New Haven's Green Deal Proposal

Originally Titled as:

"HYBRIDIZING INCLUSIONARY HOUSING AND RENEWABLE ENERGY:
EXAMINING THE ELEMENTS, BARRIERS AND COSTS:
AN ANALYSIS AND PSUEDO-CITY PLAN USING NEW HAVEN, CONNECTICUT AS AN ANALOG"

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Introduction

Affordable Housing, as an issue unto itself, historically continues to plague municipalities as a product of developer gentrification, income disparity, societal-class inequality and serves as a city planning legislative and financial dilemma. The need for an urban center to be diverse, serves as a function of successful economic growth, while reflecting on the city's cultural identity. The degree of neighborhood segregation becomes a prominent showcase feature of the economic development and city planning departments, when poor attention is paid to the necessary functional aspects that contribute to annual GDP. Mandatory inclusive housing zoning ordinances bridge that gap of societal separation between low-income gentrification and cherry-picked, new construction for people earning significantly above the poverty level.

In contrast to other efforts and case studies about affordable housing, has been the dilemma of how to fund construction and how to build the affordable units to code within quality housing standards. In 2003, the Housing and Urban Development (HUD) department of the government, authored a paper on mixed-income housing, about how the HOME program worked under the Congressional provisions that were created in 1990 (HUD, 2003). This article is an early form of inclusive housing in its purest sense, as mixed-income is at the heart of inclusion. But, the paper goes further into details about how "housing policy is school policy" is economically beneficial and how it is a safe investment (HUD, 2003). Despite the backing of the United States housing authority, NIMBYism is possibly the greatest obstacle; which is why constructing affordable housing units to be indistinguishable from market-rate housing is required.

The most recent scholarly and economic development investigative work in a couple trailblazing cities, takes inclusive and affordable housing a step further; adding solar and wind

power to the units. As so far, this has only been implemented in Queens, Denver and recently passed legislation in California. The model for this proposal extends the concept a step further in two ways; generate surplus power for the city to sell back to the power company and include food services and retail support services into the same zone. On the roofs, and scattered throughout the neighborhood, are solar panel arrays and wind turbines deployed to be safe, aesthetically functional and reflect the artistic design of the architecture. Power generation will also be located adjacent to the affordable housing, in public access to parks and community spaces. Taking this concept even a step further, deploy wind and solar to power local public utilities, like traffic lights, street lights, supply heat and air conditioning to bus stops, free community "charge stations," and water pumps. On the following pages, are examples of green energies that have been installed in urban areas, that take advantage of architectural features of buildings and have been created to be artistic.

Illustration 1. Spiral wind turbine silently spins at Pearson Court Square in Long Island City (Fox5NY, 2014).

Illustration 2. “Aeroleaves” have aesthetic leaf shaped wind turbine spinners that generate power (Barber, 2017).

Illustration 3. Vertical axis “world’s largest” wind turbines on Oklahoma City rooftop (Singh, 2012).

Illustration 4. The ‘Aeroleaves’ turbine as it spins at a railway station in Alberta, Canada (Staedter, 2014).

Illustration 5. Micro wind turbines that are integrated into the building infrastructure (ClimateTechWiki, 2018).

In the case study section that precludes the Inclusive Zoning Ordinance provisions and pseudo-city plan, it explores the focus of this paper to explain elements of the proposal, examine costs and benefits, expose barriers, explain the design concept, compare this document to existing bodies of work and propose a progressive solution to the complicated problem of affordable housing.

The Case and Rationale

Building on the point of creating an urban environment supportive to fair housing practices, lies the point of affordable living expenses. Typically, as is practiced nationwide in the United States, monetary subsidies are employed to prop-up household usage of electrical, water, and petroleum-based heating utilities for low-income families. By including photo-voltaic solar cells into existing and new construction of inclusive housing residences, decreases the financial strain on a municipality's public assistance programs. Further, small wind turbines that produce up to 50% of the rated power for a home's solar array, can augment electrical output during low solar production, and generate further net monetary credits. In fact, as outlined in a 2011 case study from the Northern Denver Housing Center (NDHC), monthly electric credits can result in a net payment return. Yet, even if the NDHC received monetary credits of $15 monthly per unit, across thirty units, at most the Denver Housing Center could potentially gain annually is $5400; not enough of an incentive to invest in solar panel installation (Dean 2011).

According to EnergySage, for the state of Connecticut in 2018, the average U.S. household solar panel array installation, costs between $11,380 to $14,990 (after tax credits). These are estimates garnered from a standard solar array, producing 6,000 watts of electricity. Mid-sized and large systems, can add an additional $4,000 to $8,000 to the installation price, producing between only 2,000 to 4,000 extra watts of electricity (EnergySage 2018). In a

theoretical scenario, should affordable housing of 250 units be fully equipped with a mid-sized array of 8,000 watts at $17,584, would cost a whopping $4,396,000 initial investment. With that in mind and an average net credit monthly of only $15 across all 250 housing units, would be $3,750; annually $45,000 and $900,000 after 20 years.

It is possible that the net credit can average slightly higher at $25 monthly, changing the 20-year return to be $1.5 million. And should the energy efficiency of the units be very high, a typical monthly net credit could reach $35, increasing the 20-year return to be as much as $2.1 million. The installation charges can be mitigated by installing a solar panel array at the time of the affordable housing units' construction, by a conservative 50%; dropping the initial investment to $2,198,000. So, the common-sense question for city planning and real estate developers needs to be asked; why bother with renewable energy for affordable housing in the first place and how can a city make it profitable? The answer to the question is very simple, UPSCALE!

Instead of constructing affordable housing units with solar arrays, separate them so that upscaling can be utilized, to provide a steady stream of income for a municipality. In this case, New Haven, CT, has a commercial electricity consumption of 7,188 kWh/month, or 86,256 kWh/year. Residential electricity consumption is 731 kWh/month, or 8,772 kWh/year. While industrial electricity consumption is 63,947 kWh/month, or 767,364 kWh/year (Electricity Local 2018). Applying the electricity rates per kilowatt to each category, estimates the total yearly earnings to the local power company. For commercial consumption, a rate of 14.65¢/kWh at 7,188kWh/month, is approximately $758,109.24 monthly, and $9,098,282.88 annually. For residential consumption, a rate of 17.34¢/kWh at 731 kWh/month, is approximately $768,642.96 monthly, and $9,222,491.52 annually. For industrial consumption, a rate of 12.67¢/kWh at

63,947 kWh/month, is approximately $5,833,501.13 monthly, and $70,002,013.54 annually. So, a total usage of 71,866 kWh/month, with a total consumption of 862,392 kWh/year, reaps the local power company, United Illuminating, approximate annual earnings of $80,022,787.94.

Few states permit an aggregate of per megawatt or kilowatt per hour credit, but as for the state of Connecticut, the House Bill 6360 permits for either municipal, state or agricultural customers to receive buy-backs. The process involves approval by the Commissioner of Energy and Environmental Protection, pursuant section 16a-3b, with oversight by the Public Utilities Regulatory Authority (Connecticut General Assembly, 2013). Several initiatives have been created to spur the development of citywide renewable energy for their constituents, partnered with Solar United Neighbors, that ties together nearby participating cities, by launching a property assessed clean energy (PACE) program or through Community Choice Aggregate (CCA) programs. One potential buy-back scenario for a municipality that opts into an aggregate program to produce power for its constituents, is an annual percentage scale that changes for the first, second and third or more years of energy production. In the first year of commercial operation, 80% of transmission and distribution charges are credited. In the second year of commercial operation, 60% of transmission and distribution are credited. In the third and each succeeding year, 40% of transmission and distribution are credited (State of Connecticut, 2016). A second scenario, which involves a specific formal billing structure for buy-back credits established by an electric utility, in this case, United Illuminating, via Avangrid, that services New Haven, CT.

The United Illuminating Company
Effective July 1, 2018 through December 31, 2018: Standard Service Generation Rates
Rates in ¢/kWh

Rate	Description	Rate ¢/kWh	On-Peak Rate ¢/kWh	Off-Peak Rate ¢/kWh
R	Residential	9.0496		
RT	Residential (Time-of-Day)		11.6062	8.1062
GS	General Service	9.0065		
GST	General Service (Time-of-Day)		11.0325	8.0325
LPT	Large Power (Time-of-Day)		11.2528	8.2528
M, MC, & MH	Street & Security Lighting	9.3261		
U	Street & Security Lighting	9.2361		

All charges include Bypassable Rates.

The United Illuminating Company
Effective October 1, 2018: Last Resort Service Generation Charges (GSC)
Apply to Rates GST and LPT**

Month	On-Peak Rate ¢/kWh	Off-Peak Rate ¢/kWh
October 2018	8.2207	8.2207
November 2018	8.2507	8.2507
December 2018	10.4367	10.4367

**Rate LPT Shoulder and Off-Peak Prices are the same

Illustration 6. Power generation aggregate buy-back rates (Avangrid, 2018).

These are moneys that can be added to the spending budget, allocated for infrastructure maintenance. Earnings increase incrementally related to scale of solar arrays and wind generation production equipment.

Cost savings designed to spare low-income and disadvantaged communities is at the heart of a successful proposed energy plan, not only in the favor of a municipality, but for property owners and assistance programs. The California Public Utilities Commission (CPUC) signed and implemented legislative proposal AB 693. To highlight pivotal key points, the formulation

involved the Federal investment tax credit (ITC), the low-income housing tax credit (LIHTC) and on-site energy storage devices (Waite 2016). The savings amount to 30% with only ITC, 30% with only LIHTC, 50% with ITC and LIHTC combined, and 99% when implementing energy storage in a multi-family affordable housing community (Waite 2016).

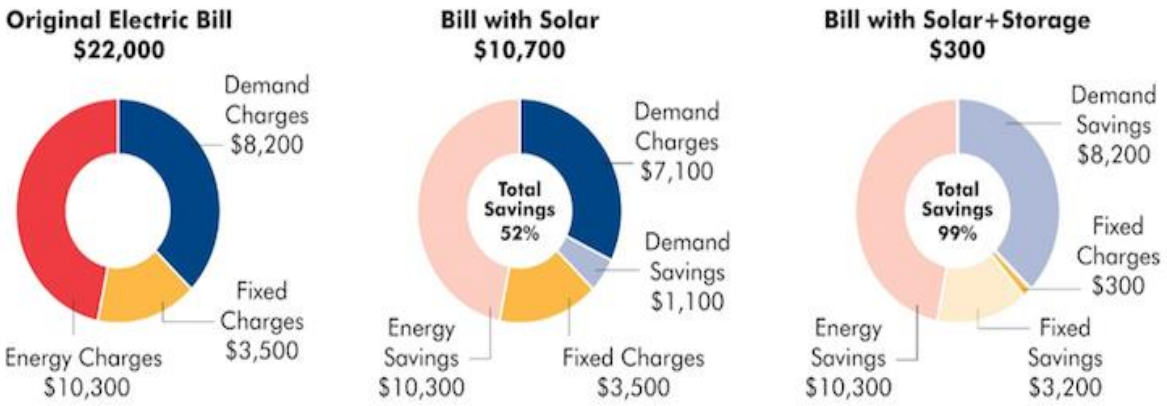

Illustration 7. Shows original electric bill without credits, bill with solar improvement, and bill with solar improvement + on-site storage. (Waite, 2016).

However, for the purposes of this case study and city pseudo-plan proposal, upscaling beyond just the needs for an affordable housing community, is needed to provide any net monetary benefits. On-site power storage, alongside passive and active clean energy, will provide long-term earnings for a municipality, dependent upon their commitment and investment. The larger the scale of renewables, the higher the monetary gains will be available for reinvestment of infrastructure. There are, of course, many other benefits, aside from monetary gains. Having a locally sourced location of power production, that does not rely on petroleum products or nuclear material, virtually eliminates the possibility of pollution or natural resource contamination. While concentrating solar and wind production into "farms" is a very valid strategy, spreading out smaller pockets of photovoltaic panels and wind turbines

throughout a city's urban centers could provide resilience to the local power grid against a regional natural disaster.

In summary, combining inclusionary housing and renewable energy technology, impacts low-income communities, reduces municipality public assistance responsibility, and benefits investors by facilitating a positive PR image. A working model is that of Denver's commitment to reduce expenses for at-risk populations. Denver constructed a 10-acre garden that provided electricity for more than 500 affordable housing units. This reduced the Denver's carbon footprint, helped to raise more than 20% of low-income residents out of poverty, and stimulated job growth for residents who attended and graduated a certified training program on solar and wind power installation/maintenance (Chatman 2018). This kind of undertaking will create long-term relationships with local industry, build onto a city's reputation in creating a qualified team to stimulate economic growth, and depict a positive image for a forward-thinking, culturally-committed city.

Disposition and Deployment of Clean Energy

From a common-sense standpoint, clean renewable energy production helps in lowering carbon pollution, is long-term low-maintenance, and virtually ends fossil fuel dependence regarding daily living electrical usage. Yet, despite the obvious benefits of sustainable, zero-polluting electrical-power generating equipment, there have been objections to deploying the technology. The negative dispositions paint a picture, that sustainable energy does more harm to the economy than it benefits. While another adversarial attitude likens solar energy to healthcare reform, stating that it's a public government service that America can't afford (The Editorial Board 2014).

Objections to the negative disposition from power companies borders on reality-based, simplistic explanations, to deeply rooted, overly complicated, technically derived analytics. The first of these are the claims of intermittency, due to unreliable factors of unstable and uncontrollable environmental factors. Stability is by far, one of the most commonly cited fallacies to attack the implementation and integration of renewable energy into the mainstream electrical grid. Then, there is the scathing criticism, that the cost of erecting and installing clean energy facilities, far exceeds the benefits, whether they be short or long-term. But, these are strategies to forestall transitioning to renewable technologies, based upon financial interests of the petroleum, nuclear, natural gas and coal industries. In part, stability is a very reasonable concern, however, the stall tactics are based upon increasing profits earned from rising costs of resources and relying on statically traditional financial analyses.

On the analytics battlefront, regarding the renewable portfolio standards (RPS) instituted by a majority of states in America, calculating costs and fees by not meeting the requirements manually is a daunting task. The General Electric (GE) Company dedicated an easily transportable application, comprising of only megabytes of data, to calculate the complex array of variables (Bollapragada et al. 2011). It takes into account over a decade, the "Energy production from new plants + energy transportation costs – penalties paid for noncompliance (Bollapragada et al. 2011, 394)" of fees paid out by not meeting the RPS requirements. Additionally, the heuristic algorithm takes in diverse pricing and other information, which can be customized depending on the scenario, to calculate the investment feasibility of costs and long-term profits. Yet, to prove that a state is complying with their commitment to RPS requirements, RECs (Renewable Energy Certificates) are available for purchase by consumers on a megawatt per hour allotment.

Instability and intermittency can be addressed by meeting higher RPS RECs percentage usage via making them more readably available for purchase. This goal, to lower costs to consumers, decrease transmission origination distances, reduce greenhouse gases, increase locally sourced renewable energy production, and lower state budget payouts for consumable resources for electrical production, leads to a strategy that meets the RPS goals (Silva 2012). Not only is the local power grid reinforced against damage and interruption of geographically distanced sources, it encourages development of nearby renewable energy facilities (Silva 2012). This strategy of reducing GHGs (greenhouse gases) is inherently flawed, without the real commitment of consuming the RECs from locally sourced facilities and the bonuses they have on future goals.

This goes beyond the bragging rights of having RECs to begin with; this speaks to the heart of capitalism and future quarterly earnings. In perspective to the potential corruptive use of cap-and-trade programs, leads to the auctioning off of emissions caps to the highest bidder, that can be allocated to cover the pollution of other industries (Harrington 2009). This reduces the available pool of carbon credits that can be utilized by legitimate low-polluting endeavors and does not act in reducing the per ton emission of CO_2 but might also lead to rising costs of coal-fired production, which costs the consumer more money over the long-term.

The ARRA also increases the value of renewable-energy projects significantly for investors through enhanced tax provisions. In total, the tax title in the ARRA includes in excess of $300 billion in tax relief provisions, over $25 billion of which is devoted to incentivizing investments in renewable energy technology (Harrington 2009, 31).

Startling statistics on the annual expenditures to maintain and reinforce delivery of electricity along the country's energy grid, grants insight into the wasted monetary investment of

the power infrastructure. "In 2002, the American electricity industry possessed more than $700 billion of embedded investment, making it the largest investment sector of the American economy (representing 10 percent of total U.S. capital expenditure). Annual sales of electricity for the same year were approximately $320 billion, close to 4 percent of the country's gross domestic product" (Sovacool 2007, #). Sovacool's topic perfectly mimics the goals of this paper, by highlighting areas of weakness in the current grid that are susceptible; fluctuations in pricing, blackouts, unpredictable externalities, natural disasters and delivery reliability. In creating municipal renewable-energy farms and installing small-scale residential solar arrays, closes the likelihood gap of power interruptions.

Reinforcement of the grid sounds like an empty sales-pitch, which historically has been a hard sell to the public, at least until people suffer from interruptions that cutoff their access to devices used in daily life. Natural disasters bring to sustainable-energy naysayers, the initiative to invest in the renewable energy plans, beyond it being the environmentally "right thing to do." Recent hurricanes, like Sandy in New Jersey, Marie in Puerto Rico, Katrina in Louisiana and Florence in North and South Carolina, have cost damage in the tens of billions of dollars. Risk assessments of extreme weather events bring into the forefront, analyses of total costs past and present. In an article from the Republic of Slovenia, outlines several modern approaches to preventing further damage to an electric power grid. They concluded that "1) technical (mechanical) improvement of the components, making them more robust and resistant to physical stress, and 2) considering the physical location of infrastructure and locating it to places where its vulnerability to gradual climate change" (Matko et al. 2016, 96). Despite the article's geographical publishing locale, it nevertheless reinforces that frequent catastrophic power

outages are a global phenomenon, requiring countries to look to other international governments for policy solutions.

Sustainable and clean renewable energy automatically ties together, local, regional and national reinforcement of the power grid against interruptions, while remaining a viable solution to global heating caused by runaway CO_2 and atmospheric pollution. This requires a paradigm shift in strategic thinking about how to utilize land for power production. Land allotted for nuclear, coal-fired, oil-fired, and natural gas-fired plants are entirely inaccessible for public use due to safety concerns. However, land with solar and wind farms pose no health threats during passive energy production. A common-sense question needs to be asked; why bother with traditional and petroleum-based energy production?

At a comparison of overall power produced in megawatts per acre, that common-sense question may be answered. Coal-fired plants that produce a gross 3,000 megawatts, requires a total of 2,688.5 acres (1.14 megawatts per acre), that must include the plant site, basic structures, coal pile, switchyard (for locomotive delivery of coal), cooling towers, fly-ash ponds, coal mine and railway, with negative environmental impact (Smil 1984). Oil-fired plants that produce a gross 3,000 megawatts, requires a total of 1,457.9 acres (2.06 megawatts per acre), that must include the plant site, oil field, pipeline and refinery, with negative environmental impact (Smil 1984). Natural gas-fired plants that produce a gross 3,000 megawatts, requires 475.7 acres (6.31 megawatts per acre), that must include the plant site, gas field and pipeline, with negative environmental impact (Smil 1984). Nuclear plants that produce a gross 3,000 megawatts, requires 358.3 acres (8.37 megawatts per acre), that must include the plant site and fuel cycle, with potentially massive environmental impact (Smil 1984). However, solar arrays that produce 3,000 megawatts, requires 6,500 acres (0.46 megawatts per acre), without the necessity of waste

management facilities and can be spread out across a large geographical area (Bureau of Land Management 2017). Wind turbines that produce 3,000 megawatts, requires about 2,500 acres (1.2 megawatts per acre), also without the necessity of waste management facilities and it too can be spread out across a large geographical area (Bureau of Land Management 2017).

As an overview example of total U.S energy production, it is important to understand the scale of total American GDP that accounts for energy usage. Illustration 8 below "provides some numbers on the value of fixed assets related to energy production in 2007. The infrastructure related to energy production amounted to nearly $2.9 trillion. This amounts to 12% of the value of the net stock of nonresidential fixed assets in that year. The bulk of energy-related assets are structures—electrical generation facilities and mining exploration, shafts, and wells" (Metcalf 2010, 3).

For coal, as an estimate against the $2.9 trillion spent, 34% of that would be $984 billion of U.S. dollars spent to purchase domestic and imported coal resources. For natural gas, an estimate against the $2.9 trillion spent, 27% of that would be $783 billion of U.S. dollars spent on natural gas resources. For crude oil, an estimate against the $2.9 trillion spent, 18% of that would be $522 billion spent on domestic use of crude oil for various industries, especially for personal and commercial vehicles usage. For nuclear production, an estimate against the $2.9 trillion spent, 12% of that would be $348 billion for operational costs and upkeep of energy production. Under the umbrella of clean energy production, in this case, biomass production for energy use, an estimate against the $2.9 trillion spent, 5% of that budget expenditure amounts to $145 billion. For hydro-electric, an estimate against the $2.9 trillion spent, 3% of that budget expense amounts to $87 billion annually. Finally, in the "other renewables" category, an

estimate against the $2.9 trillion spent, a very small 1% of the budget spent on cleaner energies like wind and solar amounts to $29 billion of the annual budget expense (Metcalf 2010, 3).

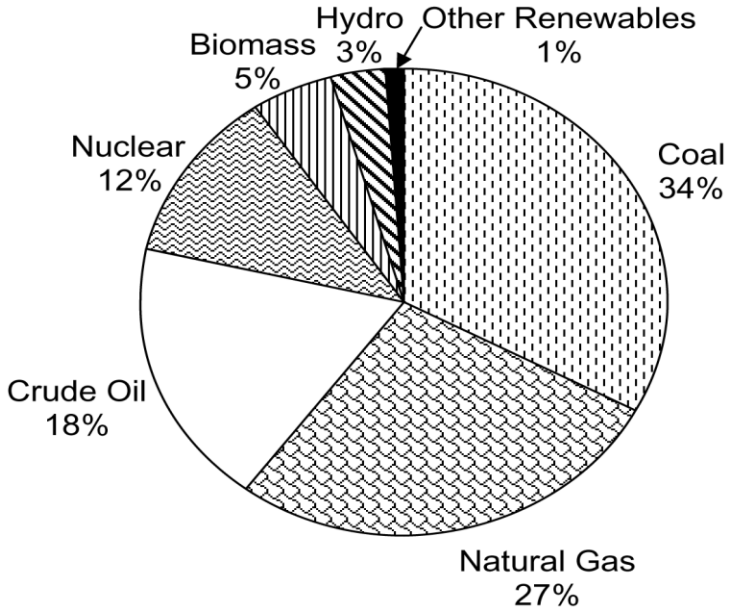

Illustration 8. Breakdown of U.S. energy production. (Metcalf 2010, 3).

As part of an EIA report of electrical power generation, for Connecticut in the years 2016 and 2017, across commercial, industrial and residential metered in megawatt hours, production is an absolute zero (Independent Statistics and Analysis, 2018). This provides the state government, or power production industry, an opportunity to become more competitive against Arizona, Nevada and California, whom are rolling out investments into clean energy, to meet the needs of consumers (Independent Statistics and Analysis, 2018). The attempt in this paragraph is not to shame Connecticut, nor other states, into complying with renewable energy initiatives, but rather to draw attention to an industry that serves American power needs and consider incorporating large scale sustainable energy.

Overcoming Barriers to Affordable Housing

Since the 1970's, the economic and societal demands for housing that is affordable for very low-income and low-income families, arose out of the desperate need to prevent people

from living in poverty or being homeless. This is also the era in which followed the Civil Rights Movement, heralding public consciousness on disparities and inequality. The strong juxtaposition with the word, gentrification, became a common association when families or communities became pushed out because of urban development. Strategies involved people being evicted or priced out of their homes, to favor profits for developers and city planning. But, in the 70's and 80's, urban residences consisted mostly of the poor and under-privileged, due primarily to the fact that the middle-class preferred to reside outside cities, because their homes consisted of idyllic settings with rolling manicured lawns, large homes, quiet surroundings and peaceful neighborhoods that shielded them from the world, priced at a market range well out of the reach of lower income earners.

After the peak of suburban development, beginning in the early 90's, new construction slowly petered out, largely due to lack of available new land to build upon. Over the last two decades, rising gentrification and spreading commercial municipal development, have begun to take back aging property in cities to favor the middle and upper class. The reshuffling of the poor and lower class speaks to the intention of developers to reap maximum profit, despite the ramifications. Common misconceptions about building affordable housing, reflects a common problem of NIMBYism, where objections are unholy unjust.

Several developers and public counter-arguments to implementing inclusive zoning may appear to be common sense on the surface, but the objections are unfounded in emotions and lack of correct information. One of these are that *developers should not be burdened* with trying to solve the problems of a city. Often sounded by developers as an undue hardship and should not be their role, is an untrue assessment, in that it is the developers and city planning that are at the root cause of gentrification, while all segments of society should bear the costs and take

responsibility of development (Shoemaker 2002, 10). Another concern focuses on inclusionary zoning to *cover all the land and property costs* associated with leveraging upscale housing. While partially true, developers should be encouraged to pay in-lieu fees or donate land to amalgamate the cost effectiveness of affordable housing (Shoemaker 2002, 10).

As fallacies go, the point that *homebuyers and renters in a nearby adjacent neighborhood bear the burden* of subsidizing the development of inclusive housing, is an outright false statement. Developers make this claim without all the factual evidence. Density bonuses and other incentives make it a prominent construction feature, so that a developer can make a tidy profit. As evidence, broadly throughout the bay area of San Francisco, inclusionary units work with the neighborhood, without causing harm to renters and homeowners (Shoemaker 2002, 10). Lastly, developers argue that *subsidy cuts deplete their incentive for profit*, reduces the maximization of earning capitol for a project. Only partially true to a very small percentage, the developer will only buy land that is worth the cost that provides for adequate profit margins (Shoemaker 2002, 10). To increase developer interest, a strategy of extending future contracts based on quality of construction and completion, can be drawn on to ensure equitable long-term relationships.

Agnew speaks to the accusation of *property values dropping*. He summarizes, "According to recent research, affordable housing does not definitively have a positive or negative impact on nearby property values. Studies finding that affordable housing projects have negative, positive, or no impact on nearby property values are all common. The impact of a particular housing project depends on complex interactions between factors such as project scale, management type, and the characteristics of the neighborhood in which the project is located" (Agnew 2018, 63). This objection leads to unfavorable opinions of the people who don't want

affordable housing to "ruin their property values", which factually, has no real-world validity to their objections.

There have been verified findings in research, that housing projects do have an impact on *neighborhood crime*, relative to the project size. Further, that the location of a city geographically is consistent in the crime rates, no matter where in the country it is. A smaller project of 50 or less units, tends to breed less crime, than that of larger, contemporary affordable housing projects (Agnew 2018, 64).

Surprising to some people that when they learn *low quality housing contributes to health problems*, is a verified issue due to degrading housing materials or shortcuts by developers. "Affordable housing may improve health outcomes for its residents by reducing exposure to hazards in poor quality housing, improving neighborhood conditions, and reducing budgetary constraints that prevent spending on health insurance and nutrition" (Agnew 2018, 64). This little-known problem plagues low-income families, and quite possibly has existed for hundreds of years, garnering little concern of the richer classes.

As a benefit to low-income households, is that an *accumulation of growing earnable income*, aggregates within affordable housing neighborhoods. This enhances the opportunity of providing an increased chance to lead to home ownership, instead of renting a unit subject to rising costs at the whim of the landlord. By owning a home, a family may have increased annual earnings, thus decreasing dependence on public housing assistance programs (Agnew 2018, 64).

Management of affordable housing communities and projects have long been known to stress municipal housing monitoring agencies beyond their capacity to administrate properly to requirements and upkeep. In what has been implemented in New Jersey, a housing coalition, the Council on Affordable Housing (COAH), is an 11-member board that oversees the state's

affordable housing act, the New Jersey Fair Housing Act. They have been charged with keeping a watchful eye on the obligations of the states as affordable housing is being constructed in municipalities. COAH enforces developers to adhere to plans, make jurisdictional decisions over in-lieu fees, enact lawsuits when appropriate against non-adherent developers and they report progress directly to the governor (Graddy & Bostic 2010).

This approach of segmenting the process of oversight and management, can be implemented at any level of the ordinance. There can be a property manager living onsite to ensure compliance of the residents regarding upkeep and annual salary requirements. Financing for owned homes and insurance, can become the responsibility of the loan originator. Databases of families whom are part of the inclusionary housing ordinance, can be kept secure at a state's housing authority. Property maintenance can be assigned to a small task force, attached to either a city's personnel or fall under the property management company.

During the construction phases, streamlining the process and reducing costs to both the developer and municipality, are key to a successful inclusionary zoning ordinance. Which is why utilizing as much of the current state's or city's existing infrastructure as much as possible, reduces the need to create new agencies which places less responsibility on city management. By amending Development Review Procedures Manuals (DRPM) at city planning, creates a singular policy that is used for the consideration of applicants for affordable housing (Cassella & Meck 2009, 72).

Amending reviews used in rezoning and the monitoring of consistency of applications for development, paginates complex requirements that reduce costs (Cassella & Meck 2009, 73). The methodology of a comprehensive plan may need to be revised to project accurate employment growth and population growth, to understand if there is actual real economic

stimulus (Cassella & Meck 2009, 74). A productivity requirement may be needed to track annual expenses and assign responsibility of monitoring during construction (Cassella & Meck 2009, 74). Standardized templates for goals, policies and objectives should be implemented to keep the project on track (Cassella & Meck 2009, 74).

An initiative is needed to facilitate higher density bonuses, that ensures costs are driven down by spreading out the cost of construction evenly among all of the housing units (Cassella & Meck 2009, 75). Fee waivers must be created to be appropriate to a proportion of market rate housing versus the affordable units (Cassella & Meck 2009, 75). Building permits and plans for architectural designs should be preapproved on a free of charge basis (Cassella & Meck 2009, 76). By waiving performance bond requirements, the affordable housing projects can be protected in the municipality in which they are constructed (Cassella & Meck 2009, 76). Subsidies and density bonuses need to be developed as a set of uniformed cost controls (Cassella & Meck 2009, 76). Design standards should be revised for affordable housing construction but cannot be used as an excuse to cut corners in architectural plans and construction materials (Cassella & Meck 2009, 76). The land development code requires amendment to permit affordable housing to be constructed as a right on "nonconforming lots" (Cassella & Meck 2009, 77). Get rid of second hearings from Board of County Commissioners on rezoning, that is meant to blockade affordable housing (Cassella & Meck 2009, 77). And most importantly, a separate track for enforcing construction code for affordable housing is needed because it is meant to reduce costs by waiving site fees (Cassella & Meck 2009, 77).

Contained in the above paragraphs, are the new affordable housing provisions that make inclusionary zoning work. Besides addressing poverty, poor quality housing, income disparity, NIMBYism, gentrification, class exclusion and societal inequality, inclusive housing emboldens

economic growth, community integration, equal opportunities and dissolves neighborhood segregation. Additionally, “Whether one considers the personal human tragedies, the lost economic productivity, and the higher social costs of poverty, or the negative effects of "sprawl," these are not simply a matter of concern for poor communities” (Barr 1999, 14), these should also be the concerns of the well-to-do. To put it bluntly, infrastructure and the economic health of a city, are a direct function of how well the diversity of people come together and be part of the societal mainstream.

Nationally, reinforcing and strengthening the country’s economy, is a fundamental strategy that strikes at the heart of American values, while stimulating competition through capitalism. As Barr points out in a three-pronged strategy, “(1) investing in people through education and training so that everyone has the tools to succeed in the modern economy; (2) helping to make communities safer so that families can live without fear and businesses and communities can prosper; and (3) expanding access to capital” (Barr 1999, 14) because ignoring private enterprise, is akin to fighting a battle without the proper weapons to win.

One of the largest, most effective tools to stave off failure of affordable housing initiatives and solutions, is to ensure that the Community Reinvestment Act (CRA), remains well funded and healthy. In fact, since 1977, over $1 trillion has been poured into commitments of affordable housing. Parallel to the CRA, the Community Development Financial Institutions Fund (CDFI), has injected more than $120 million into community programs that provide training, micro-enterprise and assistance to low-income workers (Barr 1994, 14-15).

Mixed-income communities have attracted much research into the benefits it brought, primarily on the educational impacts of children (HUD 2003). The statistics show that when low-income children attend schools mixed with middle-income students, their grades and

performance are significantly better. Beyond obviously pointing out that a measure of socio-economic intermingling, racial diversity and ethnic blending leads to a broad array of equality, it also brings economic stability to market-rate housing. (HUD 2003). To clarify on the stability argument front, is to understand the underlying subtlety of the cause and effect relationship that brings economic dependability.

During development and construction of inclusive housing, market-rate housing units are constructed in unison with the affordable housing units, the costs are spread out across the construction of buildings, while maintaining structural and aesthetic integrity. This is in direct support of bringing lower income earners closer to their origins of work in an urban environment, while stimulating the local economy with money spent in nearby businesses (HUD 2003). Further, it has been found that mixed-income communities are a safe investment, because the resale values of properties are not adversely affected. This makes for a progressive argument against political opposition when disputes are dispelled with the evidence, showing that inclusive zoning is transparent and easily handled bureaucratically at the local level (HUD 2003).

"Green-ing" Affordable Housing

A common-sense question about why local, state or federal agencies should care about installing renewable energy as part of affordable housing, has become the focus of increasing interest in research studies. The answer is very simple, without a simple explanation as how to implement such an initiative. Fortunately, the Queens in New York City, Northeast Denver and the entire state of California have become trailblazers. However, it is important to note, that the scope of this paper encompasses greening affordable housing and extending renewable energy as a measure to provide ongoing, long-term power energy credits to be added to a municipality's annual GDP.

Drawing on the success from Denver, the installation of PV systems helps to bring economic relief to the most distressed, low-earning economic earners (Dean 2001, 1). By lowering monthly electric bills, low-income families are able to utilize those saved expenses to spend on housing upkeep, pay unexpected medical bills, apply money towards higher-education and any other budgetary emergency situations that might divert from paying rent or mortgages. Green energy jobs had also been created, as part of a training program, that includes how to install and maintain solar arrays (Dean 2001, 1).

To identify which rental properties would benefit most from PV systems or small-scale wind turbines, a combination of solar access and wind speed analyses need to be utilized. To comprise the best strategy after the analysis, whichever is averaged to be the highest ratio, an emphasis on the greatest percentage would need to be implemented. Although, the average usage of electricity for most homes, is approximately 11,040 kilowatt hours (Dean 2001, 2). Which is why there needs to be a coordinated effort to increase energy efficiency by including "ENERGY STAR® appliances, compact fluorescent lighting, increased attic insulation, air sealing, and double-glazed, low-emittance windows" (Dean 2001, 2).

The U.S. Department of Energy (DOE) offers a program to reduce energy costs, that is self-funded, to increase housing energy efficiency. By tapping into this existing program, reduces the cost liability of a municipality that chooses to engage in lowering low-income family financial burdens. "The DOE Weatherization Assistance Program enables low-income families to reduce their utility bills by improving energy efficiency in their homes. Since 1976, the program has provided weatherization assistance to more than 6.3 million families. This assistance, on average, has reduced gas space heating by 32 percent" (State and Local Climate Energy Program 2011, 11).

This program is not unique in lending to energy efficiency, as is evidenced by the HUD initiative. "HUD's Mark to Market (M2) Green Initiative for Affordable Multifamily Housing is a nationwide pilot initiative to encourage owners and purchasers of affordable, multifamily properties to rehabilitate and operate their properties using sustainable Green Building principles. These principles comprise sustainability, energy efficiency, recycling, and indoor air quality, and incorporate the "Healthy Housing" approach pioneered by HUD. The Green Initiative focuses on properties within HUD's Section 8 portfolio, specifically properties in the M2M Program administered by the Office of Affordable Housing Preservation (OAHP)" (State and Local Climate Energy Program 2011, 11).

Implementing the solution, will obviously increase costs for a municipality or HUD, which is why an increase to monthly rent is justified to cover the green energy equipment installed (Dean 2001, 5). To prevent overuse of electricity, tenants need to be educated and units need to be highly energy efficient, including on-site energy storage capture, like battery power banks. It will take time to recoup costs, somewhere in the seven to eight-year time frames but will become a steady stream of income and REC payments each year (Dean 2001, 5).

Compliance and success require an examination process to ensure that implementation will not be a wasted effort, like what the city of Boulder conducted. "In order to provide maximum flexibility to property owners and address these barriers, both a performance (HERS rating) and prescriptive pathway to compliance were developed and included in the policy recommendation. The consultant developed a prescriptive points system weighted such that achieving 100 points is roughly equivalent to achieving a HERS Index of 120, or 20% *less efficient* than the 2004 IECC (with some variations because the prescriptive pathway is more carbon-focused than the HERS). The prescriptive pathway is designed to simplify the process for

landlords while not compromising the integrity of the building performance standard of this energy code. The design of the prescriptive checklist is adaptable, easy to use for a professional trained in building science and can be used for all housing types, multi-family or single family. The latest version of the city's prescriptive list can be found on the SmartRegs website (City of Boulder 2012)" (Gichon & Cuzzolino 2012, 94).

Measuring the completion and success of the Boulder initiative, "The EnergySmart service offered great value to homeowners and landlords in the City of Boulder. Of the 3,297 participants within the city, 23% (758 homes) are homeowners choosing to invest in the energy efficiency of their homes, while the remaining are rental property owners. With a 67% conversion rate of audit to implementation of energy efficiency (for homeowners), over 500 homes have completed an upgrade. In combination with direct install measures, this work has avoided an estimated 1,197 metric tons of carbon dioxide, and approximately $166,389 in energy costs per year" (Gichon & Cuzzolino 2012, 97).

Further justification and outcomes for improving energy efficiency and decreasing the burden on low-income earners, is beneficial to the community. Whole-house systems provide economic assistance by generating their own electricity, reducing the financial strain of the tenant or homeowner. Lowering monthly costs increases a person's employability, reduces the demand for federal assistance programs, decreases the emission of contributing greenhouse gases that provide electricity and enables municipal communities to reach regional clean energy goals (State and Local Climate Energy Program 2011, 1).

"Since 1987, the Low-Income Housing Tax Credit (LIHTC) program has been the federal government's primary vehicle for producing rental housing that is affordable to low-to-moderate income households. From 1995 to 2007, 1.4 million housing units in almost 19,000 projects

were developed using this financing mechanism. In the past, solar projects have not been incorporated into LIHTC projects because of the unique challenges associated with integrating photovoltaic (PV) systems into existing financing models and the added cost to the new and existing developments" (Dean 2001, 1).

So far, funding and installation of PV systems have been limited due to the narrow scope of securing monies, using only sources from grant monies. Financing can come from a multitude of sources, some from loans, federal financing, cost sharing programs and non-profit organizations. The first option is *energy performance contracting*, that "Many affordable housing developers and owners have used energy performance contracts with ESCOs to improve energy efficiency in affordable housing at no upfront cost" (State and Local Climate Energy Program 2011, 27). An additional homeowner financing option is an *energy-efficient mortgage* that "is a mortgage that gives borrowers the opportunity to finance cost-effective energy efficiency improvements in their homes as part of a single mortgage" (State and Local Climate Energy Program 2011, 28). Financing can be secured by *federal home loans*, with requirements outlined as: "The Federal Housing Finance Board requires its 12 district banks to allocate 10 percent of their income to fund the Board's Affordable Housing Program" (State and Local Climate Energy Program 2011, 28).

A funding opportunity has become available through *federal government grants* that "Affordable housing stakeholders can apply for a variety of grants from federal government agencies, including DOE and HUD" (State and Local Climate Energy Program 2011, 29). On-bill financing can help low and middle-income homeowners and renters which "offers a means for home or building owners to overcome the high upfront capital costs of making energy efficiency upgrades, which can be both a financial as well as a psychological barrier to making

investments in energy efficiency" (State and Local Climate Energy Program 2011, 29). Loans can be repaid through *Property Assessed Clean Energy (PACE)* financing, which is a "loan can be repaid through special assessments on property taxes, or through other locally collected taxes or bills, such as utility, water, or sewer bills" (State and Local Climate Energy Program 2011, 29).

Funding should never be a barrier in implementing a clean energy initiative, especially when it comes to reinforcing and committing to help affordable housing. In hybridizing inclusive housing with renewable, clean energy production, a pledge is being made to support and include the poor and low-income people of a city. The plan can, in turn, be used as a symbol to the rest of the country, as how to implement a solution to solving the housing crisis of contemporary cities and attract investors to spur economic growth. In the following inclusive zoning section, explains the details of the ordinance and how it would regulate the requirements in combining affordable housing and renewable energy. After the zoning ordinance provisions section, are depictions housing and urban landscape samples and some estimated costs of solar and wind installations.

Inclusive Zoning Ordinance Provisions

Statement of Purpose

To make available, a greater number of affordable housing for the low-income and middle-income residents in the city of New Haven, Connecticut, this renewable energy and inclusive zoning ordinance is an attempt to alleviate that housing need. By the reservation of setting aside a specific percentage of housing for those in-need, which can be low-income earners and at-risk populations, like the handicapped, elderly or developmentally challenged, and hybridizing it with renewable energy, which keeps down the costs of living to a reasonable,

affordable monthly expense, not to exceed 25% to 30% of a family's actual gross annual income. These measures are intended to meet societal and economic responsibilities of a city to eliminate gentrification, while fostering an inclusive and diverse municipal culture and creates a green energy initiative that can be used as a template to serve as a showcase lure to economic growth.

The three phases are intended to be rolled out into gradual timeframes, to build databases of the properties and families that qualify for the inclusive housing initiative. Additionally, during the beginning stages of implementation, estimates of the workforce needed to administer to the housing program can be accrued, in order to fund the necessary personnel, while gathering data for the second and third phases, installation of efficiency measures and renewable energy devices. *Phase one* and *two* are not exclusive to new properties being added to the program outside of them, but new housing and property should qualify for inclusion into the initiative to build up the available housing to keep up with the growing demand, should it be needed. *Phase three* can also be immediately utilized for existing housing that qualifies for renewable energy as affordable housing, that does not need or require energy efficiency measures. All sections of the ordinance are inclusive to this body of work only and are not taken from other existing inclusive zoning, with exception to standard definitions to ensure quality construction standards and adherence of developers to the zoning requirements.

As part of providing an alternative to the renewable energy element, two options allow for greater flexibility to meet the needs of a city. Option one shall outline the full array of inclusionary housing, energy efficiency and renewable energies. Option two shall outline only inclusionary housing and energy efficiency, while adding an additional component towards focusing on home ownership.

Option 1

Phase 1 – After adoption and implementation of this Inclusionary Ordinance, Phase 1 will include all new residential rental and for sale construction, redevelopment projects, land and housing reclamation zoned for residential development, and rezoned property deemed for residential rentals and for sale market rate housing, after the start date of Phase 1. Phase 1 shall extend for a 2-year period after the date in which it is implemented and put into action, expiring at which point that Phase 2 shall begin. All conditions from Phase 1 shall roll over into Phase 2, without exception.

Phase 2 – Following the day after which Phase 1 ends and rolls over into Phase 2, all of the conditions named in Phase 1 will become included into the additional conditions for Phase 2. Phase 2 will include the implementation of fortifying efficiency of existing affordable housing, inclusionary zoning, section 8 housing and assisted living residencies. The term, "fortifying", includes the definition as increasing housing insulation, repair of damage in which causes poor efficiency of climate control, replacement of windows as to increase insulative value, provide replacement or repair of existing climate control systems of only owned property and determine if the housing site qualifies for renewable energy on-site, outlined in the renewable energy section. Phase 2 shall extend for a 2-year period after the date in which it is implemented and put into action, expiring at which point that Phase 3 shall begin. All conditions from Phase 1 & 2 shall roll over into Phase 3, without exception.

Phase 3 – Following the day after which Phase 2 ends and rolls over into Phase 3, all of the conditions named in Phase 1 & 2 will become included into the additional conditions for Phase 3, which shall not expire before a 30-year period and can only be amended after the expiration date. Phase 3 will include all existing market rate and rental housing of 4 or more

units to comply with the on-site requirements of 22% set-aside. The renewable energy initiative shall be implemented at the approved site locations, in which are constructed for the purpose of providing electrical energy production for wholesale to the existing electric company, paid to the city into an approved account, to fund municipal related functions for housing maintenance defined as the responsibility of the city, infrastructure projects that serve the city and to provide disaster mitigation that reinforces the power grid.

Option 2

Phase 1 – After adoption and implementation of this Inclusionary Ordinance, Phase 1 will include all new residential rental and for sale construction, redevelopment projects, land and housing reclamation zoned for residential development, and rezoned property deemed for residential rentals and for sale market rate housing, after the start date of Phase 1. Phase 1 shall extend for a 2-year period after the date in which it is implemented and put into action, expiring at which point that Phase 2 shall begin. All conditions from Phase 1 shall roll over into Phase 2, without exception.

Phase 2 – Following the day after which Phase 1 ends and rolls over into Phase 2, all of the conditions named in Phase 1 will become included into the additional conditions for Phase 2. Phase 2 will include the implementation of fortifying efficiency of existing affordable housing, inclusionary zoning, section 8 housing and assisted living residencies. The term, "fortifying", includes the definition as increasing housing insulation, repair of damage in which causes poor efficiency of climate control, replacement of windows as to increase insulative value, provide replacement or repair of existing climate control systems of only owned property. Phase 2 shall extend for a 2-year period after the date in which it is implemented and put into action, expiring

at which point that Phase 3 shall begin. All conditions from Phase 1 & 2 shall roll over into Phase 3, without exception.

Phase 3 – Following the day after which Phase 2 ends and rolls over into Phase 3, all of the conditions named in Phase 1 & 2 will become included into the additional conditions for Phase 3, which shall not expire before a 30-year period and can only be amended after the expiration date. Phase 3 will include all existing market rate and rental housing of 4 or more units to comply with the on-site requirements of 22% set-aside. For the residents that qualify for loans for home ownership, funded from either a resident's preferred banking institution or from the Connecticut Housing Finance Authority (CHFA), all market rate housing that is for sale within the greater New Haven city borders, shall fall under the guidelines of HUD housing valuation, and shall be reserved by the option of the city, only for future sales to the individuals or families of the inclusive zoning ordinance, for a minimum period of 30 years, not to exceed 99 years.

Threshold Size and Applicability

Number of Inclusionary Units – Any development containing four or more dwelling units is required to include at least twenty-two percent (22%) of the total number of dwelling units within the development as affordable. All development of projects for residential housing, must fall under the set-aside requirement of 22%. Due to the limited nature of available land for development, there are no limits on threshold size for sites, aside from the requirement of a subdivision, defined as four or more dwelling units.

Threshold Size – The affordable units, in a multi-family, or multiple occupancy development, shall be within 75% square footage of the market rate units, with exception not to

exceed 1250 square feet for up to a three-bedroom unit, adding an additional 200 square feet per bedroom for up to a six-bedroom unit.

Set-asides

For the duration of the inclusionary zoning ordinance, all of the city's set-asides for on-site reservation shall be 22% and 35% for off-site development for alternatively selected sites.

Design and Building Requirements

The inclusionary zoning ordinance shall implement guidelines that require affordable units to be similar in outward appearance and construction materials to market rate units throughout the municipality. In addition, the ordinance shall implement guidelines for the development that will include a mix of housing types and lot sizes, such as single-family units, duplexes, triplexes, quadraplexes and townhouses. Should a developer demonstrate a unique hardship, the developer may substitute a donation of land suitable for development, that is equivalent to, or exceeds, the value of units not constructed, which can accommodate affordable units in place of constructing the units on the off-site location.

Time of Construction

Inclusionary units shall be made available for occupancy on approximately the same schedule as the market units, except that certificates of occupancy for the last ten percent of the market units shall be withheld until certificates of occupancy have been issued for all of the inclusionary units. A schedule setting forth the phasing of the total number of units in a construction project, along with a schedule setting forth the phasing of the required inclusionary units, shall be established prior to the issuance of a building permit for any development subject to the provisions of this Article.

Cost Offsets and Density Bonuses

Required inclusionary dwelling units in all land development projects, subdivisions of size 4 or more units or off-site exactions shall be exempt from payment of Fair Share Development Fees for both school facilities and open space, conservation, park and recreation land and/or facilities. Additionally, the cost of parking spaces, entryways, walkways, sidewalks, public transportation structures and inspection fees, shall be the responsibility of the municipality, with exception to fortified or covered parking lots and parking garages, which are the responsibility to be funded and paid for by the developer.

Fee In-Lieu

An alternative to the construction of units, is to require developers to show that constructing units would constitute a unique hardship, or that a fee would produce a greater benefit. City guidelines recommend that each community adopt a schedule of in-lieu fees that is based on a sound methodology, such as a percentage of the appraised value of the market-rate units. The fee should not exceed the difference between the cost of development and the sales price for an affordable unit. The in-lieu fee, as defined in this ordinance, shall be 40% of the estimated cost of an affordable housing unit, transferred into a designated account by the municipality, unless the developer offers suitable residential land that is of greater or equivalent value.

Certified Buyers/Renters and Maintaining Affordability

The city shall select an appropriate agency, or agent, to monitor affordable units for long-term compliance, pursuant to this inclusive zoning ordinance, which may be the city's housing authority, a community housing land trust, a federal or state agency that provides existing housing subsidies or approve the designation of an on-site agent. Monitoring shall include

housing upkeep, required maintenance, repair of failed devices required to the function of a housing unit and impose fees for non-compliance, while ensuring the resident continues to comply with the ordinance requirements to reside in the unit. Under the general provision of the inclusive housing ordinance, rental and mortgage payments, property taxes and all utilities, with granted exceptions, shall not exceed a consolidated cost in the range between 25% to 30% of gross household income, adjusted for family size, not more than 80% of the city's AMI. The municipality may implement tax relief programs to control the principal, interest, property insurance or taxes of an owned property, under the inclusive zoning ordinance.

Housing Agency Right to Buy

When a participant of the affordable housing initiative purchases an affordable housing unit, whether it be an apartment, townhouse, part of a multi-home dwelling like a duplex, or regular market rate house with land, the city, housing authority or non-profit organization, shall reserve the right to reserve the deed. Via the deed reservation, the property shall be reserved to remain affordable under the provisions of the inclusionary zoning ordinance, for as little as 30 years, or for a maximum of the estimated life of the property at 99 years. Such declaration of restrictions shall apply on contractual arrangements, restrictive covenants and resale restrictions, necessary to carry out this inclusive zoning ordinance.

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