



U.S. Department of Energy  
Energy Efficiency and Renewable Energy

# Sandia National Laboratories' Tribal Energy Program

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## Tribal Greenbuilding 101: How Tribes Can Build Homes with Sustainability in Mind

Tribal Energy Program Review  
Denver, CO



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,  
for the United States Department of Energy under contract DE-AC04-94AL85000.





# Overview

- Background
  - Current Practices
  - Our Impact
  - Tribal Housing
  - Housing
- Sustainability
  - What does it mean?
  - For tribes?
- Green Building
  - Elements
  - Benefits
- Case Study

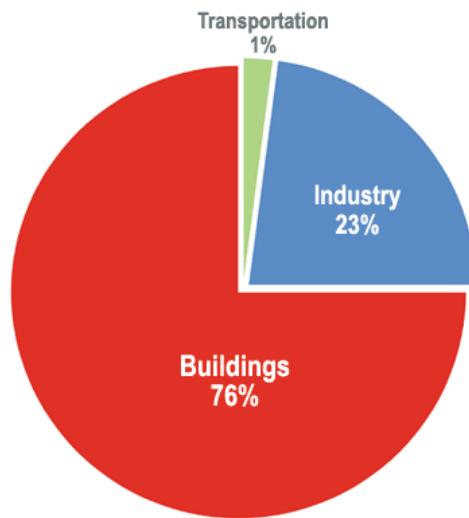
# Tribal Energy Program



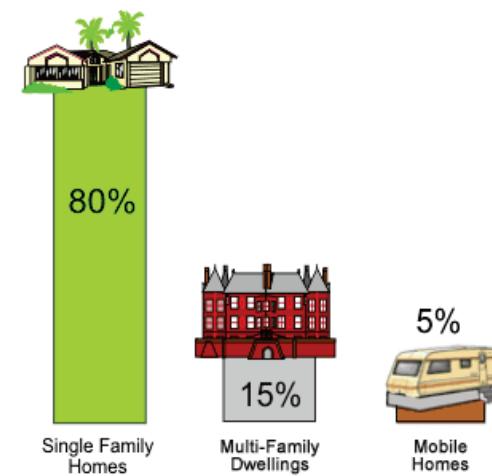


## Current Practices

### Energy Use by Sector



### Energy Use by Building type

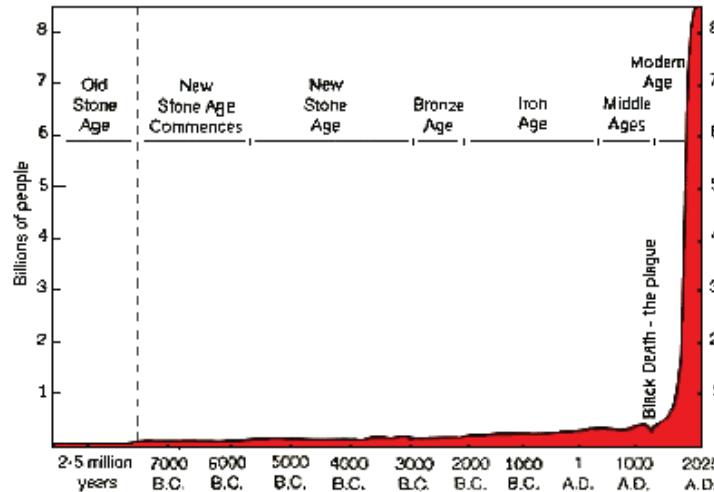




## Our Impact

### Linking Trends

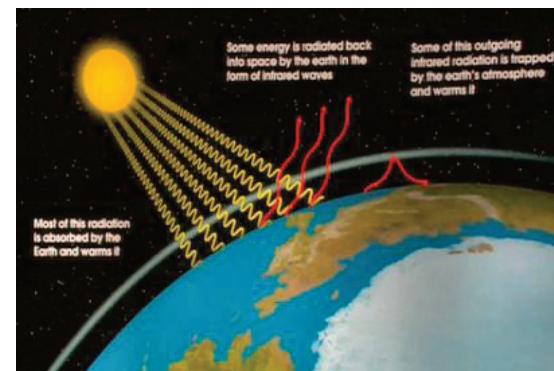
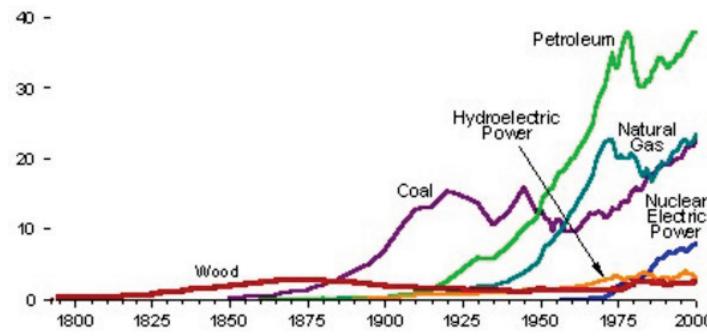
World Population Growth Through History



### Climate Change



Energy Consumption by Source  
in Quadrillion BTU





- **SUBSTANDARD CONDITIONS:**  
Native Americans suffer from some of the worst housing conditions in the nation. Some 14 percent of all reservation homes have no electricity, and on some reservations, as many as 20 individuals are forced to live in a single-family home.
- **GREAT DEMAND:**  
The US commission on Civil Rights calculates that 90,000 Native families in America are homeless or under-housed.
- **TRIBES CAN DO SOMETHING:**  
The goals of the act (NAHASDA) are simple: to put Indian tribes in the driver's seat when it comes to decisions on designing and building Indian homes and related infrastructure; and to encourage the use of creative and private sector financing in Indian housing.

# Tribal Energy Program



The study stated, “the basic standard of living of Native Americans remains well below that of the rest of the nation,” adding that these conditions are “unacceptable in 21st century America.”

- 2003 US Civil Rights Commission Study



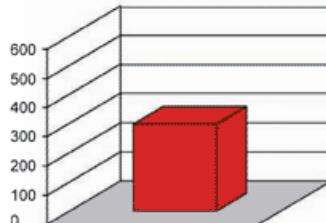


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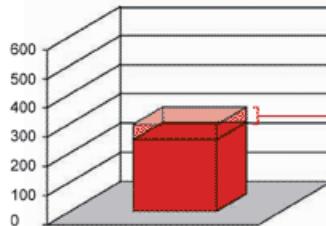
# Housing

Billion Square Feet (sf)

Source: Energy Information Administration

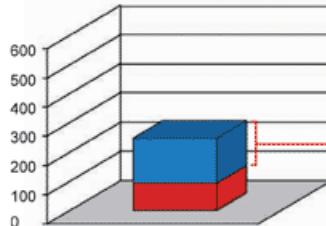


Currently the US building stock  
is approx. 300 billion sf.

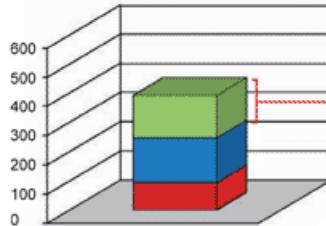


Over the next 30 years:

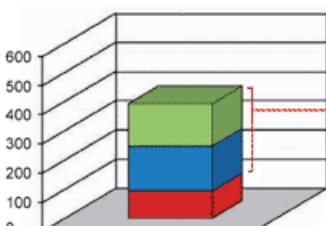
52 billion sf will be  
demolished



150 billion sf will be  
remodeled



150 billion sf will be  
new construction



Therefore, by the year 2035,  
three-quarters of the building  
stock will be new or renovated





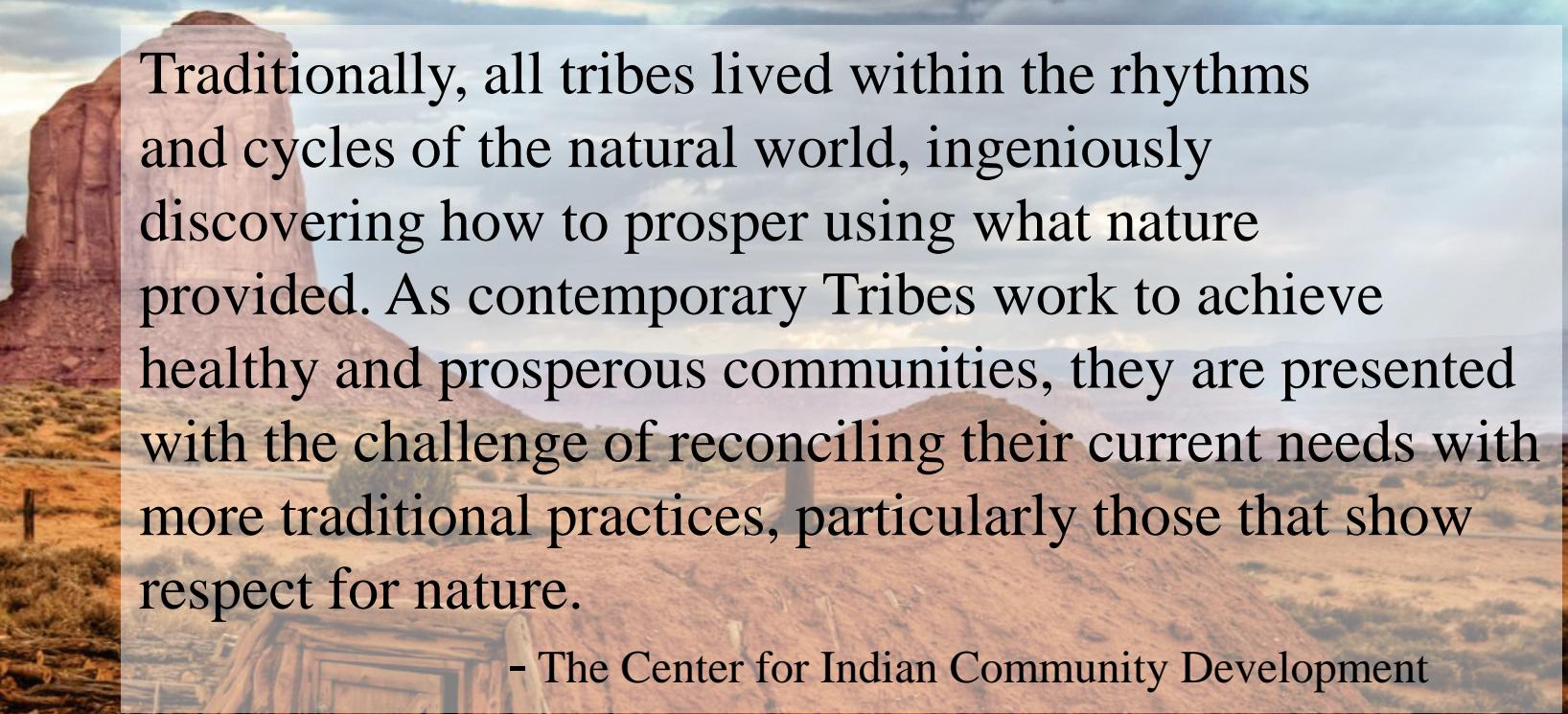
## Sustainability

“Social and environmental practices that protect and enhance the human and natural resources needed by future generations to enjoy a quality of life equal to or greater than our own.”

- Environmental Protection Agency



## Sustainability & Tribes



Traditionally, all tribes lived within the rhythms and cycles of the natural world, ingeniously discovering how to prosper using what nature provided. As contemporary Tribes work to achieve healthy and prosperous communities, they are presented with the challenge of reconciling their current needs with more traditional practices, particularly those that show respect for nature.

- The Center for Indian Community Development



## Green building

“Green, or sustainable, building is the practice of creating and using healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition.”

- Environmental Protection Agency



# Green Building Elements



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- Energy efficiency
- Sustainable development
- Environmentally preferable building materials
- Renewable energy
- Indoor environment
- Water stewardship
- Waste reduction
- Toxic reduction



Nageezi House – ASU

- ## 5 Sustainable Design Strategies:
- Site
  - Water
  - Energy
  - Materials
  - Indoor Environment

# Green Building Benefits



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## Environmental



## Economic



## Social



# Environmental Benefits



- Enhancement & protection:
  - Biodiversity
  - Ecosystems
  - Air & water quality
- Conservation & restoration:
  - Natural resources
  - ↓ energy consumption
  - ↓ climate impacts
  - ↓ waste

# Tribal Energy Program



# Economic Benefits



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- Consumer
  - Energy costs
  - Optimized life cycle performance
- Builder
  - O&M costs
  - Financial incentives





## Social Benefits



- ↑ Community values
- ↑ Aesthetic qualities
- ↑ Occupant comfort & health
- ↓ Strain on local infrastructure
- Improved Quality of Life





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# Tribal Energy Program

## Case Study



I-Sah'-Din'-Dii Housing Development  
Mescalero Apache Reservation



# Background

- 463,000 acres
- 4,000+ tribal members
- Unemployment: 8.6%  
(other tribes <80%)
- Service jobs
- Government: 63% &  
34% private workers
- Median household  
income: \$23,902  
(\$41,994 US)
- % Below Poverty: 35%  
(12.4% US)
- 400 families still on list

# Tribal Energy Program

“Every home that is built is a blessing for our people, we still have work to do to accommodate all the people who have a need. I wish and pray we get more houses in here very soon.”

- Carleton Naiche-Palmer, Tribal President



# Community-oriented Design



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# Tribal Energy Program

- 30 single family homes
- Community center
  - Kitchenette
  - Office/computers
  - Playground/bball
  - Social room
- Social Services
  - On-site health
  - Childcare
  - Employment
  - Homeowner educ.
- Access to school
  - Trails/Sidewalks
  - Transportation





### NM MFA Guidelines:

- ↓ Impact on natural landscape
- Responsive to natural landscape
- Passive solar & energy efficient techniques
- Non-toxic materials for good indoor air quality

“We want to replicate this around the state and around the country. It’s one of the most progressive projects I’ve seen anywhere.”

- James Czar, NMMFA Exec. Direct.



# Reduced Impact on Natural Landscape



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# Tribal Energy Program

- Erosion & Stormwater Plan
  - No clear cutting
  - Permeable paving
  - No building on slopes >10%
- Construction Waste Management Plan
- Local materials & workers
  - Local firewood use
  - 30% Native

“...this housing development has been designed to have as minimal an impact as possible on Mother Earth. .”

- Tim Horan, Exec. Direct.





# Tribal Energy Program

- Roads follow natural contours & ridgelines
- Undisturbed & reused natural features
  - Trees
  - Boulders

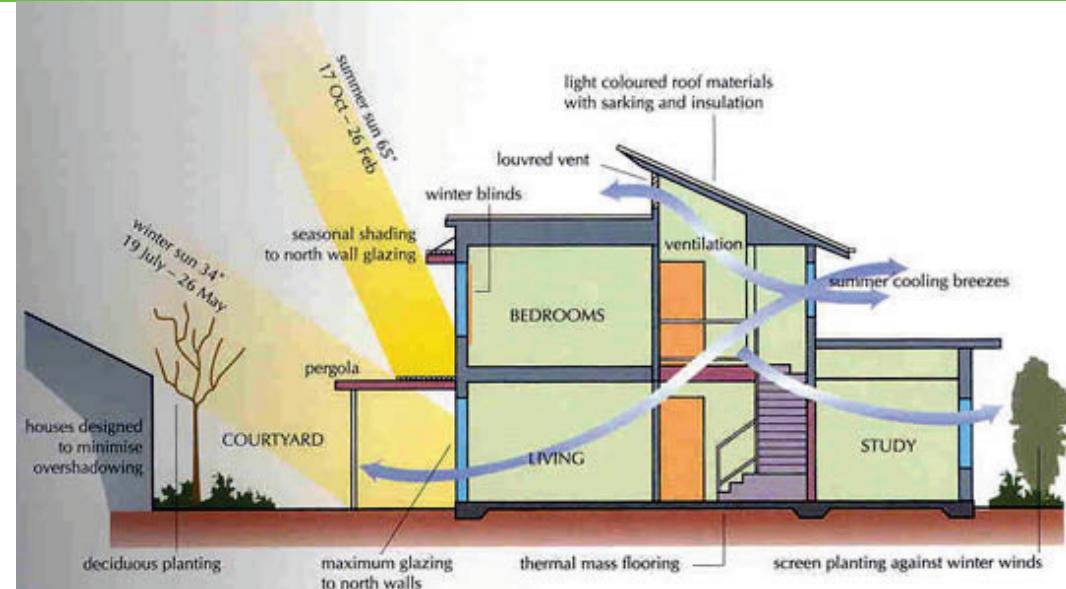
“Our people are about preserving our land here... Our ancestors lived off the land, the plants, the mescal, so this is a good plan for our people.”

- Kathryn Zuazua, Tribal member





- Orientation:
  - Southern Exposure
  - Dining
  - Living
  - Kitchen
- Large Windows & Overhangs
- Daylighting
- Thermal Massing



“This project is a wonderful example of how truly sustainable housing can be built on New Mexico’s tribal lands.”

- Diane Denish, NM Lt. Governor



- Energy Star Appliances
- EE light fixtures & furnaces
- Low flow plumbing fixtures
- High performance doors & windows

“A lot of our people really struggle with the costs of food and housing. So what we intend to do is build green, healthy homes that are very energy efficient in order to reduce the cost of energy use.”

- Tim Horan, MAHA Exec. Direct.

# Tribal Energy Program





- High windows:
  - Natural & cross ventilation
  - Warm air exhaust
- Materials:
  - Low VOC
  - Non-toxic
  - Formaldehyde-free
- Stained concrete floors

“Breathing or ingesting such chemicals is not only dangerous to respiratory systems humans and animals, but the natural environment and ozone.”

- IC Today Article, Aug. 27, 2008

# Tribal Energy Program





## Water

- Catch & Reuse
- Roof:
  - Metal
  - Pitched
- Water catchment system:
  - Two 55 gallon drums
  - Livestock
  - Garden
- Xeriscaping

“Respecting the environment is key to the values of the Mescalero people.”

- Tim Horan, MAHA Exec. Direct.





## I'-Sah'-Din'-Dii': Sustainable

### 5 Sustainable Design Strategies:

- ✓ Site
- ✓ Water
- ✓ Energy
- ✓ Materials
- ✓ Indoor Environment

“Building green is a major part of the Tribe’s commitment to provide quality, sustainable, affordable homes for Mescalero Apache families.”

- Carleton Naiche-Palmer, Tribal President





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Questions?

# Ahéhee'!

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