



# Solar, Microgrids & Small Battery Technology Webinar

Low Carbon Case Examples

Thurs May 14, 2020 | 2:00 - 3:00 PM ET

Bruce (BF) Nagy, Katherine Peretick & Geoff Osborne



## Clean Air Partnership

CLIMATE SOLUTIONS WEBINAR SERIES





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## CLIMATE SOLUTIONS WEBINAR SERIES



### ELECTRIC FLEET VEHICLES



### GEOTHERMAL FOR SCHOOLS

ENGINEER OLIVER ANETTE & MICHEL MORIN, SCHOOL FACILITIES DIRECTOR



### MICROGRIDS & BATTERIES



## WEBINAR SERIES - UPCOMING:

- Net zero heritage projects (Montreal & Toronto)
- Net zero affordable housing - Builder's perspective (Philadelphia)
- Guaranteed energy savings for schools & hospitals (Quebec)
- Solar thermal for seniors & recreation (Ontario & Alberta)
- Affordable passive house retrofits (Hamilton & Boston)



# 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



# AGENDA

INTRODUCTION

5 MINUTES

ELECTRICITY STORAGE OVERVIEW  
UTILITIES, BUILDINGS, CAMPUSES,  
PEAK SHAVING, RESILIENCE,  
SECURITY

20 MINUTES

COMPRESSED AIR, FLYWHEELS,  
PUMPED STORAGE, LITHIUM  
ION FOR CITIES

30 MINUTES

QUESTIONS  
& WRAP

5 MINUTES





# CHANGING WORLD



GLOBAL STORAGE BALLOONS FROM 12 GWH IN 2018 TO 158 GWH IN 2024.

-WOOD MACKENZIE



# ELECTRIFIED BUILDINGS & VEHICLES



GAS PEOPLE HAVE EXAGGERATED THE IMPACT ON THE GRID, BUT NONETHELESS WE MUST DEPLOY CONTEMPORARY STORAGE & OPTIMIZATION ASAP





# 6 OR 7 KINDS OF STORAGE OPPORTUNITIES



**UTILITY LOAD  
MANAGEMENT**



**COMMUNITY  
MICROGRIDS**



**LEAP-FROGGING  
ECONOMIES**



**REMOTE  
LOCATIONS**



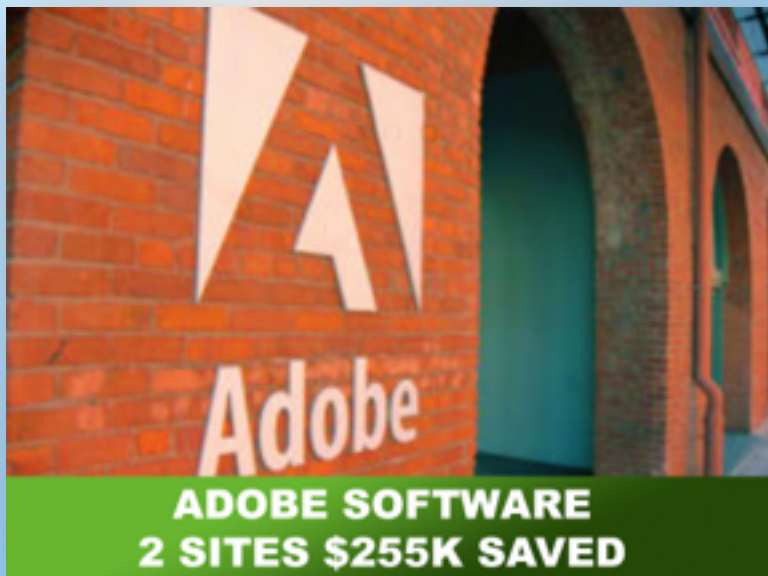
**RESILIENT COMMUNITIES  
& CAMPUSES**



**DC NETWORKS,  
OFF-GRID ETC**



## 7. PEAK LOAD CONTROL





# 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





# “OFF-GRID” MODERNIZED

## 1990-2020



- SELF BUILT OVER TIME
- LEARNING CURVE
- RURAL

## 2020-2030



- FACTORY BUILT INTEGRATED DESIGN
- PASSIVE HOUSE, SOLAR, BATTERIES
- SOPHISTICATED CONTROL SOFTWARE
- LOCATED ANYWHERE



# “OFF-GRID” EXPANDED



SECURE GOVERNMENT COMPLEXES



GATED RESIDENTIAL COMMUNITIES



APPLE HEADQUARTERS



CORPORATE & INSTITUTIONAL CAMPUSES

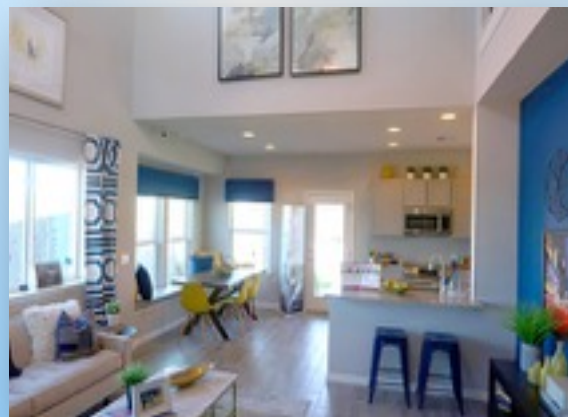


# DISTRICT ENERGY RE-DEFINED



## 7500 HOMES AT WHISPER VALLEY IN AUSTIN

- SOLAR ON EVERY ROOFTOP
- GEOTHERMAL BOREHOLE IN EVERY YARD
- HOME BATTERIES & ELECTRIC CAR CHARGERS
- CONNECTED-OPTIMIZED  
NEIGHBORHOOD MICRO-GRIDS
- SMALL 'CENTRAL PLANTS'  
ARE REALLY JUST BACKUP



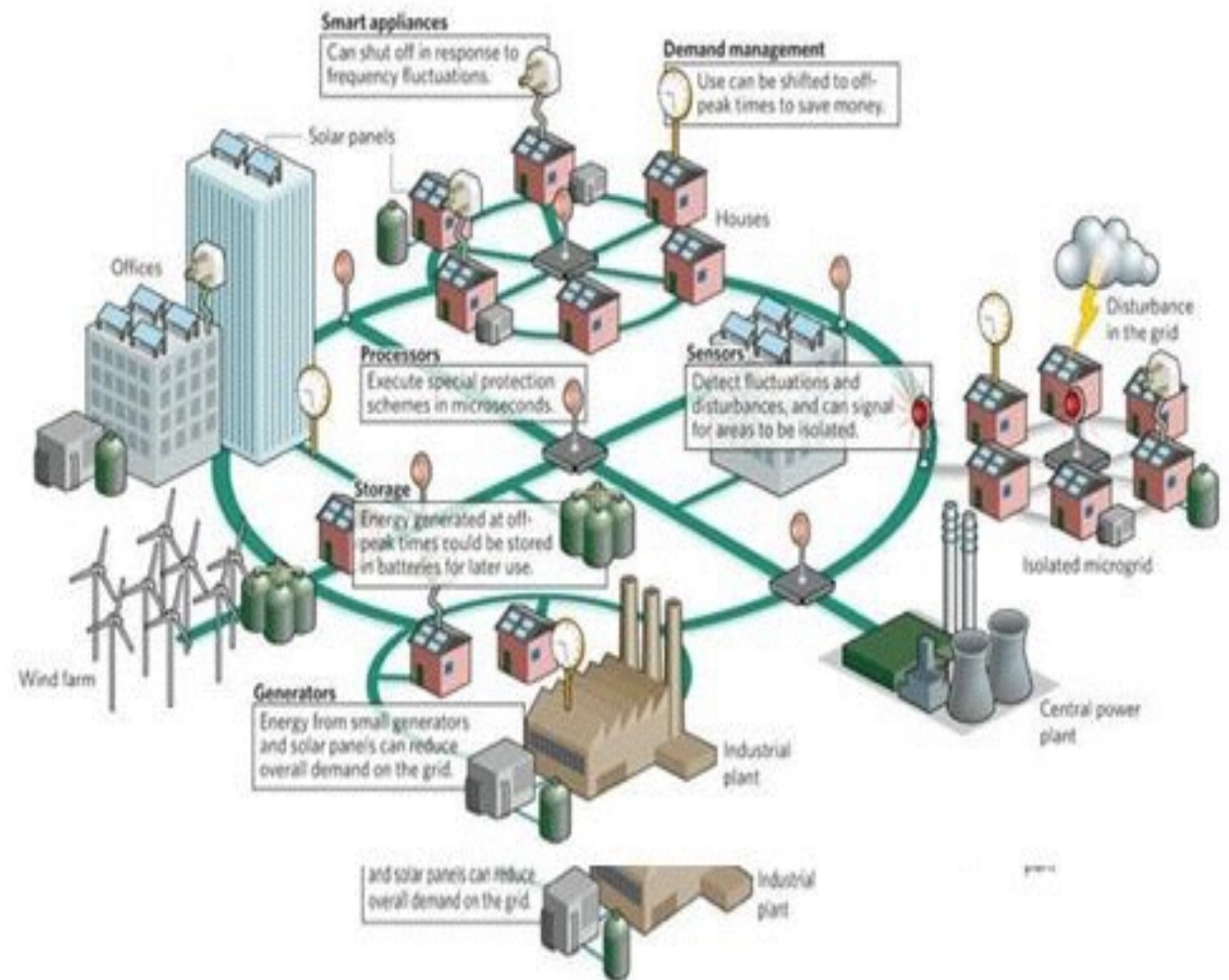
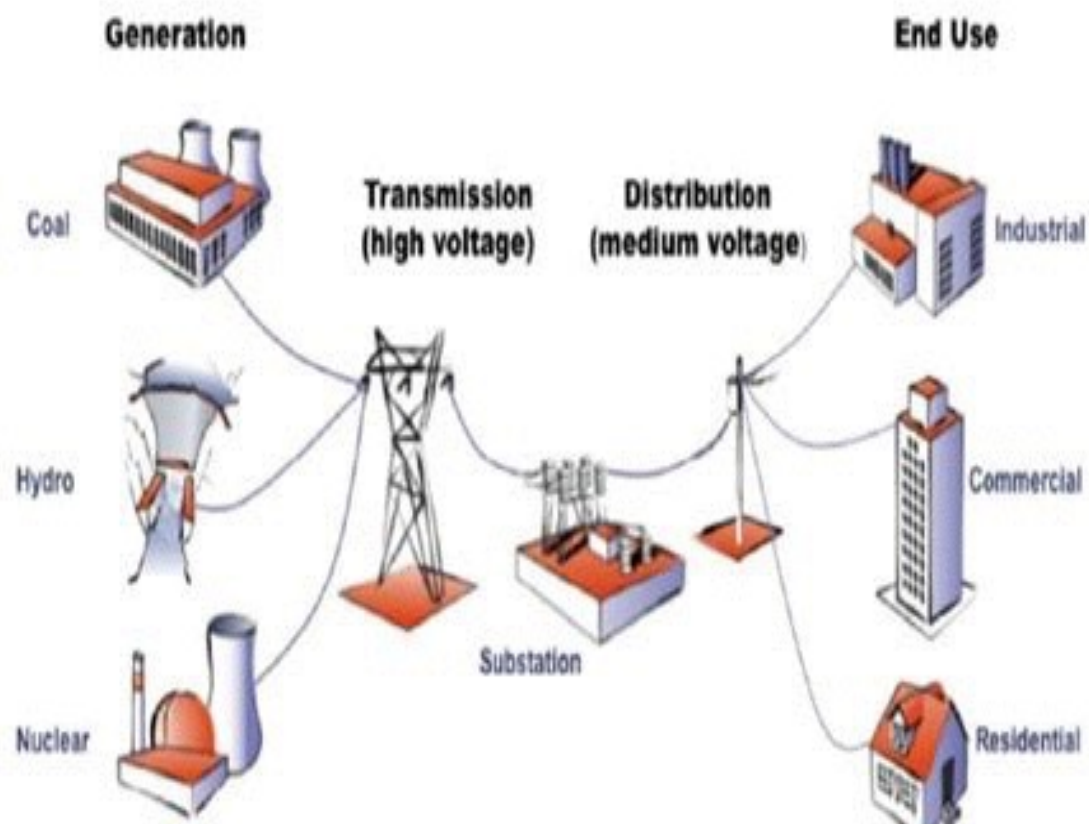


# POWER UTILITIES RE-DEFINED

Legacy Bulk Electrical System



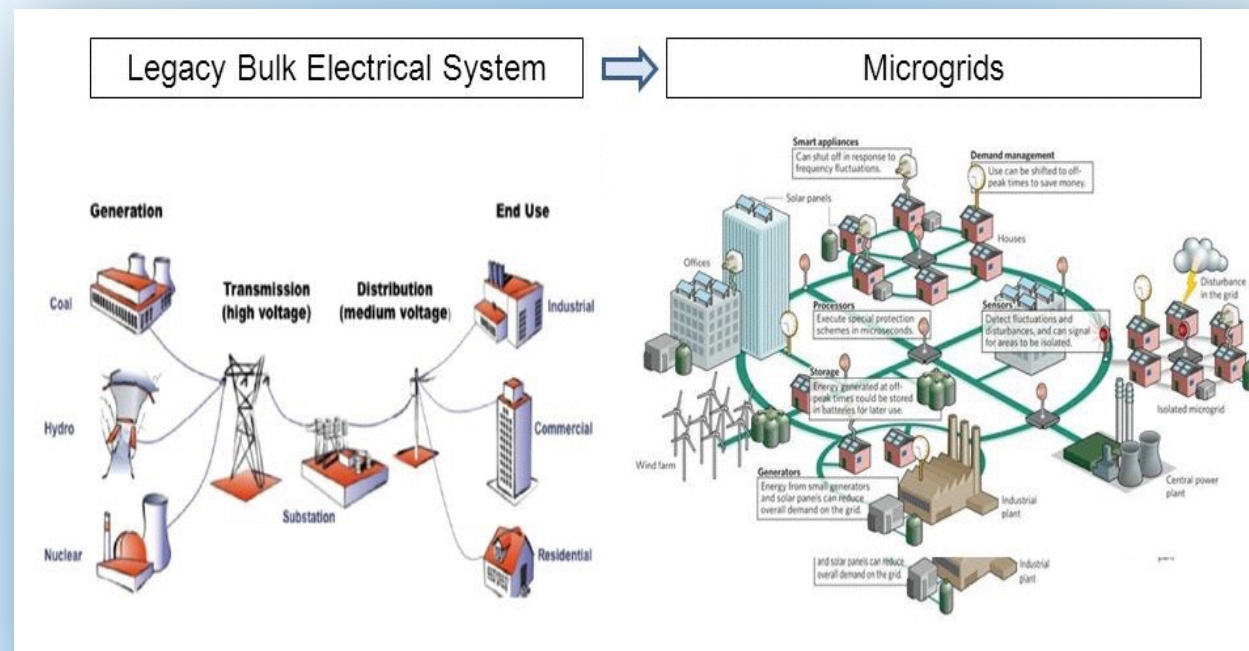
Microgrids



PRESENTLY: CENTRALLY GENERATED POWER DISTRIBUTED IN ONE DIRECTION LONG DISTANCES.  
CURRENTLY GRAPPLING WITH MORE AND MORE RENEWABLES PLAYERS AND MICRO-GRIDS  
WHO WANT TWO WAY FLOW AND NEED MORE AND BETTER INFRASTRUCTURE.



# POWER UTILITIES RE-DEFINED ELECTRICITY LANDSCAPE REDEFINED



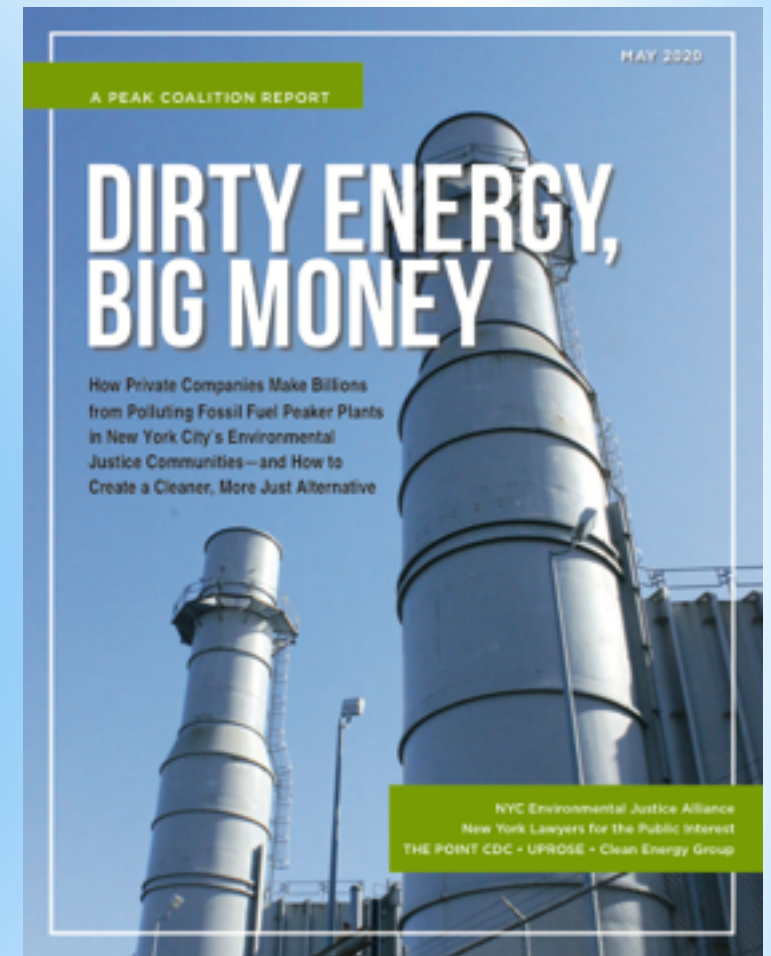
## FUTURE: NUMEROUS MICRO-GRIDS

- EACH MICROGRID ACHIEVES ITS OWN POWER GENERATION, POWER OPTIMIZATION & SHARING
- MICRO-GRIDS CONNECTED TO EACH OTHER FOR POWER TRADING
- MICRO-GRIDS STILL CONNECTED TO CENTRAL GRID FOR SOME USES AND BACKUP
- ELECTRIC CAR BATTERIES AND HOME BATTERIES ARE PART OF THE STORAGE MIX
- LOCALIZED LOW-LOSS, HIGH-QUALITY, COST EFFECTIVE POWER
- REDUCED PRESSURE ON UTILITIES & GOVERNMENTS FACING GROWING GENERATION DEMAND (POSSIBLY) AND IMPOSSIBLY COSTLY INFRASTRUCTURE UPGRADING.



# NEW YORK: RENEWABLES, STORAGE, & SOFTWARE FOR UTILITY LOAD MANAGEMENT

- IN THE LAST DECADE NEW YORK HAS PAID MORE THAN \$4.5 BILLION FOR THE CITY'S PEAKER PLANTS - THEY ONLY OPERATE 90 -500 HOURS PER YEAR. 1300% HIGHER THAN THE AVERAGE COST OF ELECTRICITY IN THE STATE.
- IN DECEMBER 2019 NY STATE APPROVED A 20-MEGAWATT BATTERY STORAGE PROJECT IN ULSTER.
- IN JULY 2019, THEY SELECTED TWO OFFSHORE WIND PROJECTS COMBINED CAPACITY IS 1,696 MW
- IN OCTOBER 2019, THEY APPROVED THE DEVELOPMENT OF A 316-MEGAWATT, 8-HOUR-DURATION BATTERY AT THE RAVENSWOOD GENERATING STATION IN LONG ISLAND CITY.





# STORAGE FOR SMOOTHING INTERMITTENCY, RESPONDING TO STORM EVENTS



- TESLA BIG BATTERY ORIGINAL COST \$66M
- SAVED \$40M IN YEAR 1 ON FCAS (POWER PURCHASING, SHARING, SMOOTHING)
- 'IMPOSSIBLY,' WIND PLUS BATTERY PROVIDES 50% - 75% OF LOCAL DEMAND
- SURVIVED 3 BIG STORMS INCLUDING THE DESTRUCTION OF 500 KV TRANSMISSION LINE.
- ADAPTED BETTER THAN GAS & COAL, TOTALLY DISPELLED INTERMITTENCY & OTHER RENEWABLES MYTHS.



# THE FUTURE IS NOW

NEW TESLA PRODUCT HELPS UTILITIES & MICRO-GRID COMMUNITIES, CAMPUSES, INDIVIDUAL BUILDINGS WITH SELF GENERATION, STORAGE PLUS THE OPTION TO CONNECT TO OTHER ENTITIES FOR TRADING, OPTIMIZATION & BACKUP.



TESLA HAS APPLIED TO BE A LICENSED ELECTRICAL UTILITY IN THE UK, THUS POSITIONING ITSELF TO CONTROL IMPLEMENTATION OF RENEWABLES PLUS BATTERIES, ELECTRIFIED HOME & TRANSPORTATION, MICROGRIDS, ETC.

RELATED FUTURE TRENDS: LOW LOAD SYSTEMS, DC POWER, MICRO-CIRCUITRY IN ALL HUMAN ENDEAVOURS: MANUFACTURING, INSTITUTIONS, RESIDENTIAL & COMMERCIAL



# LEAPFROG TRANSITION



**INTENSE WEATHER EVENTS LEAD TO BETTER TECHNOLOGY SOLUTIONS**



# TECHNOLOGY DISRUPTION OPPORTUNITY





# REMOTE LOCATIONS

## Gull Bay First Nation

**MORE THAN 1000 SOLAR PANELS,  
80 BATTERY MODULES, MICRO-GRID SOFTWARE**

“YOU CAN HEAR THE BIRDS AND THE CRICKETS...  
IT’S A RETURN TO OUR TRADITIONS OF WORKING  
IN HARMONY WITH NATURE, WE’RE GETTING  
OUR POWER FROM SUNSHINE.”

PROJECT CUTS ANNUAL DIESEL USE BY 100,000 GALLONS AND  
REDUCES GREENHOUSE GASES BY 300 TONNES EACH YEAR,  
AND PROVIDES PEACE OF MIND FOR RESIDENTS IN 97 HOMES.

THE NEW \$8 MILLION SYSTEM IS FULLY OWNED BY GULL BAY FIRST NATION AND OPERATED BY  
MASHKAWIZIWIN ENERGY. GULL BAY IS 200 KM NORTH OF THUNDER BAY, ONTARIO

OTHER FIRST NATIONS ARE ASKING ABOUT THE DEVELOPMENT PROCESS, WHICH INVOLVED  
NUMEROUS GOVERNMENT PARTIES, NGOS, AND ONTARIO HYDRO.





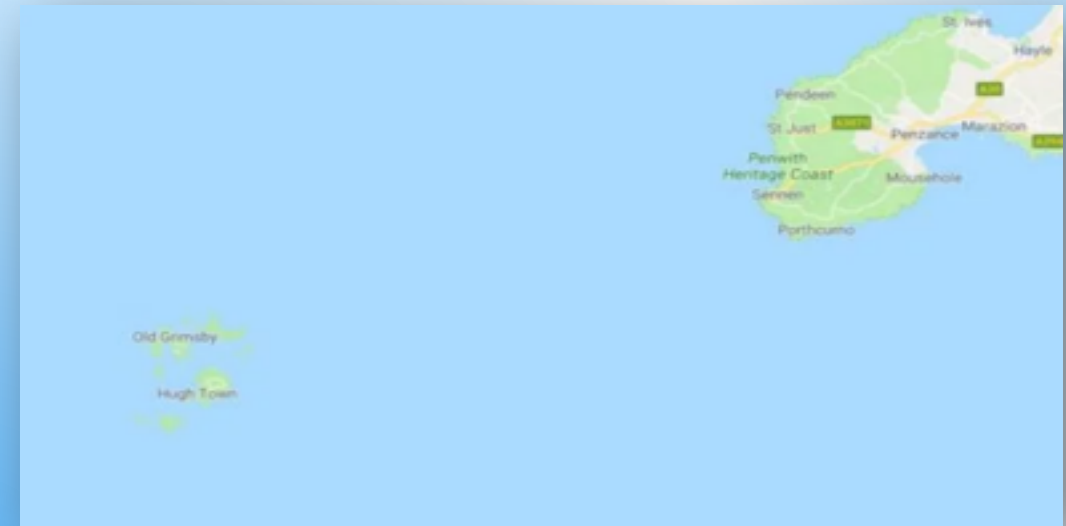
# OTHER REMOTE LOCATIONS

COLEVILLE LAKE, ARCTIC CIRCLE,  
SCILLY ISLANDS NEAR UK, ISLANDS OFF  
GREECE, ITALY, MAINE.



WITH REMOTE LOCATION PROJECTS, ESPECIALLY  
CANADIAN FIRST NATION PROJECTS IT IS BEST NOT  
TO COMMENT ON ECONOMIC 'ACHIEVEMENTS.'

SUFFICE IT TO SAY STORAGE & RENEWABLES WILL  
OUTPERFORM CONVENTIONAL SYSTEMS RE  
BUDGET COST EFFECTIVENESS, IF THE PROJECT  
IS MANAGED WELL.





# ONTARIO STORAGE & SOFTWARE



STEM

NRSTOR

HYDROSTOR

SURVALENT

KINETRICS

N-DIMENSION

ARDA POWER

POWIN

CONVERGENT

IHI ENERGY

ECAMION



**SWITCH TO KATHERINE & GEOFF**





# QUESTIONS?

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# THANK YOU

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