



Deep energy retrofits New York, Vancouver & more

New York, Vancouver and other municipalities are moving methodically toward electrification of EXISTING buildings through retrofits. In New York City old multi-unit residential buildings are being insulated and electrified with the tenants still in them! How are they accomplishing this?

Feb 25th 2021 | 2:00 PM - 3:00 PM ET



Clean Air Partnership

CLIMATE SOLUTIONS WEBINAR SERIES





Clean Air Partnership

CLIMATE SOLUTIONS WEBINAR SERIES



WEBINAR SERIES - UPCOMING:

- **Municipal/Community renewables & storage**
- **Electrified buses, trolleys and inner-city transit planning**
- **Carbon accounting for governments & businesses**
- **Sewage heat recovery & community energy**

BRUCE (BF) NAGY CLIMATE SOLUTIONS

- Columnist & features
- Consultant
- Author 200+ articles on climate solutions
- Author *The Clean Energy Age*, Rowman & Littlefield



Climate solutions
Expert best practices
Case examples
Clear priorities



SOLUTIONS, PRIORITIES, CASE EXAMPLES



BUILDINGS

NEW & RETROFIT TECHNOLOGY & PROGRAMS



TRANSPORTATION

ELECTRIC FLEETS, INFRASTRUCTURE & TRANSIT VEHICLES



POWER GENERATION & STORAGE

TECHNOLOGY, PLANNING & ECONOMICS

TODAY

NEW YORK CITY

CASA PASIVA – CHRIS BENEDICT

OTHERS

VANCOUVER/VICTORIA

CHRIS HIGGINS – CITY OF VANCOUVER PLANS

HEATHE THOMPSON PROJECTS - BAKERY AND HOUSE

MARK BARNHARDT IN VICTORIA: FERNWOOD RENO

WILL ALSO TOUCH ON

HAMILTON UPDATE, MONTREAL,

GEO IN ONTARIO & NY,

ATLANTA'S ASHRAE

HEADQUARTERS RETROFIT



TODAY'S GUEST PRESENTER



CHRISTOPHER A. HIGGINS

GREEN BUILDING PLANNER WITH THE CITY OF VANCOUVER

CHRIS WORKS WITH THE CITY OF VANCOUVER AS A GREEN BUILDING PLANNER AND HIS WORK IS FOCUSED ON CREATING ENERGY EFFICIENT BUILDING CODES THAT HELP TO ACHIEVE VANCOUVER'S 100% RENEWABLE GOAL. NEW BUILDINGS WILL ACHIEVE THIS GOAL BEFORE 2030.

HE RECENTLY SWITCHED HIS FOCUS TO EXISTING BUILDINGS. IN THE PAST HE HELPED RENEWABLE PROJECTS HAPPEN (NEW CONSTRUCTION), CREATED GREEN BUILDING POLICY AND MANAGED COMPLIANCE

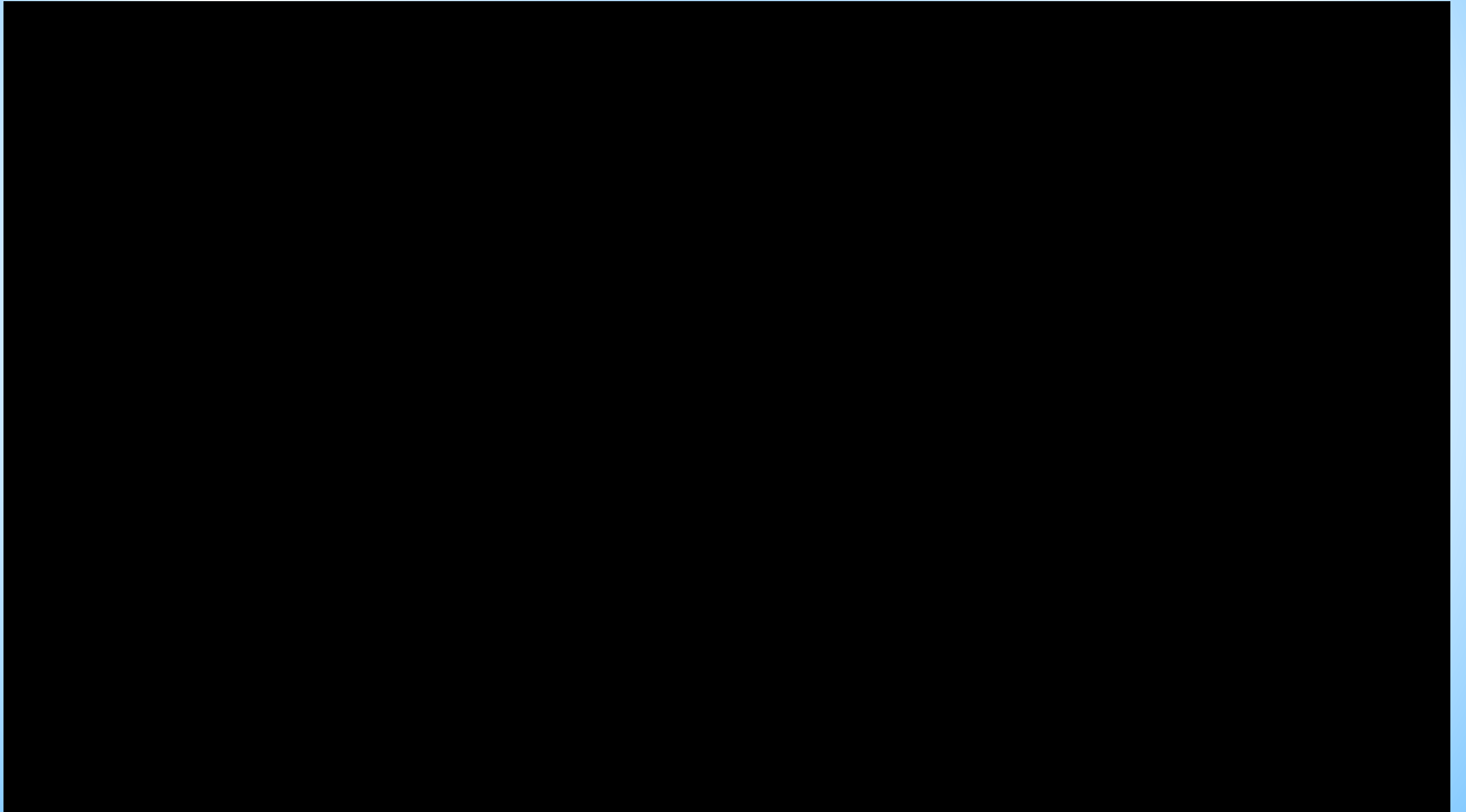
PRIOR TO WORKING WITH THE CITY, CHRIS WORKED WITH THE CANADA GREEN BUILDING COUNCIL, HELPED DEVELOP A CANADIAN STANDARD, LAUNCH A NATIONAL NETWORK OF SERVICE ORGANIZATIONS, AND CERTIFIED THOUSANDS OF HOMES.

BEFORE THAT CHRIS WAS THE NEW STORE PLANNING AND PROJECT MANAGER FOR MOUNTAIN EQUIPMENT COOP WORKING ON THE CONSTRUCTION, OPERATION, MAINTENANCE, AND RENOVATION OF MEC'S GREEN BUILDING STOCK.


CHRIS GREW UP IN NEWFOUNDLAND, BEFORE MOVING TO BRITISH COLUMBIA. HE WAS EDUCATED IN BUSINESS AND REAL ESTATE AT MEMORIAL UNIVERSITY AND SIMON FRASER.

CHRIS BENEDICT IN NEW YORK CITY

MULTI-UNIT RETROFITS WITH TENANTS IN PLACE



NYSERDA RETROFIT NEW YORK



New Net Zero Opportunity Coming Soon: Request for Qualifications

RetrofitNY is continuing to make progress in transforming New York's existing building stock to net-zero energy (NZE).

Our next step? RetrofitNY will soon be releasing three Request for Qualifications (RFQs) to build a pool of candidates for upcoming NZE demonstration pilots.

Individual RFQs will be available for:

- Affordable housing multifamily building owners
- Component manufacturers
- Solution providers

Candidates that are qualified through these RFQs will be able to apply for funding for a NZE or near NZE retrofit project when they form a project team with other pre-qualified candidates.

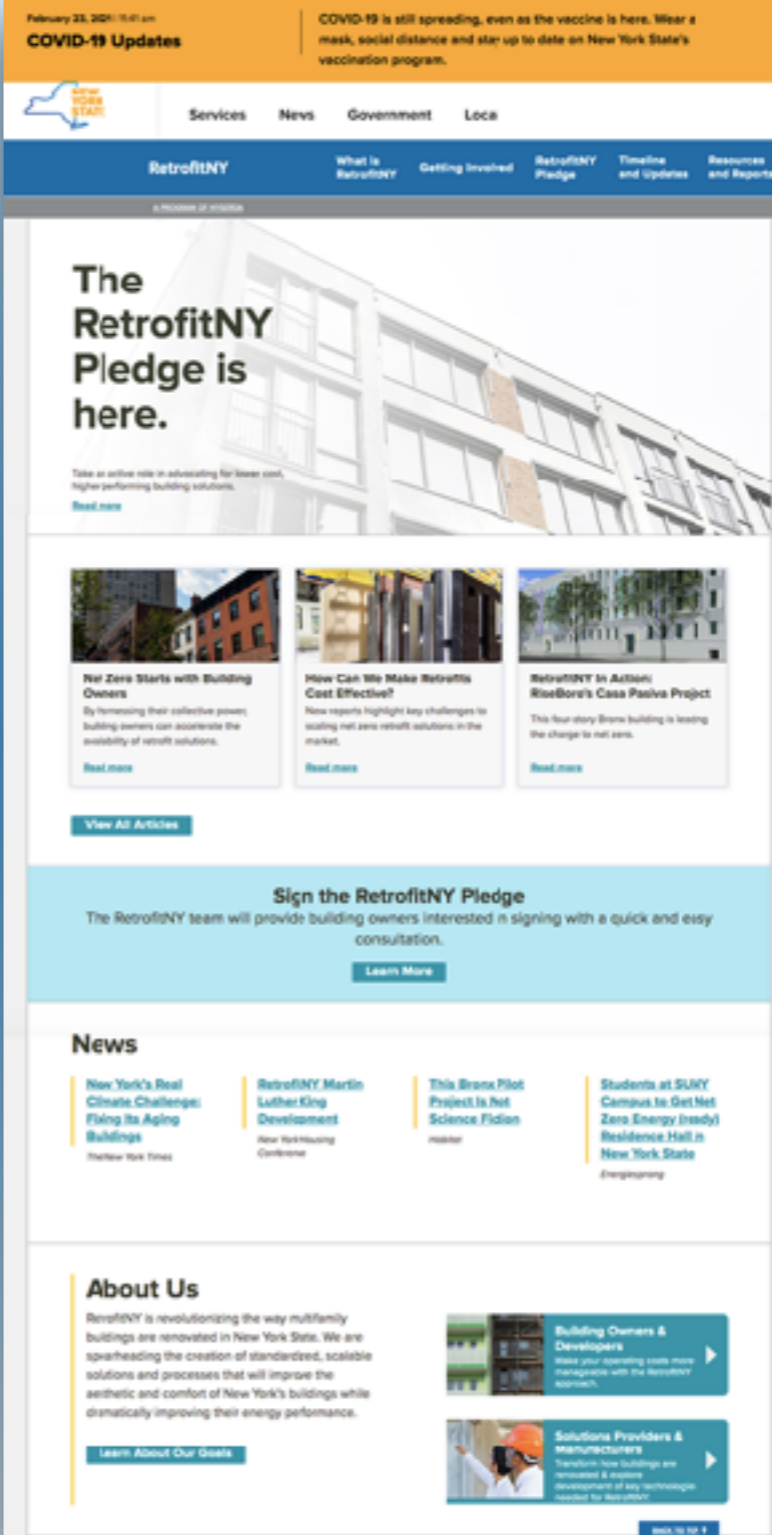
If you're interested in this opportunity, keep an eye out for a formal release of the Request for Qualifications in the coming weeks.

CONNECT WITH US

About NYSERDA
NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975. To learn more about NYSERDA's programs, visit nyserdanyc.gov or follow us on [Twitter](#), [Facebook](#), [YouTube](#), or [LinkedIn](#).

info@nyserdanyc.gov | 1-888-NYSERDA | 17 Columbia Circle, Albany, NY 12242

[HTTPS://TINYURL.COM/MEFHNT7U](https://tinyurl.com/mefhnt7u)



February 23, 2021 11:41 am

COVID-19 Updates COVID-19 is still spreading, even as the vaccine is here. Wear a mask, social distance and stay up to date on New York State's vaccination program.

Services News Government Local

RetrofitNY What is RetrofitNY Getting Involved RetrofitNY Pledge Timeline and Updates Resources and Reports

The RetrofitNY Pledge is here.

Take an active role in advocating for lower cost, higher performing building solutions.

Net Zero Starts with Building Owners
By removing their collective power, building owners can accelerate the availability of retrofit solutions.

How Can We Make Retrofits Cost Effective?
New reports highlight key challenges to scaling net zero retrofit solutions in the market.

RetrofitNY in Action: BlueBoro's Casa Passiva Project
This four-story brick building is leading the charge to net zero.

Sign the RetrofitNY Pledge
The RetrofitNY team will provide building owners interested in signing with a quick and easy consultation.

News

- New York's Real Climate Challenge: Facing Its Aging Buildings
- RetrofitNY Martin Luther King Development
- This Bronx Pilot Project Is Not Science Fiction
- Students at SUNY Campus to Get Net Zero Energy Ready

About Us
RetrofitNY is revolutionizing the way multifamily buildings are renovated in New York State. We are spearheading the creation of standardized, scalable solutions and processes that will improve the aesthetic and comfort of New York's buildings while dramatically improving their energy performance.

Building Owners & Developers
Make your existing code more manageable with the RetrofitNY approach.

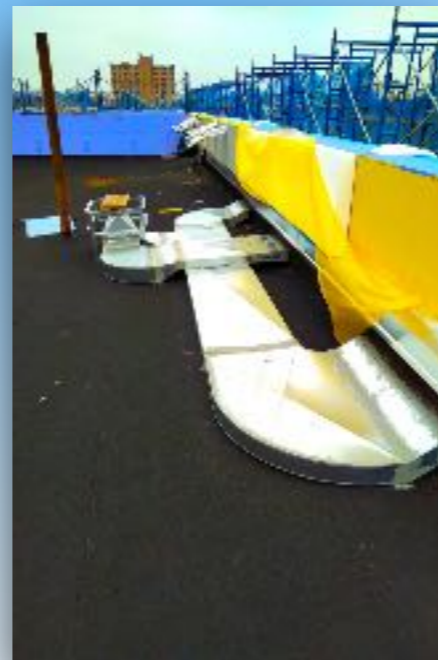
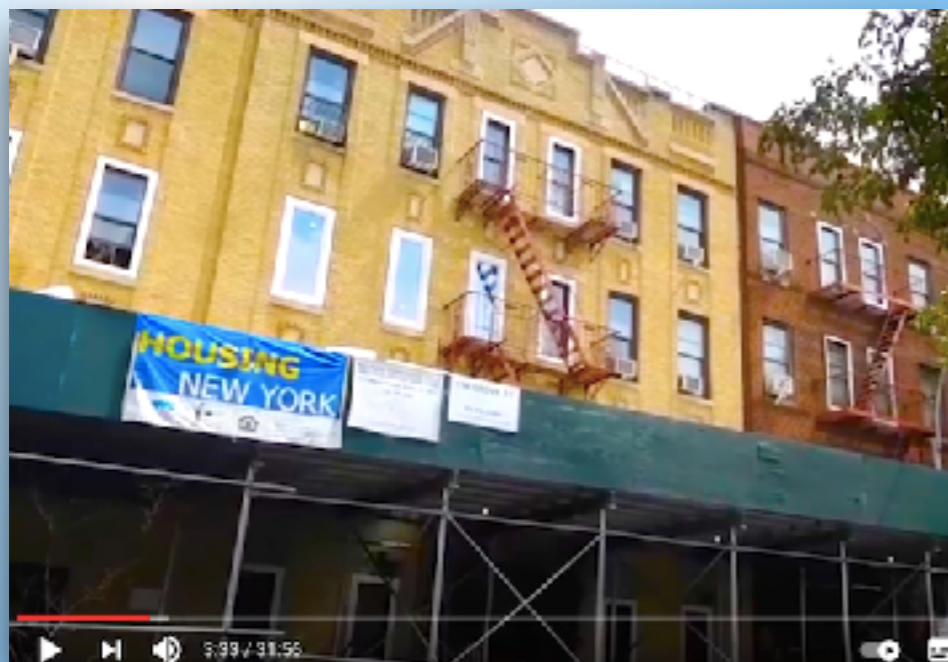
Solutions Providers & Manufacturers
Transition New Buildings and Increase the Market Demand of Key Technology Leader for RetrofitNY.

[HTTPS://WWW.NYSERDA.NY.GOV/
ALL%20PROGRAMS/PROGRAMS/RETROFITNY](https://www.nyserdanyc.gov/all%20PROGRAMS/PROGRAMS/RETROFITNY)

CHRIS BENEDICT IN NEW YORK CITY

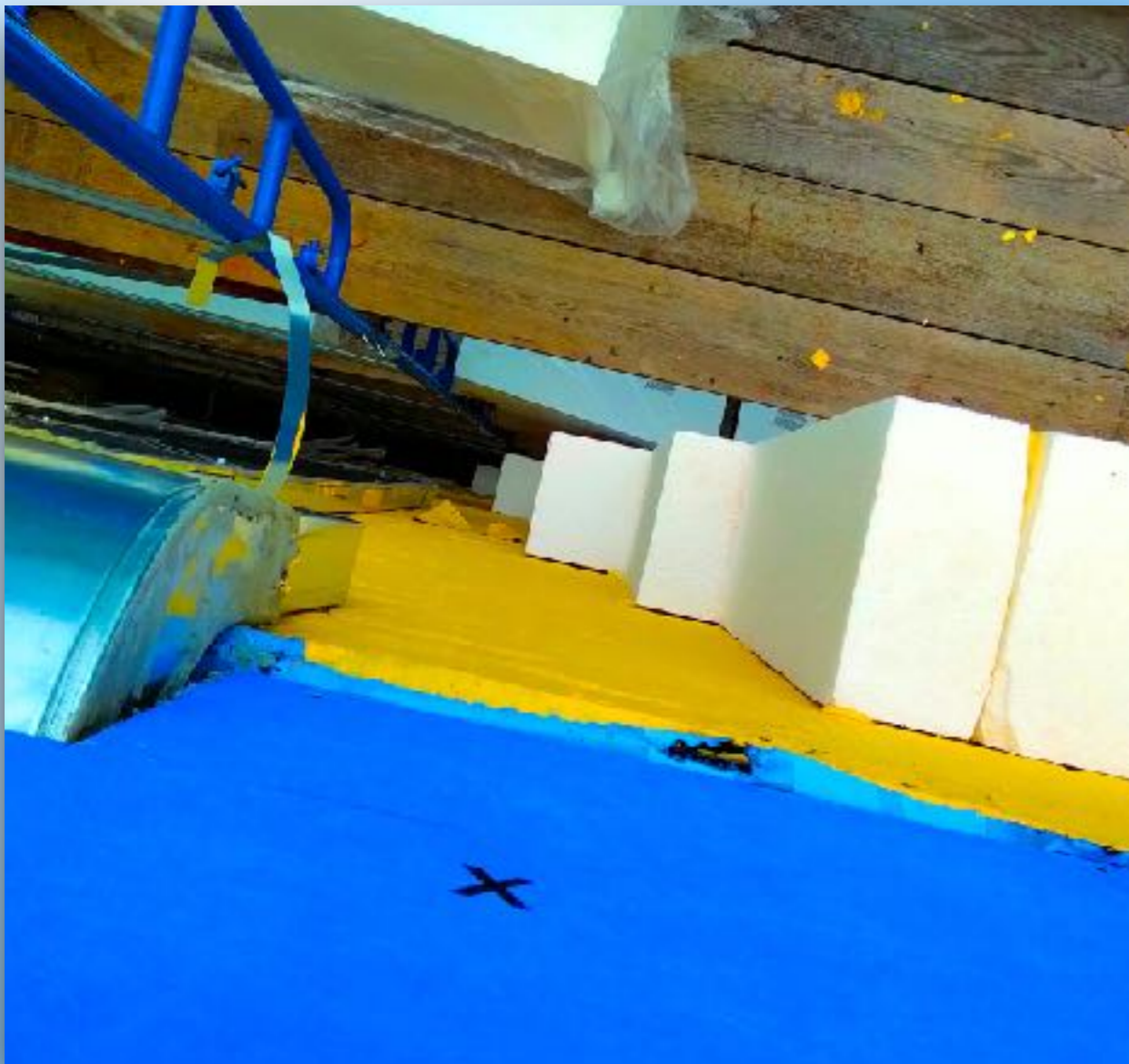
MAYOR BLOOMBERG REALIZED THAT IN BIG CITIES BUILDINGS CREATE 70% OF EMISSIONS, AND THAT BY 2030 A HIGH PERCENTAGE OF NEW YORK'S EXISTING BUILDINGS WILL STILL BE HERE. HE CREATED A TASK FORCE.

CHRIS BENEDICT, ONE OF THE FIRST GREEN BUILDING ARCHITECTS WORKING IN NEW YORK, SAT ON THE TASK FORCE. SHE'S NOW WORKING ON A 9-BUILDING RETROFIT PROJECT CALLED PASIVA CASA



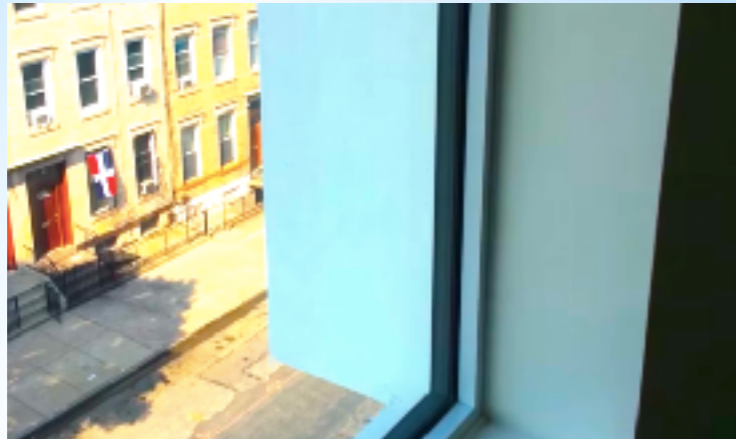
NEW RULES IN NY CITY

TASK FORCE ON 'GREENING THE CODE' DETERMINED THAT 8" OF EXTERIOR INSULATION/CLADDING PLUS SEALING BRICKWORK, ETC WOULD BE PERMITTED AND INCLUDED IN THE NY CITY STANDARD



BENEDICT USED THICK EXTERIOR INSULATION AS AN ARCHITECTURAL FEATURE ON KNICKERBOCKER AVENUE IN BROOKLYN

CHALLENGES: PASSIVE HOUSE RETROFIT WITH TENANTS IN PLACE



- EXTERIOR INSULATION & CLADDING (NO SQ FT PENALTY) & BRICK SEAL

- NEW WINDOWS INSTALLED OUTSIDE BEFORE INSIDE WINDOWS REMOVED



- NO ROOM FOR NEW MECHANICALS EXCEPT ON ROOF

- BUT ENERGY RECOVERY VENTILATORS (ERVs), DUCTS, HEAT PUMP LINES MUST BE INSULATED



- ONCE IN PLACE AND TESTED, LINES, DUCTS AND ERVS AT CASA PASIVA ARE ENCAPSULATED INSIDE CONTINUOUS FOAM-WITH-STUCCO INSULATION SYSTEM CALLED STO EIFS

- INNOVATION: CUSTOM DESIGNED INSULATION CABINET FOR ERV

BENEFITS

DRIVING DEEP & CLEAN ENERGY RETROFITS:

- HEALTHY INDOOR AIR
- ENERGY SAVINGS
- TOUGH MUNICIPAL BUILDING EMISSION STANDARDS

THE PANDEMIC HAS MADE EVERYONE MORE CONSCIOUS OF INDOOR AIR QUALITY, HEALTH, COMFORT, AND GLOBAL PROBLEMS LIKE CLIMATE CHANGE

THIS SYSTEM SAVES ENERGY USING EFFICIENT HEAT RECOVERY UNITS THAT PROVIDE HEALTHY, 100% FRESH, DEDICATED OUTDOOR VENTILATION AIR.

WITH THIS SOLUTION: “WE HAVE A GOOD AIR BARRIER ON THE EXTERIOR OF THE BUILDING TO MEET PASSIVE HOUSE AND ALSO A BARRIER BETWEEN EACH APARTMENT SO THAT AIR, BUGS, SMOKE, AND SOUND DON’T MOVE FROM ONE UNIT TO ANOTHER.”



TENANTS CONTROLS

TENANTS USE REMOTES TO CONTROL

THE DAIKIN HEADS, WHICH BY

OWNER REQUEST, ARE MODIFIED

USING AN **INTENSIS ELECTRONIC**

MODULE INSIDE THAT LIMITS

UPPER AND LOWER TEMPERATURES.

APARTMENT DEVICES ARE

SEPARATELY SUB-METERED,

ALLOWING TENANTS TO LEARN ABOUT ENERGY USAGE AND INCORPORATE CONSERVATION BEHAVIOURS INTO

DAILY LIVING.



INDUCTION COOKTOPS

BENEDICT: “EVERY APARTMENT HAD TO GET AN ELECTRICAL UPGRADE FOR INDUCTION. THEY NEEDED A 220 OUTLET AND MORE AMPS... WE ALSO PROVIDED A NEW SET OF POTS AND PANS AND A MAGNET FOR TESTING TENANT’S OLDER PANS.”



INDUCTION COOKTOPS ARE NOW RECEIVING MORE ATTENTION. THE USUAL PUSHBACK FROM STATUS QUO INTERESTS WAS THAT ELECTRIC OR INDUCTION ALTERNATIVES HAD BEEN REJECTED BY PROFESSIONAL CHEFS AND CITIZEN FOODIES. THIS HAS BEEN CHANGING QUICKLY. MORE PROMINENT CHEFS AND ORDINARY HOMEOWNERS ARE HAPPY WITH COOKING RESULTS, EASY CLEANING, INDOOR AIR QUALITY, ENERGY AND GREENHOUSE GAS SAVINGS.

OTHER RETROFIT NEW YORK PROJECTS



THE STATE UNIVERSITY OF NEW YORK
(SUNY)

MARTIN LUTHER KING DEVELOPMENT

BRONX PILOT PROJECT



EMERGING PATHWAY FOR MUNICIPALITIES



Strategy

Climate emergency declaration

Set targets

- Emissions
- Renewables
- Waste management

Create specific Supports

- Regulatory
- Incentives
- Training
- Support hubs
- (Some research)

Implementation

• Building standards & deep energy retrofit incentives, programs

• Urban planning for density, retrofits, transit, cycling, walking, new kinds of electric vehicles

• Rapid transit investment, modern approaches including electric buses, BRT, LRT

• Government fleets & infrastructure, private sector fleet support

• Vehicle incentives & infrastructure

• Waste management

Corollary

Education/Training

- Developers/architects/engineers
- Homeowners
- Trades/students
- Civil service/Inspectors

Create partnerships

- Federal
- Province, City, State
- Utilities
- Consultants
- Professional & Trade Orgs
- (Universities & thinktanks)

FCM CLIMATE GUIDANCE VIDEOS

[HTTPS://FCM.CA/EN/RESOURCES/MCIP/
VIDEO-CLIMATE-IN-FOCUS-READY-SET-GO](https://fcm.ca/en/resources/mcip/video-climate-in-focus-ready-set-go)



UPDATE ON HAMILTON HIGH-RISE RETROFIT

YA'EL SANTOPINTO THIS WEEK SENT THESE NEWEST PHOTOS OF KEN SOBLE SENIORS TOWER IN HAMILTON, ONTARIO.

PANDEMIC DELAYS, BUT OCCUPANCY EXPECTED THIS SUMMER.

PASSIVE HOUSE GUT JOB, 18 STOREYS, 146 UNITS, 1967, FAILING MECHANICALS, ASBESTOS, GENERAL DETERIORATION.



ADDED INSULATION BOTH INTERIOR & EXTERIOR, HEAT PUMP VRF BOTH TOP AND BOTTOM.

PARKDALE LANDING, HAMILTON

- GUTTING, RECLADDING & PARTIAL RECONSTRUCTION TO A BANQUET HALL, TAVERN & ROOMING HOUSE AT MELVIN & PARKDALE. ORIGINALLY ERECTED 1880S, 1960S & 1970S.
- CREATED 57 STUDIO APARTMENTS, EIGHT OF WHICH ARE BARRIER FREE. GROUND FLOOR INCLUDES A RESTAURANT & TWO STOREFRONTS, OFFICES, 4,324 SQUARE FEET AT ABOUT \$204 PER SQUARE FOOT.



PARKDALE LANDING, HAMILTON

- R55 ROOF, R35 WALLS, AND R43 UNDERSLAB INSULATION, SUN SHADES, KLEARWALL WINDOWS, GLAZING, LOCALLY-MADE FIBERGLASS ANGLES & FIBERGLASS CLIPS. INSULTHANE EXTREME POLYURETHANE SPRAY FOAM WITH A GLOBAL WARMING POTENTIAL OF 1.0. CONTINUOUS AIR BARRIER PROVIDED BY HENRY BLUESKIN SA, ENVELOPE REACHED FINAL AIRTIGHTNESS OF 0.3ACH @50PA.
- APARTMENTS ARE HEATED & COOLED BY A HIGH-PERFORMANCE HRV WITH BACKUP ELECTRIC HEATERS. TENANTS HAVE COMMENTED ON COMFORT AND SECURITY.
- THANK YOU TO EMMA CUBITT & GRAHAM CUBITT OF INDWELL, THE DEVELOPER.



SUNLIFE BUILDING MONTREAL

RICH IN HISTORY, BUILT IN PHASES FROM 1914 TO 1933
26 FLOORS, MORE THAN ONE MILLION SQ FT

NEVER ENDING PRIVATE SECTOR HERITAGE RETROFIT:
OVER THE YEARS THE BENTALLGREENOAK
MANAGEMENT TEAM HAS REPLACED ITS OLDER
SYSTEMS WITH MORE THAN 1600 WATER SOURCE
HEAT PUMPS AND ENERGY RECOVERY VENTILATORS.

THESE INCLUDE WATERFURNACE OR
THERMOPLUS 12 MBH OR 18 MBH, AND OTHER KINDS.

A MASTERPIECE OF ZONE MANAGEMENT, USING SOPHISTICATED COMPUTER CONTROLS FROM DELTA TO RECOVER,
OR MOVE HEAT AND COOLING ENERGY THROUGHOUT THE STRUCTURE SO EFFICIENTLY THAT SURPRISINGLY LITTLE
ACTIVE HVAC IS REQUIRED. THE HEAT PUMPS ARE ALL CONNECTED IN ONE CLOSED LOOP NETWORK.

“THE INTERIOR ALWAYS NEEDS SOME COOLING AND THE PERIMETER USUALLY NEEDS SOME HEATING,” SAYS
OPERATIONS MANAGER PIERRE PICARD. BACKUP CHILLERS AREN'T REALLY USED,”



THANKS FOR INFORMATION FROM RYAN ZAMESTRIEUS, GENERAL
MANAGER, REAL ESTATE SERVICES AND PIERRE PICARD, DIRECTOR
OF OPERATIONS, BENTALLOAKGREEN.

SUNLIFE BUILDING MONTREAL

IN COLD MONTHS, 5% OF THE TIME (BELOW MINUS 10°C), THE SYSTEM RECEIVES STEAM FROM CHAUFFAGE CLIMATISATION URBAINE MONTREAL, A DISTRICT ENERGY SYSTEM. “WE HAVE A LOT OF HEAT RECOVERY OPPORTUNITIES. OUR TENANTS ARE HIGH TECH COMPANIES WITH DATA CENTRES.” COOLING TOWERS ARE ON THE ROOF OF PLACE VILLE MARIE, A NEIGHBOURING BUILDING ALSO OWNED BY SUN LIFE. THE TWO BUILDINGS OPTIMIZE AND SHARE.

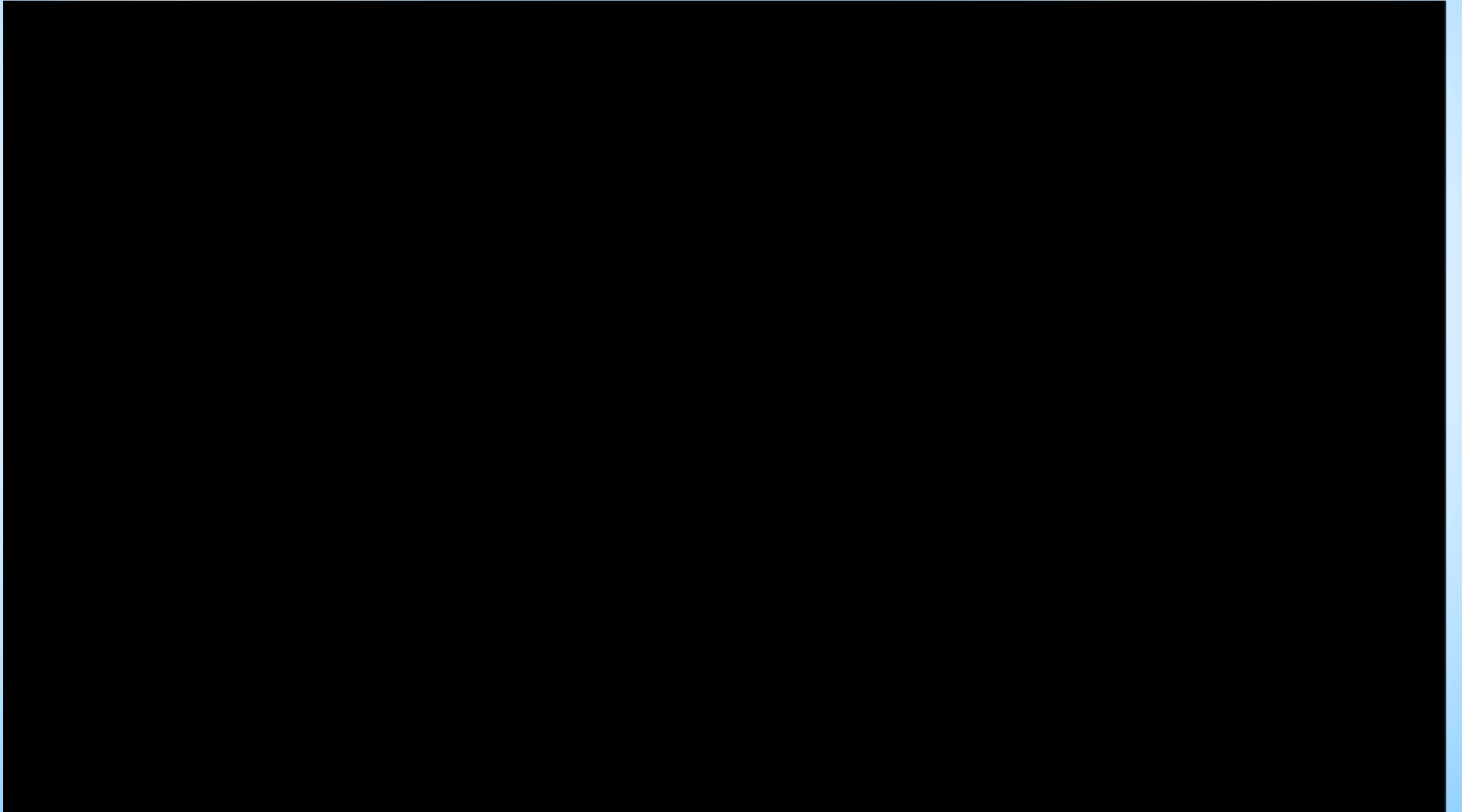
ENERGYSTAR SCORE OF 92, LOW FLOW PLUMBING, CARBON DIOXIDE SENSORS TO MANAGE FRESH AIR INTAKE, MERV 13 AIR FILTERS FOR INDOOR AIR QUALITY. LED LIGHTING WITH SENSORS THAT FOLLOW NIGHT-TIME CLEANING CREWS. RECYCLING PROGRAM HAS A DIVERSION RATE OF 70% AND RISING, FRUIT AND VEGETABLE GARDEN AND SOME BEE HIVES ON ONE OF ITS ROOFS.



SUNLIFE STORIES: CLARENCE CAMPBELL WAS FORCED TO SUSPEND ROCKET RICHARD THE NHL’S LEADING SCORER, FOR THE REST OF THE SEASON, INCLUDING THE PLAYOFFS. STREET RIOTS ENSUED. WINSTON CHURCHILL & “OPERATION FISH”: DURING WWII THE UK HID SOME ITS GOLD & CASH IN THE BASEMENT OF THE BUILDING FOR SEVERAL YEARS.

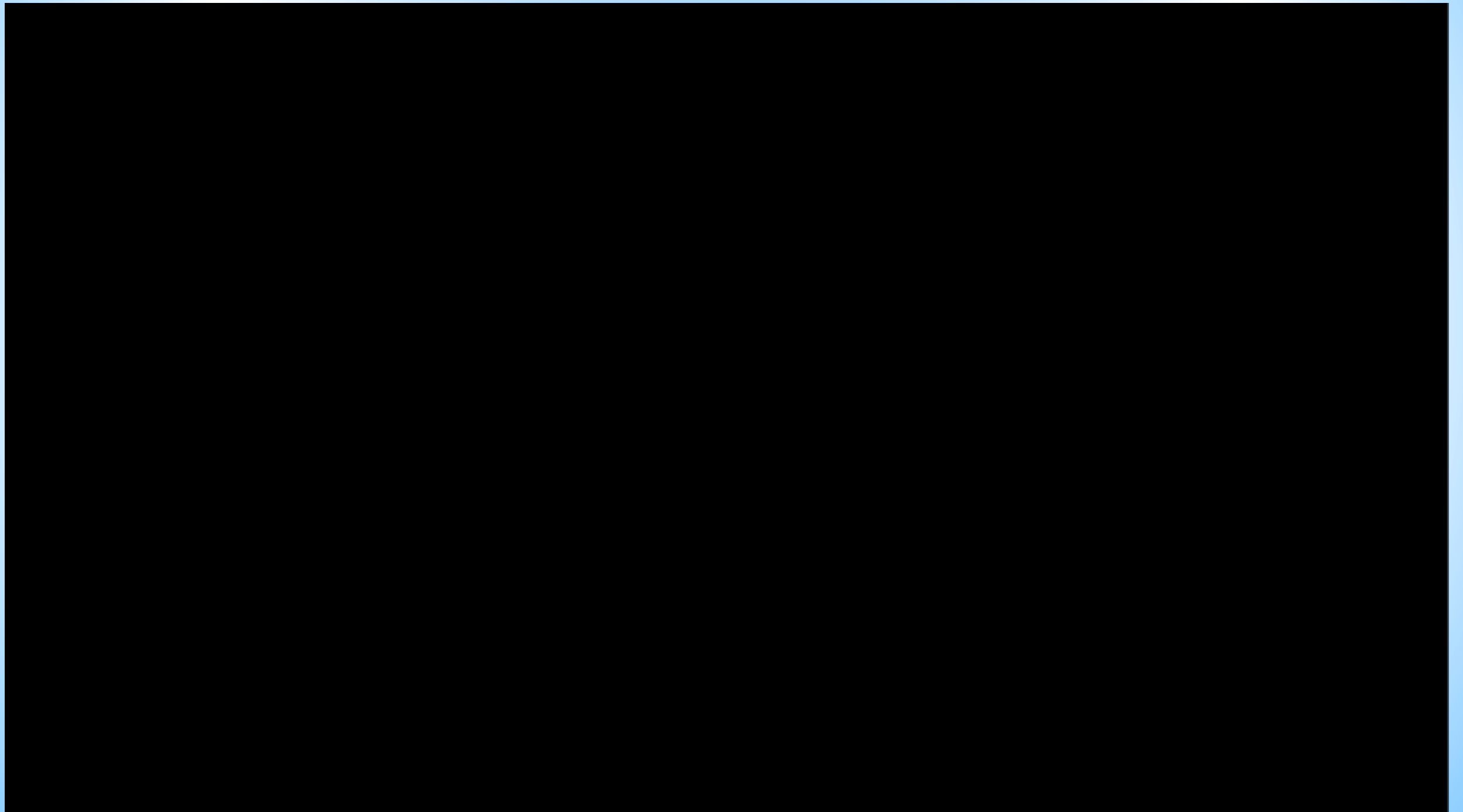


GEO RETROFITS IN NEW YORK STATE





GEO RETROFITS IN ONTARIO



NEW ASHRAE HEADQUARTERS IN ATLANTA

BEGAN RETROFIT IN JANUARY 2020 TO 66,700 SQ FT DOUBLE WING, TWO-STOREY BUILDING, ORIGINALLY CONSTRUCTED IN 1978. LOCATED NEAR ATLANTA IN PEACHTREE CORNERS, GEORGIA (CLIMATE ZONE 2).

EXPECTED:ENERGY USE INTENSITY OF 19,000 BTUS /SQ FT/YR. OBJECTIVE WAS 24.1 EUI, STRETCH GOAL WAS AROUND 15, AFTER HVAC SYSTEM DESIGN THEY WERE AT ABOUT 17. SUBSEQUENT TWEAKS HAVE BROUGHT IT UP A LITTLE TO 19

ENGINEERING TEAM REMAINED ON SITE FOR MONTHS, OPTIMIZING THE SYSTEM.



BEFORE



AFTER

ASHRAE DESIGN CONSIDERATIONS

SEEKING NET-ZERO ENERGY, THE TEAM REVIEWED THE EXISTING BUILDING PERFORMANCE BASELINE, POTENTIAL FOR ON-SITE ENERGY GENERATION, CLIMATE CONDITIONS, POSSIBLE PASSIVE DESIGN AND BUILDING ENVELOPE IMPROVEMENTS. THEN BEGAN ANALYSIS OF ACTIVE SYSTEMS.

DESIGN TEAM LED BY INTEGRAL GROUP'S STANTON STAFFORD NARROWED HVAC APPROACHES DOWN TO TWO. ONE WAS AN ALL AIR COOLED SYSTEM USING ZONED PACKAGED ROOFTOP AIR-COOLED HEAT PUMP SYSTEMS, PLUS A DEDICATED OUTDOOR AIR SYSTEM (DOAS). IT WOULD HAVE BEEN LESS EXPENSIVE FROM A FIRST-COST POINT OF VIEW.

"HOWEVER, ASHRAE MADE THE DECISION..TO SHOW A FORWARD-THINKING APPROACH TO THE INDUSTRY --SHOW THAT WE COULD PUT IN A DIFFERENT SYSTEM TYPE, MORE UNCONVENTIONAL..FOR THE US MARKET, PERFECTLY VIABLE AND SOMETHING WE COULD USE IN WARM, HUMID CLIMATES WHERE THERE ARE A LOT OF NAYSAYERS SAYING THESE TYPES OF SYSTEMS CANNOT BE INSTALLED."



PATH TO NET ZERO ENERGY BUILDING

Items to consider (in order of importance)

Reduce demand side consumption

Maximize Passive Opportunities

Daylight

Site

Shading

Incorporate Active Opportunities

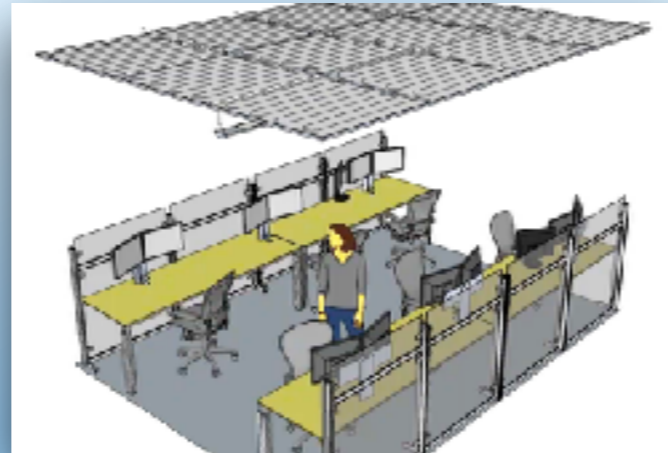
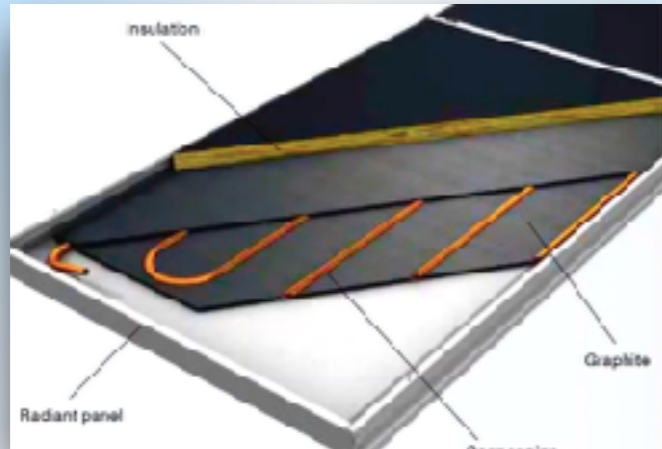
Envelope

Mechanical System - type, set points, etc.

Electrical System - lighting

.....
On-site Renewable Power Generation

ASHRAE SOLUTION



MAINLY: RADIANT CEILING PANELS IN MOST OF THE UPSTAIRS OFFICE AREAS FOR COOLING AND HEATING IN EXTERIOR ZONES, COOLING ONLY IN INTERIOR ZONES. CEILING PANELS ARE ARRANGED IN 'CLOUDS' ABOVE THE OCCUPIED SPACES AND CONTAIN MULTI-PASS SINGLE CIRCUIT COILS WITH 6-WAY VALVES, TWO COLD PIPES, TWO WARM AND ONE DISTRIBUTION PIPE, AND ZONE CONTROL SENSORS. THEY CAN BE PIPED IN SERIES UP TO 64 SQ FT. QUICK DISCONNECTS FOR EASY INSTALL AND REPLACEMENT. WATER SOURCE HEAT PUMPS FOR HUMID PARTS OF THE LOWER LEVEL.

ALSO 120 HIGH VOLUME, LOW SPEED FANS IN THE SPACE, WHICH EXPAND THE THERMAL COMFORT ZONE WHILE STILL CONSERVING ENERGY. OCCUPANTS CAN SWITCH THEM ON OR OFF, OVERRIDING THE CONTROL SYSTEM WHICH THEN MAKES APPROPRIATE ADJUSTMENTS. FAN COMFORT PERCEPTION - FROM 82% TO 89%.

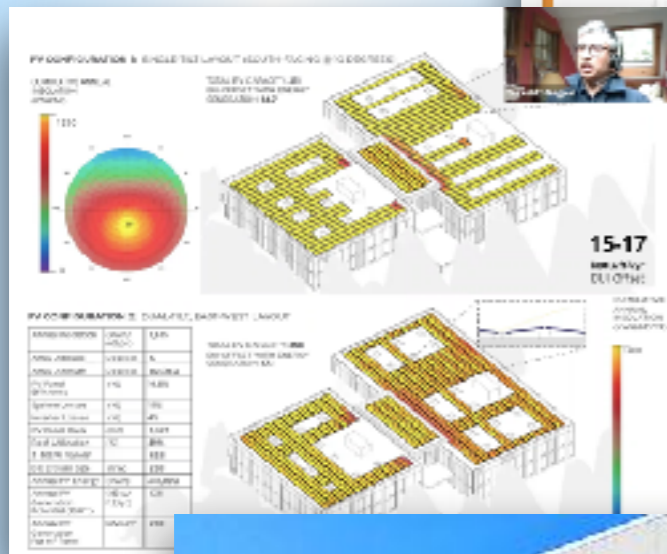
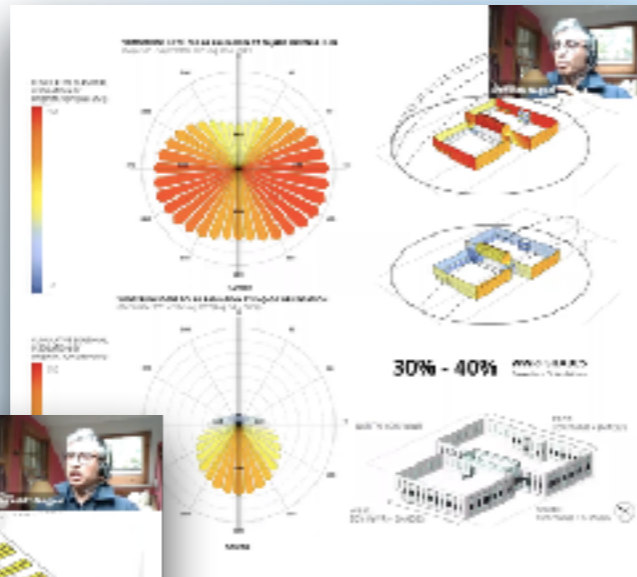
ALSO OUTDOOR AIR COOLED MODULAR HEAT PUMP, HOT & COLD BUFFER TANKS, STAGED PUMPING, ENTHALPY HEAT RECOVERY, DEMAND CONTROL VENTILATION USING AN AIR COOLED **DOAS**, DECOUPLED FROM WATERSIDE SYSTEMS. DEDICATED FABRIC VENTILATION DUCTS DELIVER ABOUT 0.15 CFM/SF, CONSTANT VOLUME.

ASHRAE SOLAR & SHADING

ENVELOPE IMPROVEMENTS INCLUDED EXTERIOR INSULATION, REDUCE WINDOW-TO-WALL RATIO FROM 70% TO 40%, WINDOW SHADES, ADDING A ROOF TO A LARGE 'HOT HOUSE' ATRIUM BETWEEN THE TWO WINGS OF THE COMPLEX, OTHER MEASURES.

THE DESIGN MET MOST OF ITS GOALS, OPTIMIZED THE AMOUNT OF ROOFTOP SOLAR THAT COULD BE INSTALLED. TO HIT NET-ZERO THE ROOFTOP COULD SUPPLY ABOUT 17/19 OF THE REQUIRED ENERGY, SO IT WILL BE SUPPLEMENTED BY SOME GROUND MOUNTED SOLAR CARPORTS IN THE PARKING LOT.

“WE WANTED TO DEMONSTRATE A REPLICABLE PROCESS FOR RETROFITTING MID-CENTURY BUILDING TO A HIGH PERFORMANCE BUILDING, AND SHOW THAT YOU CAN TAKE A LEAKY BUILDING AND GET IT TO NET ZERO.”



THANKS FOR INFORMATION FROM STANTON STAFFORD, SHRESHTH NAGPAL AND GREG WALKER.

FOR YOUR REFERENCE

RESOURCE SCREENS

CITY OF VANCOUVER

RETROFITS

GOAL TO CUT 50% GREENHOUSE GAS FROM SPACE HEAT & HOT WATER FROM EXISTING BUILDINGS BY 2030 HAS MEANT POLICY CHANGES, CODE CHANGES, INCENTIVES

ROUGHLY 2000 HOMES TO BE RETROFIT TO ZERO EMISSIONS EACH YEAR

CURRENTLY, EXISTING BUILDINGS: ANY RENOVATION EXCEEDING \$25K MUST GET ENERGY ASSESSMENT, MUST UPGRADE ATTIC INSULATION AND BETTER AIR TIGHTNESS.

FINANCIAL INCENTIVES \$12K REBATE FROM CITY & BC HYDRO UP TO 80% OF COST IF YOU REPLACE FOSSIL FUEL SYSTEM (GAS OR OIL) WITH HEAT PUMP

MUST BE COLD CLIMATE HEAT PUMP EG MITSUBISHI

IT'S EARLY DAYS BUT CITY IS UP TO 75 PROJECTS REGISTERED SINCE OCTOBER 2020. DOING SOME CASE STUDIES ON FUEL SWITCHING TO HELP PROMOTE PROGRAM

NEW CONSTRUCTION

“COUNCIL PREVIOUSLY REQUESTED NEW HOUSING TO BE ZERO EMISSION SPACE HEAT & HOT WATER BY 2025 WE ARE DELIVERING ON THE GOAL BY 2022, THREE YEARS AHEAD OF SCHEDULE.”



CHRISTOPHER A HIGGINS
GREEN BUILDING PLANNER
CITY OF VANCOUVER

CITY OF VANCOUVER

TRAINING FOR INSPECTORS

SENT 10+ INSPECTORS TO PASSIVE HOUSE COURSE
THEY STILL HAVE TO WRITE EXAMS
AIR SOURCE, HYDRONIC SYSTEMS, GEOTHERMAL

BC HYDRO DOING TRAINING FOR
'PROGRAM REGISTERED CONTRACTORS'

BUSINESS CASE ELEMENTS

FOR PRESENTATIONS TO COUNCILS

- COST OF UNDERTAKING AN ACTION OR PROGRAM
- COST OF INACTION EG. RETROFIT COST LATER
- ANNUAL COST IN CARBON TAX
- ANNUAL EMISSIONS
- RETROFIT PROGRAM COST
- INCENTIVE OFFSETS IMPACT



CHRISTOPHER A HIGGINS
GREEN BUILDING PLANNER
CITY OF VANCOUVER

REFERENCE SCREENS

WHY DO RETROFITS MATTER?

- REGULATING NEW CONSTRUCTION IS IMPORTANT, BUT WE ONLY REPLACE ABOUT 3% OF BUILDING STOCK ANNUALLY.

- WE MUST ADDRESS EXISTING BUILDINGS.

- ROCKY MOUNTAIN INSTITUTE ESTIMATES 4-5 MILLION BUILDINGS IN NORTH AMERICA MUST BE RETROFITTED EVERY YEAR FOR 10 YEARS TO MEET PARIS TARGETS.



- CANADA: HUNDREDS OF THOUSANDS OF BUILDINGS, TENS OF THOUSANDS OF GOVERNMENT BUILDINGS, THOUSANDS OF AFFORDABLE HOUSING & SOCIAL HOUSING BUILDINGS.

REFERENCE SCREENS

HARVARD: “OLD BUILDINGS ARE THE BIGGEST CHALLENGE”



“THE VAST MAJORITY OF OUR CURRENT BUILDING STOCK WILL STILL BE IN PLACE IN 2030 — THE CURRENT TIMEFRAME IDENTIFIED TO MAKE SIGNIFICANT PROGRESS TOWARD CLIMATE COMMITMENTS. THIS IS ESPECIALLY TRUE IN THE COMMERCIAL BUILDINGS MARKET, SPECIFICALLY LARGE COMMERCIAL BUILDINGS, WHERE WELL OVER 75 PERCENT OF EXISTING BUILDINGS WILL STILL BE IN USE...”

[HTTPS://HBR.ORG/2016/01/OLD-BUILDINGS-ARE-U-S-CITIES-BIGGEST-SUSTAINABILITY-CHALLENGE](https://hbr.org/2016/01/old-buildings-are-u-s-cities-biggest-sustainability-challenge)

REFERENCE SCREENS

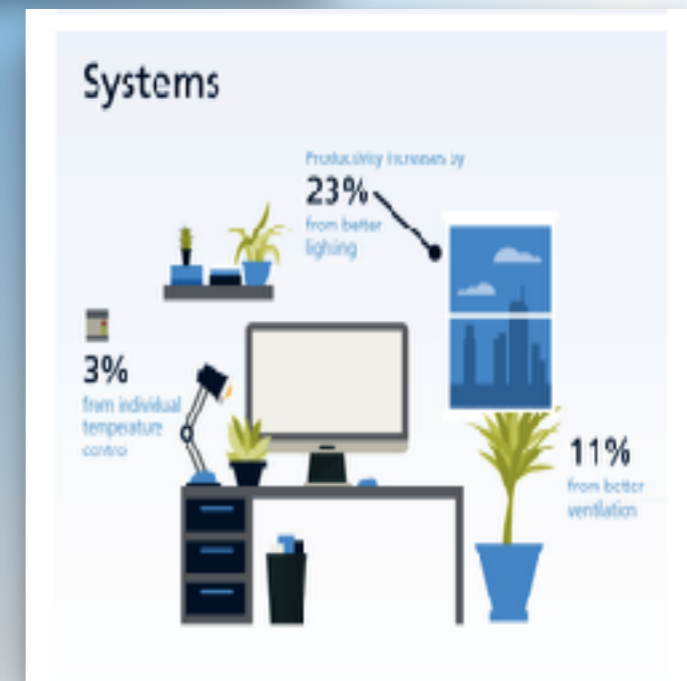
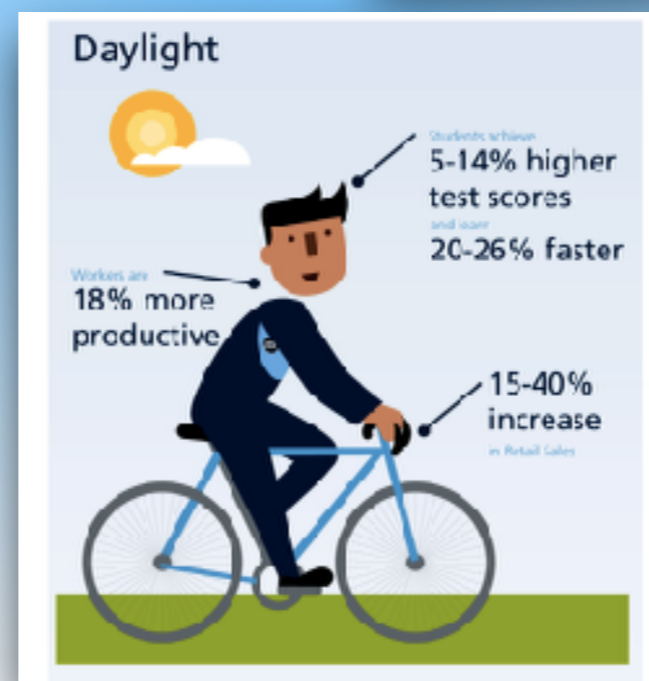
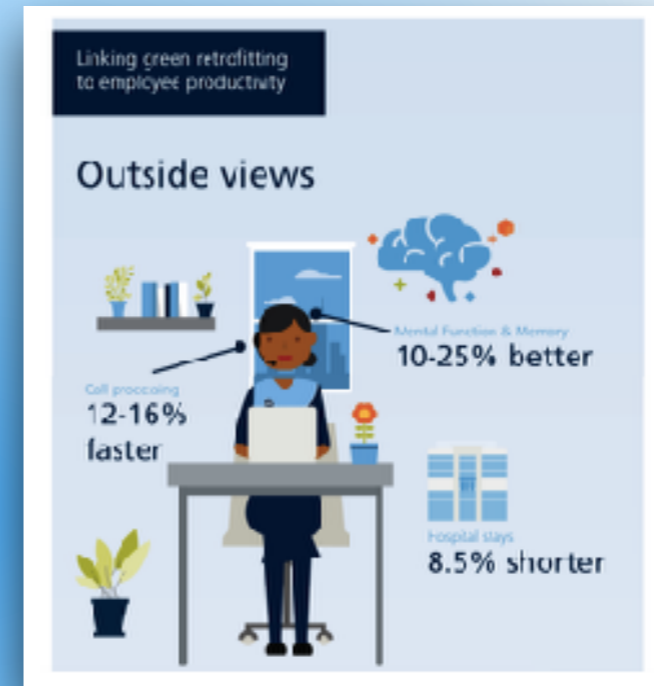
BETTER OUTCOMES - OFFICE BUILDINGS

CORPORATE TENANTS

- ENERGY & WATER SAVINGS
- EMPLOYEE HEALTH, COMFORT & WELLBEING
- PRODUCTIVITY
- ATTRACT & RETAIN TALENT

BUILDING OWNER/OPERATORS

- PROPERTY VALUE
- OCCUPATION LEVELS
- BRAND ENHANCEMENT



REFERENCE SCREENS

WITH ENERGY THE BUILDING ENVELOPE IS CRITICAL



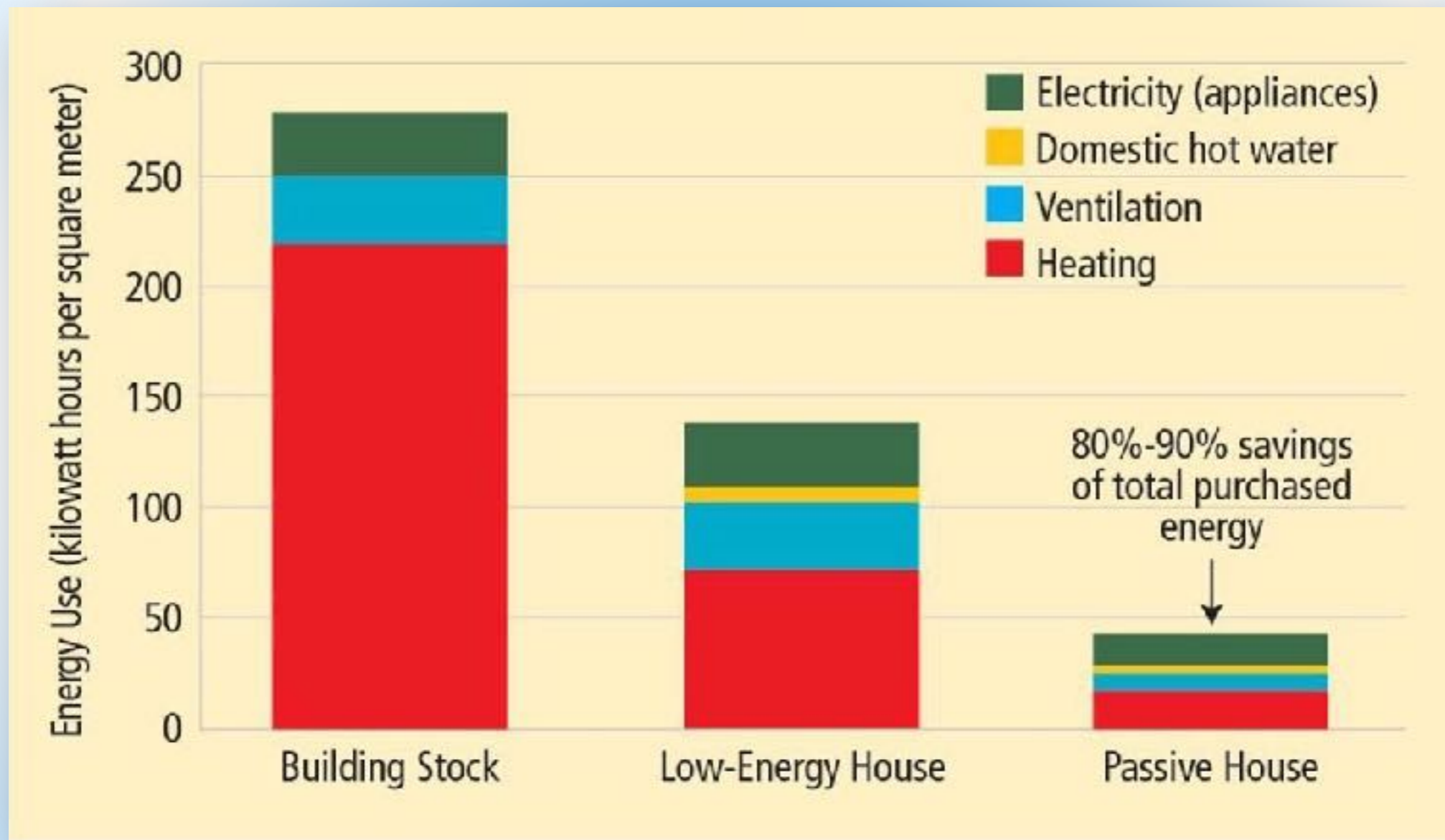
ENERGY DOES NOT GET "USED UP"
ENERGY LEAKS OUT



TIGHT BUILDING ENVELOPES
MAKE EVERYTHING ELSE EASIER.

REFERENCE SCREENS

TINY ENERGY LOADS INCREASE TECH OPTIONS LOW LOAD, LOW TEMPERATURE



Numerous clean energy low load options: Air source heat pumps, energy recovery ventilators, VRF, ground source, earth tubes, radiant, chilled beams, small hydronic coils, with everything powered by renewables & batteries.

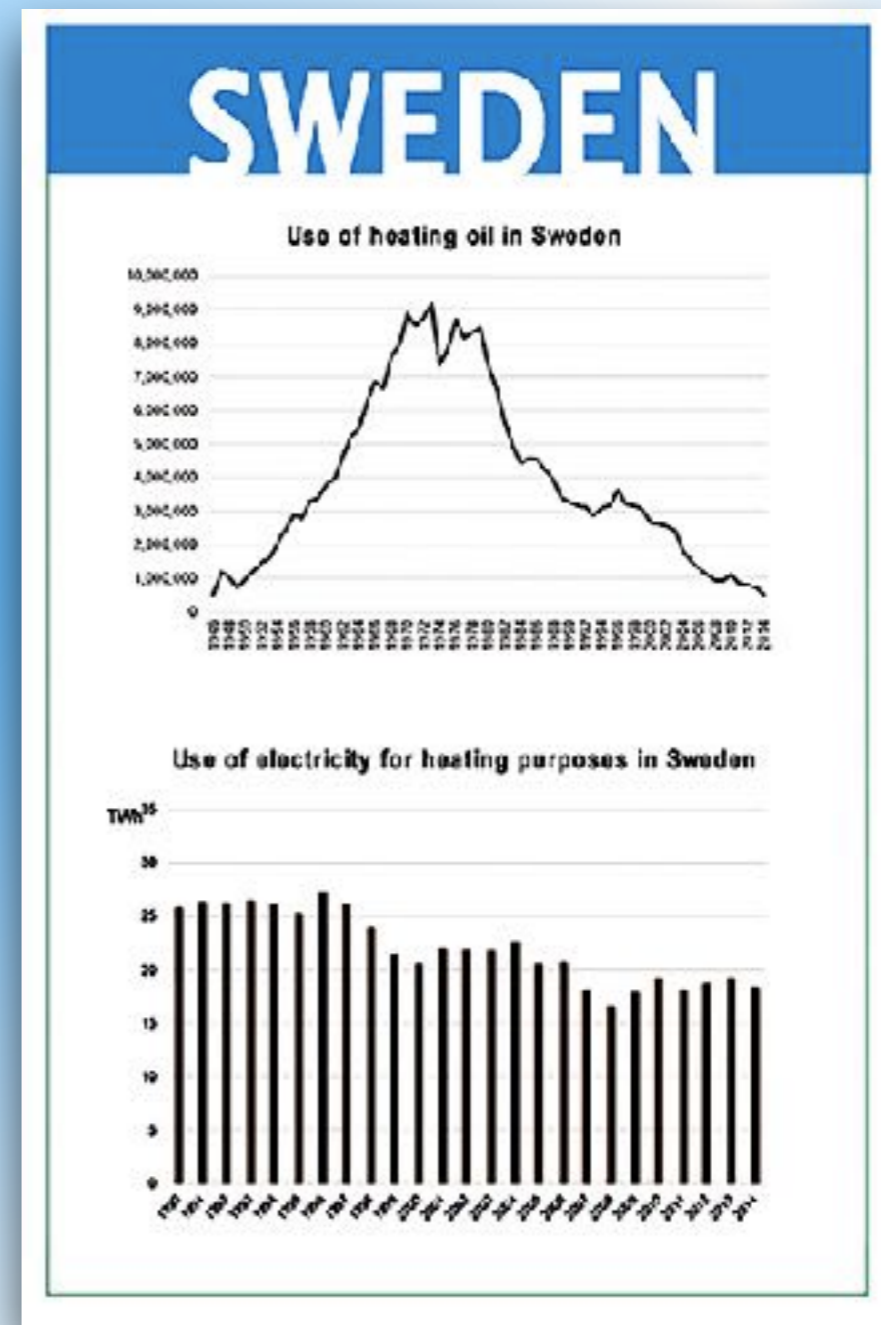
REFERENCE SCREENS

SWEDEN: WIDESPREAD HEAT PUMP ADOPTION



- IN CANADA THE GAS INDUSTRY HAS SUGGESTED THAT WIDESPREAD ADOPTION OF HEAT PUMPS COULD OVERWHELM THE GRID. UNLIKELY.
- IN 1975 SWEDEN WAS USING MORE THAN 9,000,000 CUBIC METRES OF HEATING OIL. BY 2014 THIS HAD DROPPED TO ABOUT 500,000 (94.5% REDUCTION).

ELECTRICITY USE DID NOT INCREASE. IT WENT DOWN NEARLY 30%, HELPED PARTLY BY IMPROVING HEAT PUMP EFFICIENCIES, REPLACEMENTS OF ELECTRIC RESISTANCE, ETC.



REFERENCE SCREENS

BETTER HEALTH

Study: Health Outcomes and Green Renovation of Affordable Housing 2011

US National Library of Medicine

Results

Adults reported statistically significant improvements in overall health, asthma, and non-asthma respiratory problems. Adults also reported that their children's overall health improved, with significant improvements in non-asthma respiratory problems. Post-renovation building performance testing indicated that the building envelope was tightened and local exhaust fans performed well. New mechanical ventilation was installed (compared with no ventilation previously), with fresh air being supplied at 70% of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers standard. Radon was <2 picocuries per liter of air following mitigation, and the annual average indoor carbon dioxide level was 982 parts per million. Energy use was reduced by 45% over the one-year post-renovation period.

Conclusions

We found significant health improvements following low-income housing renovation that complied with green standards. All green building standards should include health requirements. Collaboration of housing, public health, and environmental health professionals through integrated design holds promise for improved health, quality of life, building operation, and energy conservation.

Low-income families are more likely to encounter environmental health and safety hazards in their homes and communities and are, therefore, disproportionately affected by environmental diseases.^{1,2} Low-income children are eight times more likely to suffer from lead poisoning,³ and childhood asthma rates are higher in low-income communities.⁴ Housing affects health directly and indirectly, and the burden of housing-related diseases and injuries is substantial.⁵ Physical, chemical, and biological exposures in the home that produce adverse health outcomes and associated housing interventions have been reviewed elsewhere.^{6–9} Data are needed to elucidate the complex links between health, buildings, and communities to enable building owners, community planners, and others to more confidently implement health-based housing interventions. This study sought to determine whether renovating low-income housing using green and healthy principles improved resident health and building performance.

[HTTPS://WWW.NCBI.NLM.NIH.GOV/PMC/ARTICLES/PMC3072905/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3072905/)

[Public Health Rep.](#) 2011; 126(Suppl 1): 64–75.
doi: [10.1177/00333549111260S110](https://doi.org/10.1177/00333549111260S110)

REFERENCE SCREENS

PASSIVE HOUSE & GREEN TECHNOLOGY IS CLEAN

PASSIVE HOUSE

- SUPER-INSULATION
- DOUBLE OR TRIPE PANE WINDOWS
- DESIGNED FOR SOLAR GAIN MANAGEMENT
- ALL ENERGY LEAKS SEALED
- AIR SOURCE HEAT PUMPS
- ENERGY RECOVERY VENTILATORS
- OR VRF, OR HYBRID CLEAN HVAC DEVICES

GREEN

- SMART THERMOSTATS
- SOLAR PV
- LOW ENERGY APPLIANCES & LIGHTING
- LOW FLOW PLUMBING
- WATER HEAT RECOVERY
- HEAT PUMP WATER HEATERS
- SOLAR THERMAL FOR WATER INTENSE PROJECTS



REFERENCE SCREENS

LOW CARBON BUILDINGS ASSISTANCE rdh.com



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NEW BUILDINGS

ENERGY & SUSTAINABILITY

EXISTING BUILDINGS

HISTORIC BUILDINGS

FAÇADE STRUCTURAL ENGINEERING

BUILDING SCIENCE LABORATORIES

Making Buildings Better™

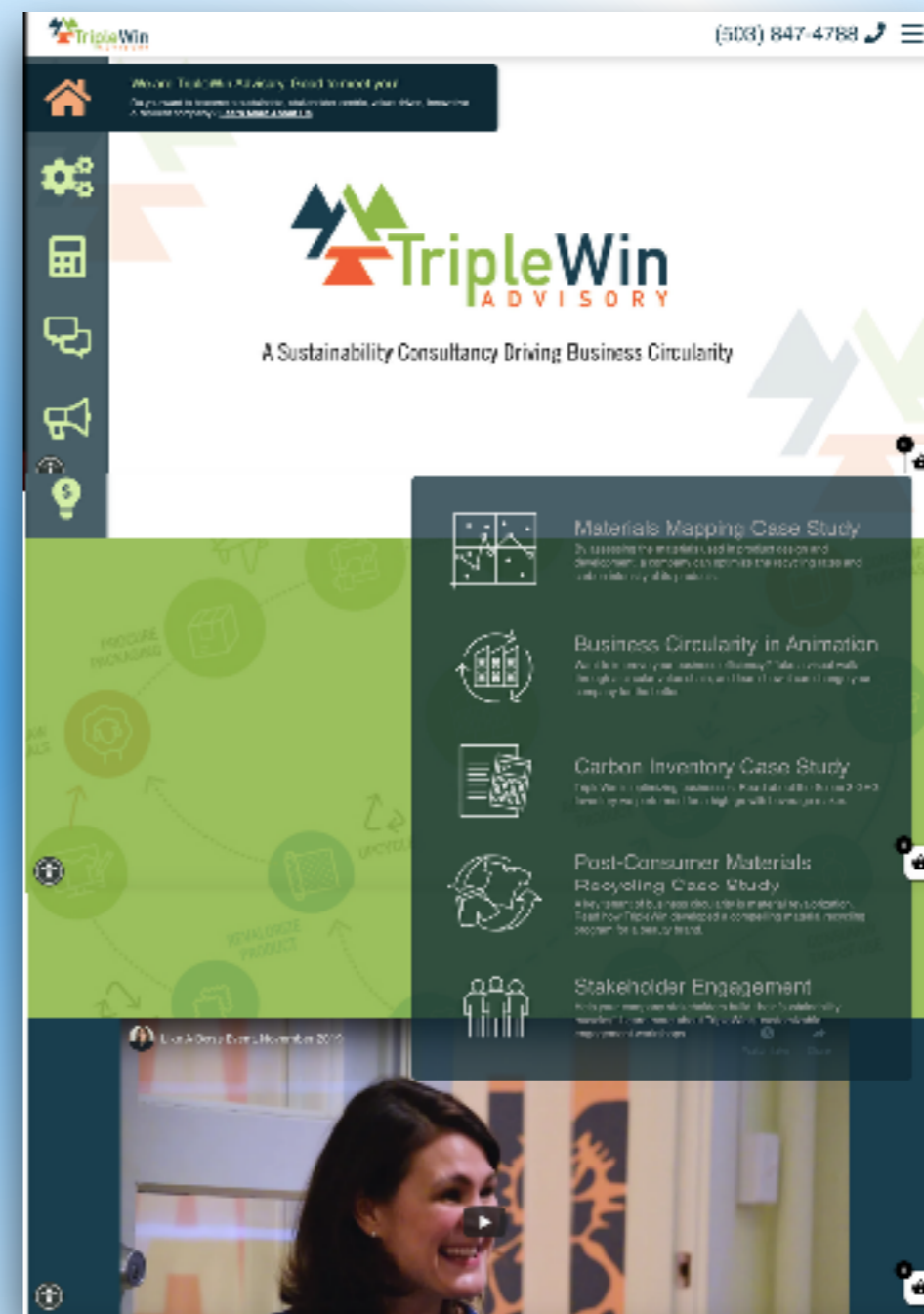
For over 20 years, RDH has continued to lead change in making buildings better through the integration of science, design, and construction expertise.



CONSULTANTS



FOR GOVERNMENT ORGANIZATIONS
<https://climatesolutiongroup.com/>



FOR BUSINESSES
<https://triplewinadvisory.com/>

VANCOUVER RETROFIT EXAMPLE PROJECTS

COMBINED COMFORT SYSTEMS (CCS) OF VANCOUVER IS DOING DOZENS OF GAS-TO-HEAT PUMP PROJECTS EVERY MONTH IN SMALL HOUSES, LARGER HOUSES AND BUSINESSES

HEATHE THOMPSON:

“CURRENTLY UNTIL MARCH 31
CITY \$6000 PLUS \$6000 PROVINCIAL UTILITY
AFTER MARCH CITY \$6000 PLUS 3000 PROVINCIAL UTILITY

FOR SINGLE FAMILY HOMES
PROJECT COST IS ABOUT \$16000+
HOMEOWNER GETS \$12000 BACK

NORTH VAN \$6000 + \$3000 = \$9000
WEST VAN \$6000 + \$2000 = \$8000
LANGLEY \$6000 + \$2000 = \$8000

HEAT PUMP WATER HEATERS ARE ALSO INCENTIVIZED.”

“OUR CUSTOMERS ARE SOME OF
THE MOST INTELLIGENT PEOPLE WE KNOW.
THEY ARE DOING HOMEWORK AND RESEARCH.
OTHER CONTRACTORS, OUR COMPETITORS, NOT SO MUCH.”



HEATHE THOMPSON,
CCS VANCOUVER
HEAT PUMP
SPECIALIST

VANCOUVER BAKERY RETROFIT EXAMPLE

“THE BAKERY IS SAVING THOUSANDS ON FUEL.
WHILE OTHER BAKERIES ARE GOING UNDER.
PUREBRED HOPES TO CONTINUE EXPANDING”

INSTALLATION:

WALL MOUNT HEAT PUMP UNITS SIMILAR TO MINI SPLITS
BUT CONNECTED TO LARGER HEAT PUMP SYSTEMS
2 UNITS ON ROOF AT 10 TONS EACH & 7 INDOOR HEADS
PLUS ERVS FOR 100% FRESH VENTILATION



VICTORIA SINGLE FAMILY HOME

NEW YORK COUPLE MOVED TO VICTORIA, BC TO RETIRE.
PURCHASED 4400 SQ FT 1902 HOME CONTAINING AN
OLD OIL TANK.

THE HOUSE HAD BEEN RENOVATED SEVERAL TIMES
OVER THE YEARS, BUT STILL VERY LEAKY. TARGET WAS
NET-ZERO, THEY DID BETTER, REACHED ENERGY POSITIVE.

ITS ORIENTATION MADE EXTENSIVE USE OF ROOFTOP SOLAR
A GOOD OPTION - ABOUT 11 KILOWATTS

OTHER IMPROVEMENTS INCLUDE NEW ROCKWOOL
INSULATION & WINDOWS, HEAT PUMPS & HEAT RECOVERY
VENTILATOR, HEAT PUMP WATER HEATER, LED LIGHTING
& ENERGY STAR APPLIANCES



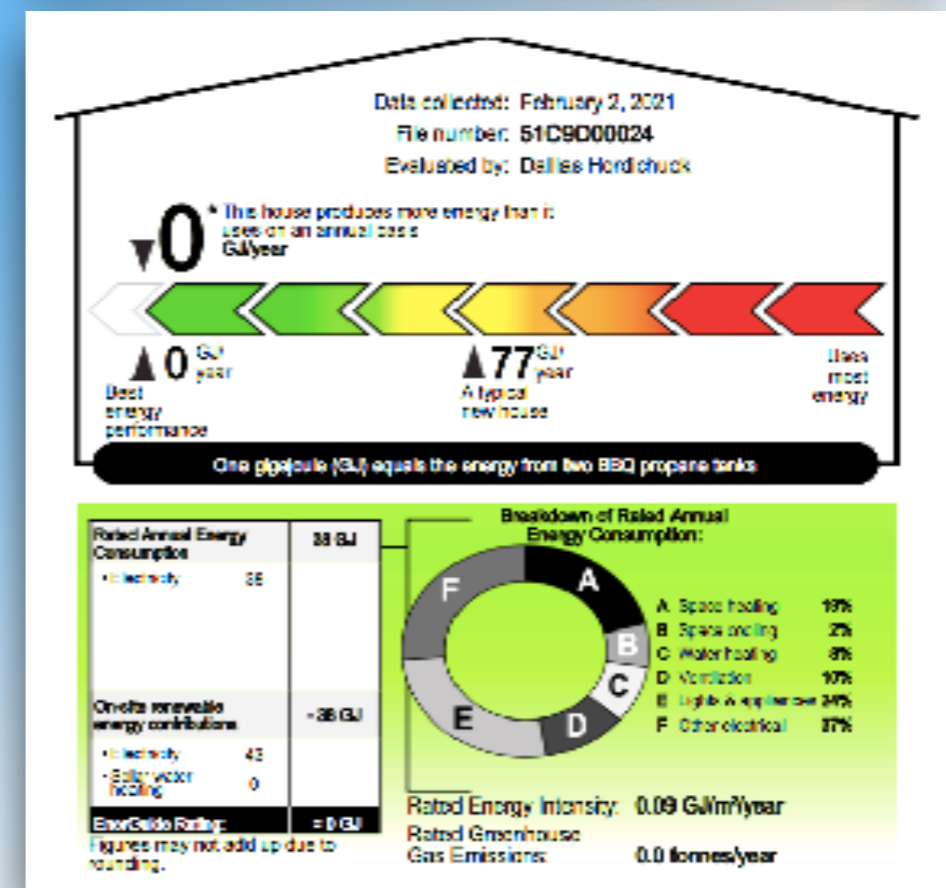
VICTORIA SINGLE FAMILY HOME

QUALIFIED FOR \$12,200 IN REBATES RELATED TO HEAT PUMPS, UPGRADED ELECTRIC SERVICE, WINDOW UPGRADES, INSULATION IMPROVEMENTS.

ALSO SAVED ON GROUP PURCHASING DISCOUNTS AND PAYMENTS FOR EXCESS POWER GENERATION.

A TYPICAL HOME OF THIS SIZE USES 77 GIGAJOULES (GJ). AFTER RENOVATIONS THE LOAD FOR THIS HOUSE WAS 38 GJ AND THE SOLAR ARRAY GENERATES 43 GJ OR 110% OF THE NEEDED POWER.

THANKS FOR INFORMATION PROVIDED BY MARK BERNHARDT & TAYLOR MCCARTHY



VICTORIA SINGLE FAMILY HOME

MECHANICAL SYSTEMS

SPACE HEATING

BACKUP SYSTEM

TYPE	OUTPUT SIZE	EFFICIENCY
Electric baseboard	5 kW 17500 BTU/h	100% Steady State
Mini-split air-source heat pump	5 kW 17500 BTU/h	10.1HSPF
Advanced airtight wood stove	2 kW 7000 BTU/h	30% Steady State

Design heating load: 4.59 kW – refer to glossary for details

SPACE COOLING

TYPE	OUTPUT SIZE	EFFICIENCY
Mini-split air-source heat pump	5 kW 17500 BTU/h	15.8 SEER

Design cooling load: 3.58 kW

WATER HEATING

TYPE	TANK VOLUME	EFFICIENCY
Integrated heat pump	246L (65 USG)	0.92 EF

WHOLE-HOME VENTILATION

TYPE	AIR FLOW RATE	EFFICIENCY
Heat recovery ventilator	50.03 L/s (106 cfm)	84%



**DESI PLEASE SWITCH TO
CHRIS HIGGINS,
CITY OF VANCOUVER**



Deep energy retrofits
New York, Vancouver & more

QUESTIONS?

Feb 25th 2021 | 2:00 PM - 3:00 PM ET
BRUCE (BF) NAGY



**Clean Air
Partnership**

CLIMATE SOLUTIONS WEBINAR SERIES





Clean Air Partnership

CLIMATE SOLUTIONS WEBINAR SERIES



ELECTRIC FLEET VEHICLES



GEOTHERMAL FOR SCHOOLS

ENGINEER DUFRANETTE & MOSE, LOCAL SCHOOL DISTRICTS DIRECTOR



MICROGRIDS & BATTERIES



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- Electrified buses, trolleys and inner-city transit planning
- Carbon accounting for governments & businesses
- Sewage heat recovery & community energy

THANK YOU

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