The Greenlink Clean Energy Policy Toolkit

General Framing

The Clean Energy Policy Toolkit is meant to be an exhaustive list of all policy options a city could consider in advancing a clean energy agenda.

Not all of these options are good ideas in all contexts. Some of them might be bad ideas in all contexts!

The idea is to demonstrate a thoughtful, thorough approach and to create a way to compare and score across policy options without needing to individually analyze every single one.

In that effort, the Toolkit can produce a weighted score for each policy based on several factors and weights, to be assigned in the process of reviewing these options for suitability.

The rest of this deck is a review of the various policy options and their efficacy

Policy Categorization

Policies are divided between **action areas**, **pathways, sectors,** and **lead actors**

Actions areas: What is the mechanism this policy uses to create change? Options include: *Financing, Information, Regulatory, Technology, and Programmatic*

Pathways: What part of a city is generally targeted by this policy?
Options include: *Buildings and Energy, Community, Environment, Transportation*

Sector: What energy-using sector is targeted by this policy?
Options include: Residential, Commercial, Industrial, Transportation, Municipal, and Cross-cutting

Lead: Who takes responsibility for implementation and administration of this policy?
Options include: municipal government, transit authority, NGOs, utilities

Policy Scoring

Policy are scored (minimally) on **clean energy impact, feasibility, cost-effectiveness, equity impact,** and **economic development**. Participants can add more categories. Each is scored 1-5, with below as a guide. Participants can then assign weights to each category to develop a weighted index score for each policy.

Score	**Feasibility**	**Impact**	**Equity**	**Cost-Effectiveness**	**Community Wealth**
1	Extremely high barriers and amounts of financial and political capital required	Very low	Harmful/unfair; likely worsens equitable processes and outcomes	High Cost/Slow Return on investment	Less than 10 jobs created/sustained
2	Somewhat high barriers and high amounts of financial and political capital required	Low	On-balance harmful to equitable processes and outcomes without special care or attention	Somewhat high cost/slow return on investment	10 - 50 jobs created/sustained
3	Moderate barriers and amounts of financial and political capital required	Moderate	Equity-neutral	Typical costs and return on investment	50 - 100 jobs created/sustained
4	Slight barriers and mild amounts of financial and political capital required	High	Likely improves the status quo on equitable processes and outcomes	Better than average costs and return on investment	100-500 jobs created/sustained
5	Low barriers and amounts of financial and political capital required	Very high	Could greatly improve equity in process and outcome	Low cost/Excellent Return on investment	500+ jobs created/sustained

Buildings and Energy Policies

In most cities, the largest single source of emissions is buildings. These are broken down by sector - residential, commercial (and sometimes industrial is included). Non-transportation energy use is heavily concentrated in buildings, so these two are frequently grouped together.

Policy: Revolving Loan Fund

Action Area: Financing

Sector: Cross-Cutting

Description: Self-replenishing clean energy fund that issues loans to projects as capital returns from lendees.

Lead: Local government

Notes: This is a widely favored financing option because it is self-sustaining, unlike grants or rebates. It can be limited to government facilities or deployed more widely. On the other hand, it is a slower way to inject capital into the market because the speed of deployment is limited by the repayment of prior loans.

Key examples: The Texas LoanStar program is one of the most successful revolving loan funds in the US.

Policy: On-Bill Financing

Action Area: Financing

Sector: Cross-Cutting (but frequential residential-only)

Description: Allows the utility to absorb the upfront cost of a clean energy upgrade, incrementally repaid by the utility customer each billing period.

Lead: Utilities

Notes: On-Bill Financing is an old policy concept that is intended to use a more liquid (and potentially more patient) source of funding to provide the funds necessary to pay for energy improvements on the home. General advice is that the repayment terms are *cash-flow positive*, meaning that the energy savings + the cost of the financing is less than the energy bill would have otherwise been. On the plus side, these programs open more dollars to the clean energy marketplace and make it easy for customers to repay the loan - it's done directly through the energy bill. These programs can also be used to provide equitable financing options for customers whose credit ratings may limit access to other capital streams.

Opposition tends to come from utilities, which may not be interested in funding clean energy activities and will frequently say "we are not bank" when this idea is proposed. Utilities may claim (correctly or not) that their bill-pay systems are not capable of accommodating on-bill financing. Lastly, if the loan is tied to the customer, the outstanding debt can be complicated to manage at time-of-sale and utilities may require full repayment at point-of-sale. Some utilities get around this by tying the debt to the meter; others allow the debt to move with the customer so long as the customer remains in the utility's territory.

Key examples: ACEEE produced a review of OBF. Recent examples with utilities in the Southeast have gone by the name PAYS (Pay As You Save)

Policy: Energy Savings Performance Contracts

Action Area: Financing

Sector: Cross-Cutting (primarily Commercial/government)

Description: Contractual partnership between building owners (typically MUSH market) and an energy service company (ESCO) that encourages energy savings and facility improvements with no upfront costs to the owner.

Lead: Building Owners (Government could encourage through education and demonstration)

Notes: ESPCs are a big industry. An ESCO is a combination financing and engineering shop. The typical process is a detailed energy audit, agreement on energy activities, installation, then monitoring. A contract might be a 10-year agreement; the ESCO will invest in opportunities that will payback and provide a profit within that window. ESCOs frequently guarantee performance (ie, that bills will be at or less than before after the installation), providing owners with assurance.

Difficulties tend to be legal, especially for governments. ESPCs are long-term, high-value contracts and subject to rigorous procurement standards as a result. In some states, governments are prohibited from entering long-term contracts, although this is less and less the case. In implementation, ESCOs have a reputation for trying to take advantage of less-diligent owners, so it can be beneficial to have a skilled owner's representative under contract who can advise and help manage the project.

Key examples: DOE has produced an entire ESPC toolkit with examples, best practices, and more

Policy: Utility Energy Efficiency Commercial Custom Programs

Action Area: Financing

Sector: Commercial

Description: Reduces the cost of energy efficient technologies and upgrades.

Lead: Utilities

Notes: Utility programs typically break down into prescriptive and custom programs. Custom programs allow customers to propose their own route to energy savings and receive payment per energy-saved. Energy savings can be modeled or demonstrated (or both) depending on the program.

Challenges come in the proving of energy savings, which can devolve into arguments about energy models or EM&V actions, and in the quantity of dollars available to the program. Most utilities will try to modulate marketing and program participation to avoid customer dis-satisfaction with funding limitations.

Key examples: Georgia Power offers $0.10/kWh up to $75,000 in their program

Policy: Utility Energy Efficiency Commercial Prescriptive Programs

Action Area: Financing

Sector: Commercial

Description: Reduces the cost of energy efficient technologies and upgrades.

Lead: Utilities

Notes: Utility programs typically break down into prescriptive and custom programs. Prescriptive programs allow customers to receive rebates for specific pieces of equipment, like LED lighting.

Complications here are minor; program administration and the quantity of dollars available to the program are the most frequent issues. Most utilities will try to modulate marketing and program participation to avoid customer dis-satisfaction with funding limitations.

Key examples: Georgia Power has a list of opportunities here

Policy: Utility Energy Efficiency Residential Prescriptive Programs

Action Area: Financing

Sector: Residential

Description: Reduces the cost of energy efficient technologies and upgrades.

Lead: Utilities

Notes: Utility programs typically break down into prescriptive and custom programs. Prescriptive programs allow customers to receive rebates for specific pieces of equipment, like LED lighting. Most residential efficiency program dollars are prescriptive and not custom.

Complications here are minor; program administration and the quantity of dollars available to the program are the most frequent issues. Most utilities will try to modulate marketing and program participation to avoid customer dis-satisfaction with funding limitations.

Key examples: Georgia Power has a list of opportunities here

Policy: Green Building Rebate for New Construction

Action Area: Financing

Sector: Commercial/Residential

Description: Provides a rebate proportional to a specified level of performance achieved

Lead: Government/Utilities

Notes: These programs typically reduce permitting fees to developers in exchange for including “green” features when offered by governments; utilities typically provide a financial rebate for beyond-code builds.

Difficulties can be political for governments - there are foregone revenues for this incentive. They can be financial for utilities - if a construction boom hits with this incentive, program funds can be exhausted and result in upset customers.

Key examples: Here’s an example from California for LEED properties

Policy: Commercial Property-Assessed Clean Energy Tax Lien Financing (C-PACE)

Action Area: Financing

Sector: Commercial

Description: Property-Assessed Clean Energy (PACE); program that finances energy efficiency programs and renewable energy upgrades to commercial buildings through property taxes.

Lead: Government

Notes: This operates similar to OBF or a loan, but instead of paying back through a bill, the debt is repaid through property taxes. The original source of funding is typically a government bond. PACE can be advantageous because the debt is assigned to the property, not the owner, so if the asset is sold, the debt doesn't have to be repaid in full at time of sale. If implemented by government, PACE can also provide lower interest rates than a private lender because the cost of borrowing for governments is generally lower than the average business. Many governments use 3rd party administrators for these programs, which ease implementation but increase the interest rate (this is how the administrators make their profit). One final benefit is that PACE is "off books" financing, so it has minimal effect on the balance sheet.

Difficulties can come from many corners. PACE requires enabling legislation at the state level. Tax liens are generally considered senior debt (ie, first to be repaid) when a property goes into foreclosure or bankruptcy, which means they will jump ahead of private lender mortgage debt. As a result, banks, including Fannie and Freddie, are not supportive. The leading 3rd party administrators have also made certain potentially-predatory business decisions that have caused the perception of PACE to decline, sometimes with political consequences. Most of these issues (except the banks) are more pronounced with R-PACE than C-PACE.

Key examples: Pacenation.org is the major advocate for PACE nationally. DOE has a description of PACE in both sectors here.

Policy: Residential Property-Assessed Clean Energy Tax Lien Financing (R-PACE)

Action Area: Financing

Sector: Residential

Description: Property-Assessed Clean Energy (PACE); program that finances energy efficiency programs and renewable energy upgrades to residential buildings through property taxes.

Lead: Government

Notes: This operates similar to OBF or a loan, but instead of paying back through a bill, the debt is repaid through property taxes. The original source of funding is typically a government bond. PACE can be advantageous because the debt is assigned to the property, not the owner, so if the asset is sold, the debt doesn't have to be repaid in full at time of sale. If implemented by government, PACE can also provide lower interest rates than a private lender because the cost of borrowing for governments is generally lower than the average business. Many governments use 3rd party administrators for these programs, which ease implementation but increase the interest rate (this is how the administrators make their profit).

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Policy: Power Purchase Agreement

Action Area: Financing

Sector: Cross-cutting

Description: Sign a long-term contract to buy electricity from solar installed on-premise (generally rooftop)

Lead: Property Owners

Notes: In a PPA, the owner agrees to pay the developer a fixed rate for electricity. This rate may increase over time (called an escalator), and the contract generally include O&M for the installation. This is typically preferable to a lease because the owner only pays for performance. PPAs have been transformative for DGPV in many states across the country. Developers are often open to reducing the fixed rate in exchange for upfront cash also.

Difficulties can come from many corners. In some states, PPAs are not legal. Other utilities make it very difficult to interconnect for PPAs. Primary barriers tend to be legal uncertainty in states without a track record of using this policy.

Key examples: City of Atlanta's SEPA. Here's an NREL Explainer.

Policy: Green Loans (aka Energy Efficiency Mortgages)

Action Area: Financing

Sector: Cross-cutting

Description: Use/Promote effective bank loan approaches and practices to support renewable energy and energy efficiency projects

Lead: Banks

Notes: Many banks have developed clean energy loan products that provide special financing terms for these investments. The process is very similar to any other loan, but the banks have frequently trained personnel to be capable in handling these requests.

Challenges can enter for banks who are not familiar with issuing loans for energy purposes. Individuals with poor credit scores are also likely cut out from this funding option. Energy audits may be required before a bank issues funding as well, requiring upfront capital from the applicant.

Key examples: DOE has a prepared step-through of the process

Policy: Special Purpose Local Option Sales Tax (GA-only)

Action Area: Financing

Sector: Cross-cutting

Description: Establish a sales tax for a specific purpose

Lead: Municipal government

Notes: SPLOST funding generally requires public approval in a referendum and is a county-led effort. The funding can be used for capital investments.

Challenges: There are generally limitations on how funds can be spent - OpEx and maintenance are not permitted in most cases. There is also a state-wide cap on the combined amount of local sales taxes; some areas may not be able to take advantage of SPLOST funding if other LOST/HOST levies are already in place. Lastly, as a sales tax, it is regressive in nature with negative equity implications.

Key examples: Augusta's SPLOST explainer

Policy: Virtual Power Purchase Agreements

Action Area: Financing

Sector: Cross-cutting, but far more prevalent for Commercial/Industrial/Government

Description: A renewable energy “contract for differences” used to provide a financial hedge against energy price fluctuations in exchange for renewable energy credits. The renewable energy is not generated or used on-premise, but credit for its generation is legally assignable to the buyer.

Lead: Shared by renewable energy developers and the buyer

Notes: A vPPA allows a buyer to obtain RECs and potentially profit at the same time if the fixed price of the contract ($/MWh) is less than the generation-weighted average sales price to the offtaker (typically, the grid operator). In a state without an active RECs market, these can be even more cost-effective because there’s not a secondary market to compete for the RECs.

Challenges: Vertically integrated utilities are opponents because these contracts are outside their control or visibility. As a result, they tend to attempt to create legal challenges to their establishment. Since vPPAs are at core a risk management strategy by the developer and purely financial instruments, the utilities have a weaker argument, but efforts can get tied up in litigation.

Key examples: RMI’s explainer

Policy: Bulk Purchasing Programs (Solar, Solar+Storage)

Action Area: Financing

Sector: Cross-cutting

Description: Partner to reduce costs through bulk purchasing on solar and battery storage equipment

Lead: Private sector administration w/ municipal support

Notes: These programs are commonly called “Solarize” and offer significant savings to participants over individual procurement of the same equipment. Program registrations are “limited time” events. A high number of registered participants results in lower costs to all.

Challenges: These programs are generally successful with high and moderate income households but struggle to engage commercial customers and low-income households. The commercial sales cycle is typically longer than the registration period (even with highly targeted participants). Low-income households frequently don’t have the cash or the credit scores to enable their participation.

Key examples: Dated, but still useful, from NREL

Policy: Building Energy “Stretch” Code

Action Area: Regulatory

Sector: Cross-cutting

Description: Adopt a building code that requires energy performance exceeding the current base code. Frequently paired with an incentive (such as “achieving a certain level of energy performance exempts a building from other code requirements”).

Lead: Government

Notes: A stretch code (aka a reach code) operates alongside the regular building code process. It can be used to familiarize the construction community with improvements or accelerate the adoption of new technology and best practices.

Challenges: This is an “in-between” step from adopting a more rigorous code to doing nothing new. As a result, developers will not oppose this as stridently as a new code, but still expect opposition. In a home-rule state, local governments will have plenty of freedom in this area. But in a Dillon Rule state, local governments won’t be permitted to adopt more stringent codes without changing state law. A stretch code may be viewed as a “parallel” compliance path, but that would need legal approvals as well.

Key examples: NBI’s explainer; Massachusetts is the OG; San Jose is a recent adoptee

Policy: Net Zero Energy Code

Action Area: Regulatory

Sector: Cross-cutting

Description: Adopt a building code that requires new buildings to provide as much energy to the grid as they consume (generally proposed as a phased-in approach)

Lead: Government

Notes: A net zero energy code requires buildings to be very efficient and to have on-site renewable generation. If all buildings performed at this level, net emissions from the buildings sector would be eliminated.

Challenges: Developers will oppose this stridently as a new code. In a home-rule state, local governments will have plenty of freedom in this area. But in a Dillon Rule state, local governments won't be permitted to adopt more stringent codes without changing state law. An NZE Code is a very effective decarbonization policy but also comes with powerful opposition.

Key examples: Denver recently adopted a NZE Plan. NBI also has an explainer of the policy.

Policy: Benchmarking and Transparency

Action Area: Regulatory

Sector: Typically Commercial (including government and multifamily)

Description: Adopt an ordinance requiring that building owners meeting certain criteria (generally sqft and use type) must track and report energy (and sometimes water) data to the City (benchmarking). The City then publishes this data (transparency)

Lead: Government

Notes: The intent of these policies is first, to overcome information gaps about resource use by the building owners and managers, and second, to simultaneously avoid the creation of information asymmetry in the market, by making that information available to the public. The effects are to provide an incentive to reduce resource consumption through information and market forces. Ideally, a “virtuous circle” is created in a market, where high-performing buildings become more desirable, thus producing more market pressure for all buildings to improve performance.

Challenges: Highly professionalized building owners and managers with national footprints already do this in many jurisdictions and may be supporters. Local building owners and managers are the key source of opposition, many of whom may benefit from this information remaining secret, similar to the used car dealer who selling issue-prone cars that only they know about. Depending on the clout of the locals, this can and has risen to the point of inspiring state preemption of local BMT ordinances.

Key examples: IMT is national leader in assisting with BMT policies. You can see their factsheet and map.

Policy: Update Building Codes and Increase Enforcement

Action Area: Regulatory

Sector: Cross-Cutting

Description: Increase energy efficiency in new construction through updated building codes and increased enforcement.

Lead: Government

Notes: Depending on the details of state-local delegations, local governments can exercise significant influence on the performance of new buildings. In many cases, states adopt bare-minimum energy codes and leave the enforcement of code to local authorities. Local code enforcement officials may or may not be well-trained on the current energy code; training in this area can lead to significant improvements simply through improved enforcement of current law. In home-rule states, local governments can frequently adopt energy codes that are more stringent than the state code. In these circumstances, there can be significant gains through mandating better performance in new buildings. Many states are slow to adopt improved model codes issued by ASHRAE and ICC, so localities may seek to adopt the most recent code or go beyond it.

Challenges: Better enforcement requires training, which requires an investment of dollars. Developers may be opposed to better enforcement but generally have a difficult time arguing that their objections are reasonable (they are *de facto* asking for a permit to break state law). When adopting a code more stringent that the state floor, developers are likely to oppose these actions. Reasons provided typically include increased costs and a lack of demand from clients, although these are often covers for requiring modifications in building practice for an industry that doesn't want to change.

Key examples: PNNL performs the bulk of the code analysis for DOE. Their state-level estimates of performance and savings for new codes can be found here. Additionally, a series of field studies were performed recently for DOE to evaluate the success of current code enforcement levels. While the coverage is not universal, there are great findings in the case studies for specific states, found here.

Policy: Municipal Efficient Equipment Procurement Policy

Action Area: Technology

Sector: Municipal

Description: Require that energy-using products purchased by municipality meet efficient equipment standards.

Lead: Government

Notes: These requirement are commonly roped under a “Green Procurement” policy that requires more environmentally-friendly procurement practices in general. Generally, a municipality would require that new equipment achieve a standard level of energy performance such as being Energy Star certified; could also apply to EV purchases.

Challenges: Requires a certain amount of internal and political buy-in to be adopted; municipalities may see higher upfront costs (although these will be offset by lower energy costs in the long run)

Key examples: USEPA has collected a group of reports with best-practices

Policy: Install LED Streetlights and Traffic Signals

Action Area: Technology

Sector: Municipal

Description: Invest in LED street and area lighting in order to improve energy efficiency.

Lead: Government/Utilities

Notes: The payback for these kinds of investments is generally under two years at this stage for equipment that typically lasts 10+ years and reduces energy consumption 5-10x.

Challenges: Most issues arise in program implementation as the financial case is so obvious. How many streetlights are there? Who owns and maintains them? Are there other desirable pole maintenance or add-on requests? While these seem like and ought to be minor issues, working through them has taken some cities years. On the other hand, ownership reviews have identified significant savings for municipal governments due to being overcharged by utilities for non-existent infrastructure.

Key examples: Los Angeles got “platinum package” when they did their LED retrofit. Simpler versions have fewer controls and likely come in at lower expense.

Policy: Develop Local Microgrids for Critical Infrastructure

Action Area: Technology

Sector: Utilities

Description: Partner with utility to develop microgrid projects; provide local leaders with an understanding of what microgrids are and how they can serve communities

Lead: Utilities

Notes: Microgrids typically allow one section of the bigger energy grid to “island” - to operate independently - through a separate set of generators and wires. This enables the end-users connected to the microgrid to retain power when the rest of the grid goes down. It can also allow for new, clean generation sources to meet the energy demand of specific customers.

Challenges: Microgrids are not cheap and typically are viewed as redundant. There may be a resilience benefit (hence the focus on critical infrastructure), but utilities are hesitant to make such investments for customers without significant political pressure. Utilities will argue (frequently correctly) that these costs are likely to be socialized and shared across all customers while a smaller subset benefit from the infrastructure. This can be characterized (or caricatured, depending) as an inequitable cross-subsidy, especially if the beneficiary of the microgrid is a wealthy district or university. Due to the degree of customization and specificity, it can be difficult to generalize cost estimates or performance from one project to another, and not all power on microgrids is clean.

Key examples: The Pittsburgh Airport recently completed their microgrid, publicly noting their desire to avoid an Atlanta-style long duration power outage

Policy: Improve Lighting in Municipal Buildings

Action Area: Technology

Sector: Municipal

Description: Take advantage of savings opportunities through high-efficiency interior and exterior lighting solutions in municipal properties

Lead: Utilities

Notes: Lighting has been and remains the least-cost, fastest ROI energy improvement most cities can make. Incandescent and fluorescent lighting are more costly to keep using and increasing criticized as lower-quality light.

Challenges: Financial concerns if upfront funding is completely absent (although some companies will offer financing plans). Technical issues are the largest source of frustration - can run into issues with replacing fluorescents around ballasts, and can run into lumens mismatches in parking structures. Most facilities management teams should be able to overcome these hurdles.

Key examples: This is honestly such low-hanging fruit, there’s not one key example - this is pretty commonplace.

Policy: Investigate Floating Solar Opportunities

Action Area: Technology

Sector: Municipal

Description: Investigate and install floating solar (Floatovoltaics) on suitable water bodies.

Lead: Government (maybe utilities, depending)

Notes: Most municipalities are exploring rooftop solar opportunities. Less explored is solar on the water bodies under control of the government, but these can also be opportunities to deploy solar on surfaces otherwise unused.

Challenges: Financially, floating solar is a bit more expensive (typically $0.5-$1/W installed) than rooftop applications. It may be more difficult to send power to municipal buildings; if there is not on-site demand, the energy will need to be sold to the utility, which will have financial implications in most cases.

Key examples: Orlando has installed a small floating solar system

Policy: Develop and Deploy Smart Grids/Smart Meters

Action Area: Technology

Sector: Cross-Cutting

Description: Deploy smart meters to allow households and businesses to monitor and adapt their energy usage patterns.

Lead: Utilities

Notes: Smart meters are critical technology that enables appliances and equipment in buildings to communicate with grid operators, and in so doing, enable significant changes in utility operations.

Challenges: Financially, utilities need to be able to spend the money required to procure and install the equipment. Many utilities have struggled to develop programs that make use of the functions enabled by smart meters also, making some regulators hesitant to permit utilities to deploy the technology.

Key examples: The Oklahoma Gas and Electric Smart Hours program is a great example of how useful smart meters can be at keeping energy use and costs low.

Policy: Energy Operations Manager Position

Action Area: Programmatic

Sector: Government

Description: Have a full-time employee to oversee energy operations for municipal properties

Lead: Government

Notes: A full-time energy operations manager will generally pay for themselves each year through identifying energy savings opportunities or billing errors. They can also be a key liaison between government and private sector actors on energy policy activities and legislation.

Challenges: Generally, this is more about bureaucratic steps required to establish a new position, which can be a headache but can be worked through with management.

Key examples: This is a common position and process.

Policy: Municipal Energy Task Force

Action Area: Programmatic

Sector: Government

Description: Establish an internal clean energy task force to identify clean energy opportunities

Lead: Government

Notes: A municipal task force is generally composed of government staff and can be a key means of maintaining stakeholder interest and relationships as a government implements energy goals. Done well, it can be a source of new thinking and can establish champions across all of government operations

Challenges: The chair needs to retain active engagement with the task force for it to yield benefits. Meeting rarely and not covering substantive issues will lead participants to feel like their time isn't valued.

Key examples: This is a common practice.

Policy: Solar Co-operatives

Action Area: Programmatic

Sector: Buildings/Utilities

Description: A group of building owners within close proximity of one another obtain solar installations through a competitive bid process, leveraging the combined purchasing power and scale of participants.

Lead: Building owners and utilities

Notes: A solar installation (generally up to several MWs in capacity) would be developed to provide energy to the group of participating buildings. Financially, this would operate similarly to a PPA, with the energy shared across multiple customers.

Challenges: In regulated utility territories, this will require the direct engagement and permission of the utility, largely making it a non-starter unless the utility develops the solar installation and can sell it at a premium to the participants. In deregulated contexts, this will be easier, but may also require the joint-development of a microgrid depending on the proximity of participants. In general, this approach has fallen out of favor as other options (PPAs, vPPAs, community solar) have grown more prevalent and face fewer barriers. Note that people use the term “solar co-op” to mean a lot more than this description, also - it is used loosely by others to include things like community solar, Solarize, and other distinct programs.

Key examples: This was always more of a concept than a widely-deployed program and there are few remaining options to point to. However, it may re-emerge as more communities seek to power themselves directly with clean energy.

Policy: Voluntary Energy Efficiency and Conservation Program

Action Area: Programmatic

Sector: Buildings (primarily Commercial/Government)

Description: A program where leading businesses, manufacturers, local and state governments voluntarily commit to improving the energy efficiency of their building portfolio over time.

Lead: Building owners/Development authorities

Notes: These programs try to bring together the largest number of participating buildings/sqft as possible with a pledge to reduce energy consumption. Successful programs pair the challenge aspect with high profile recognition events and splashy media features to keep interest with the participants. The DOE Better Buildings Challenge is the most successful program of this kind, although many communities ran Kill-A-Watt programs prior to the BBC's launch. There are few barriers to entry and participation frequently comes with assistance and resources.

Challenges: Maintaining interest in the program at the launch, during, and after achieving the goals of the effort is difficult and requires local champions, influencers, and skilled communications efforts. Tracking the impact and validating performance and progress towards the goals can also be a challenge when there is not an incentive for good recordkeeping.

Key examples: The Atlanta Better Buildings Challenge was, for the majority of the past decade, the nation's leading voluntary program.

Policy: Clean Energy Task Force

Action Area: Programmatic

Sector: Government

Description: Establish a clean energy task force to identify clean energy opportunities and provide accountability to the clean energy goals.

Lead: Government

Notes: A task force is generally composed of members of the public and can be a key means of maintaining stakeholder interest and relationships as a government implements energy goals. Done well, it can be a source of political support, new thinking, and community engagement.

Challenges: Government needs to retain active engagement with a task force for it to yield benefits. Meeting rarely and not covering substantive issues will lead participants to feel like their time isn't valued.

Key examples: This is a common practice.

Policy: Track, Publish, and Review Municipal Energy Usage

Action Area: Information

Sector: Government

Description: Provide energy efficiency planning and design approaches for local government operations through benchmarking, transparency, and auditing.

Lead: Government

Notes: This is a lead-by-example opportunity for governments that may ultimately want to adopt benchmarking and transparency legislation in their community. Government buildings and data tend to have worse data management procedures than the large private sector owners - proving it works for government can help demonstrate it can work more broadly. It’s recommended that the governments use standard tools like Energy Star Portfolio Manager for this task.

Challenges: Government data can be difficult to organize and assess, especially the first time. It will require coordination between the relevant departments in order to successfully benchmark properties.

Key examples: This is a common practice.

Policy: Exploration of Greywater and Rainwater Harvesting Incentives

Action Area: Information

Sector: Cross-cutting

Description: Investigate opportunities to increase greywater use and rainwater harvesting in order to reduce local water usage.

Lead: Government

Notes: One of the most energy-intensive (and expensive) aspects of water management is wastewater treatment. If water can be diverted from the wastewater system, there are energy and water savings to be had. Additionally, water utility funding for these initiatives may be leveraged to improve energy efficiency if the connection between the two can be made.

Challenges: There are generally restrictions on how greywater and rainwater can be used. These need to be vetted before moving forward with a program.

Key examples: EPA/HUD developed this overview of the issues and some examples here.

Policy: Audit Building Energy Use

Action Area: Information

Sector: Commercial

Description: Implement commercial building energy audit efforts.

Lead: Buildings Owners/Utilities

Notes: After a building has successfully benchmarked its resource consumption, conservation is the most obvious step - just use less if usage levels are higher than average or surprising. But if a building wants to go deeper, the management needs to know what options are available to improve performance. An energy audit studies the systems installed at the property and identifies resource-saving opportunities.

Challenges: Audits come at cost in most places (although some utilities offer zero-cost audits). Generally, these should be “Level 2” audits to be worthwhile (audit levels are defined by ASHRAE). Audits are not especially good at causing energy saving actions to take place - but they enable a smart energy performance plan.

Key examples: Many cities require energy audits (or “energy assessments” if audits was politically charged); the IMT BMT map provides these details. Not all of these are the same; the Atlanta/New York City examples are my favorites.

Community Programs

Clean energy programs can be developed and deployed with a focus on community engagement and benefits

Policy: Community Solar

Action Area: Programmatic

Sector: Cross-cutting

Description: A utility-scale solar power installation where the utility makes capacity and generation available for purchase by customers

Lead: Utilities

Notes: This is one of the most common ways of moving to a 100% clean electricity supply for customers in regulated monopoly territories. Customers pay a premium to buy “capacity blocks”. Depending on the structure of the program, there may ultimately be a financial return on investment or not, depending on how compensation for the generation from the capacity is determined.

Challenges: Some customers may struggle or even be barred from participating in community solar programming given the premium charges. For example, some municipalities do not allow the procurement of commodities at higher than market prices, including power, and would therefore be legally barred from participating without changing the law.

Key examples: Georgia Power provides a community solar option that does not have the opportunity to see a positive ROI for the majority of customers. FP&L offers one that does provide an ROI for most customers.

Policy: Workforce Training Collaboration

Action Area: Programmatic

Sector: Government/Business

Description: Collaborate with technical colleges and trades to develop a clean energy workforce.

Lead: Government

Notes: A clean energy transition will require investments in new ways of meeting energy needs which will in turn create new employment. An intentional effort to train up a clean energy workforce can help ensure that goals are met and economic development opportunities are distributed equitably.

Challenges: Standing up a workforce training program can be done in collaboration with existing workforce development authorities. The biggest challenge is a chicken-and-egg problem - no one wants to train a workforce for jobs that won't materialize - so commitment to the clean energy goal and significant policies to support it are a must if these programs are to take off.

Key examples: ACEEE developed this overview with case studies

Policy: Clean Energy and Equity Planning

Action Area: Programmatic

Sector: Cross-Cutting

Description: Ongoing outreach to keep the public aware of progress towards an energy efficient and equitable goal and to continue receiving citizen input.

Lead: Government

Notes: Clean energy and equity planning involves steps from benchmarking to developing a plan to passage of specific policies to public accountability.

Challenges: At its core, this is about good data and good community engagement. Many cities lack both.

Key examples: See the GLA Theory of Change

Policy: Energy Efficiency Demonstration Programs

Action Area: Programmatic

Sector: Cross-Cutting

Description: Support or implement innovative energy efficiency projects.

Lead: Government

Notes: Aggressive efforts to produce super-high performance buildings can increase learning and show how deep decarbonization can be achieved. These projects need to be publicized in order to make their biggest impact across the community; government can play a role in developing and publicizing such projects.

Challenges: These efforts do not scale easily and are typically more expensive investments that standard building practices; achieving widespread change through these efforts is unlikely.

Key examples: Recent research has started to show these efforts do have catalytic effects.

Policy: Water Efficiency Business Certification

Action Area: Information

Sector: Commercial

Description: Encourage business owners to obtain a water-efficient certification for their buildings.

Lead: Government

Notes: Water use requires energy and vice versa. Therefore, saving water will also save energy and represents an indirect way to reduce energy-related emissions. There are a few ways to approach a business certification, such as requiring WaterSense-certified equipment and emulating other existing standards (like the Water Audit Standard).

Challenges: These programs are customized; there is not a federally-recognized water standard that applies to the commercial sector (there are for homes and irrigation professionals). As a result, these tend to be regional and developed *ad hoc*.

Key examples: Atlanta has created one for restaurants as does Athens (Certified Blue)

Policy: Community Engagement and Communication on Clean Energy Efforts

Action Area: Information

Sector: Cross-Cutting

Description: A necessary component of an equitable clean energy transition, government needs to establish and maintain accountability and credibility with the public through informing on current programs and progress while also empowering the public to play a leadership role in the development of new programs and policies.

Lead: Government

Notes: Many city pledges in energy and environmental arenas have failed to yield substantive results in part due to a lack of accountability and regular communication. Some cities acknowledge this but dismiss it as a capacity issue. This misses the point that these activities are actually required for government to work in the public interest and to support a functioning democracy.

Challenges: Ongoing meetings are not always comfortable and progress can move slowly. Technological dashboards and new communication channels are making parts of the accountability agenda easier and more scalable.

Key examples: Sierra Club Accountability Framework for Clean Energy Transitions

Policy: Community Choice Aggregation

Action Area: Regulatory

Sector: Cross-Cutting

Description: The municipality purchases electricity from a power generation source on behalf of residents and businesses within their community.

Lead: Government

Notes: CCAs are a popular option in many states that allows local governments to enter into power markets and contracts without establishing full-blown utilities. Originally designed to provide cities the opportunity to prove that they could meet power demands at lower cost than incumbent utilities through market forces, CCAs have now become a leading means of procuring city-scale renewable energy, sometimes 24x7, sometimes on a net or accounting basis.

Challenges: There are many legal challenges to a CCA. Only 8 states have permitted them to operate (MA, OH, CA, RI, IL, NJ, NY, and VA). Enabling legislation would first need to be established in most jurisdictions.

Key examples: There are many good examples in California; a recent one from the ACCC is Columbus.

Environmental Policies

The environmental group includes policies, program, and technologies with effects that are primarily targeted at environmental attributes.

Policy: Net Zero Water Code

Action Area: Regulatory

Sector: Municipal/Commercial

Description: Phase-in code requirements that new buildings match total water consumed with water obtained from rain, reuse, or returned to the original source.

Lead: Government

Notes: Net Zero Water Codes ride the coattails of similar efforts in the energy sphere. They are different in principle though, as water is not generated on-site and sent back to the grid; the “net” here is about offsetting and avoiding sending water back to the wastewater system through water capture and reuse on site. These codes are newer and less implemented at this stage.

Challenges: There are not many of these adopted; anticipate strong developer pushback for being a pioneer!

Key examples: DOE’s FEMP Guidance

Policy: Update and Publish Greenhouse Gas Inventories

Action Area: Information

Sector: Cross-Cutting

Description: Create a streamlined way to update an existing or new inventory for tracking greenhouse gas emissions.

Lead: Government

Notes: Greenhouse gas inventories are regarded as the bare minimum to show a commitment to reducing emissions - akin to benchmarking energy use. Publishing these in a public location can help keep interested parties informed and serve as a basic piece of an accountability strategy.

Challenges: Most local governments rely on faulty, outdated, low-resolution technology that fails to accurately capture the dynamics driving emissions; as a result, many are off by 30% or more. A good inventory will have good temporal and geographic resolution for both supply and demand components that lead to GHG emissions.

Key examples: We've done higher quality inventories for the City of Atlanta and Cleveland.

Policy: Water Efficiency Bulk Purchasing

Action Area: Financing

Sector: Cross-Cutting

Description: Reduce cost by bulk-purchasing water-saving equipment

Lead: Government

Notes: This is more theoretical than an existing program, similar to the energy efficiency bulk purchasing. The concept would be similar to Solarize, but focus on water.

Challenges: Implementation might be first-of-its-kind.

Key examples: N/A

Policy: Round-It-Up Energy/Water Efficiency Program

Action Area: Financing

Sector: Residential

Description: Fund low-income efficiency by “rounding up” participant utility bills to the nearest dollar.

Lead: Utilities

Notes: These programs have been successful in creating voluntary opt-out funding streams for low-income energy efficiency work that improves energy equity and increases clean energy simultaneously.

Challenges: Utilities need to agree to operate as funding agent and program overseer (even if administration and implementation is contracted out, there are overheads).

Key examples: Knoxville has a long-running, well-received program

Policy: Renewable Energy Credit Procurement

Action Area: Financing

Sector: Cross-Cutting

Description: Organized bulk purchases of credits for renewable energy generation

Lead: Government

Notes: This approach is a common way the private sector “acquires” clean energy. RECs transmit the credit for generating a MWh of clean energy to the buyer (referred to as the “environmental attributes”). As a result, the more you buy, the more dirty energy you offset (from a legal and accounting standpoint).

Challenges: RECs only cause new clean energy to be brought online in some cases and in some place - frequently not near the buyer. This makes it very difficult to determine the carbon impact of purchasing a REC because you don’t know what was avoided. There’s also no return on investment with a REC unlike many other energy investments.

Key examples: Sterling Planet, located just north of Atlanta, has been a leader for decades in REC procurement

Policy: Carbon Offsets

Action Area: Financing

Sector: Cross-Cutting

Description: Organized bulk purchases of carbon offsets to account for local CO2 emissions

Lead: Government

Notes: Carbon offsets function similarly to RECs, but instead of buying the rights to the environmental attributes of clean energy, you buy the avoidance or removal of 1 ton of CO2. Avoidance offsets are frequently much cheaper than removal-based offsets.

Challenges: Carbon offset markets are consistently questioned for their efficacy (are the offsets actually avoiding emissions - can it be proven? For how long?) and their sustainability (eg; Brazil has burned forestland that was producing offsets to make way for agriculture, and California has had forestland that was also producing offsets burned up by wildfires. What are the contractual obligations and options for all parties in such circumstances?).

Key examples: Sterling Planet, located just north of Atlanta, also sells carbon offsets

Policy: Improve Wastewater Efficiency/Expand Wastewater CHP

Action Area: Technology

Sector: Government

Description: Enhance GHG emission reduction strategies that local governments can reasonably employ; specifically energy efficiency in water and wastewater facilities.

Lead: Government

Notes: There are many opportunities to improve energy efficiency and clean energy production at wastewater facilities that mirror other opportunities in the industrial sector. Process improvements, heat capture, electrification, and more can help typical on-site operations improve. Additionally, wastewater facilities are high quality candidates for combined heat and power that can be fueled by methane produced on-site with anaerobic digesters - a truly renewable source of natural gas that can be used to provide electricity and high heat levels required in the water treatment process. Lastly, wastewater plants tend to be sited on large plots of land, making them potentially good candidates for solar installations.

Challenges: Financing and payback periods can be site-specific so what works well at one facility may not easily translate.

Key examples: The RM Clayton Case Study is a good example.

Policy: Reduce Urban Heat Island Effect

Action Area: Technology

Sector: Government

Description: Pursue efforts to promote increase the reflectivity of impervious surfaces and tree coverage and to address social stresses induced by urban heat island issues.

Lead: Government

Notes: Urban heat island (UHI) is a phenomenon where urbanized areas capture more heat than surrounding areas, resulting in higher temperatures. UHI can lead to higher health risks and other issues related to elevated heat exposures. UHI is typically caused by the geography having lower albedos (ie, more dark, less-reflective surfaces that capture heat). Solutions include deploying reflective surfaces (eg, white roofs) and more green area (especially trees) - plants will help marginally with the albedo issues but they induce cooling through evapotranspiration.

Challenges: Attention and knowledge. White roofs qualify for incentives and are generally no more expensive than alternatives but still lag in adoption. Other efforts, like reflective surfaces on streets and sidewalks do tend to be more expensive, so funding issues may arise. Green space solutions may encounter funding and land-use barriers.

Key examples: DOE has an explainer up. Matt wrote a large research paper on this topic for EPA/DOE that can be referenced also.

Transportation Policies

The transportation group includes policies, programs, and technologies with effects that are primarily targeted at improving the environmental performance of the transportation sector.

Policy: Upzoning near transit stations and decreasing parking requirements

Action Area: Programmatic

Sector: Transportation

Description: Boost ridership per transit vehicle around affected transit stations through density

Lead: Government

Notes: Reducing the distance to transit stops, increasing density, and transit-oriented developments are shown to reduce vehicle miles traveled, to reduce single occupancy vehicle trips, and increase ridership per transit vehicle. Increasing density can also help with housing shortages and affordability issues.

Challenges: Increasing density may face pushback from existing residents. Decreasing parking requirements can also lead to reduced parking availability, so if the transit system is not able to easily accommodate increased demand, there are risks of user dissatisfaction. May be less politically palatable in less urbanized contexts.

Key examples: City of St Paul recently passed legislation to eliminate parking requirements

Policy: Transportation Behavioral Nudging

Action Area: Programmatic

Sector: Transportation

Description: Develop a program to nudge usage of transit (eg: a texting system to determine if transit or driving is more time-efficient).

Lead: Government/Transit Authority

Notes: Many programs have been launched to provide nudges to potential transit users. These are generally based either on the provision of information or cash rewards (eg, lotteries). Both are effective in inducing about a 5% reduction in single-occupancy vehicle trips.

Challenges: As this is typically driven by the adoption and use of technology like an app or a website, attracting users is generally the biggest challenge. If a cash incentive is provided, funding may be another obstacle.

Key examples: Durham has a successful program in place

Policy: Implement High Priority Segments in the Walking and Bicycling Network

Action Area: Programmatic

Sector: Transportation

Description: Increase the amount of walking and biking infrastructure in order to reduce motorized trips.

Lead: Government

Notes: Research has shown that improving and expanding bike/ped opportunities can increase the number of people using that infrastructure. A 5% increase in walkability can cut VMT by 6.5%, and a 1 mile expansion in bike lanes can induce a 0.1% increase in cycling commutes, for example.

Challenges: Current rates are so low that it is sometimes difficult to take the marginal elasticities from the research and believe they will hold long term. There are also variations in the quality of the infrastructure additions (not all bike lanes are created equal). These investments will also be competing with other public works dollars, so internal budgetary constraints and debates may be a barrier.

Key examples: In May 2021, Los Angeles committed to a major bike lane expansion; as of this writing (late summer 2021), LA has installed 87 miles of bike lanes.

Policy: Increase new mobility options (e.g. bikeshare, electric bikeshare)

Action Area: Programmatic

Sector: Transportation

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Lead: Government

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Key examples: Denver passed two initiatives in May 2021 to increase the number of dockless scooters and e-bikes in the city

Policy: EV Education and Incentives

Action Area: Programmatic

Sector: Transportation

Description: Provide investments in electric vehicle education programs to increase the adoption of EV fleets.

Lead: Government

Notes: Research on the marginal incentive required to induce a new EV purchase ranges widely, but generally falls between $2000 and $30,000 per vehicle. Education programs are a great way to reach people and economic incentives can be effective. Given the cost, partnering with utilities may be a good path forward.

Challenges: The cost-per-vehicle is oftentimes far higher than governments realize. Most people reached through education and incentive programs were already highly likely to purchase EVs (ie, they are *freeriders* on the program). Inducing new purchases turns out to be more difficult. While education is generally cheaper than incentives, its effectiveness requires tailored programming for new audiences and both pathways require significant outlays to provide significant EV purchases.

Key examples: Austin has partnered with Austin Energy to provide EV incentives that have led to more than 5,000 EV purchases. It's unclear how many of those were freeriders.

Policy: Market Transformation Programs to Accelerate Transition to EVs

Action Area: Programmatic

Sector: Transportation

Description: Provide financial incentives to drive EV adoption.

Lead: Government/Utilities

Notes: The most effective purchase incentive is an upfront grant or tax exemption. Do NOT incentivize high-end luxury BEVs; it's 100% free ridership. Also, do not incentivize short-range PEVs. The "optimal" incentive level to drive consumer adoption is a current research gap

Challenges: The challenges are essentially the same as for EV Education and Incentives. The new angle here is to provide a tax exemption, although GLAs own research has shown the leveraging effect (the private dollars induced to the market per public dollar foregone) of tax policy instruments like reduced licensing fees is far lower than upfront grants or tax credits.

Key examples: None to speak of, yet.

Policy: Public Transit Investments to Expand Service and Increase Passenger Miles Traveled

Action Area: Financing

Sector: Transportation

Description: Improve public transit speed, reliability, and user experience

Lead: Government

Notes: This is regarded as a foundational transportation climate policy, bringing more people to use transit options by improving the experience. Effects vary by community, but research has shown mid-range estimates of a 10% improvement in frequency yielding a 5% increase in ridership. The addition of an app or real-time information yields an additional 1.7% increase in ridership.

Challenges: Overcoming political inertia and acknowledgment that current service levels are not ideal has been difficult for many communities. Despite this as a “foundational” policy, few cities have successfully moved this policy forward without ballot initiatives - it seems to require a strong public vote of confidence to get beyond internal political and bureaucratic hurdles and special interests.

Key examples: San Antonio’s Prop A levy; Cincinnati has done similarly, uses sales tax revenues to improve frequency on 26 routes and reducing wait times to 20 minutes or less on all major routes.

Policy: Commuter Carpooling Incentives

Action Area: Financing

Sector: Transportation

Description: Reduce commuting trips and shift commuting to transit & higher-occupancy vehicles through carpooling, parking incentives, and transit incentives.

Lead: Government

Notes: This is one of the most impactful, heavily-studied transportation climate policies that can be broadly deployed across the nation. Research shows a 5% VMT reduction for carpooling and a 70% VMT reduction for telecommuters. Having experienced COVID and seeing that most cities in the US saw a reduction in SOV transportation emissions of over 20% in 2020, we have direct evidence of how impactful telecommuting can be as a climate solution.

Challenges: Governments almost never focus these programs in a useful way, choosing to outsource program enrollment and targeting to private sector employers instead of directly targeting commuters ("We've signed up 50 employers for our commuter program!"). This leads to highly variable, nearly unmeasurable results that are very unhelpful to measuring effectiveness. Targets should be established for the number of enrollees in the program, not the number of employers, if the program seeks to be meaningful. These programs also require financial outlays, although post-COVID, more employees are seeking work-from-home opportunities that may ease the financial burdens on government.

Key examples: Austin launched a commuter program in 2019 that resulted in 2,000 people newly enrolled in commuter incentive programs. They simultaneously launched the ATD Equity committee and community-driven transportation mapping system.

Policy: High Frequency Public Transit Network

Action Area: Regulatory

Sector: Transportation

Description: Define and expand the existing public transit network to increase the efficiency of routes and ridership.

Lead: Government

Notes: Decreasing the distance to a transit stop and increasing transit vehicle-miles/hours has a well-established effect of increasing ridership. This also has the observed effect of reducing VMTs community-wide. The relationships are especially strong in areas with new transit service, university towns, and in suburbs with rail transit stations; the full effects frequently take between 1-3 years to materialize.

Challenges: Expense and patience. It costs more to provide greater transit access and it takes a few years before the effects are fully known. Vehicle availability can also be a challenge depending on the kind of transit vehicle being deployed.

Key examples: Cincinnati's example: improving frequency on 26 routes, reducing wait times to 20 minutes or less for all major routes, adding 8 new routes and bus rapid transit in 2 key corridors.

Policy: Low Emissions Zones

Action Area: Regulatory

Sector: Transportation

Description: Create areas where high emitting vehicles are restricted at all times or during certain hours of the day.

Lead: Government

Notes: LEZs can reduce pollution concentrations and spur adoption of low-emission/zero-emission vehicles. The pollution effects are relatively minor (ie, <5%), but vehicle conversions and the reduction of emissions from high-emission vehicles are pronounced outcomes. Deployed well, LEZs can produce significant equity wins.

Challenges: Political will can be the largest impediment. Freight and commercial fleets are likely to oppose limitations in their movements within their delivery areas.

Key examples: London and Stockholm have had LEZ policies in place for roughly a decade and are good case studies; London in particular has been heavily studied and documented.

Policy: Parking Management and Pricing

Action Area: Regulatory

Sector: Transportation

Description: Increase parking fees in high congestion zones in order to encourage ridesharing or public transportation use.

Lead: Government

Notes: Research on this policy has shown a reduction in trips of 0.2% for a 1% increase in parking fees (ie, an elasticity of -0.1 to -0.3, with -0.2 as a median), with significant variation depending on demographic, geographic, travel choice and trip characteristics. However, studies also revealed a decline in employees driving cars to work from 72 to 53 percent, a substantial drop in auto use in comparison to other policies with a trip reduction objective.

Challenges: Pushback is likely from commuters and retailers who benefit from free/subsidized parking costs today or believe that they do.

Key examples: Austin recently implemented a Smart Curb program with parking management at its core. Columbus has done similarly, putting 2 city districts under new parking pricing schemes. Portland launched Pricing Options for Equitable Mobility (POEM) in the same spirit.

Policy: Congestion Pricing/Go Zones

Action Area: Regulatory

Sector: Transportation

Description: Surcharge on motor vehicle drivers during peak congestion times to encourage alternative mobility choices.

Lead: Government

Notes: This policy has not been widely deployed in the United States despite its obvious appeal to economists and technocratic elites. In general, our literature review found that $5 congestion pricing spurs a 1% reduction in travel demand (i.e. 1% reduction in PMT, all modes) combined with a 7% increase in ridership (passengers per vehicle, all modes). The biggest barrier to this becoming a highly-effective policy is the geographic limitation. Many jurisdictions make the area subject to congestion pricing small, thus reducing overall efficacy.

Challenges: Pushback in the US has been significant in the cities where this has been proposed and seriously debated - San Francisco and New York City both engaged in decades-long efforts to establish the policy, and so far (8/21) only NYC has succeeded in passing legislation (still not implemented). There can be significant equity concerns for this policy that require careful consideration.

Key examples: London, Stockholm, and Singapore are preeminent examples. New York City has recently also moved towards implementing congestion pricing.

Policy: Electrify City Fleets and Buses

Action Area: Technology

Sector: Transportation

Description: Electrify municipal ICE vehicles

Lead: Government

Notes: This is becoming widely popular as governments recognize the fuel and maintenance cost savings that can offset the initially higher upfront costs of EV alternatives. The full transition may take 10-15 years if governments do not retire vehicles ahead of schedule.

Challenges: Upfront cost, primarily, although USDOT does provide investments in transit vehicles that reduces these costs substantially.

Key examples: Charlotte, Albuquerque, LA, Orlando, and more. These policies typically come with a title like “Electric First” to communicate that EVs are only to be passed over after careful consideration.

Policy: Ubiquitous EV Charging Infrastructure

Action Area: Technology

Sector: Transportation

Description: Provide charging stations throughout the city to promote the adoption of electric vehicles.

Lead: Government (sometimes utilities)

Notes: Research has shown that for every 1% increase in EV charging stations, there is a 3% increase in EV ownership. That suggests that these efforts can drive significant EV adoption at scale.

Challenges: Upfront cost and red tape, especially if not managed by the utility.

Key examples: St Paul and Minneapolis won a grant from USDOE to install 70 charging hubs across both cities.

Policy: Electric Vehicle Battery Reuse

Action Area: Technology

Sector: Transportation

Description: Recycling EV batteries in order to provide electricity services and resilience value to the grid.

Lead: Utilities

Notes: Current engineering/economics estimates are that EV batteries will still hold 70% of their original charge at the time that they are taken out of vehicle service. They could continue to serve as a grid asset.

Challenges: Essentially still a theoretical policy at this stage. With EVs being relatively new, there is not a large supply of EV batteries yet, and battery prices for grid applications are falling rapidly, reducing the urgency to look into a recycling program for several more years at least.

Key examples: None at scale to speak of, yet.