

Renewable Energy Development: Lessons Learned from the Navajo Tribal Utility Authority

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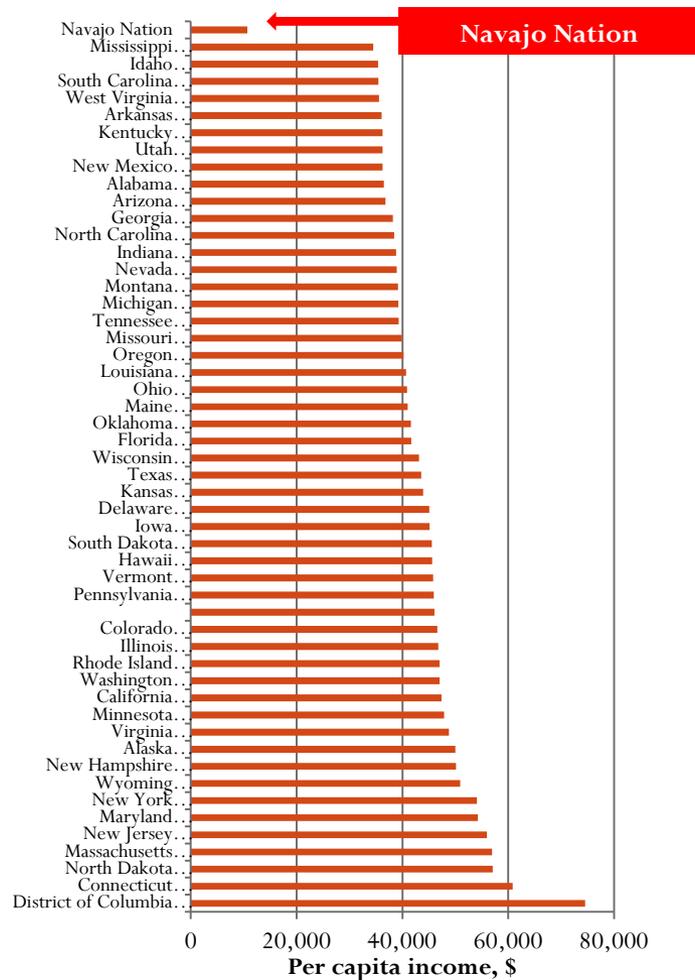
Counsel to Navajo Tribal Utility Authority

Navajo Nation is a uniquely disadvantaged people

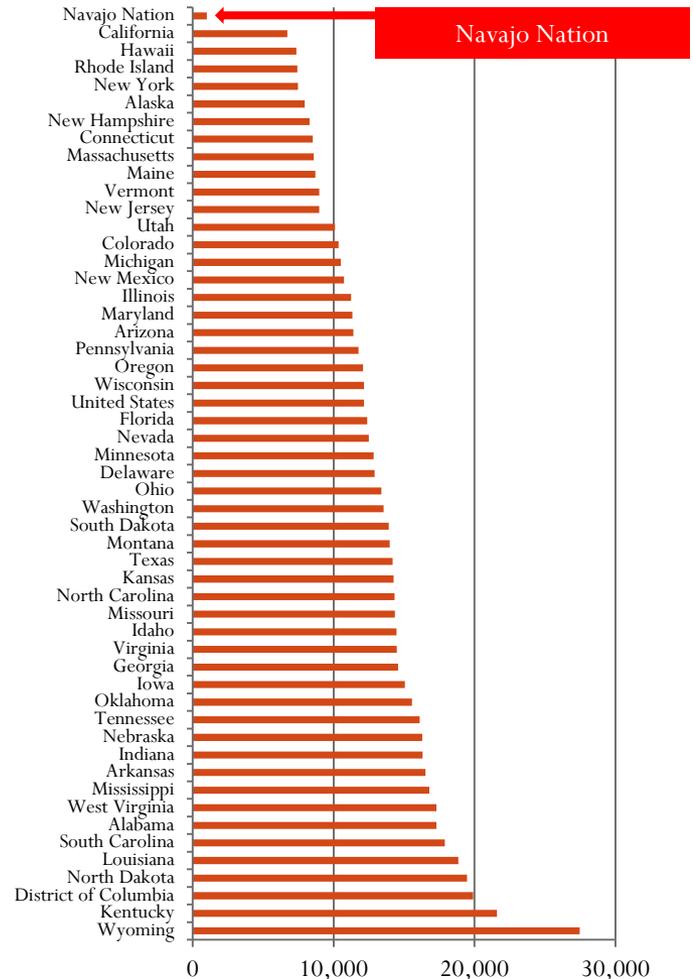
- Navajo Nation has more than 300,000 members
- The boundaries of the Navajo Nation covers a land area of more than 27,000 square miles (an area larger than the State of West Virginia)
 - The Navajo Nation extends into 13 counties in the States of Arizona, New Mexico and Utah
- The majority of the Navajo people continue to lead an agrarian lifestyle, which results in some of the lowest income levels across the United States
 - **Unemployment of 52% compared to 6.1% for US**
 - **Per capita income less than one third that of poorest state (Mississippi)**
- Many Navajo have no access to basic services:
 - **32% don't have electricity**
 - **38% lack water**
 - **60% lack telephone**

Income and Energy Use

Per capita personal income [Dollars]

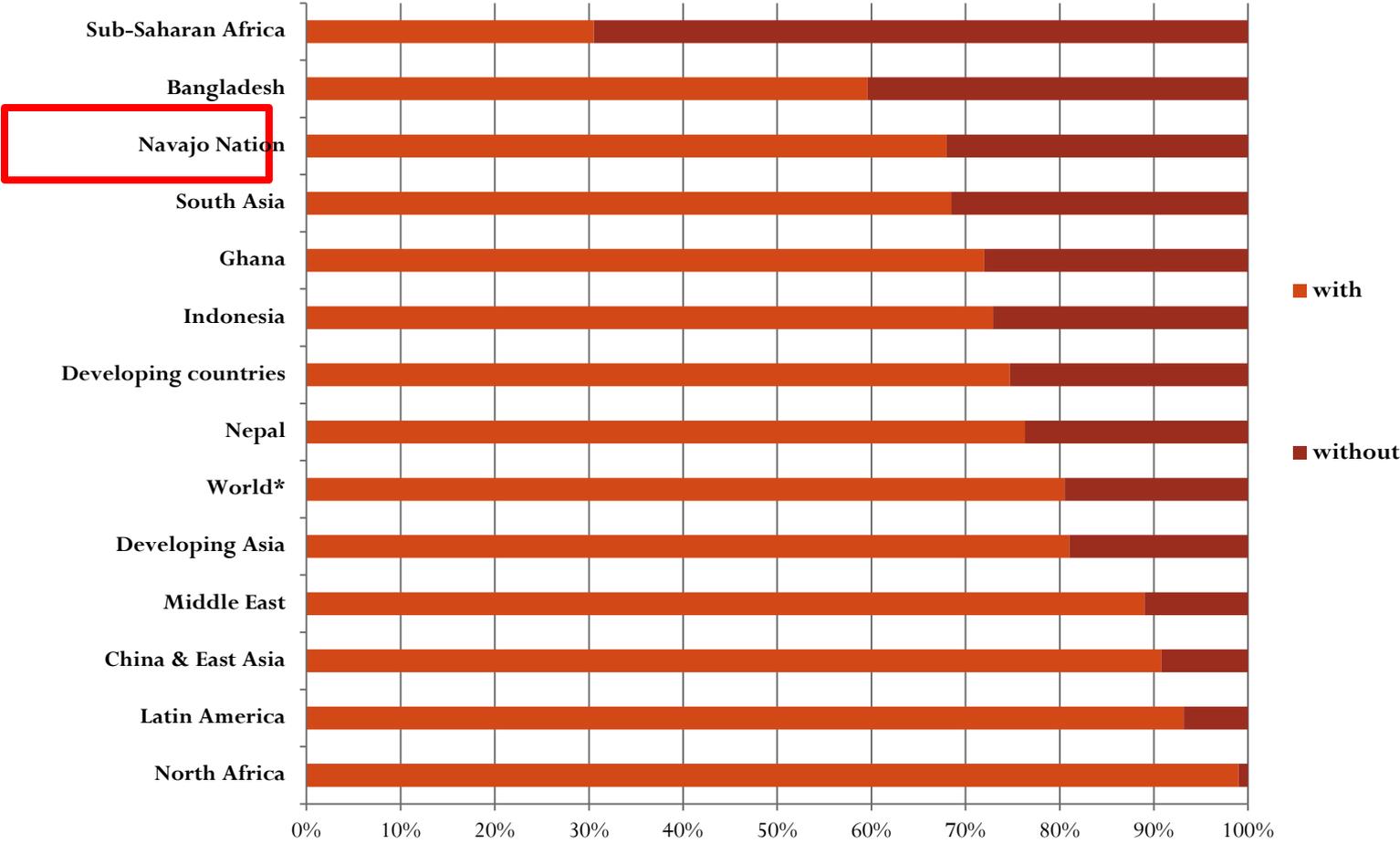


kWh per capita



Access to electricity

Access to Electricity



Navajo Nation

Renewable Energy Development

- The Navajo Nation has abundant natural resources that include renewable energy resources
- NTUA has taken on a leadership role in developing renewable energy projects within the Navajo Nation
 - Promotes long term economic security and community development
 - Promotes skills enhancement and workforce development

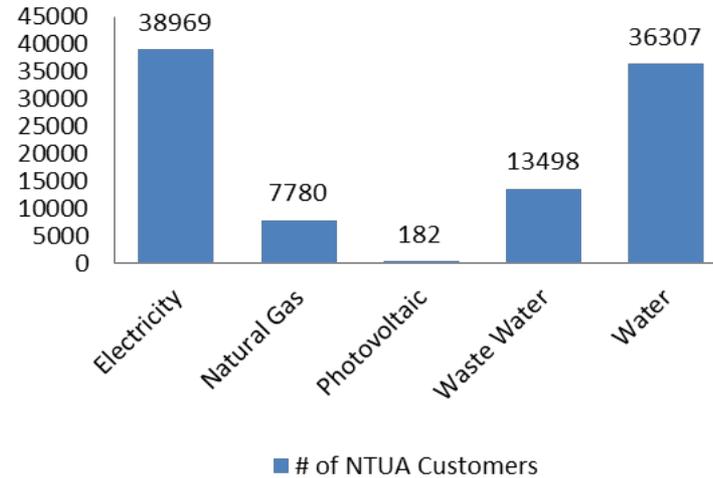
NTUA Mission

- Organized for the operation, maintenance, and expansion of utility services to customers within the Navajo Nation
 - To promote employment for Navajo people
 - To improve the health and welfare of the residents of the reservation
- NTUA currently has over 700 employees, of which 98% are Navajo
- NTUA provides utility services which improve the quality of life for the Navajo Nation

NTUA Offers Multi-Utility Services

NTUA provides a range of services on the Navajo Nation in Arizona, New Mexico, and Utah:

- Electricity
- Natural Gas
- Photovoltaic (Off-grid power)
- Waste Water
- Water
- Communications



NTUA Goals

- NTUA strives:
 - To provide quality utility services at low cost for its customers
 - To continuously improve the quality and reliability of services for its customers
 - To expand services to new customers through line extensions, community projects and partnerships
 - To help the Navajo Nation fulfill its goals and objectives
 - To continuously maintain and upgrade its optimize services
 - To develop new services (e.g. large scale renewable generation) to benefit the Navajo people

History of NTUA's Renewable Program

- The Navajo Tribal Utility Authority (NTUA) first began using solar energy on a demonstration basis in the late 1970's.
- In the 1980's solar power was employed at water well sites in the NTUA system.
- In the early 1990's NTUA deployed its first residential solar systems. These units were 240W systems which were sized to provide lighting for homes.
- The Solar Program was formally established in 1998 when NTUA deployed its 640W PV systems, which were sized to power small home appliances and lighting.

PV Residential Program

PV System	# of Installed Systems	Approximate Annual Output
Golden Genesis 640/680W	50 Installed Systems	31 MWh
SunWize 880W	91 Installed Systems	72 MWh*
Sacred Power 1,080W**	65 Installed Systems	54 MWh*
Sacred Power 1,800W**	95 Installed Systems	137 MWh*

*400W wind turbine added to system; not included in output total

**Includes Energy Star refrigerator in system

- Access to electricity services for Navajo families living beyond the reach of the grid
- Navajo families show a preference for the larger systems and refrigeration
- 300+PV systems are deployed throughout the Navajo Nation, Hopi Partitioned Lands and the Westwater (UT) community



PV Generation Plants

PV System	Installation Date	Approximate Annual Output
SunCarrier 69kW (Chinle)	October, 2011	161 MWh
SunCarrier 69kW (Crownpoint)	July, 2012	161 MWh
SunCarrier 110.25 kW (Fort Defiance)	September, 2012	257.3 MWh
SunCarrier 73,5 kW System (Dilkon)	November, 2012	171 MWh

- Demonstration of Net Metering at NTUA and community sites
- Example of DOE's Energy Efficiency and Renewable Energy (EE/RE) Model in practice
- Renewable Energy Component of Two LEED certified buildings



Kayenta Solar Project

- The Navajo Tribal Utility Authority (NTUA) created NTUA Generation, Inc. (NGI) to own, build and operate utility scale generation projects
- NGI is a for profit subsidiary of NTUA
- NGI and NTUA entered into power purchase agreement wherein NTUA will purchase all of the energy and environmental attributes from the Kayenta Solar Project.
- The electricity generated will feed into the Navajo Tribal Utility Authority substation located in Kayenta, Arizona.
- The proposed solar project will have a name plate capacity of approximately 27.3 MW.
- The site was selected by considering daily average solar radiation, ease of access to the local electrical system and environmental considerations.

Sample Pictures of Kayenta Solar Project

Kayenta Solar Project



Kayenta Solar Project



QUESTIONS?

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