

# Housing Development Consortium of Seattle-King County

## Exemplary Buildings Program Charrette Series

### SOLAR

July 22, 2020

**Steve Gelb**

*Emerald Cities Seattle*

**Casey Dilloway**

*A&R Solar*

### Our Vision

All people live with dignity in safe, healthy and affordable homes  
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# Welcome and Introductions



What is the most unusual or interesting application you have seen for solar?

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# Charrette Agenda

**1:30 PM – Welcome, Introductions & Overview**

**1:40 PM – The Current Context & Ultra-Efficient Buildings**

**1:50 PM – Solar Goals, Charette Objectives**

**2:00 PM - Cost Reductions: Streamline the Process**

**2:30 PM - Best Product Specifications**

**3:00 PM - Maximize Funding & Minimize Financing Costs**

**3:30 PM - Document the Monetary and non-Monetary Benefits**

**4:00 PM - Putting it all Together**

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# Tesla's Latest Moves In Solar Indicates It Is Either Crazy Or Has Made A Breakthrough



July 20th, 2020 by [Paul Fosse](#)

Advertisement

An advertisement for Vonage Contact Center on AppExchange. The background is blue. At the top left, it says 'salesforce appexchange |'. To the right is the Vonage logo, which consists of a stylized 'V' followed by the word 'VONAGE'. Below the logo, the text reads 'Create EXCEPTIONAL CUSTOMER EXPERIENCES WITH THE RIGHT DATA.' Underneath that, it says 'Find Vonage Contact Center on AppExchange.' There is a dark blue button with the text 'WATCH DEMO'. On the right side, there is an illustration of a woman in a business suit standing behind a podium, and a cartoon cat wearing glasses and a headset, representing a customer service agent.

**WHAT:** “Create a smoothly integrated and beautiful solar-roof-with-battery product that just works, empowering the individual as their own utility, and then scale that throughout the world. One ordering experience, one installation, one service contact, one phone app.”

**WHY:** In the [Solar Energy Industries Association \(SEIA\) report](#) last updated June 11, 2020, the “supply chain, overhead and margin” are listed as over half of the average industry costs of \$2.83 per installed watt.

**HOW:** Use the power of Tesla’s brand, Elon Musk’s Twitter following, and the [legions of satisfied Tesla car owners](#) to draw people to the website for less than \$500 a system instead of more than \$5,000 (my estimate after reading a variety of articles including the [SEIA report](#)) it costs for most of the industry to get past that first step.

# The Current Context



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**We Have Both  
an Affordable Housing Crisis  
and a Climate Crisis**



**“While climate change reality becomes more apparent, and as technologies and methodologies for building ultra-efficient buildings improve, the ability to mainstream the practices at scale are hampered by the perfect storm of high costs, tight labor market and—dare I say—our housing delivery system’s lack of imagination.”**

- Marty Kooistra, Executive Director, HDC

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**We Need Ambition**

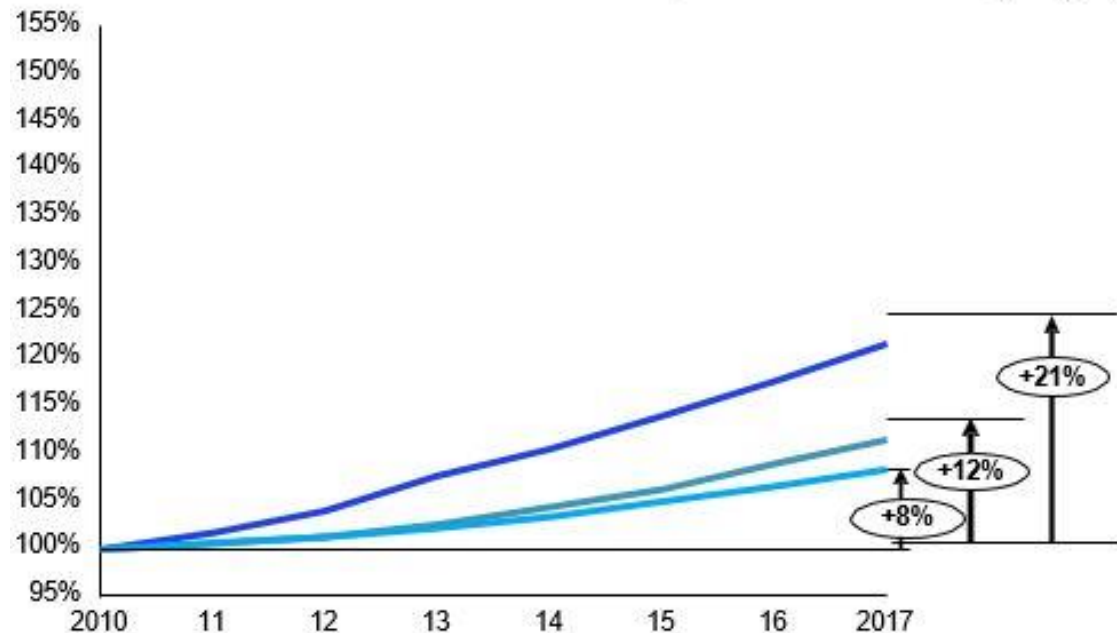
**We Need Scale**

# Not Keeping Pace: Housing Supply & Incomes vs. Job Growth & Rent Increases

## Jobs and population growing faster than housing

Population, job, and housing growth in King County  
% of 2010 value

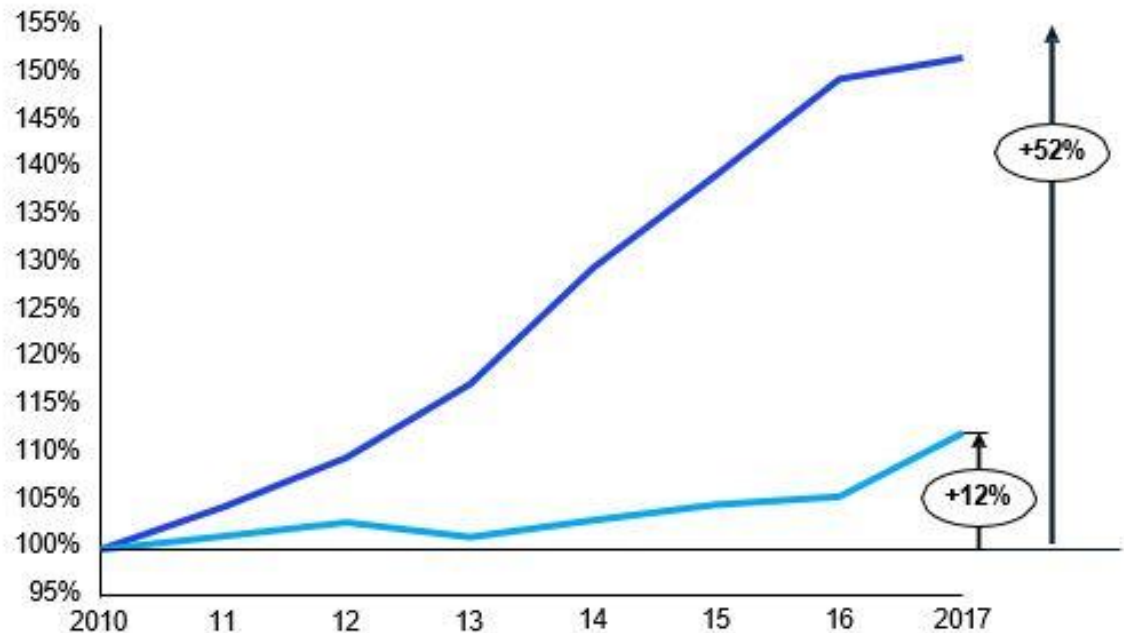
— Jobs<sup>1</sup> — Population<sup>2</sup> — Housing supply<sup>2</sup>



## Rents growing much faster than incomes

Median rents and incomes  
% of 2010 value

— Median market rent<sup>4</sup>  
— Median Household Income<sup>5</sup>



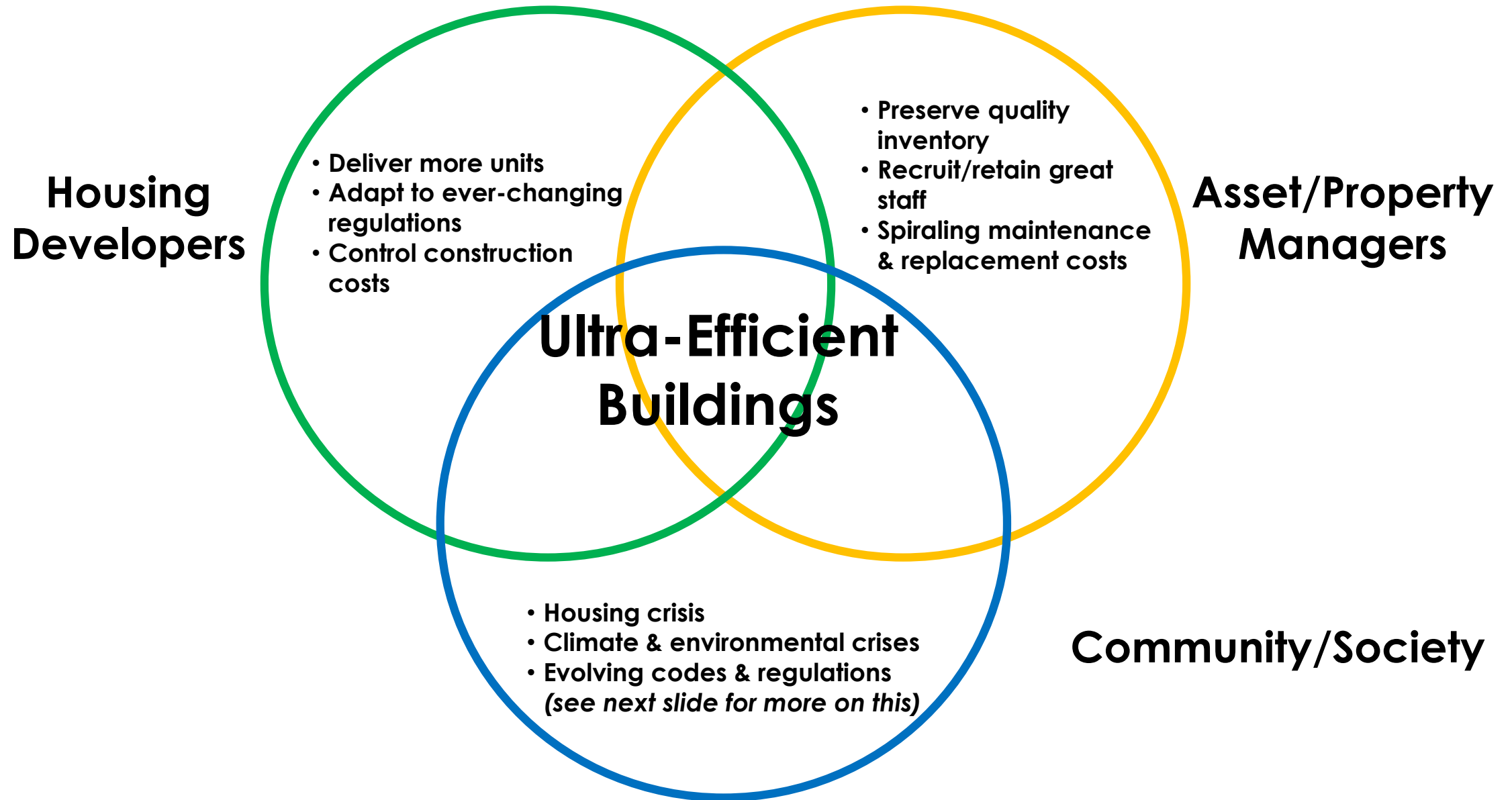
1. Puget Sound Regional Council estimates for King County

2. WA State Office of Financial Management population estimates for April 1 of each year

3. September Zillow Rent Index time series data for multifamily, single family, and co-op/condo residences in King County

4. HUD Office of Policy Development and Research annual median income data for King County

# Pressures on the Affordable Housing Ecosystem



# Evolving Codes & Regulations

## Washington State Goals for the Building Sector

Many organizations and jurisdictions have adopted a range of building performance goals over the past decade that have significantly changed the conversation about energy codes and building energy performance.

The primary policy driver for the increased stringency of the Washington State Energy Code is the language adopted by the Washington state legislature, which reads:

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# Washington State Goals for the Building Sector (cont.)

“Residential and Nonresidential construction permitted under the **2031 state energy code must achieve a 70 percent reduction** in annual net energy consumption (compared to the 2006 state energy code)” (RCW 19.27A.160)

— and —

“Construct increasingly efficient homes and buildings that help achieve the broader goal of building zero fossil-fuel greenhouse gas emission homes and buildings by the year 2031.” (RCW 19.27A.020)

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# Ultra-Efficient Buildings



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# What Can– and Should– We Do?

We believe one approach responds to each of these urgent challenges and legislative mandates: **Ultra-efficient affordable housing.**

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# What We Mean by “Ultra-Efficient”

In an ultra-efficient affordable housing building, energy & water consumption and stormwater runoff are reduced—

- **first** through state-of-the-art building design strategies and efficiency measures,
- **then** through on-site renewable energy generation and water capture.

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# What We Mean by “Ultra-Efficient”

An ultra-efficient affordable housing building:

- maximizes housing units produced,
- offers long-term life-cycle cost benefits, and
- provides an improved quality of life to residents.

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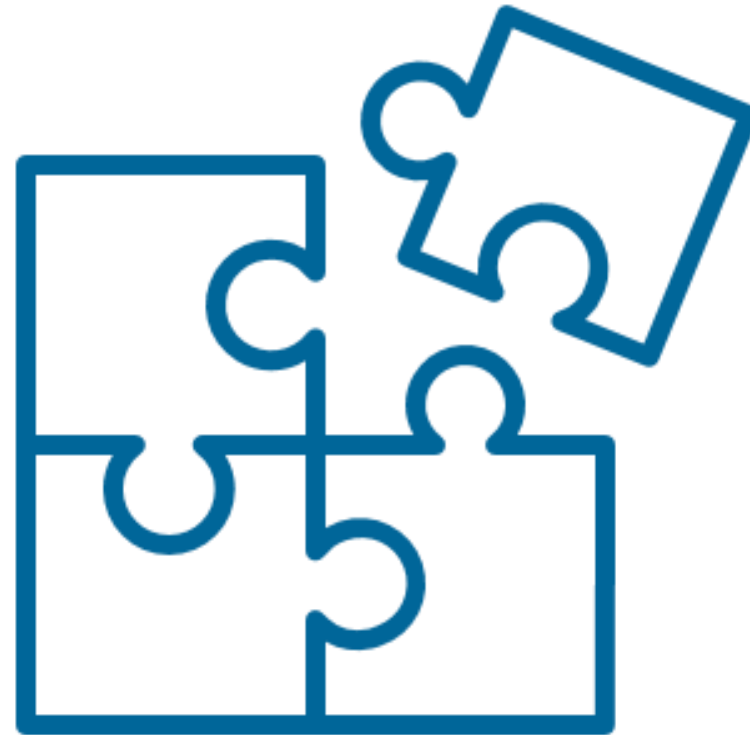
# How Do We Propose to Create Ultra-efficient Affordable Housing?

*Through nothing less than regional transformation of the affordable housing market.*

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# Program Goals, Process, & Success Factors



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# Housing That's **BOTH** Affordable **AND** Ultra-Efficient?

Yes, it's possible!  
**Process is key.**

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# The Heart of the Exemplary Buildings Process

HDC's **Exemplary Buildings Program (EBP)** uses a community-based, collective process of testing, learning, and sharing while exploring other innovative strategies, including off-site construction methods and optimized building units.

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# EBP's Multi-pronged Goal

- Environmental preservation;
- Healthy homes;
- Extremely durable buildings; and
- A way to balance first costs **without minimizing overall units produced.**

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# EBP's Six High-Level Steps to Success

- 1) **Define standardized building practices & specifications, support early integrative design, and create consistency.** This will transcend the challenges arising from each nonprofit-developed affordable housing project being a one-off design build completed by a newly assembled development team.
- 2) **Garner opportunities for volume purchasing and discounted supplier agreements for essential building materials.** This helps reduce the incremental premium and overall costs of producing ultra-efficient and healthy affordable housing at scale.

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# EBP's Six High-Level Steps to Success

- 3) **Develop and deliver professional training and certification programs and expand a diverse contractor workforce** capable of erecting, installing and operating ultra-efficient housing.
- 4) **Marshal funding from sources that typically don't support affordable housing.** This will offset premium costs that remain after implementing the previous three steps and mitigate concerns by developers on how to make the project viable.

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# EBP's Six High-Level Steps to Success

- 5) **Provide stellar tools and methods for affordable housing owner/operators to modify resident behavior while also managing utility allowance.** This will leverage the value created by producing ultra-efficient buildings.
- 6) **Bring an open source intentionality and deliberate monitoring & evaluation throughout all early demonstration phases.** This will feed learning back into future projects for persistent improvement.

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# Program Standards & Specs



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# EBP's High-Level Standards

- All electric (no use of fossil fuels, with exception for emergency power systems).
- Exemplary building envelope.
- Balanced ventilation with heat recovery.
- Electric heat pump domestic hot water with efficient distribution design.
- Energy Star appliances and efficient lighting.
- Low-flow fixtures to conserve water and lower utility costs.
- Design for maximum renewable energy on-site & install when feasible.
- Ensure appropriate commissioning to achieve intended performance.

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# Whole Building Design Standards

- Integrated design methods.
- Whole building energy modelling for energy & water optimization.
- Recommended ratio of enclosure volume to floor area  $\leq 1.0$ .
- Advanced framing used in structure.
- Back-to-back bathrooms recommended.
- Window-to-wall ratio  $< 25\%$ .
- Target one of the following:
  - $\leq 20$  EUI;
  - 50% less energy than WSEC baseline;
  - Meet PHIUS+ standard.

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### Manufacturing



### Construction





### **Defects**

Efforts caused by rework, scrap, and incorrect information.



### **Overproduction**

Production that is more than needed or before it is needed.



### **Waiting**

Wasted time waiting for the next step in a process.



### **Non-Utilized Talent**

Underutilizing people's talents, skills, & knowledge.



### **Transportation**

Unnecessary movements of products & materials.



### **Inventory**

Excess products and materials being processed.



### **Motion**

Unnecessary movements by people (e.g. walking).

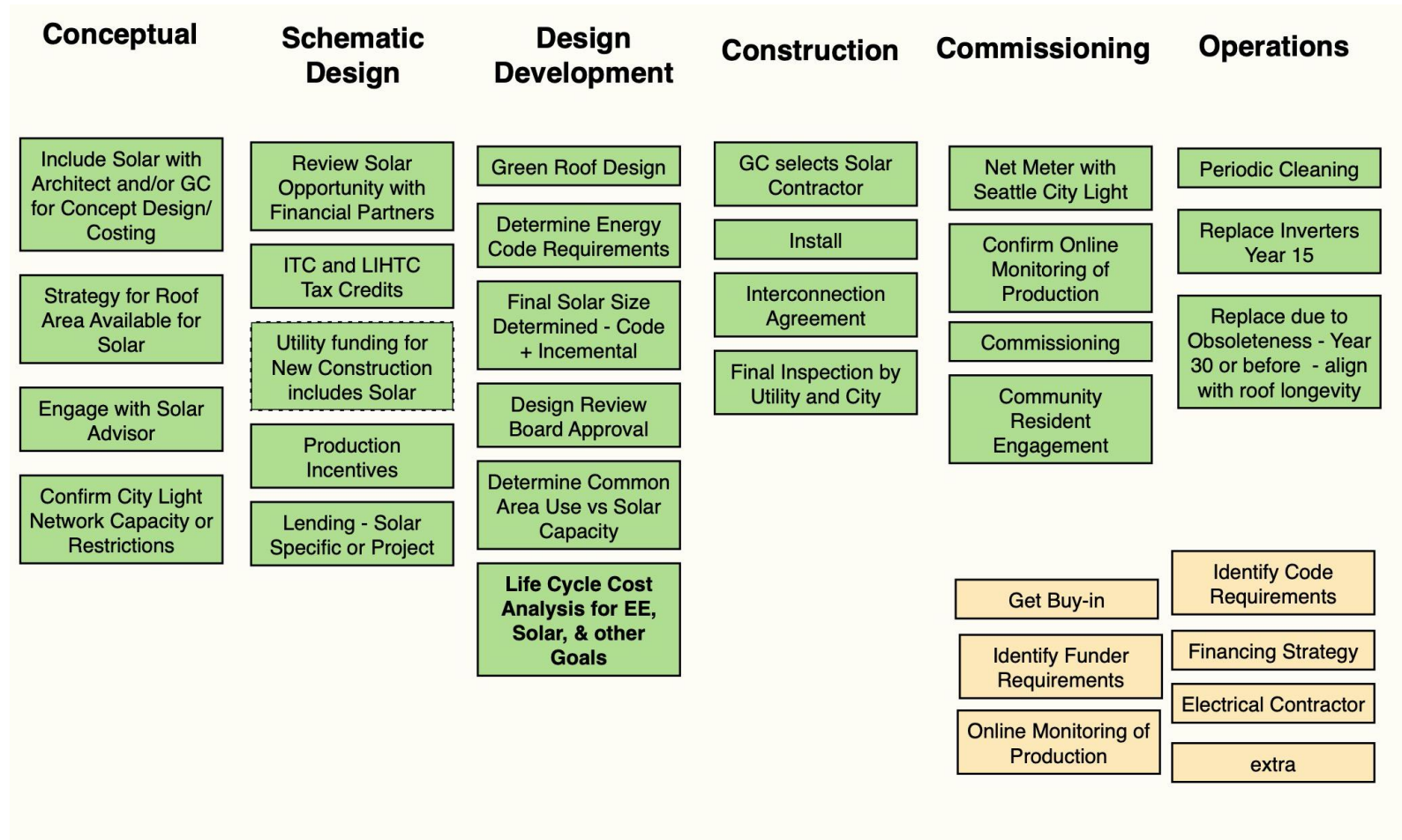


### **Extra-Processing**

More work or higher quality than is required by the customer.



# Streamline the Process



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# Process Improvements

- Reduce design iterations due to roof layout changes
- Integrate solar installation with construction schedule (hoisting infrastructure) to save on installation costs
- Pre-approved roof warranty considerations
- Electrical infrastructure (conduit, room for inverters) standards
- Discussion for more...

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# Solar Project/Product Specifications

	Strong standard	Weak standard
Modules	Tier-1 modules, 25-year warranty	Limited brand list, 10-year warranty
Module efficiency	18% minimum	Too high or too weak
Inverters	String inverters with designated space	Micro inverters due to space limits
Monitoring	Standard online portal, integrated?	Inverter LCD, weather stations
Racking	Ballast, no attachments if possible	Required attachments
Other equipment	No production meter, no displays	
TSRF	90% minimum	75% minimum
Module layout	Contiguous, large rows/columns	Broken up, sub-arrays of a few modules
Max cost/watt	Cost < \$#.##/watt	Cost > \$#.##/watt
Other...		

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# Maximize Funding and Financing

## Seattle City Light – Green Up REC Purchase

\$1500 per kW (DC) prepayment for 5 years REC production

- Application launching Sept 2020
  - Initial funding available to projects expecting completion in 2021
- Eligibility
  - 30+ kW solar projects
  - Installed on public or non-profit affordable housing or low-income service provider facilities
  - Within SCL service area

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# Borrowing

- Tax Exempt Bond Financing – 4-5%
- Taxable Debt – 4.5-5.5%
- Community Debt – 2.5%
- Sustainable Energy Trust – 2-3%

## Washington State Housing Finance Commission

### Sustainable Energy Trust loans

2-3% interest rates

- Available now
  - Offset initial costs of solar installation with a SET loan, then apply Green Up REC purchase payment against principal
  - Combination funding brings debt service payments below the value of net-metering in **year 1 of operation**
- Eligibility
  - Clean energy projects
  - Installed on multifamily affordable housing or low-income service provider facilities

Break

# Document the Benefits

- Evergreen Sustainable Development Standard (ESDS) Compliance (State, County, City Funders)
- WA State Housing Finance Commission –
  - 9% LIHTC Points
  - 4% LIHTC Points
- Code Compliance
- Production Value

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# ESDS Public Funders Compliance

## Minimum Scoring Requirements for ESDS:

State's Housing Trust Fund (HTF), King County's Housing Finance Program, and Seattle Office of Housing (OH):

1. New Construction 50 points
2. Rehabilitation 40 points

Seattle's OH - If the project exceeds the minimum, may require a more comprehensive narrative on cost effectiveness and how it's critical to long-term operations.

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# ESDS' Solar Requirements and Points

## ESDS Version 3.0.1:

### 5.2A - ADDITIONAL REDUCTION IN ENERGY USE- NEW CONSTRUCTION

### 5.8A - RENEWABLE ENERGY

- All systems must provide at least 1200 kWh year production

## ESDS Version 4 Updates – Fall 2020:

1. 5.2A and 5.8A - Unchanged from V3.0.1
2. Mandatory PV Ready for New Construction
3. Additional Commissioning (Cx) Requirements
4. Updated for 2018 Washington State Energy Code

Multifamily greater than 3 stories		
C406—Additional efficiency package options (in addition to code requirements)	C407 Performance-based compliance (in addition to code requirements)	ESDS Points
1	-3%	ESDS Mandatory
2	-6%	5
3	-9%	10
4	-12%	15
5	-15%	20
NA	-18%	25

kWh/SF/Year	ESDS Points
0.14	1
0.28	2
0.42	3
0.56	4
0.7	5
0.84	6
0.98	7
1.12	8
1.26	9
1.4	10
1.54	11
1.68	12
1.82	13
1.96	14
2.1	15

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# Low Income Housing Tax Credits (LIHTC) and Bond Program Requirements and

- WA State Housing Finance Commission (WSHFC):
  - 9% LIHTC
    - All Projects Must Meet the ESDS Minimum of 50 Points for New Construction and 40 points for Rehabs
  - 4% LIHTC
    - Same ESDS Standards as for 9% LIHTC
    - Solar Options Points
      - 3 points - between 0.15-0.27 kWh/SF/Year
      - 5 points - greater than or equal to 0.28 kWh/SF/Year
      - Architect's certification and a solar contractor's assessment
      - Must submit documentation stating the size of the system installed

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# 4% LIHTC Continued

- Points will be awarded for projects that score additional ESDS points in ESDS section 5.2a.
  - 3 points: 5 ESDS points over mandatory in ESDS Section 5.2a
  - 6 points: 10 ESDS points over mandatory in ESDS Section 5.2a

\*Note: Projects looking to take points for Section 4.21 and Section 4.22 may use Table R406.2 Option 6 or Table C406 Option 4 to comply with the state energy code or ESDS mandatory. Table R406.2 Option 6 or Table C406 Option 4 cannot be used to comply with Section 4.22.

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# Affordable Housing Financing and Solar

## Combining Renewable Energy Tax Credits (RETC) with LIHTC

- Both RETC and LIHTC must be monetized
- LIHTCs is reduced by half the amount of RETCs
- Since RETC program tax credit devalues to 10% is 2022 the combining the RETCs and LIHTCs won't make financial sense for projects

## Other Financial Resources

- SCL's net metering program
- Potential on leveraging Property Assessed Clean Energy (PACE)

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# Code Compliance

2018 WA Code

2018 Seattle Code (Proposed)

- Solar vs other code compliance – weigh the cost & other benefits

## Proposed Amendments to Seattle's Commercial Energy Code

### Lighting & Electrical

1. Reduce interior LPAs (lighting power allowances) 10%.
2. Provide LLLC (luminaire-level lighting controls) or networked lighting control system for large (>5,000 sf) open office areas
3. Increase minimum efficacy for "indoor horticultural lighting" to 1.6 micromoles per joule
4. Provide electrical receptacles at dwelling unit gas-fired appliances, for future electric appliances
5. Extend solar readiness requirement to multifamily buildings
6. Increase requirement for on-site PV from 0.07 W/square foot to 0.25 W, based on all floors

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# Production Value

Current Commercial Rate:  
\$.105

Projected Average Rate  
Increases:

2018-2024 4.4%

Rate For 2052: (3.5% Annual  
Increase) \$.31 - +195%

Average rates are derived by dividing the revenue requirement by retail sales. The primary driver for rates is the growing revenue requirement, which is increasing by a little over \$30M per year on average. However, declining volume of retail sales is also a factor contributing to increased rates.

## RATE INCREASE SUMMARY

	2018*	2019	2020	2021	2022	2023	2024	Avg
Revenue Requirement	888.3	922.7	967.5	990.2	1,019.6	1,051.1	1,089.1	
Annual Increase		3.9%	4.9%	2.3%	3.0%	3.1%	3.6%	3.5%
Retail Sales GWh	9,456	9,279	9,230	9,116	9,034	8,955	8,903	
Annual Change		-1.9%	-0.5%	-1.2%	-0.9%	-0.9%	-0.6%	-1.0%
Average Rate, ¢/kWh	9.40	9.94	10.48	10.86	11.29	11.74	12.23	
<b>Annual Increase</b>		<b>5.8%</b>	<b>5.4%</b>	<b>3.6%</b>	<b>3.9%</b>	<b>4.0%</b>	<b>4.2%</b>	<b>4.5%</b>

*\*The 2018 revenue requirement is the 2018 adopted revenue requirement of \$902.1M adjusted downward for the impacts of the 2017 BPA Passthrough, which also reduces the 2018 average rate. 2018 retail sales GWh are the forecasted sales used to set the 2018 adopted rates. The 2018 average rate is based on current 2018 rates and consumption profiles based on the most recent retail sales forecast.*

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# Other Considerations

- Maximum Net Metering
- Operations
- Maintenance

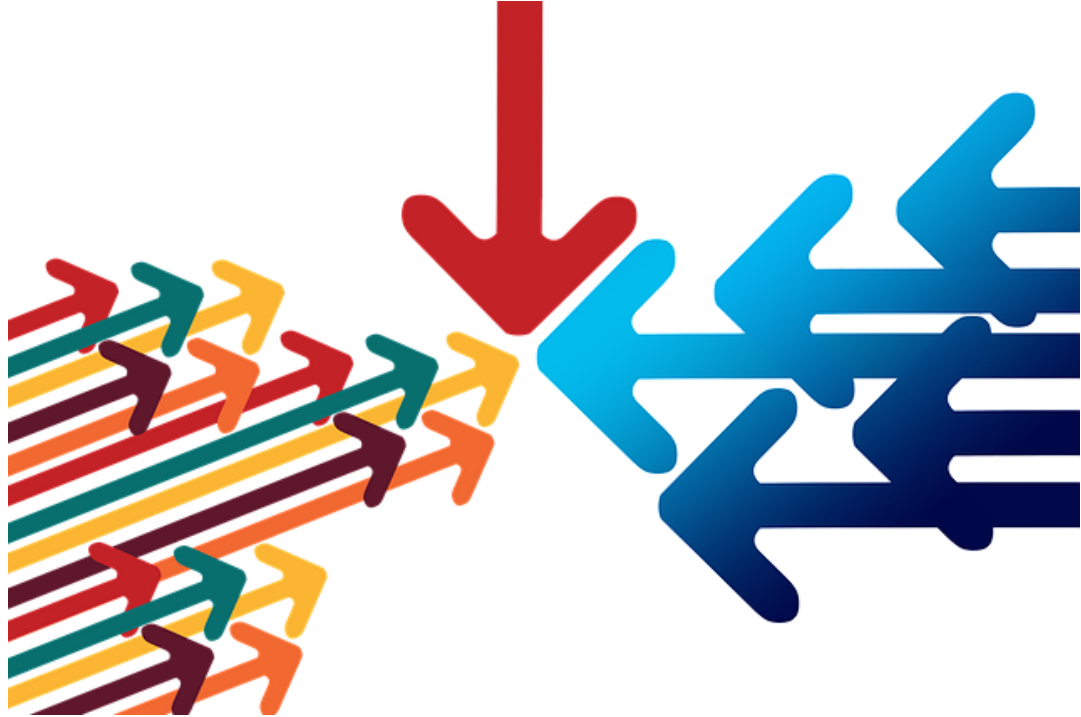
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# Summary & Conclusions



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# Assignments & Next Steps



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