The Energy Cohort

- **The Energy Cohort is a peer learning group for affordable housing professionals interested in energy efficiency, renewable energy, resiliency, and resident health. The group meets to network, learn, and share information.**
- Goal: Support affordable housing community in developing and preserving high-performance, resilient, and healthy buildings at scale. Encourage sharing of promising practices as well as challenges/barriers to adoption and advancement.

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Energy Cohort Meeting Agenda

10:00am-10:20am: Intros (Name, Organization and Role, Why You're Interested in Cohort)

10:20am-10:40am: What We Have Accomplished and the Current Landscape (Emily Jones and Lauren Baumann)

10:40am-11:10am: Goals/Priorities for Next 3-5 Years – Group Discussion

11:10am-11:30am: How Do We Get There? Creating and Maintaining a Culture of Stewardship in Your Organization (Mary Wambui)

11:30am-11:50am: What Issues Should Energy Cohort Focus on in 2020?

11:50am-12:00pm: Next Steps/Next Meeting Agenda

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Green Affordable Housing: 15 Years of Progress and Goals for the Future

Energy Cohort Meeting: January 13, 2020

Dorchester Bay Economic Development Corporation's Dudley Terrace (Photo Credit: Sparhawk Group).

The Early Days: 2000 - 2010

- **Green CDCs Initiative – over 25 CDCs/CBOs participated**
  - "…supports and engages MA CDCs and CBOs in environmentally sound or "green" development."
- **Enterprise Green Communities Program Founded**
- **The Costs and Benefits of Green Affordable Housing**
- **First Generation of "Green" affordable new construction projects**
  - Energy Star, Enterprise Green Communities
  - No requirements – grants to encourage participation
- **Early Mass Technology Collaborative (MTC) solar grants to affordable housing**

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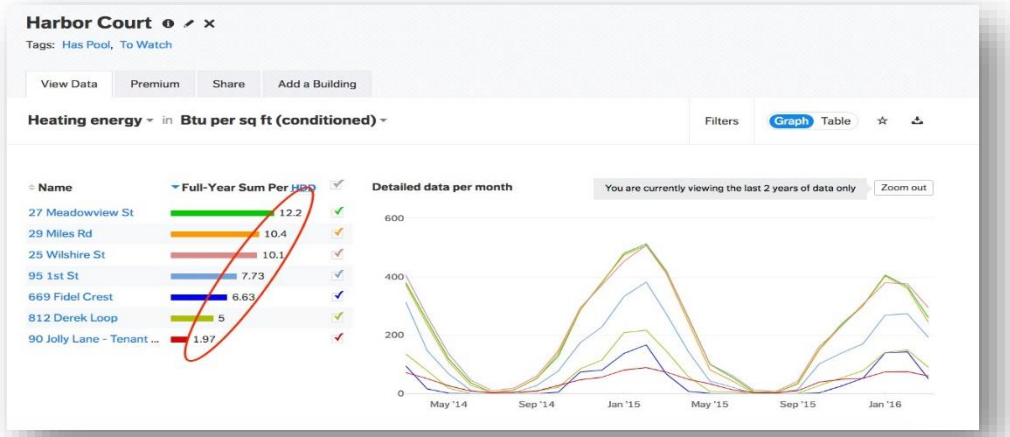
Existing Buildings Matter Too!: 2010 - 2015

- **Increased interest in existing building performance from owners/management companies/Housing Finance Agencies**
  - Benchmarking of energy and water use…but what do we compare it to???
  - WegoWise, EnergyScoreCards gain traction
- **LEAN Low Income Multi Family Utility Funding Program**
- **Green Retrofit Initiative**
  - Focus on operational savings through energy and water conservation measure implementation. 20% reduction goal.
  - Green Asset Management Plans



Heating Energy Intensity (btu/square foot/heating degree day) for a sample set of properties in WegoWise (Slide Credit: WegoWise).

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What Were the Drivers?

- Social and environmental ethic of mission-based CDCs
- Cost-benefit of energy and water use reduction
- Small grants to drive experimentation with process (integrated design, green certs., energy and water audits)
- Larger grants/incentives to drive experimentation with renewables/clean tech (solar, cogen)
- Generous utility programs to pay for mid-cycle upgrades
- Regulation and Codes

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Climate Change Mitigation and Adaptation: 2015 - 2020

- **Much more aggressive goals around building performance to meet climate goals/requirements**
  - Passive House; Deep Energy Retrofits
  - Electrification/Renewable Technologies
  - Energy Use Reduction Targets
    - Boston, Cambridge
    - Energy Audits during operations and at ReFi
- **Building Resilience – Living with Water; Living with Heat**
  - Assessments of existing buildings
  - Resilient design of new construction projects
  - Emergency Preparedness Planning

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What Are the Drivers?

- **Shift from Cost/Benefit to Carbon/Climate Change Focus**
- **More Stringent Green Building Requirements**
  - Top Down – Boston, Cambridge Zoning Requirements
  - Bottom Up – Special Permit Process, Gas Bans
- **Financial /Funding Drivers**
  - Competitive advantage for LIHTCs
  - HFAs – preferential financing
  - Generous Passive House Pilot Funding and Utility Rebate Program

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What Have We Learned?

- Incremental costs for greening construction projects are small, and basically disappear over time as systems become more cost-effective and teams get more experienced.

- Mid-cycle debt to implement energy and water conservation projects in existing affordable housing is challenging. Must take aggressive advantage of opportunities at rehabilitation.

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What Have We Learned?

- **Building mechanical system technology is getting more complicated. Potential performance levels are high, but only if it is programmed and operated properly.**
  - We need tools to evaluate system data and building performance that are better than monthly utility bills.
  - We need an operations workforce that can successfully operate and maintain these systems.
  - We need manufacturers to respond with more design and user-friendly high performance equipment.

- **Organizational Leadership is needed to systematize this work efficiently and effectively.**

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What is Coming?

- **Implementation of Action Plans to achieve Commonwealth and Municipal carbon neutrality goals.**
  - Aggressive energy/carbon use reduction targets over time for existing buildings
  - Passive House/Net-Zero targets for new construction
  - Expansion into more communities

- **Transition from fossil fuels to all-electric buildings**
  - More Bans
  - State programs to support energy storage integration

- **Digitalization and IOT (Internet Of Things) transition**

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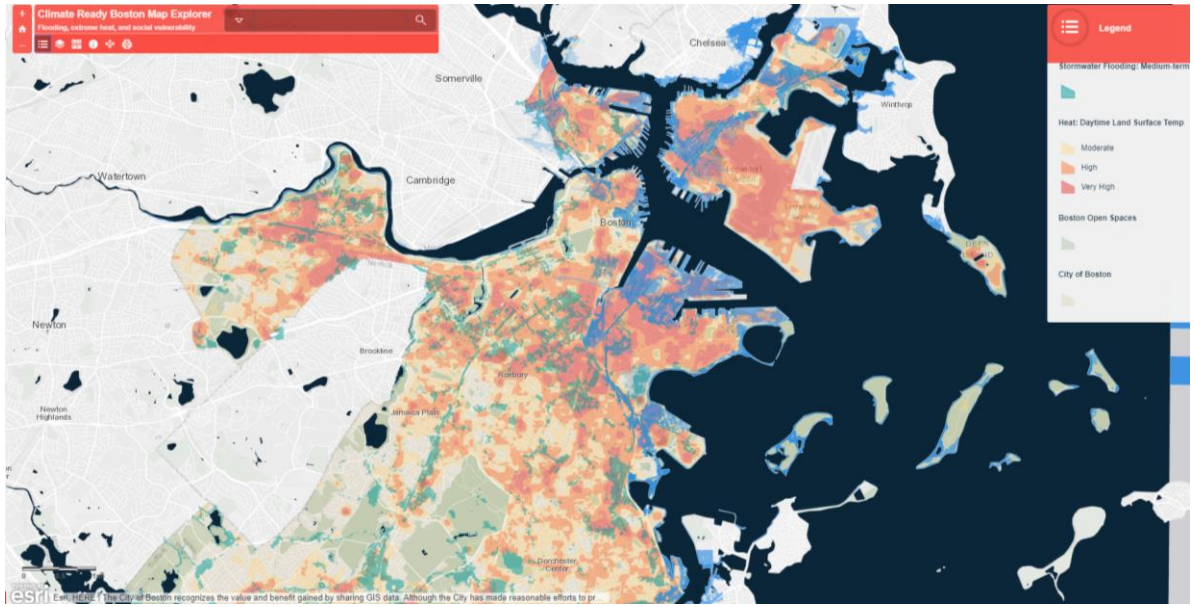
What is Coming?

- **Stronger focus on protection of low-income populations in the face of more frequent extreme weather and climate change**
  - Flooding protection and/or relocation
  - Resilient back-up power systems with storage
  - Emergency Preparedness Planning to protect lives and property



Climate Ready Boston Map Explorer (Credit: City of Boston).

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What is Coming?

- **Health and Indoor Air Quality**
  - Materials (occupant and environmental impact)
  - Ventilation
  - Sensors for measurement of IAQ

- **Training and Education**
  - Passive House
  - (M/WBE) Contractor training
  - Sector specific trainings

The Green Engineer leading 50 affordable housing professionals in LISC's Fall 2018 LEED Green Associate Training (Photo Credit: LISC Boston).

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Discussion:

Your Sustainability Goals and Priorities for the Next 3-5 Years

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A CULTURE OF STEWARDSHIP

BUILDING AND MAINTAINING A CULTURE OF ENERGY EFFICIENCY AND RENEWABLES STEWARDSHIP IN AFFORDABLE HOUSING PORTFOLIOS.

“The earth will not continue to offer its harvest, except with faithful stewardship. We cannot say we love the land and then take steps to destroy it for use by future generations.”
— **Pope John Paul II**

FOUR PILLARS OF STEWARDSHIP

- Ownership
- Responsibility
- Accountability
- Reward

OWNERSHIP

- Stewardship is really taking care of what has been entrusted to us with purity and integrity.
- Perform an inventory of green features, solar panels, energy efficiency upgrades, new project design.
- Part of ownership is knowing what you actually have on the ground in terms of energy efficiency and renewable technologies in your affordable housing stock whether you own as an LP, GP or are a managing owner or a management agent.
- This is not a difficult exercise – Take stock.

OWNERSHIP

DBEDC PORTFOLIO
Green Features

Property Name	No of Units	No of Buildings	Renewable Energy Features	Energy Audits	Energy Upgrades
Quincy Heights	129	14	ERV System , Solar	New Construction	Platinum LEED level efficiency(not certified) & stretch code with 5+ efficiency ratings,blower door testing and energy commisioning in each building (b) Solar PV on 14 of 16 buildings) © Solar hot water on 14 of 16 buildings (d) Windows Energy Star Tier 1 with U value less than 0.30 (e) Energy Recovery Units (ERV's) in each unit .(f) LED lighting and EnergyStar appliances (g) 96% efficient heating systems.

OWNERSHIP- IT MATTERS!

Property Y Strat		
Year	**2017**	**2018**
Total Revenues	2,745,450	2,745,450
Total Expenses	2,179,659	2,093,614
Net Operating Income	565,791	651,836
Other Adjustments		
Capital Expense	500,364	546,201
Reserve Contribution	150,000	150,000
Reserve Drawdown	500,364	546,201
Other Adjustments		
Mortgage Expense (P and	**215,369**	**215,369**
Net Cash Flow	**200,422**	**286,467**
Debt Service Coverage	2.63	3.03
Number of Units	147	147
Gas-P/U	**1,249**	**999**
Electricity P/U	**261**	**261**
Fuel-Oil	**0**	**0**
Water and Sewer P/U	**1,403**	**1,067**
Total Utilities P/U	**2,913**	**2,327**
Operating exp as % GPI	**91%**	**88%**
NCF as % of GPI	**-6%**	**-3%**
we have reduced water use by 14% and gas by 20%		

RESPONSIBILITY

- Decide where the ongoing energy efficiency and renewables role lies in your organization
- EE and or renewables are investments and must be monitored and evaluated
- Benchmarking, tracking, reporting and action.
- Establish portfolio energy efficiency standards
- Make sense of the data.

BENCHMARKING

Energy Efficiency Portfolio-Property Standards	
Action	**Goal**
Energy Assessment	Energy Report twice a year to enable comparisons year after year.
Energy Reduction	Reduce energy use in buildings to achieve the target energy benchmark in existing buildings of less than 7 BTU/ft2/HDD for gas/oil heated buildings and 4 BTU/ft2/HDD for electrically heated buildings and in new construction to 3 BTU/ft2/HDD or less, any fuel.
Water Use Goal	55-59 gallons per bedroom per day preferred , 60-80 performing -medium watch and above 81 gallons per bedroom per day is high watchlist
Equipment	Require energy star equipment , laundry machines, refrigerators
Energy Audit	once every 3 years
Pursue Recommended actions on energy audits	Number of LEAN applications in the portfolio or pursuit of energy efficiency$$
Integrated Pest Management	All management agents to use IPM certified exterminators
Green Cleaning	Property Manager, vendors and contractors to use green cleaning products that meet third-party certification unless such products are not available or cost-effective. Acceptable green certifications include: Green Seal, U.S. EPA Safer Choice, and EcoLogo
Waste reduction and recyling	Provide resident training on recycling, require vendors to recycle carpets during turnover.
Active design	Encourage the development team to pursue active design strategies during construction to increase opportunities for physical activity for building residents, workers, and visitors
Smoke Free Housing	Support property manager in enforcing smoke free housing policy
Resident Engagement	Work with Resident Services to provide residents with information, tools, and activities to support and participate in green practices

DBEDC STRATEGY

- Established a foundation between 2014-2015, this means we started by collecting data to come up with a baseline of where the assets were in terms of efficiency.
- Checked whether DBEDC had benefited from the States energy efficiency funding mechanism – LEAN Multifamily.
- Completed a utility arrangement review to determine owner paid utilities and tenant paid utilities in the portfolio since they would influence how we were going to tackle energy efficiency.
- Established a portfolio sustainability tracker to track efficiency projects.
- Incorporated Energy Audits in the properties to identify low hanging fruit.
- Disaster- Emergency Preparedness Plans for each entity – Resilience.

ACCOUNTABILITY

- We have a twice a year reporting system. One that compares the current 6 month period with same period last year. And an annual 12 month report of consumption compared to the previous year.
- Reporting is an established energy efficiency culture in this organization.
- Let us use water tracking as an example.

WATER TRACKING

Development	Building Address / Name	Water Use (Gallons/ BR/Day - average of last 12 months) 8/2015	Water Use (Gallons/ BR/Day - average of last 12 months) 8/2016	Water Use (Gallons/ BR/Day - average of last 12 months) 6/2017	Water Use (Gallons/ BR/Day - average of last 6 months) 6/2018	Property Average	Water Use Goal	Meets Water Use Goal in 2015?	Meets Water Use Goal in 2016?	Meets Water Use Goal in 2017?	Meeting Water Use Goal in 2018?	Notes	
Dudley Village	571 Dudley	112	116	101	99	73.4	65	N	N	N			Decreased
	580-590 Dudley	144	132	126	124		65	N	N	N			Decreased
	600-610 Dudley	33	35	29	23		65	Y	Y	Y			Decreased
	630 Dudley	67	69	79	69		65	N	N	N			Decreased
	546-570 Dudley	42	59	43	52		65	Y	Y	Y			Decreased
Ceylon Field	30 Thane St	78	90	84	147	97.3	65	N	N	N			Increased
	70 Harvard St	102	118	111	193		65	N	N	N			Increased
	286-88 Columbia	100	103	72	75		65	N	N	N			Increased
	40-42 Stanwood	129	127	103	110		65	N	N	N			Increased
	44-46 Stanwood	48.4	42	43	56		65	Y	Y	Y			Increased
	14-14A Circuit	114	136	102	105		65	N	N	N			Increased
	93 Intervale	53	61	60	92		65	Y	Y	Y			Increased
	52-54 Stanwood	43	64	55	36		65	Y	Y	Y			Decreased
	48-50 Stanwood	191	105	102	112		65	N	N	N			Increased
	255 Magnolia	84	77	74	78		65	N	N	N			Increased
	259 Magnolia	119	89	67	66		65	N	N	N			Decreased

ACCOUNTABILITY

Cost-Benefit Analysis

Toilet Replacement to Niagara .8 g/f

Columbia Road

# of Toilets	Cost per Toilet (plus materials)	Cost per Toilet (labor & recycling)	Total Project Cost
134	$ 178.00	$ 275.00	$ 60,702.00

Total 2015 Gallons	Total 2015 W/S Cost	2015 Cost per Gallon	Estimated 30% Usage Toward Toilets	Annual Gal. Savings with .8 g/f	Annual $ Savings with .8 g/f	Simple Payback (Years)
6,628,291	$ 109,457.00	$ 0.0165	1,988,487	994,244	$ 16,418.55	3.7

Dudley Village - North & South (Combined)

# of Toilets	Cost per Toilet (plus materials)	Cost per Toilet (labor & recycling)	Total Project Cost
76	$ 178.00	$ 275.00	$ 34,428.00

Total 2015 Gallons	Total 2015 W/S Cost	2015 Cost per Gallon	Estimated 20% Usage Toward Toilets	Annual Gal. Savings with .8 g/f	Annual $ Savings with .8 g/f	Simple Payback (Years)
3,450,423	$ 61,060.00	$ 0.0177	690,085	345,042	$ 6,106.00	5.6

ACCOUNTABILITY

Dudley Village

Dudley Village North: Average Utility Consumption			
	Gas btu/month	**Water** g/b/d	**Electric** kwh/month
January-June 2017	62,902,900	84.82	1,857.46
January-June 2018	66,273,255	87.88	1,775.72
% Change	**5.36%**	**3.61%**	**-4.40%**

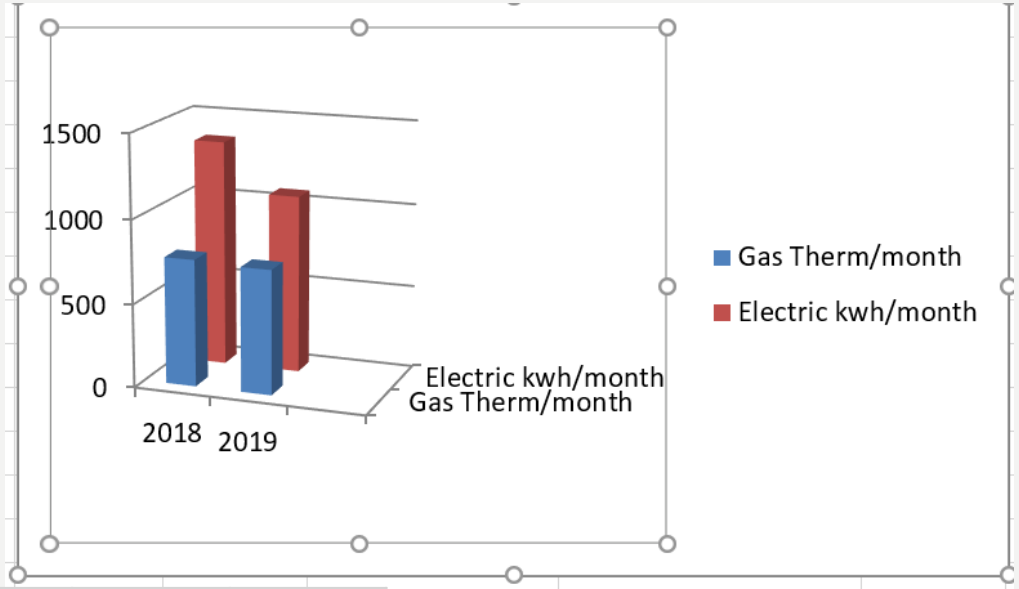
Dudley Village South: Average Utility Consumption			
	Gas btu/month	**Water** g/b/d	**Electric** kwh/month
January-June 2017	38,708,911	68.93	958.06
January-June 2018	41,975,113	63.65	918.47
% Change	**8.44%**	**-7.66%**	**-4.13%**

Historic: LEAN Lighting project completed 06/07/16. DV North and South toilets replaced to Niagara .8 g/f "Stealth" in 2015 and 2016.

SAMPLE 2019 REPORT

- Geneva Apartments

January 1 - June 30, 2018 & 2019 Geneva Apartments Average Energy Consumption		
	Gas Therm/month	Electric kwh/month
2018	761	1358
2019	745	1066
% change	-2.1	-21.5



Electric	
History	Received common area LED lighting installation per LEAN multi-family program.
Current:	Upgraded all exit signs and emergency lights in common areas to LED.

REWARD

Wilder Gardens

Boiler Replacement

Under the LEAN program, heat and DHW boilers were replaced in August 2014 at 414, 418, 422 and 466 Columbia Road.

All Blgs. 7,194 Therms saved in 2015 compared to 2014.
Reduction of 22.3% Savings of $8,633. @ $1.20/therm

Lighting Upgrade

Under the LEAN program, all common area lighting was upgraded from compact fluorescent to LED in January 2015.

All Blgs. 39,740 kwh saved in 2015 compared to 2014.
Reduction of 10.9% Savings of $7,153. @ .18/kwh

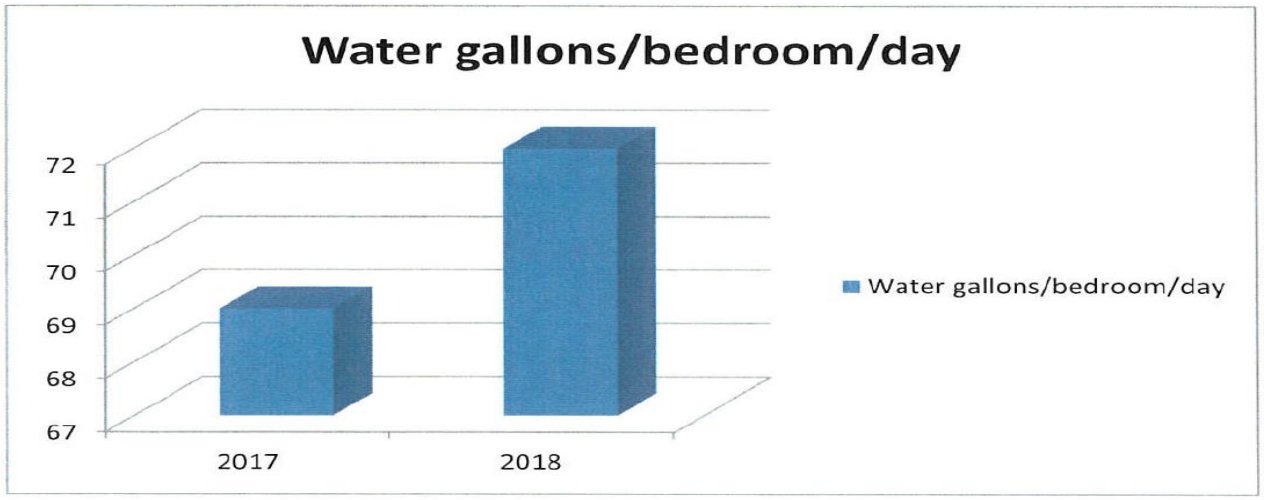
REWARD – THE CASE OF QUINCY HEIGHTS

- Quincy Heights – Cost of Gas prior to Rehab was approx. $227K – After Rehab approximately $103K.
- Quincy Heights – Units were expanded in rehab to make them more livable-All building have high-efficiency condensing boilers for heat and indirect hot water tanks. These water tanks require less fuel to heat the water due to the benefit of preheated water from roof top solar panels. Photovoltaic panels are also mounted on roof tops to assist in the buildings electric loads.
- 13 of the 16 buildings have solar panels for hot water and photovoltaics for electricity installed on their roofs. Photovoltaic panels produce 90846 Kwh of power which at $0.14 generated approximately $14,000 collectively for the past 12 months.
- Enough electricity was produced last year for 20,647 electric washer and dryer loads.
- In the most energy efficient building, which uses no natural gas at all, a HERS 5 stars plus rating of 48 was achieved. This standard means that it uses only 43% of what a standard energy compliant home would use.

REWARD – CASE OF QUINCY HEIGHTS

January 1 - June 30, 2017 & 2018

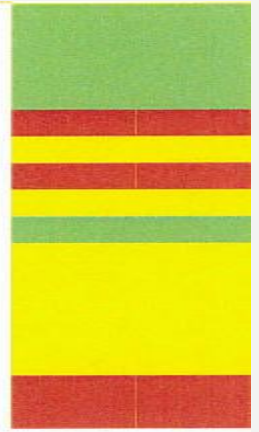
	Water gallons/bedroom/day
2017	69
2018	72
% change	4.35



QUINCY HEIGHTS – WATER

- Consumption is above the 55-60 gallons per bedroom per day
- Investigations reveal – The irrigation system maybe the culprit – needs to be assessed, there are smart technologies that sync irrigation of landscape with the weather to avoid waste and unnecessary man hours.

Quincy Heights	*97-99 Woodledge*	63	62	65	Y
	100-102 Woodledge	58	65	65	Y
	104-106 Woodledge	45	61	65	Y
	89 Fayston	54	46	65	Y
	8-10 Dunkeld	95	105	65	N
	5-7 Dunkeld	69	69	65	N
	4-6 Dunkeld	106	106	65	N
	180 Howard	103	69	65	N
	177-185 Magnolia	62	58	65	Y
	193-195 Magnolia	68	76	65	N
	14-16 Kineo	68	76	65	N
	18-20 Kineo	68	76	65	N
	228 Quincy	65	80	65	Y
	222-226 Quincy	64	79	65	N
	223-227 Quincy	77	85	65	N
	231-233 Quincy	97	108	65	N



QUINCY HEIGHT-NOTES

- The ERV (Energy Recovery Ventilation) system – supplies air to the buildings and exhaust stale air while recovering energy from the exhaust air in the process. The benefits include: reduces humidity – air conditioning costs lower than previously. Promotes natural indoor air quality. This means preventative maintenance expense – Optimization and monitoring of system will extend life of system and thus accrue benefits of system to owner.

LESSONS LEARNED

- A project in Roxbury had an unfriendly solar arrangement – after 10 years the project had all its reserve wiped out with solar costing them $100,000 due to the need for a roof replacement ($230K).
- Green affordable housing is more cost effective as studies say but without stewardship of the "green" it will be wasted investment and very costly to operate.
- Capital and operating costs must be considered at the onset of a development
- Energy efficiency and renewables are INVESTMENTS!
- By EE and Renewables – Green to me is resource conservation during design and construction, operations and residents well being and productivity.
- As we get more into resiliency in new projects the role of resident education will become critical. The role of human behavior in the stewardship of energy efficiency and renewable investments cannot be underestimated.

"We are faced not with two separate crises, one environmental and the other social, but rather with one complex crisis which is both social and environmental. Strategies for a solution demand an integrated approach to combating poverty, restoring dignity to the excluded, and at the same time protecting nature."

– Encyclical Letter Laudato Si' "On Care for Our Common Home," Pope Francis

THE END. THANK YOU.

Topics You Would Like to See Addressed in this Forum?

Upcoming topics could include:

- Maximizing Energy and Water Efficiency of Existing Buildings
- Achieving Green and Healthy Building Standards;
- Navigating New Regulations/Requirements;
- Healthy Building Materials;
- Integrating Solar and Battery Storage;
- Increasing Building and Community Resilience;
- Building Electrification;
- Planning Regenerative Buildings;
- Carbon Pricing
- Other ideas?

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