

Solar Energy in the Northwest Territories

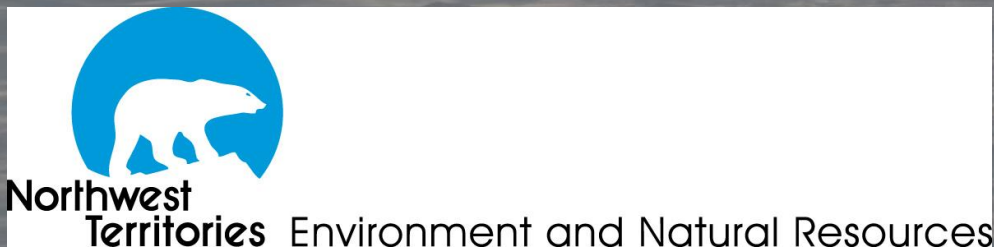
Renewables in Remote Microgrids Conference

Early adopters, project development experiences

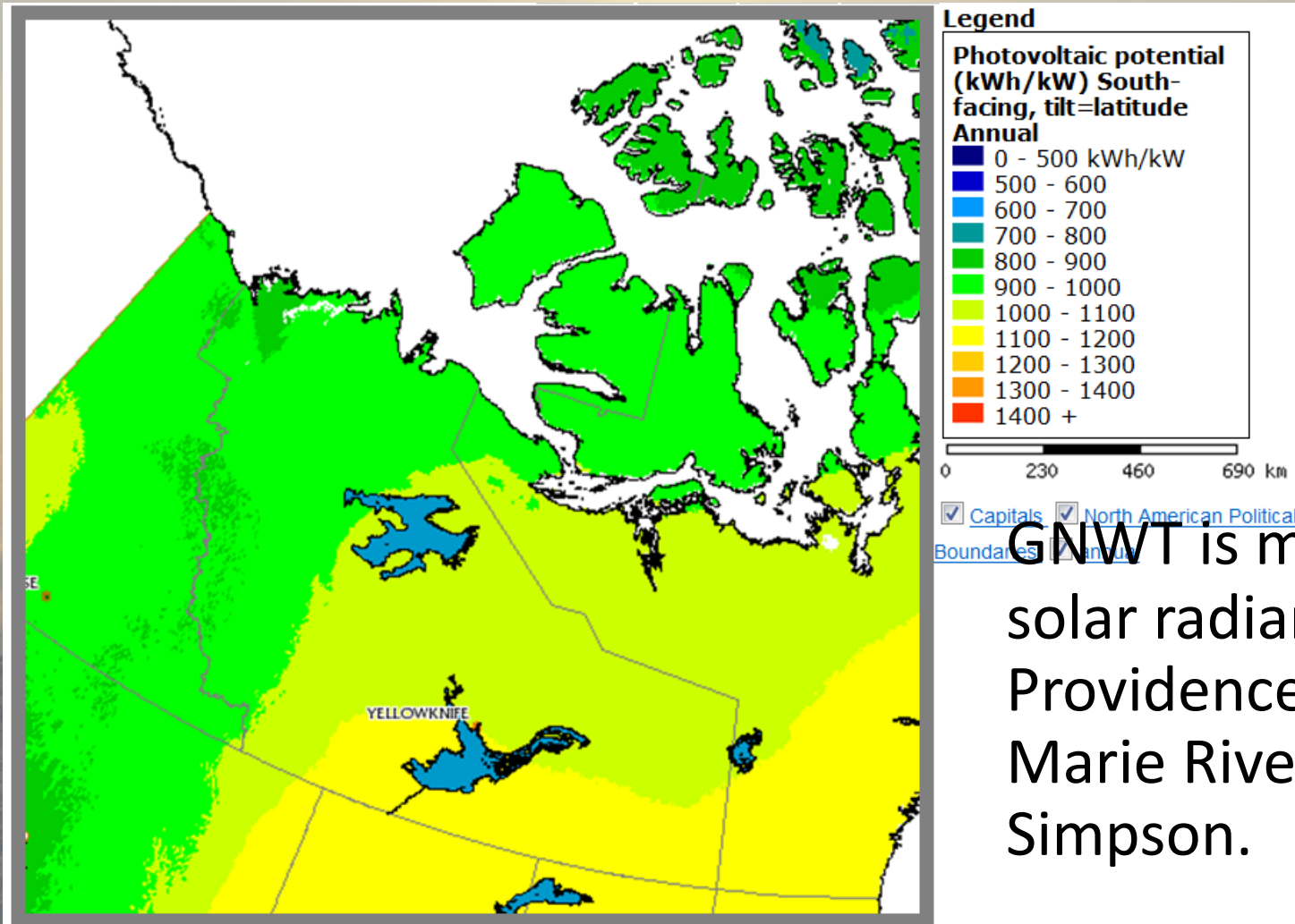
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The Solar Resource in the NWT



GNWT is monitoring solar radiance in Fort Providence, Jean Marie River and Fort Simpson.

These modules have been powering a houseboat on Yellowknife Bay since 1982 and are producing at about 70% capacity.

This is the oldest battery- based solar PV system that I know of in the NWT. The panels were manufactured in the late 70's or early 80's.



RETCAP (2001-2003)

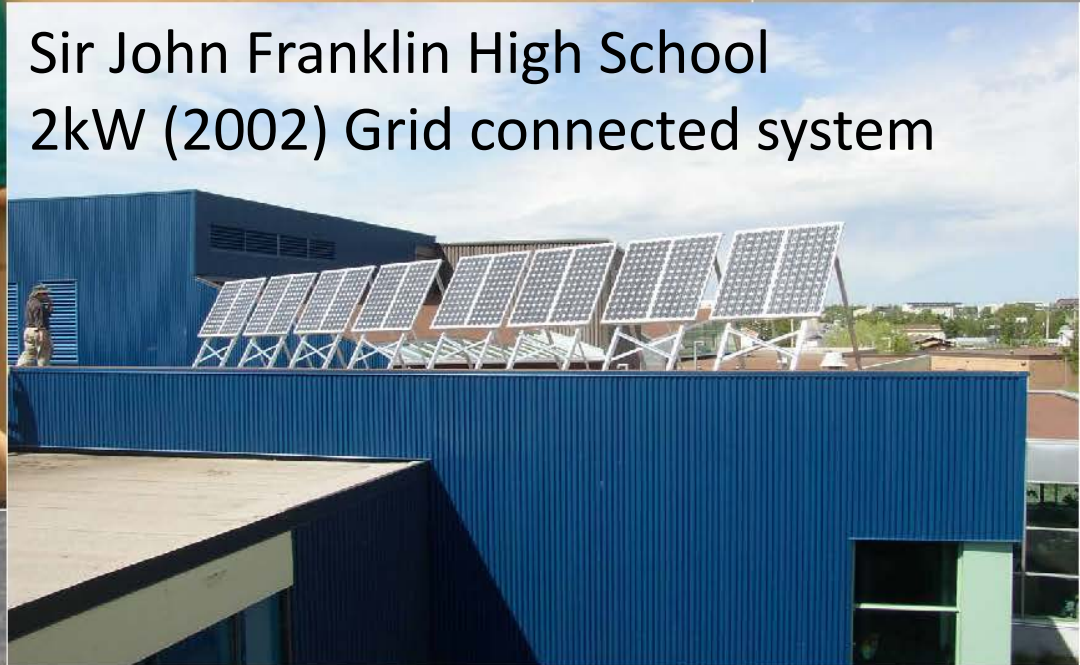
Starting in April of 2001, off grid home-owners, houseboaters and remote lodge operators installed 36 renewable energy systems during a two year period, when funding was available through this program.

It was the first incentive program for solar in the NWT and was primarily an effort to offset diesel use and reduce noise from generators. The grant provided a 50% rebate for panels and balance of system costs. The cost of modules at the time was Approximately \$7/watt





Sir John Franklin High School
2kW (2002) Grid connected system



Alternative Energy Technologies Program

2007 to present (base funding 300K per year)



- Community Renewable Energy Fund –1/2 funding up to \$50,000 per community/year
(several communities partner with ecoEnergy for Aboriginal and Northern Communities)
- Medium Renewable Energy Fund- 1/3 funding up to \$15,000 per business/year
- Small Renewable Energy Fund- 1/3 funding up to \$5,000 per home/year

Residential Off-grid and Grid Connected Systems



Business Installation-PolarGrizz Inn Sachs Harbor

Roger and Jackie Kuptana- Northern Solar Pioneers





4.3kW – Installed 2010

Community Based Solar Projects



How do solar trackers work north of 60?

We tried three...5kW's

Result= 35-39% increased output compared to static system of same capacity.

Worth the added cost?





Workshops are needed to train maintenance staff

Seasonal Tracker lock out (November to end of Feb)



Utility Scale Installation- 104 kW Fort
Simpson (Diesel Grid)
Northwest Territories Power Corporation
60kW- 2012
44kW-2013 Installed cost +/- \$10 /watt





Northwest Territories Solar Energy Strategy

2012
2017



Vision

Promote the use of solar energy technology and reduce the consumption of, and reliance on, fossil fuels for electricity generation in the NWT.

Objectives

1. Increase education and awareness of solar energy technologies for residents, businesses, communities, government departments and public power utility companies.
2. Develop policies and guidelines to reduce institutional barriers to solar energy technology deployment in the NWT.
3. Assist public power utility companies to advance solar-diesel hybrid systems in communities.
4. Promote the use of battery-based solar charging systems in remote 'off-grid' applications.
5. Increase the monitoring of solar energy systems to measure and assess their performance.

Target

Working with communities, industry and businesses, install solar systems with the capability to supply up to 20 percent of the average load in NWT diesel communities.

Summary of Actions- NWT Solar Energy Strategy

1. The Arctic Energy Alliance (AEA) will continue to provide energy information to both public and private sectors.
2. Deliver Solar Energy Workshops through the Arctic Energy Alliance (AEA).
3. Establish a GNWT Interdepartmental Solar Energy Committee.
4. Install visible solar output displays in public buildings with solar collectors.
5. The GNWT, together with power utilities, will develop a comprehensive program for grid-interconnected PV systems.
- 6. Deploy solar systems sized up to 20 percent of the average load in diesel communities.**
- 7. Investigate ways to deploy solar systems sized at up to 75 percent of the average community load in diesel communities.**
8. Continued support for off-grid solar applications.
9. Develop an NWT Solar Energy Monitoring Program for solar electric, solar hot water and solar air heating installations.

NWT Solar Strategy Target
20% of Average Community Load
Low Penetration

Community	2010 Annual Consumption (kWh)	Solar Potential kWh/kW	Install Size (kW)	Solar Output (kWh)
Whati	1,567,981	1,093	35	38,255
Gameti	968,322	1,079	20	21,580
Lutsel K'e	1,459,065	1,129	35	39,515
Fort Simpson	7,635,754	1,088	175	190,400
Fort Liard	2,727,276	1,055	60	63,300
Wrigley	641,763	1,040	15	15,600
Nahanni Butte	397,276	1,049	10	10,490
Jean Marie River	248,077	1,104	5	5,520
Inuvik	28,236,611	927	645	597,915
Norman Wells	8,401,711	994	190	188,860
Tuktoyaktuk	3,662,150	927	85	78,795
Fort McPherson	3,278,992	939	75	70,425
Aklavik	2,890,381	927	65	60,255
Deline	2,532,891	1,008	60	60,480
Fort Good Hope	2,649,798	968	60	58,080
Paulatuk	1,385,475	993	30	29,790
Sachs Harbour	928,835	944	20	18,880
Tsiigehtchic	663,671	936	15	14,040
Colville Lake	406,019	990	10	9,900
Uluhaktok	1,833,157	980	40	39,200
Tulita	2,211,650	1,008	50	50,400

Total: 1.7 MW

Revenue/Cost to purchase based on General Service Non-Government

Assumes primary use of solar is each generators own load (which saves line losses)

COMMUNITY	BUILDING	YEAR OF INSTALLATION	CAPACITY (kW)
T=Tracker B=Battery back-up			
Hay River	NTPC Headquarters	late 90's	1.00
Yellowknife	Sir John Franklin High School	2002	2.00
Yellowknife	Greenstone Building	2004	33.50
Jean Marie River	Band Office	2006	1.30
Yellowknife	ENR Air Monitoring Station	2009	1.75
Yellowknife	Private Resident	2009	1.25
Inuvik	Town Hall	2009	5.00
Inuvik	Midnight Sun Rec Complex	2009	7.00
Sachs Harbor	PolarGrizz Inn	2010	4.30
Wekweeti	Wekweeti Youth Center	2010	4.20
Nahanni Butte	Community Gymnasium	2011	4.80
Behchoko	Tlicho Construction Shop	2011	4.8 (T)
Paulatuk	Angik School	2011	1.70
Paulatuk	Paulatuk Youth Center	2011	5.00
Inuvik	Aurora Research Institute	2011	1.00
Inuvik	Northern Sustainable House	2011	3.50
Fort Smith	Frontier Handiwork Ltd.	2011	0.47
Norman Wells	ENR Office	2011	2.86
Yellowknife	Ollerhead & Associates Ltd.	2011	5.00
Yellowknife	Renewable Resources Inc.	2012	5.00 (B)
Gameti	Gameti Store	2012	5.00
Whati	Whati Store	2012	5.00 (T)
Edzo	Edzo Youth Center	2012	5.00 (T)
Fort Good Hope	K'asho Got'ine Band Office	2013- May	5.00
Fort Simpson	Lidlil Kue Band Office	2013	5.00
Total			100.63
Fort Simpson Solar-Disel Hybrid			104.00
Total NWT Grid Interconnections (KW)			204.63

COMMUNITY	BUILDING	GRID	Net-Billing Eligible	NET- BILLING	Partial ENR Funding	#	Project cost	Cost per watt Installed
Hay River	NTPC Headquarters	Hydo- NUL	No	No	N	1		
Yellowknife	Sir John Franklin High School	Hydro-NUL	Yes	No	Y	2		
Yellowknife	Greenstone Building	Hydro-NUL	No	No	N	3		
Jean Marie River	Band Office	Diesel-NTPC	Yes	No	N	4		
Yellowknife	ENR Air Monitoring Station	Hydro-NUL	No	No	Y	5		
Yellowknife	Private Resident	Hydro-NUL	Yes	Yes	Y	6		
Inuvik	Town Hall	Diesel-NTPC	Yes	No	N	7		
Inuvik	Midnight Sun Rec Complex	Diesel- NTPC	Yes	No	N	8		
Sachs Harbor	PolarGrizz Inn	Diesel-NTPC	Yes	No	Y	9	\$ 56,726	\$13.19/Watt
Wekweeti	Wekweeti Youth Center	Diesel-NUL	Yes	No	Y	10	\$ 57,189	\$13.61/Watt
Nahanni Butte	Community Gymnasium	Diesel-NTPC	Yes	No	Y	11	\$ 43,462	\$9.05/Watt
Behchoko	Tlicho Construction Shop	Hydro-NTPC	Yes	Yes	Y	12	\$ 57,729	\$12.02/Watt
Paulatuk	Angik School	Diesel-NTPC	Yes	No	Y	13		
Paulatuk	Paulatuk Youth Center	Diesel-NTPC	Yes	No	N	14		
Inuvik	Aurora Research Institute	Diesel-NTPC	Yes	No	N	15		
Inuvik	Northern Sustainable House	Diesel-NTPC	Yes	No	Y	16		
Fort Smith	Frontier Handiwork Ltd.	Hydro-NTPC	Yes	Yes	Y	17		
Norman Wells	ENR Office	Natural Gas-NTPC	No	No	N	18		
Yellowknife	Ollerhead & Associates Ltd.	Hydro-NUL	Yes	?	Y	19	\$ 41,977	\$8.39/Watt
Yellowknife	Renewable Resources Inc.	Hydro-NUL	Yes	?	Y	20	\$ 52,571	\$10.51/Watt
Gameti	Gameti Store	Diesel-NTPC	Yes	?	Y	21	\$ 48,557	\$9.71/Watt
Whati	Whati Store	Diesel-NTPC	Yes	?	Y	22	\$ 74,329	\$14.86/Watt
Edzo	Edzo Youth Center	Hydro-NTPC	Yes	?	Y	23	\$ 64,776	\$12.95/Watt
Fort Good Hope	K'asho Got'ine Band Office	Diesel-NTPC	Yes	?	Y	24		
Fort Simpson	Lidlii Kue Band Office	Diesel-NTPC	Yes	?	Y	25		



Solar Policy in the NWT

- Net-Billing Pilot Project, May 2010
- NWT Solar Energy Strategy, Nov, 2012
- Micro generation/Net Metering, October 1st, 2013

Working towards renewable
integration on diesel grids

- NRCan/CanMet - Smart Meter/data collection
Jean Marie River & Nahanni Butte, 2013

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