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Sandia National Laboratories



# Energy Efficiency & Renewable Energy Benefits

## Indian Canyons Trading Post –

## Agua Caliente Band of Cahuilla Indians

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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# Overview

- Objective
- Background
- Methods
- Indian Canyons Trading Post
- History
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- Energy Efficiency
- Comparisons
- Conclusion

# Objective

- Benefits of renewable energy & energy efficiency
  - Energy demand
  - Cost
  - Emissions

# Background

- Global warming
- Climate change
- Non-renewable energy
- Biggest energy users: buildings
- Solutions: energy efficiency & renewable energy

# Methods

- Site visit
- Approval from Agua Caliente Band Tribal Council
- Communication with tribe
- Research

# Indian Canyons Trading Post

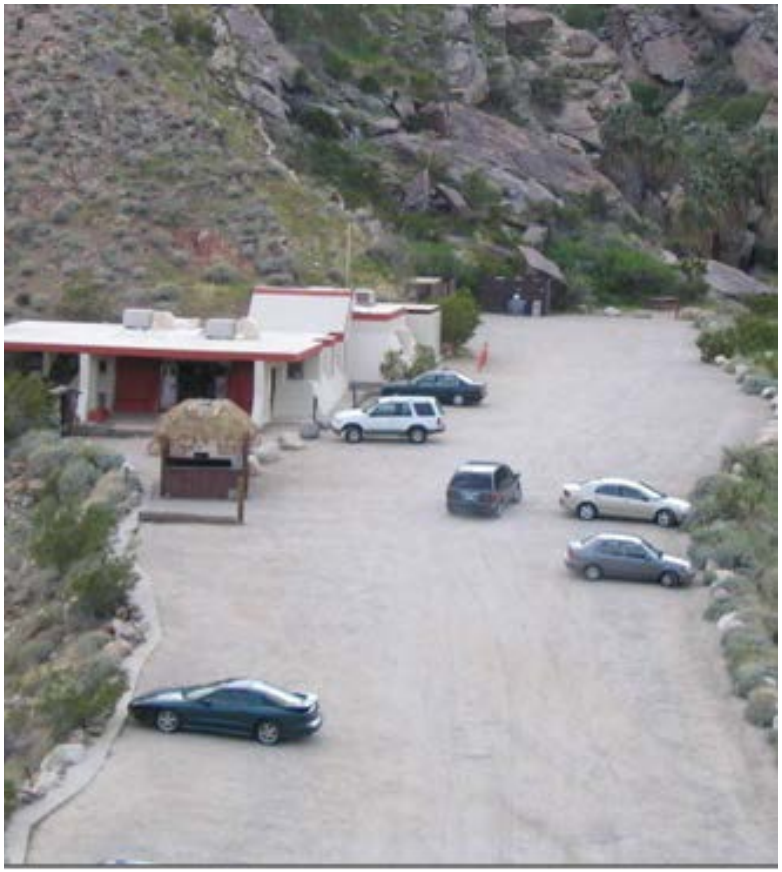


Photo showing Trading Post prior to PV installation, taken from Eastern view. Source: *Mineral Assessment Program Phase II*

- Historical site within tribal boundaries
- Situated within canyon
- Off-grid ~700 square feet visitor's center & retail shop

# History

- Propane: generator, refrigerator, & freezer
  - High costs
  - Noise pollution
- 2005: DOE Tribal Energy Program Grant
  - Strategic Energy Plan
- 2009: DOI Bureau of Indian Affairs 638 Mineral Assessment Program Grant
  - Implementation

# Renewable Energy

- 8.25 kW photovoltaic array
- Diesel generator back-up
- Propane designed equipment removal
- Roof repair

Picture showing Trading Post after PV installation, taken from Southwestern view. Source: Sandra Begay-Campbell

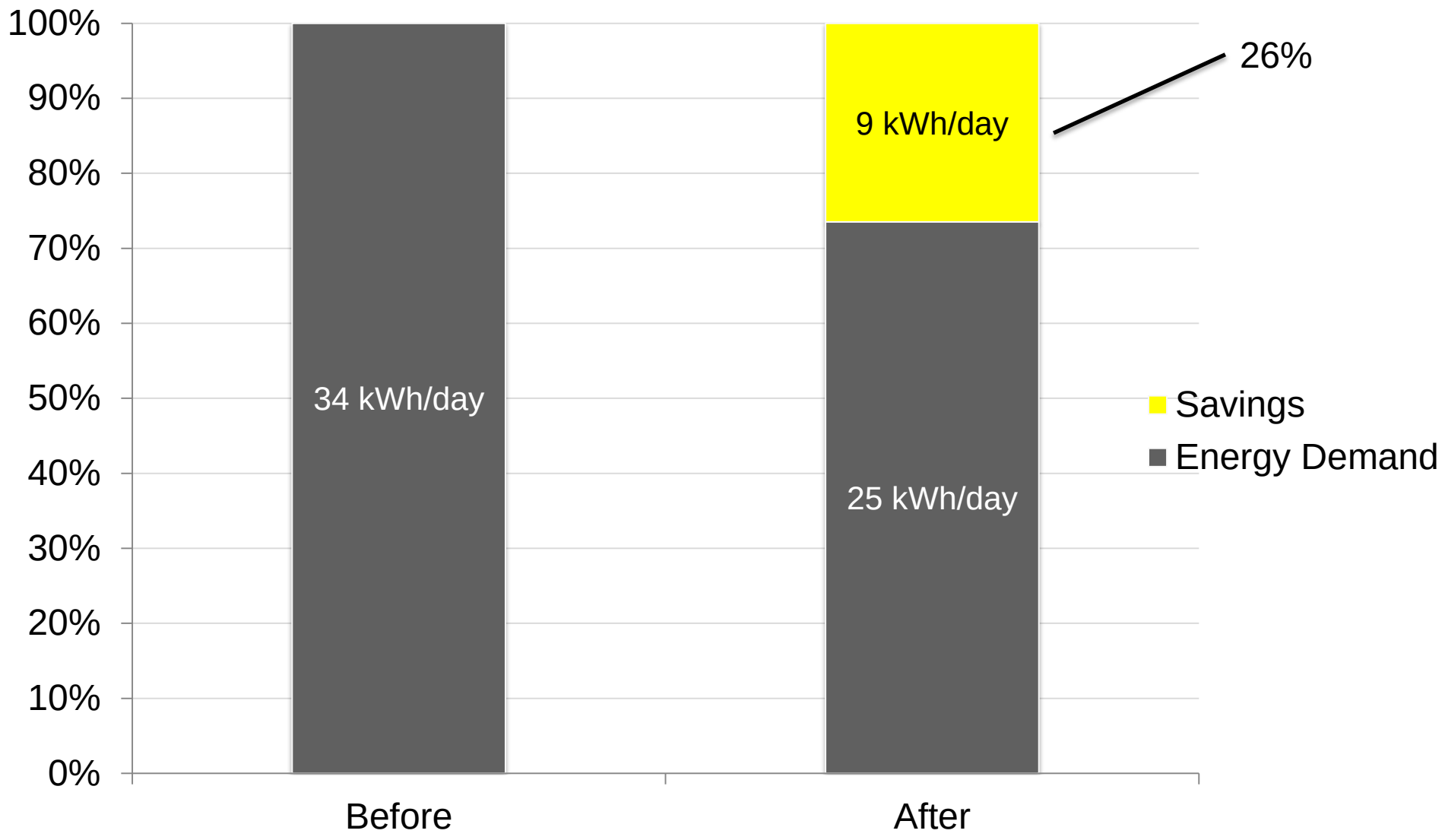
# Energy Efficiency

- Electric Frigidaire Refrigerator/Freezer
- Electric Arctic Air Commercial Freezer Model
- Lights: 160w to 475w
- Toaster: 1000w to 1500w
- Two ceiling fans
- Unnecessary extra electric freezer

# Energy Comparison

| Table 1: Comparison of Energy Demand Before and After Energy Efficiency Measures | | |
|---|---|---|
| | Before EE | After EE |
| Energy Demand | 34 kWh/day | 25 kWh/day |

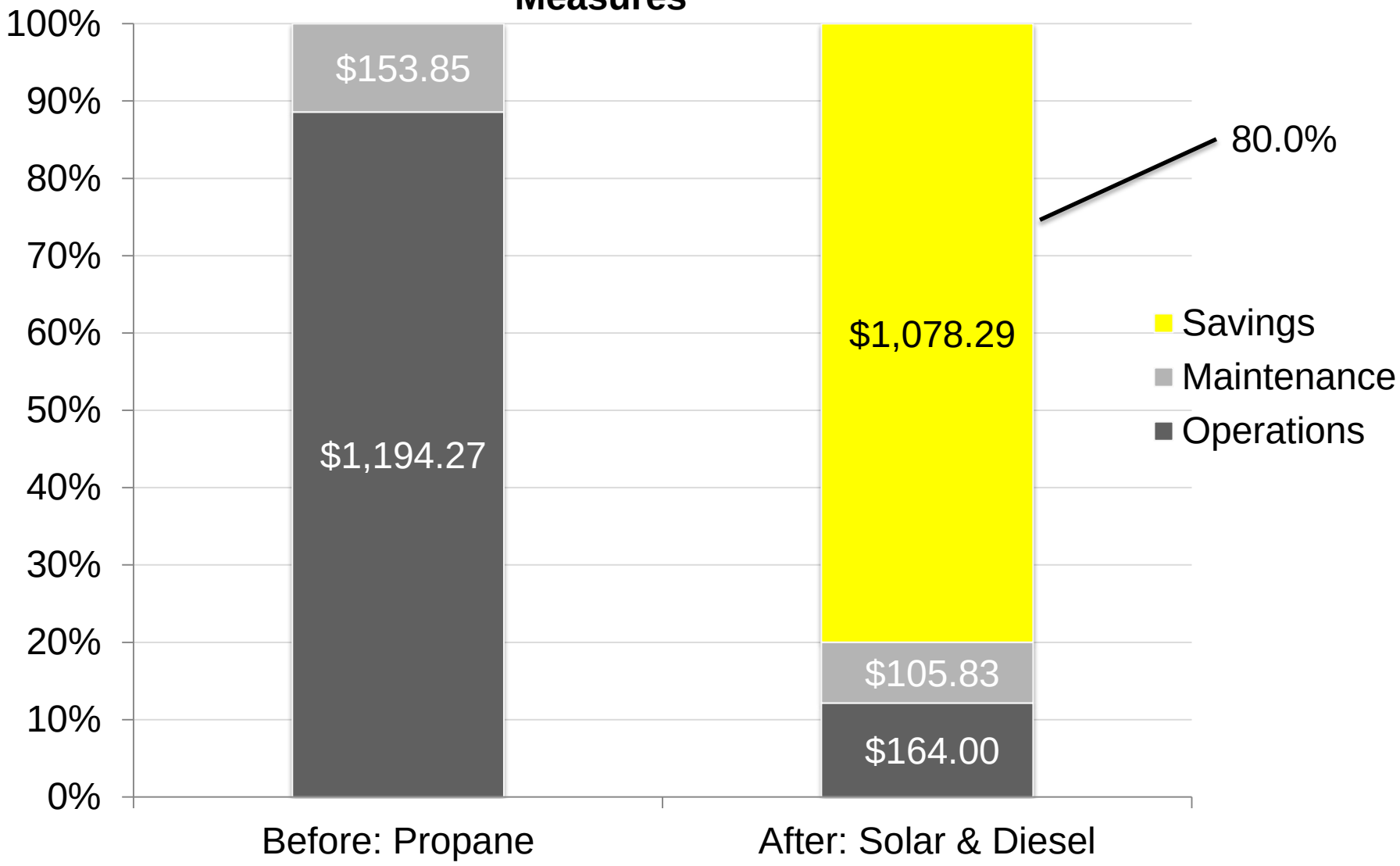
# Comparison of Energy Demand: Before & After Energy Efficiency Measures



# Cost Comparison

| Table 2: Comparison of Off-Grid Costs Before and After Energy Efficiency & Renewable Energy Implementation | | | |
|---|---|---|---|
| | BEFORE | AFTER | |
| | Propane | PV | Diesel |
| Operations | $1,194.27 | $160.00 | $4.00 |
| Maintenance | $153.85 | $100.00 | $5.83 |
| Total Costs Per Month | $1,348.12 | $269.83 | |

# Comparison of Total Costs Per Month: Before & After Energy Efficiency & Renewable Energy Measures



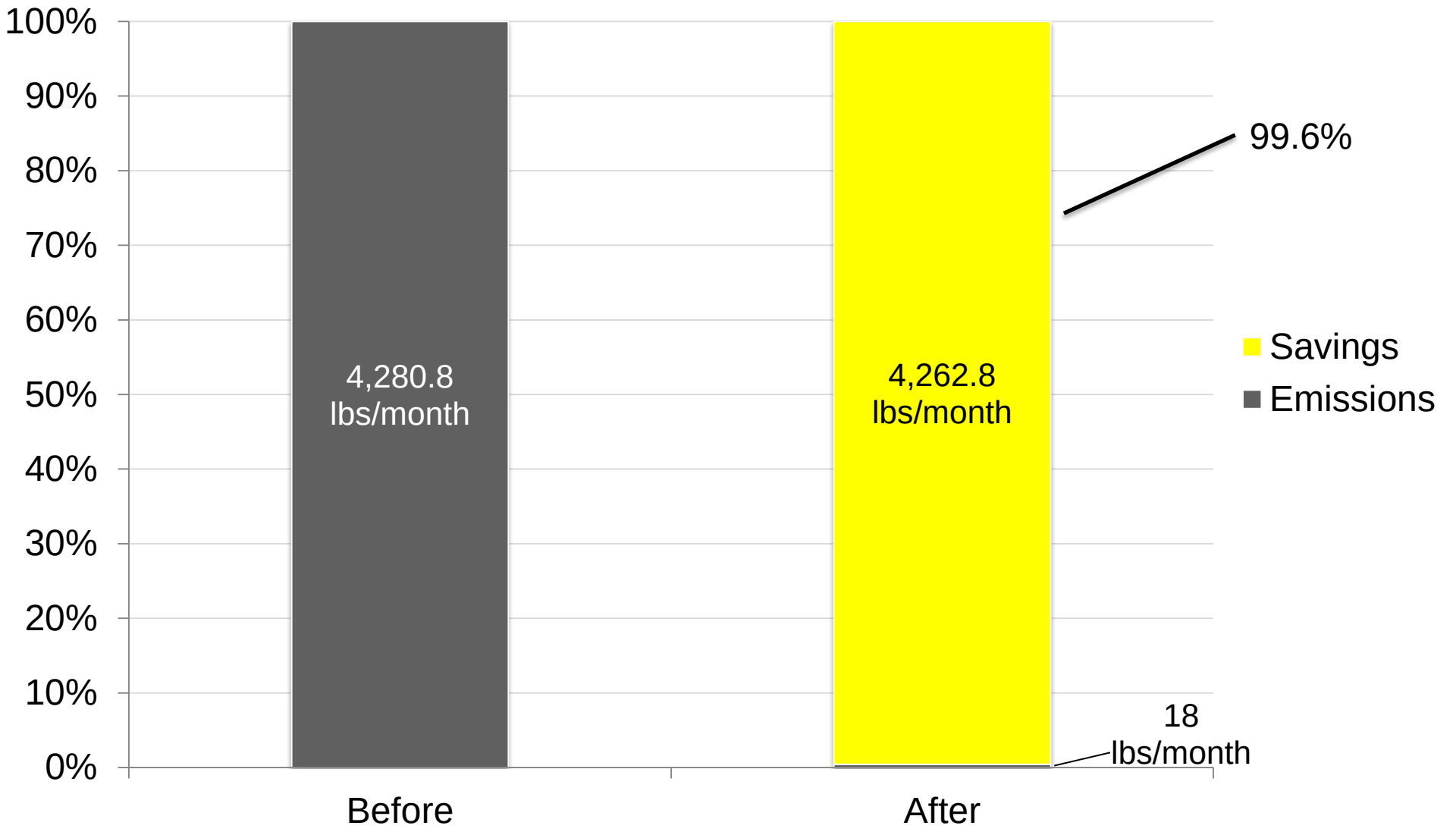
# Cost Savings

- $12,939.48 per year
- $129,394.80 per decade
- Initial cost of system = $117,000
- Return on investment = ~9.5 years
- At 10 years: $12,394.80 after investment
  - O&M costs for 3 years & 10 months

# Emissions Comparison

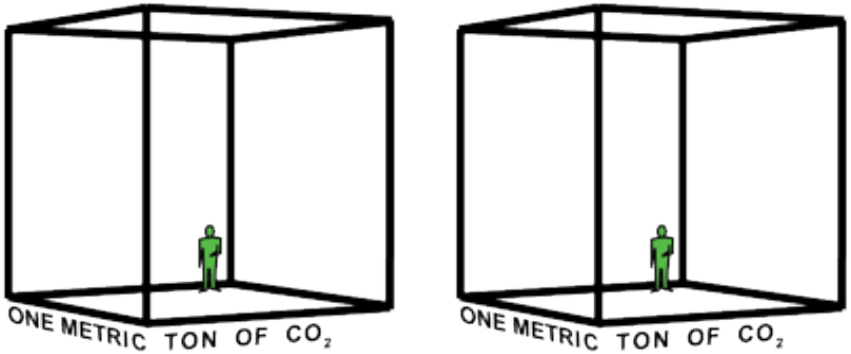
| Table 3: Comparison of Off-Grid Carbon Emissions Before and After Energy Efficiency & Renewable Energy Implementation | | | |
|---|---|---|---|
| | BEFORE | AFTER | |
| | Propane | PV | Diesel |
| Fuel Amount (per month) | 329.39 gal | - | 0.83 gal |
| $CO_2$ Emissions (per month) | 4,280.8 lbs | - | 18 lbs |

# Comparison of CO2 Emission: Before & After Energy Efficiency & Renewable Energy Measures



# Emission Savings

- 4,262.8 pounds = 1.9336 metric tons per month




Versus Carbon Neutral. (March 2011). *What Does a Metric Ton of CO2 Look Like?* Retrieved from http://www.verus-co2.com/blog/?p=1964

- 23.203 metric tons per year

# Conclusion

- Cost effective than running business as usual
- Uniquely designed systems
- Energy efficiency & conservation as 1st step
- Sustainable marketing
- Future implementation = future benefits
- Reducing effects of climate change

# Before & After

Photo showing Trading Post prior to PV installation, taken from Eastern view. Source: *Mineral Assessment Program Phase II*

Picture showing Trading Post after PV installation, taken from Southwestern view. Source: Sandra Begay-Campbell

# Thank You

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