

CLEAN ENERGY SOLUTIONS



AGENDA

OUR CLIMATE
CRISIS

A FEW
MINUTES

SOLUTIONS
& SUCCESS STORIES

ABOUT
40 MINUTES

QUESTIONS
& DISCUSSION

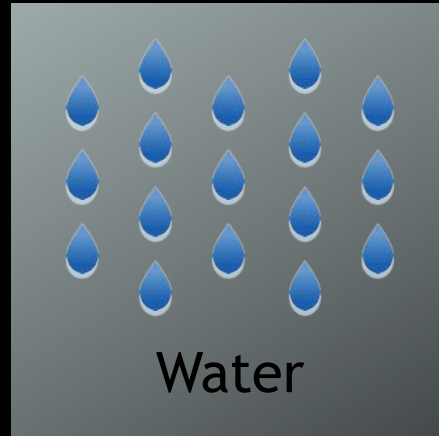
10-15
MINUTES



THE CRISIS



PROBLEM SUMMARY



POLES & GLACIERS MELTING FASTER THAN EVER

FIRES, DROUGHT, INTENSE WEATHER, FLOODING

GULF STREAM & OTHER CURRENTS DISRUPTED

COASTAL CITIES &

COASTAL NUCLEAR PLANTS UNDER WATER

DEFORESTATION & SPECIES EXTINCTION,

INCLUDING POLLINATORS

WATER SHORTAGES, FOOD SHORTAGES

DISEASE PANDEMICS, SOCIAL INSTABILITY,

ECONOMIC COLLAPSE

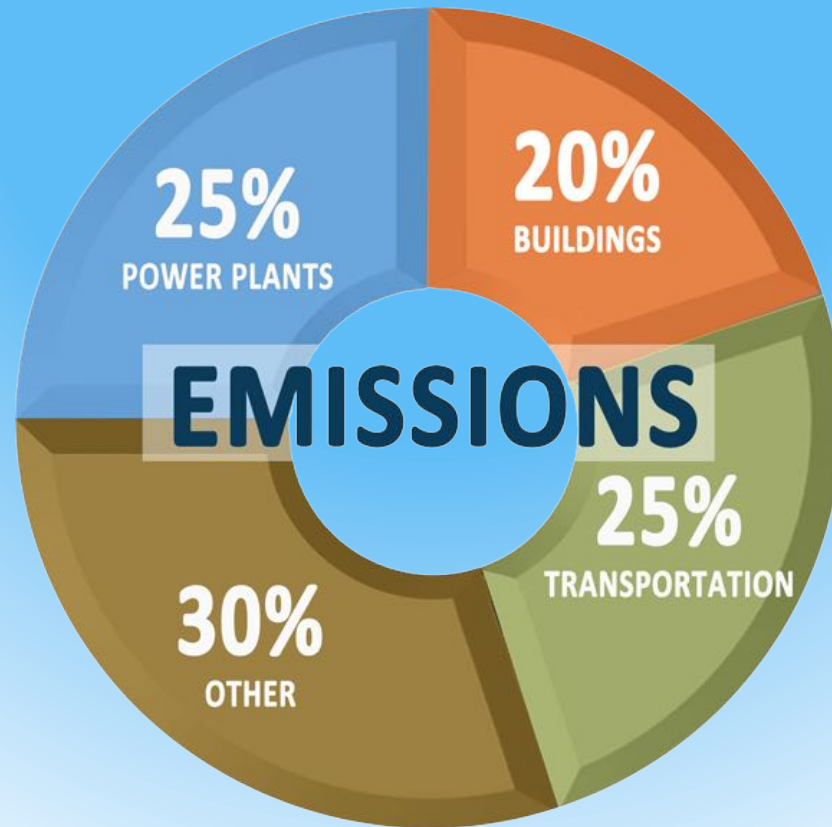
OUR CHILDREN



2000+
SCHOOL
STRIKES
IN 125
COUNTRIES



SOLUTIONS & PRIORITIES



SIMPLIFIED BREAKDOWN OF GLOBAL CO2 EMISSIONS
BASED ON INTERNATIONAL ENERGY AGENCY DATA

SOLUTIONS & PRIORITIES



BUILDINGS

YOUR HOME OR ORGANIZATION'S BUILDINGS



TRANSPORTATION

YOUR RIDE - ELECTRIC VEHICLES FOR INDIVIDUALS & FLEETS



POWER PLANTS & TRANSIT

YOUR VOTE & YOUR ORGANIZATION'S ACTIVITIES

CHANGING WORLD



**INDIANA: COAL CAPITAL
CHOOSES RENEWABLES**



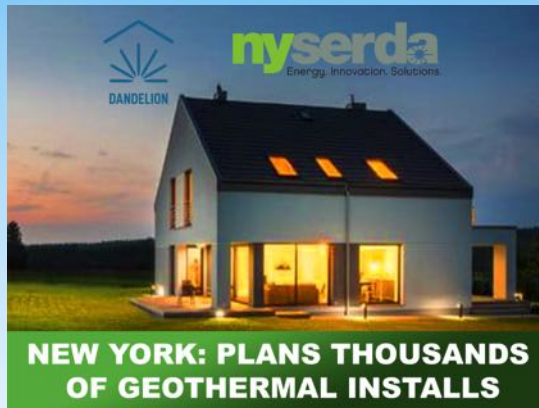
**ILLINOIS: WILL LIKELY
CLOSE 11 NUCLEAR REACTORS**



**TEXAS: WIND LEADER
WITH 13,000 TURBINES**



**HAWAII: SOLAR ON
10% OF ROOFTOPS**



**NEW YORK: PLANS THOUSANDS
OF GEOTHERMAL INSTALLS**



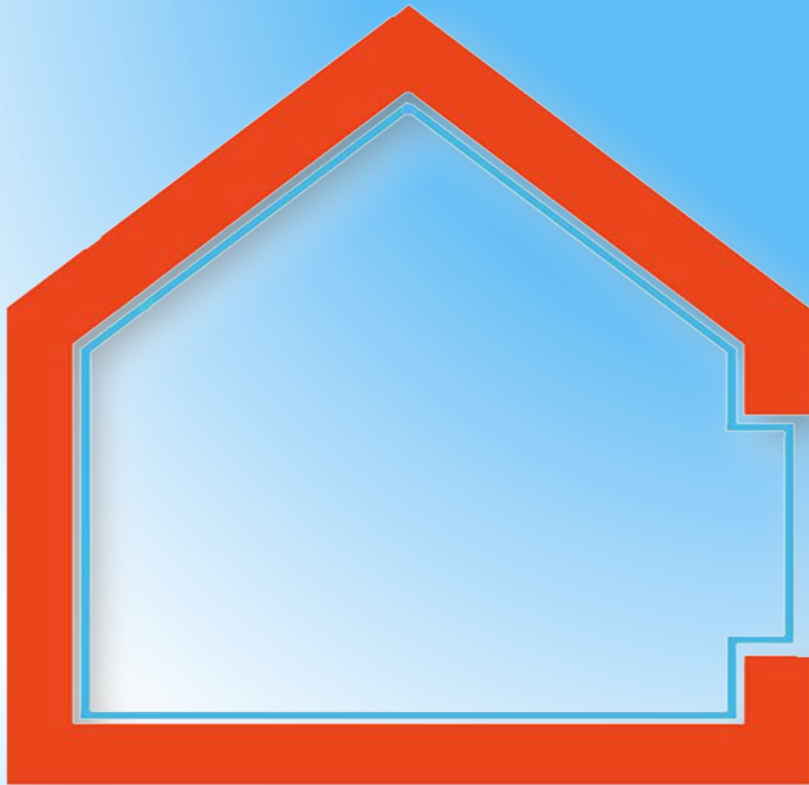
**GLOBALLY: EVs
3M TO 30M BY 2030**

**ECONOMICS ARE NOW WITH US & CHANGE IS HEADING IN THE RIGHT DIRECTION
BUT WE NEED FAR MORE MOMENTUM**

THE PASSIVE HOUSE STANDARD WHY IS IT IMPORTANT?



WITH ENERGY THE BUILDING ENVELOPE IS CRITICAL



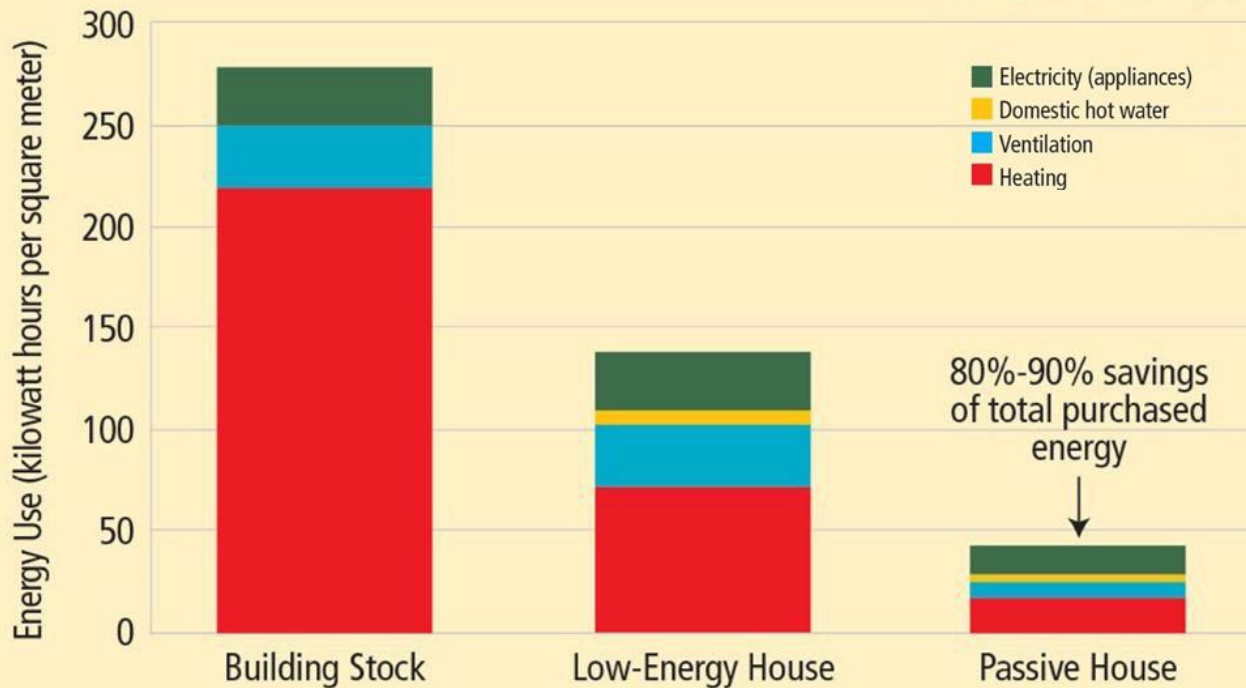
ENERGY DOES NOT GET “USED UP”

ENERGY LEAKS OUT

WHEN THE BUILDING ENVELOPE
IS DONE CORRECTLY, EVERYTHING
ELSE IS FAR EASIER.

TINY ENERGY LOADS INCREASE TECH OPTIONS

Passive House Reduces Energy Used by **80-90%**



ELECTRIFIED BUILDINGS



AIR SOURCE HEAT PUMPS & SMALL COILS
ENERGY RECOVERY VENTILATORS
SOLAR & GEOTHERMAL



ELECTRIFICATION IS MORE AFFORDABLE

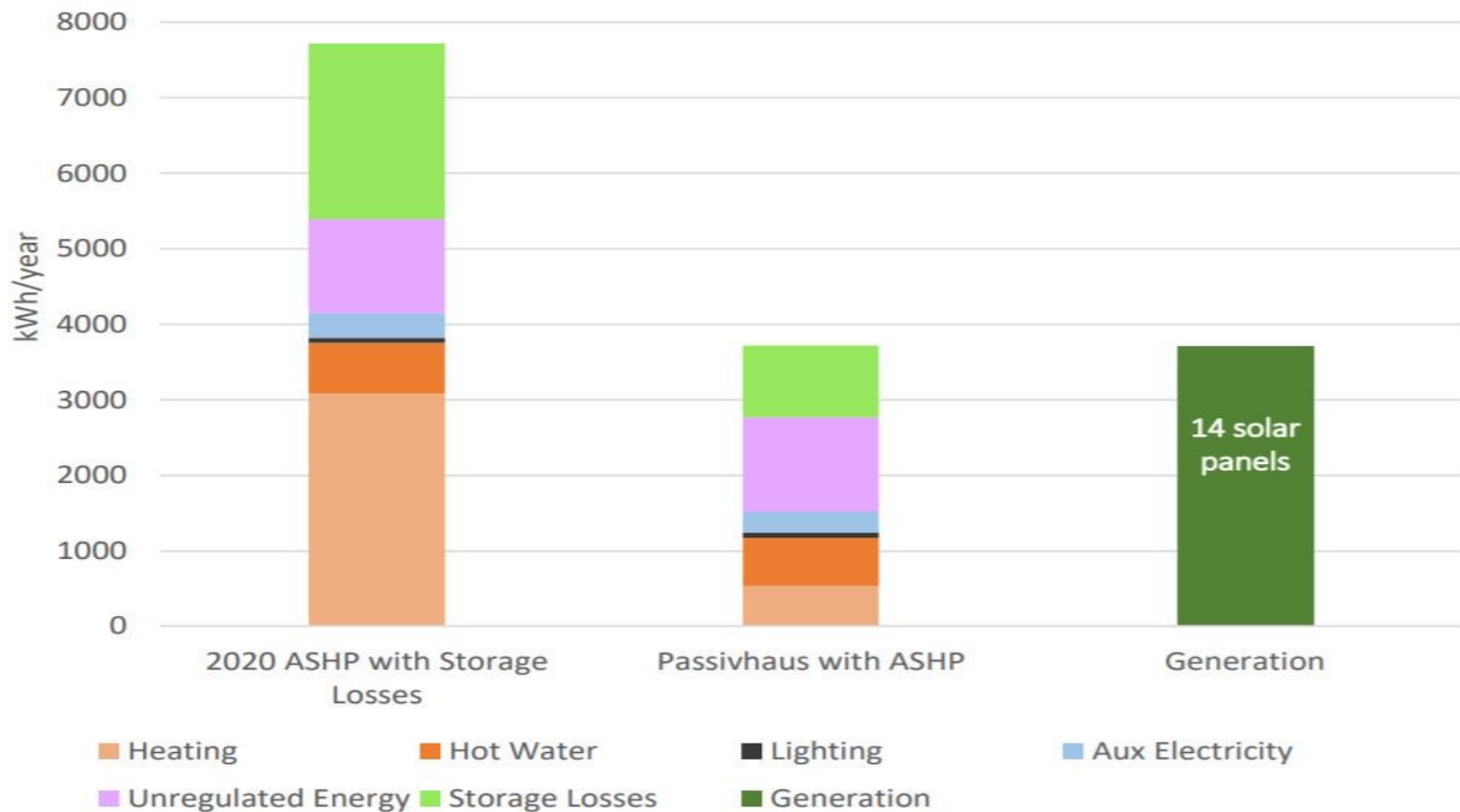


Figure 4 - Average new build energy demand vs Passivhaus

ONTARIO PASSIVE HOUSES



GODERICH



MINDEN



COLLINGWOOD

WESTERN CANADA



VANCOUVER



CALGARY



VICTORIA, BC



SASKATOON



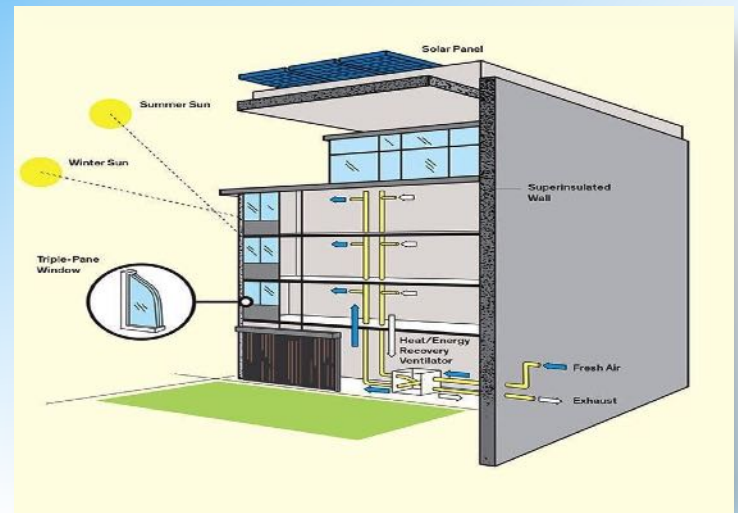
SASKATOON

AMERICA



USA

HOW DOES IT WORK



OUTSIDE NORTH AMERICA



中国



CHINA

TOKYO



JAPAN

DEUCLAND



GERMANY

EUROPE



SPAIN & FRANCE

UNITED KINGDOM



UK

SINGAPORE & AUSTRALIA



PACIFIC

HIGH RISE



BIG

HIGH RISE



HAMILTON RETROFIT

HIGH RISE RETROFIT – NOT PH



EMPIRE STATE BUILDING

TONY MALKIN

\$4.4 M YEAR SAVINGS

\$13 M INVESTED

53 OTHER BUILDINGS

PASSIVE HOUSE AFFORDABLE

UNITS: 26, 42, 57 AND 65
RESPECTIVELY

RANGE FROM ZERO TO 9%
UP FRONT CONSTRUCTION
COST PREMIUM

OPERATING COST
IS 25%-45% !



HVAC TECH: PASSIVE HOUSE, AIR SOURCE HEAT PUMPS,
ENERGY RECOVERY VENTILATORS, SMART THERMOSTATS

OTHER: SOLAR, LOW ENERGY APPLIANCES & LIGHTING, LOW FLOW PLUMBING.

OTHER MUNICIPAL PH

GERMANY POOL, VERMONT
SENIORS RESIDENCE, SURREY
COMMUNITY CENTRE, PITTSBURG
SENIORS

POOLS & HOT TUBS HUGE
SAVINGS WITH PASSIVE HOUSE
& WITH SOLAR THERMAL



FUTURE

MULTI-FAMILY:
PASSIVE HOUSE PRE-FAB

REMOTE: PASSIVE HOUSE
PRE-FAB OFF GRID



SIDEWALK LABS TORONTO



GOOGLE/ALPHABET/WATERFRONT
CONTEMPORARY COMMUNITY
3,000+ RESIDENTIAL UNITS FUTURISTIC
URBAN HIGH TECH

LOW CARBON MICROGRID



HEATING/COOLING/ENERGY OPTIONS:

- PASSIVE HOUSE / AIR SOURCE HP
- GEOSOURCE & DEEP WATER COOLING
- DEEPWATER RETURN-SIDE HEATING
- SEWAGE HEAT RECOVERY
- SOLAR PV, STORAGE & SMART MICROGRID
- 'RAIN COATS'
- SNOW-MELT

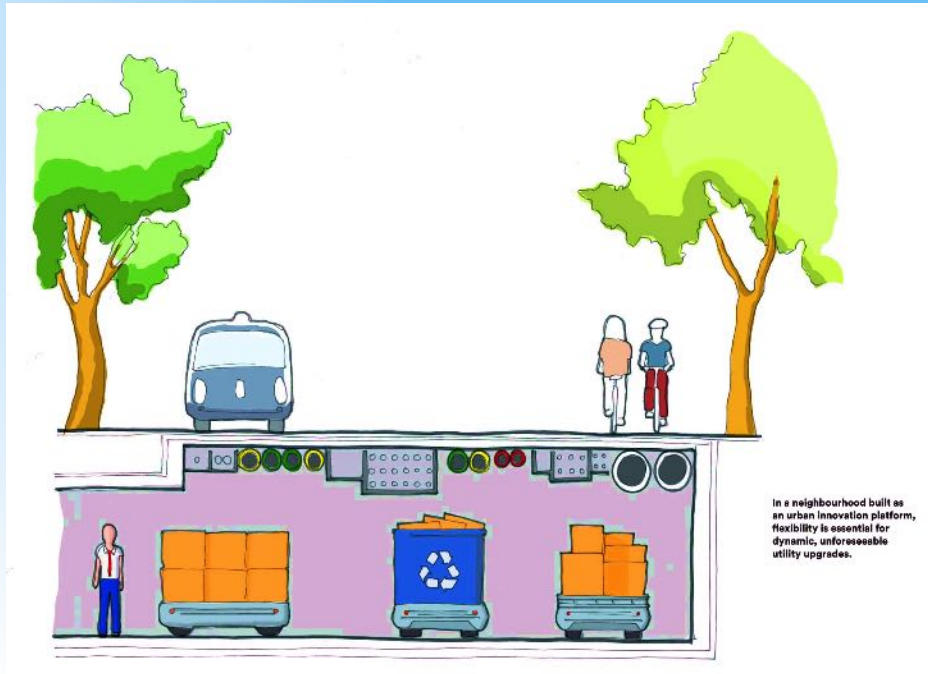
SIDEWALK LABS TORONTO



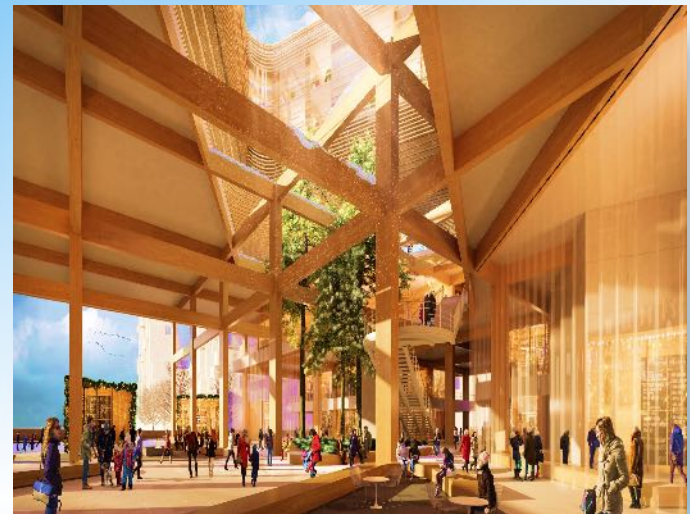
HEATED STREETS WITH 'FLOOR PLATES'

STREET LANE DIODES FOR REAL TIME TRAFFIC MANAGEMENT

SIDEWALK LABS TORONTO



SENSORS, ANALYTICS, CONTROLS
UNDERGROUND CITY FOR
ROBOTIC WASTE MANAGEMENT
AI & IOT



GEOHERMAL COMMUNITIES



EDMONTON'S NEW BLATCHFORD CARBON NEUTRAL COMMUNITY

217-HECTARE 30,000 PEOPLE

GEOHERMAL, SOLAR, DRAIN WATER HEAT RECOVERY,

100% RENEWABLE POWER

GEO THERMAL COMMUNITIES



LULU ISLAND IN RICHMOND, BC GEO THERMAL COMMUNITY STARTED 2014
5 PHASES ELIMINATING 2340 TONNES OF GHG EMISSIONS
3100 RESIDENTIAL UNITS, A WAL-MART, OTHER RETAIL,
INSTITUTIONAL & DAYCARE. 385 BOREHOLES 250' DEEP.

GEOHERMAL IN SCHOOLS

QUEBEC SCHOOLS

SAVE \$18M

DROPPING FOSSIL FUELS

SAMARES SCHOOL BOARD

52 SCHOOLS

GEOHERMAL, SOLAR,
& CERAMIC THERMAL STORAGE



ENGINEERING FIRM SIGNS CONTRACT FOR GUARANTEED ENERGY SAVINGS
& ONGOING MAINTENANCE

SAME KIND OF CONTRACT FOR 3 LAVAL HOSPITALS, BIODOME &
OLYMPIC STADIUM MODERNIZATION. USED FOR GOVT BLDGS IN COLORADO

SOLAR FOR SCHOOLS

TDSB (TORONTO)

SCHOOL BOARD

311 SCHOOLS

SOLAR PLUS NEW ROOFS

THIRD PARTY FINANCING

LEASEBACK/NET METER

SCHOOLS REDUCED EMISSIONS

MOST RECEIVED FREE ROOF REPLACEMENTS

SOME NEW ROOF PLUS ENERGY SAVINGS

AFTER 20 YEARS ALL SCHOOLS OWN SYSTEMS.



GEO THERMAL FOR CONDOS

THIRD PARTY
'UTILITY' MODEL

564 CONDOS
LILLIAN PARK IN
DOWNTOWN TORONTO

370 UNITS WESTWOOD
GARDENS
RICHMOND HILL

IMPROVES THE HEALTH
OF THE PLANET & FAMILIES.



GEO THERMAL FOR CONDOS

TORONTO ENGR FIRM/
QUEBEC FINANCIER
OWN, MAINTAIN & OPERATE
GEO SYSTEM

20 YEAR TERM
AFTER WHICH CONDO
ASSOC CAN BUY OUT

DEVELOPER: REDUCES CAPITAL
BUDGET & TECH UNCERTAINTY

FIRST-TIME BUYERS:
LOW, PREDICTABLE
MAINTENANCE FEES



CLEAN ENERGY FUNDING MODELS



1	Local Improvement Charge aka PACE LIC with GOVT backstop
2	Utility model aka Energy Service Agreement aka Guaranteed Energy Savings
3	Green bond Green bank Foundation
4	Modern bank loan with IREE from ICP
5	Government incentive eg Feed-In Tariff or energy upgrade
6	Many other bank & financial instruments/arrangements

LIC OR PACE PROGRAMS

HALIFAX
& 125 OTHERS

ZERO DOWN
10-YEAR LOAN
AT 4.75% INTEREST

UTILITY SAVINGS
COVER PAYMENTS

LOAN IS ON THE PROPERTY TITLE – NO EFFECT ON SELLING DECISIONS

NO BURDEN ON NON-PARTICIPATING TAXPAYERS



THIRD PARTY

KUAKINI MEDICAL CENTRE
212 BED HOSPITAL IN HONOLULU

\$5.8 MILLION CLEAN TECH HVAC
EQUIP OWNED BY AN INVEST CO/
ENGINEER FIRM

ENERGY SAVINGS
& MAINTENANCE GUARANTEED



HOSPITAL SAVES MORE ON POWER THAN THE PAYMENTS (\$1.1 M YR)
ZERO UP FRONT COST, ZERO RISK

IN MAINLAND USA: THIRD PARTY HOMEOWNER LEASEBACKS FOR SOLAR & GEO

MODERN BANK LOAN WITH IREE FROM ICP

INVESTOR READY
ENERGY EFFICIENCY
(IREE)

INVESTOR CONFIDENCE
PROJECT (ICP)



THIRD PARTY ENGINEERING PANEL VERIFIES PROJECT ENERGY SAVINGS, PROVIDES IREE CERTIFICATION

REDUCES BANK RISK AND THEY PROCESS LOAN BASED ON TRADITIONAL CREDITWORTHINESS

NY CITY FLEET VEHICLES



591 FULLY ELECTRIC VEHICLES (WITH HYBRIDS 1919)

690 CHARGE STATIONS, 86 SOLAR CARPORTS BY SEPT.

GHG OF ENTIRE FLEET CUT BY 50% BY 2025 (2000 FULLY ELECTRIC)

SAVING 80% ON FUEL, 65% ON MAINTENANCE

VANCOUVER FLEET VEHICLES



100 ELECTRIC VEHICLES NOW, 200 ELECTRICS BY 2021

50 HYBRID VEHICLES NOW

CUT EMISSIONS 70% BELOW 2007 BY 2023

ALSO: EFFICIENT DRIVING, VEHICLE RIGHT-SIZING, CAR SHARING.

ELECTRIC VEHICLE NEWS



RYDER	150
RYDER HAS ORDERED	500 MORE
NEW YORK CITY	591
NEW YORK CITY	2000 BY 2025
UPS	300
FRITO LAY	280
LA POLICE	100
VANCOUVER	100
DHL	45
PACIFIC GAS & ELECTRIC	HUNDREDS



ELECTRIC VEHICLE NEWS



ELECTRIC VEHICLE NEWS



ELECTRIC VEHICLE NEWS

TESLA SEMI
FRITO LAY 100
WALMART 50
LOBLAWS 20



TESLA FORCES THE ISSUE



FORD/RIVIAN & GM



RENEWABLE POWER



*According to *Renewable Capacity Statistics 2019* from the International Renewable Energy Agency (IRENA).

RENEWABLES NOW ACCOUNT FOR ONE-THIRD OF GLOBAL POWER CAPACITY.*

ABOUT HALF OF RENEWABLES COME FROM HYDRO, MOST OF THE OTHER HALF FROM WIND, SOLAR, GEO, & TIDAL.

ABOUT 84% OF NEW RENEWABLES IN THE PAST DECADE WERE WIND & SOLAR.

ELECTRICITY STORAGE

RENEWABLES / SMART GRID / MICROGRID / STORAGE



**UTILITY LOAD
MANAGEMENT**



**COMMUNITY
MICROGRIDS**



**LEAP-FROGGING
ECONOMIES**



**REMOTE
LOCATIONS**



**RESILIENT COMMUNITIES
& CAMPUSES**



**DC NETWORKS,
OFF-GRID ETC**

WOOD MACKENZIE: GLOBAL STORAGE 12 GWH IN 2018 TO 158 GWH IN 2024.

ONT STORAGE & SOFTWARE



STEM
KINETRICS
HYDROSTOR
SURVALENT
NSTOR
N-DIMENSION
ARDA POWER
POWIN
CONVERGENT
IHI ENERGY
ECAMION

UTILITY LOAD MANAGEMENT



**HORNSDALE POWER RESERVE
SOUTH AUSTRALIA**

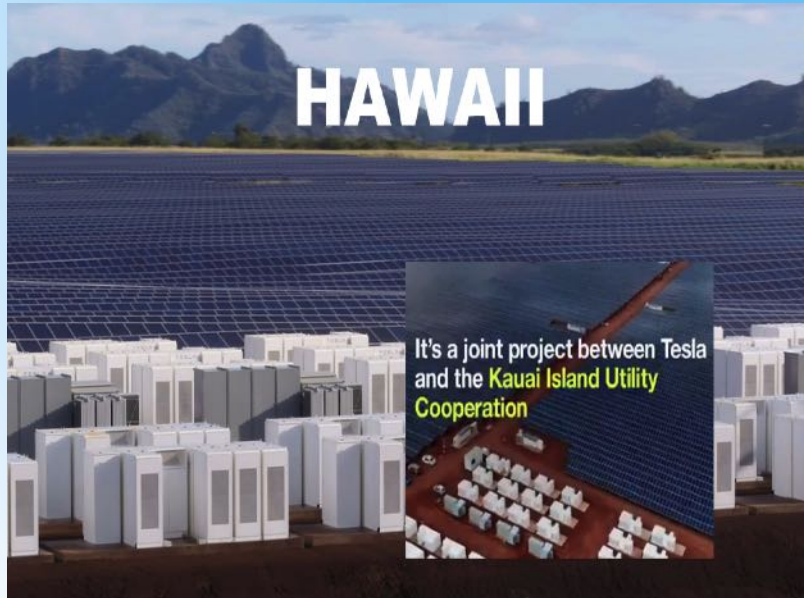
COST \$66M
SAVED \$40M IN YEAR 1 ON FCAS
GAS PLANTS NOT RENEWED
PANELS/BATTERIES FOR 50,000 HOMES



**STAFFORD HILL
VERMONT**

**IN 2016 ONE OF THE FIRST
SOLAR PLUS STORAGE PROJECTS**
**SAVED \$200K IN FIRST HOUR
RE PEAK CHARGES**

POWER SYSTEM REINVENTION



HAWAII

55,000 PANELS & 52 MWH OF BATTERIES

– SAVE ON DIESEL & GHG

17 MEGAWATTS

(OVER 100,000 HOMES)



PUERTO RICO

NEW HYDRO SYSTEM

COMMITS TO RENEWABLES

NO MORE BEING HELD HOSTAGE

ALSO 1000 TESLA POWERWALLS

PEAK SHAVING MICROGRIDS



BED BATH & BEYOND
4 SITES \$144K SAVED



WHOLE FOODS
7 SITES \$514K SAVED



JC PENNEY
26 SITES \$1M+ SAVED



ADOBE SOFTWARE
2 SITES \$255K SAVED



ALBERTSON'S
8 SITES \$380K SAVED



EXTENDED STAY AMERICA
68 SITES \$465K SAVED

SOKA UNIVERSITY CALIFORNIA

PEAK SHAVING

300 & 100 KILOWATT

BATTERIES & LOAD MANAGEMENT

SOFTWARE - NO UP FRONT COST

AFTER LEASE COSTS

NET SAVINGS WERE

\$55K IN THE FIRST YEAR

WILL INCREASE EACH YEAR TO ABOUT \$100K IN YEAR 10

ENERGY SAVINGS TRANSLATE TO GHG FOOTPRINT REDUCTIONS

SELF LEARNING SOFTWARE IMPLEMENTS STORAGE DECISIONS AUTOMATICALLY



COLEVALE LAKE -ARCTIC CIRCLE



REMOTE & DIESEL DEPENDENT FOR
ELECTRICITY \$140,000 PER YEAR

SOLAR & BATTERIES ADDED WITH DIESEL
BACKUP IF BATTERY 40%



THERE ARE ABOUT 300 OFF-GRID COMMUNITIES ACROSS CANADA.

OTHER REMOTE LOCATIONS



SCILLY ISLANDS NEAR UK, ISLANDS OFF GREECE, ITALY, MAINE



Clean Air Partnership



THANK YOU

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