or overhaul** of the entire utility system. This parallel, opt-in structure means ***low risk*** *and* ***high optionality***: if a program works, it can scale; if not, it hasn’t disrupted the whole city’s power supply. Over time, multiple successful SCU projects can link together, ultimately achieving the community's vision of local energy autonomy and sustainability.

For city leaders looking to launch an SCU, these examples offer several practical takeaways:

- **Start with High-Impact Opportunities:** Identify a need that an SCU can meet early on – for example, backing up a critical facility or equipping a new housing development with solar. Focusing on a visible, high-impact project builds community support and political momentum.

- **Leverage the Parallel Opt-In Model:** Keep the initial SCU service voluntary and parallel to the incumbent utility. Allow customers to opt in for additional benefits (like resiliency or local clean power) without forcing a citywide change. This lowers resistance and regulatory hurdles, while demonstrating demand for the SCU's offerings.

- **Maintain Independent Operations and Billing:** Set up the SCU's pilot project with its own management and billing system. Clear separation (e.g., a dedicated microgrid tariff or a subscription fee) makes it easier to track performance and finances. Independence ensures the SCU can reinvest revenues into expansion and operate sustainably, even as it coexists with the traditional utility.

- **Build Infrastructure Gradually:** Plan for **modular growth**. Rather than investing in a full network upfront, design the SCU infrastructure to be built in phases. For instance, install infrastructure that meets today's needs but can be interconnected later (microgrids that can link to other microgrids, solar installations with capacity for future neighborhoods, etc.). This incremental buildout minimizes financial risk and allows adjustments as technology and needs evolve.

- **Adapt to Community Needs:** Tailor the SCU's services to what the community values – whether it's clean energy, lower costs, reliability, environmental justice, or local control. An SCU in a suburban town might focus on solar and EV charging, while one in a fire-prone rural area might prioritize off-grid capability and backup power. This ensures strong local engagement and uptake for each phase of development.

- **Plan for Scalability and Federation:** Even at the pilot stage, keep the end goal in mind. Design governance and technical systems that can scale. For example, use open standards for microgrid controls so additional sites can be added, or structure the SCU as a utility enterprise fund that can handle growing revenue. Envision how isolated projects could interconnect in the future – moving toward the "grid of microgrids" concept where appropriate 📎. This foresight will smooth the path from a single project to a citywide (or even multi-city) utility network.

The SCU model offers California city leaders a **bold yet feasible path to transform their local energy landscape to gain greater control over their energy future one step at a time**. By learning from Ann Arbor's SEU and leveraging the unique regulatory freedoms in California, SCUs can deliver cleaner, more reliable, and community-centric energy services. Each case study – from a solar-powered new development to a tribal microgrid network – reinforces that starting small does not limit the ultimate potential. By learning and adapting through pilot projects, an SCU can scale from an early innovation into a comprehensive, municipal energy solution that delivers parallel benefits: cleaner power, enhanced resilience, local investment, and empowered consumers. With an open-minded approach and a focus on practical pilot projects, cities, developers and other local leaders can take inspiration from these examples to craft SCU initiatives that align with their local goals, confident that a flexible, incremental approach can lead to transformative outcomes. The SCU is not just a theoretical idea; it's a customizable framework that cities can start working on *today* to achieve their sustainability and resilience goals within the existing system 📎. The message is clear: **begin now, start small, and build on success – a Spark Community Utility can evolve into a cornerstone of your community's infrastructure** 📎. With patience and strategic scaling, today's opt-in microgrid or solar program could become tomorrow's citywide clean energy utility.