

Pawnee Nation DOE First Steps Project

DOE Tribal Program Review November 8, 2007

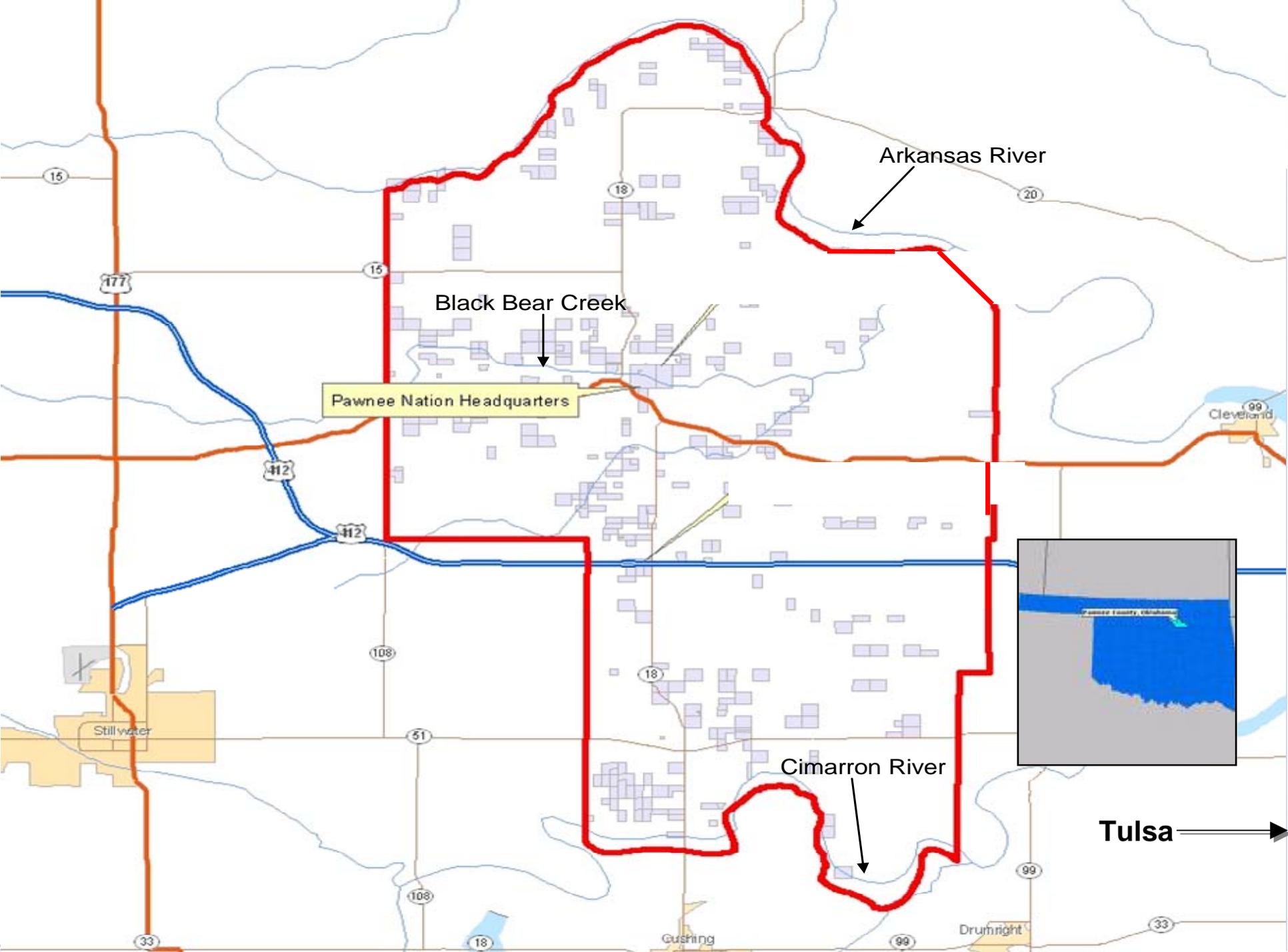
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Overview of Presentation

- Background
- Project Objectives
- Activities Performed
- Renewable Energy Resource Development Opportunities
- Electric Utility Options
- Energy Efficiency Opportunities
- Key Findings and Recommendations
- Implications for Strategic Energy Plan and Next Steps



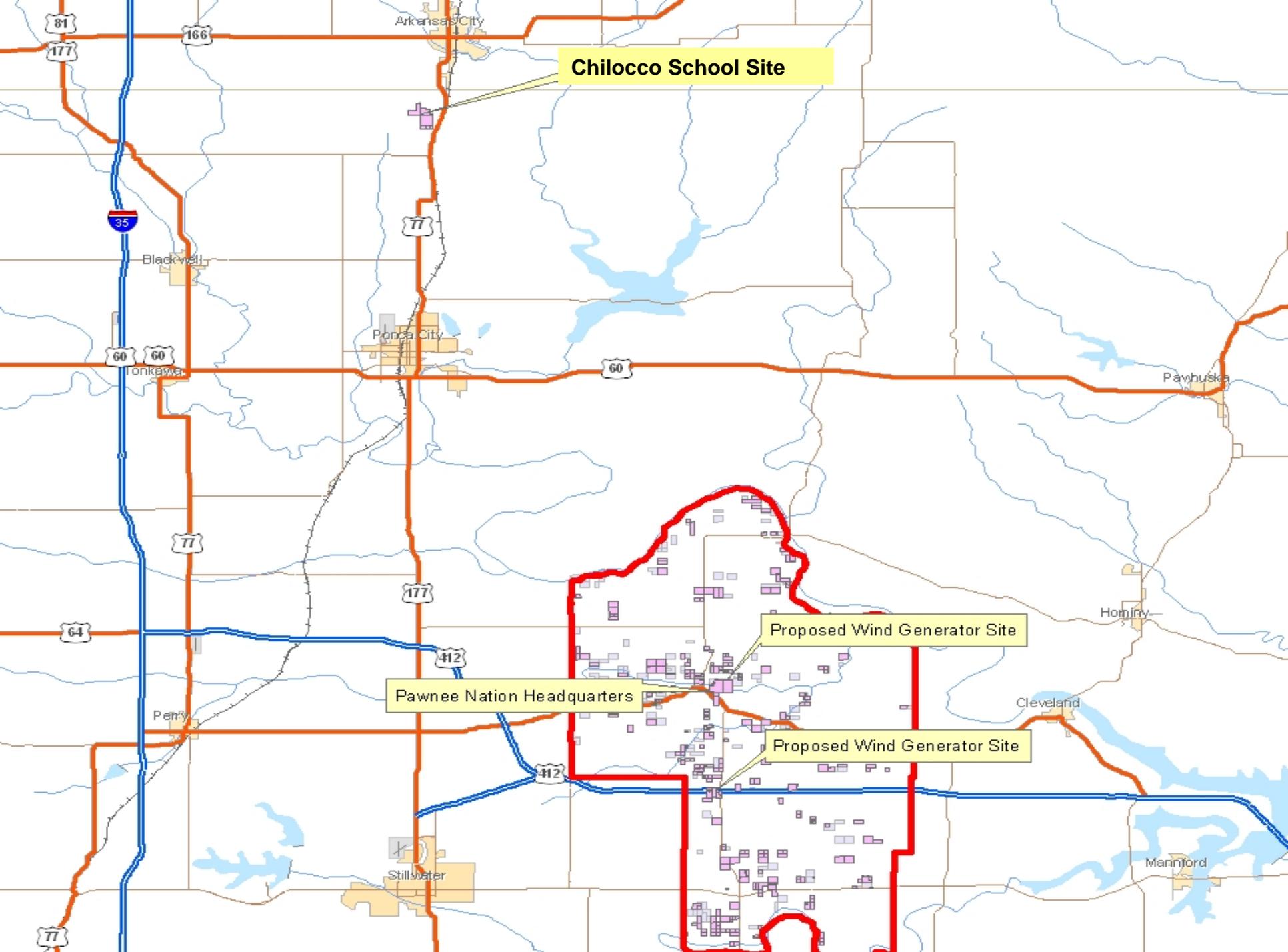
Arkansas River

Black Bear Creek

Pawnee Nation Headquarters

Cimarron River

Tulsa



Chilocco School Site

Proposed Wind Generator Site

Pawnee Nation Headquarters

Proposed Wind Generator Site

Background

- Land:
 - Tribe-owned lands scattered across boundaries of Nation.
- Existing Buildings:
 - Limited housing exists on tribal lands. Housing was built in 1950s.
 - ~18 tribe-owned non-residential buildings, several historic
- New Construction: Chilocco casino, and several renovations on reservation
- Served by multiple electric utilities, and have good working relationships, though concerned about rising prices



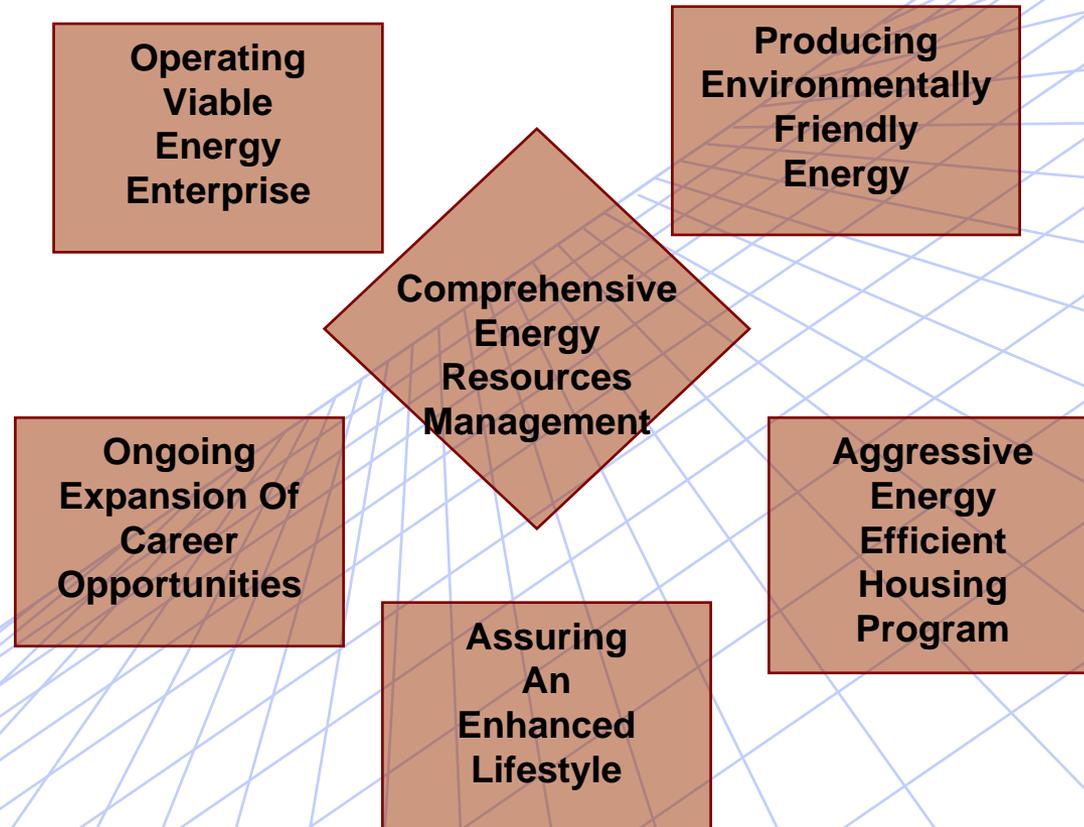
Dining Hall

Most Pawnee-owned buildings: historic, stone structures

Pawnee Nation Strategic Energy Plan

- Energy Planning Session held with Council of Energy Resource Tribes (CERT) Fall, 2003
- Tribal leaders, program managers and staff of Pawnee Nation developed energy plan looking ahead to 2013
- Developed six point vision for the future

Six Point Vision for the Future



First Steps Project Goals

- Assure future energy resource development reflects Pawnee values.
- Assess demand and supply-side energy resources
- Provide information necessary to prioritize / screen opportunities
- Identify infrastructure needs
- Establish participatory decision-making process
- Define specific objectives and progress indicators
- Ensure Tribal members receive training needed to carry out energy initiatives.
- Provide tools necessary to pursue “best fit” options

Activities Performed

- Reviewed potential **renewable energy applications** and funding sources
- Reviewed opportunities for cost savings through electric **utility options**
- Also provided overview of current and future electric demand, and outlined energy efficiency options

Biomass



**BIOMASS
FEEDSTOCK**



**CONVERSION
PROCESSES**

Wood Waste
MSW
Agricultural Crops
Agricultural
Residues
Animal Wastes



Gasification
Fermentation
Acid Hydrolysis
Hydro-thermal
liquefaction
Combustion
Co-firing



USES

Transportation Fuels

- Ethanol
- Biodiesel
- Biocrude Oil

Electricity

Heat

Products

- Oils
- Plastics
- Solvents
- Chemical Intermediates
- Adhesives
- Dyes, Pigments, and Ink
- Detergents
- Etc.

Pawnee Biomass Resource

- 19,000 acres of cropland, meadow/pasture and timber could provide ~95,000 green tons of biomass per year.
- Data based on BIA, USDA, Natural Resources Conservation Service data (forestry data outdated-1993/1995)
- Notable resources:
 - Red Cedar: Considered invasive & fire hazard, currently being burned
 - Underutilized Croplands



Sources: Natural Resources Conservation Service, Oklahoma Living Magazine, 2005; and www.huntingcountry.net

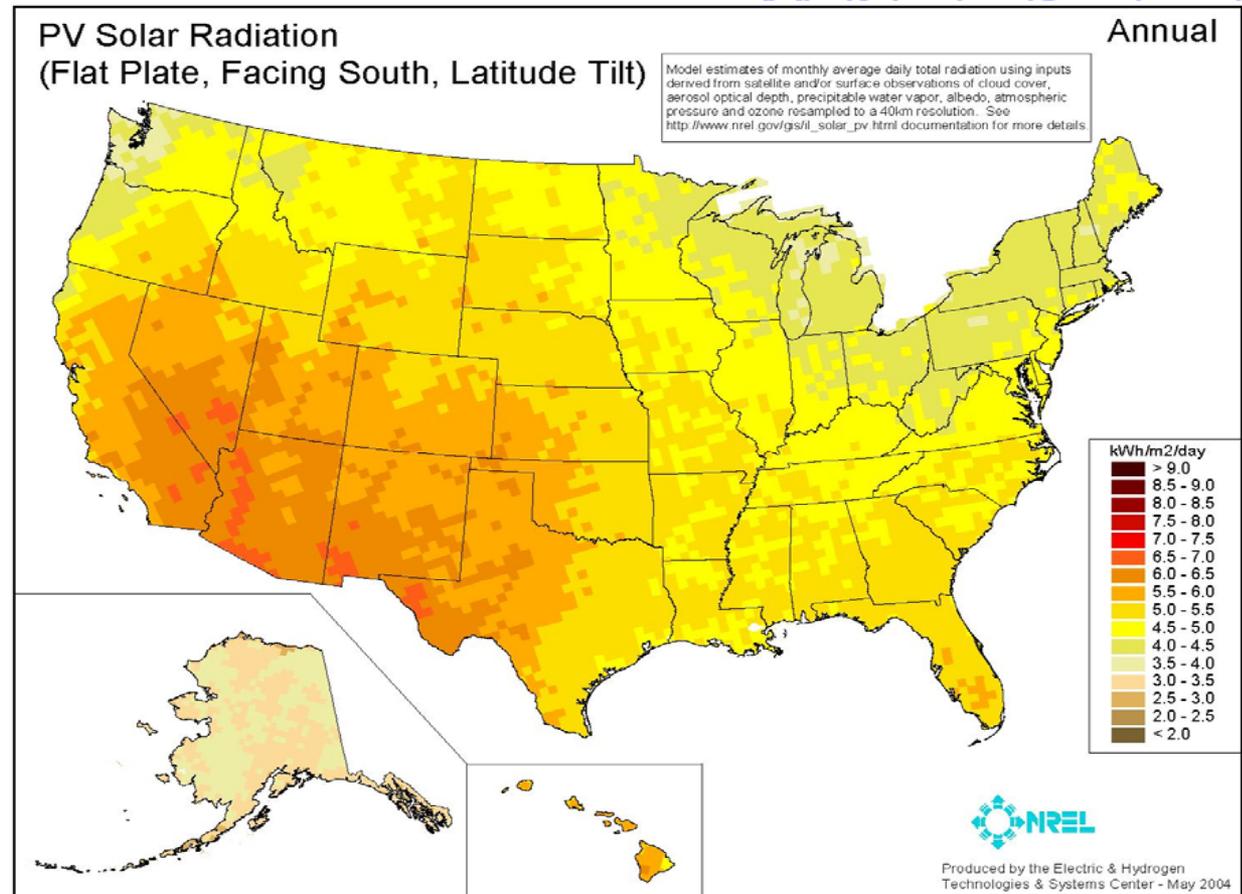


Potential Pawnee Biomass Uses

- Heating for non-res buildings (preliminary analysis completed for admin building)
 - Use invasive red cedar to fuel outdoor wood boiler.
 - Next steps: Complete comprehensive economic feasibility analysis and identify funding mechanism.
- Agricultural biomass holds great promise in next decade.
 - Substantial amount of underutilized cropland available.
 - Growth in biofuel demand over next decade may warrant sale of energy crops to biofuel refinery.
 - Next steps: Monitor biofuel market development, attend trade shows, establish communications with Oklahoma's new Bioenergy Center.

Solar Resource

Solar resource slightly above national average (averages 4.58 kWh/m²/day)



Pawnee Solar Development Potential

- Photovoltaics (PV)
 - Strong technical potential, but not cost-effective given lack of financial incentives. Financing with gov't loan could make economically feasible.
 - 5 kW system, -\$31,000 net present value, >25 year simple payback.
 - Next step: determine level of commitment to PV and whether want to pursue financing
- Solar Hot Water
 - Cost effective for gym
 - ~5-7 year payback
 - Next step: contact vendors, obtain buy-in from tribal decision-makers, determine funding approach (finance v. upfront payment)

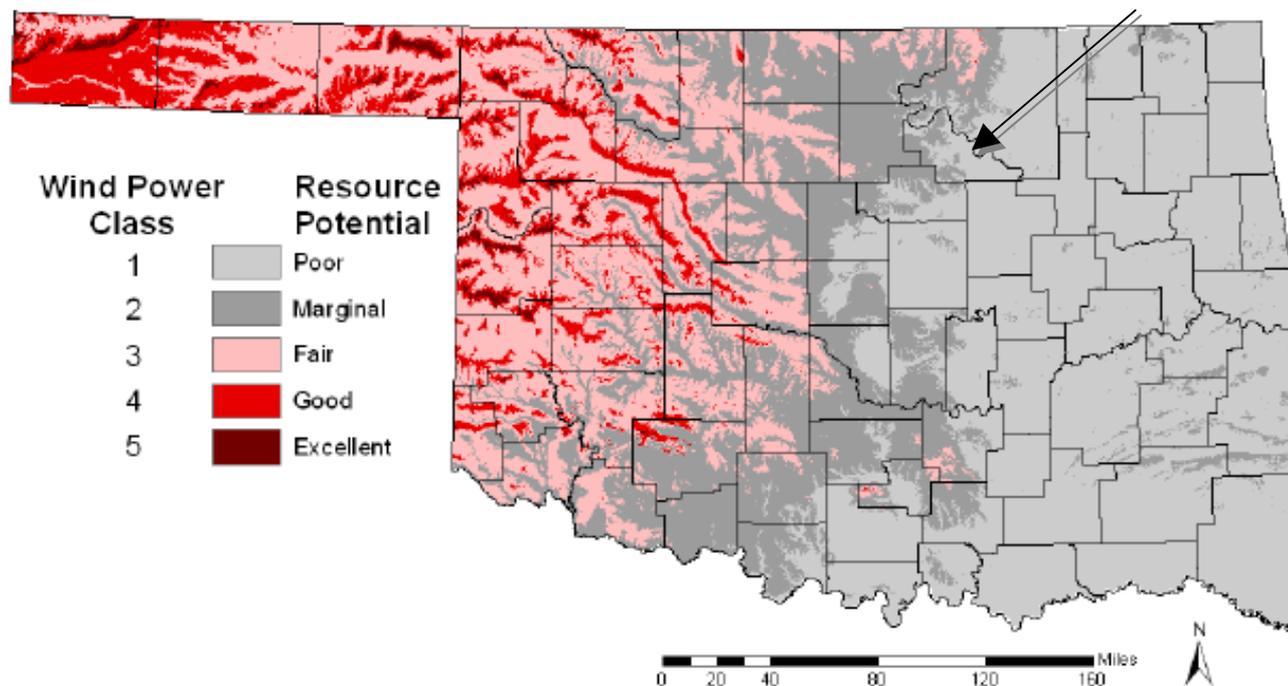


Nebraska commercial solar project,
Source: www.motherearthnews.com

Wind Resource

OKLAHOMA WIND POWER INITIATIVE'S
WIND RESOURCE MAP

Pawnee County

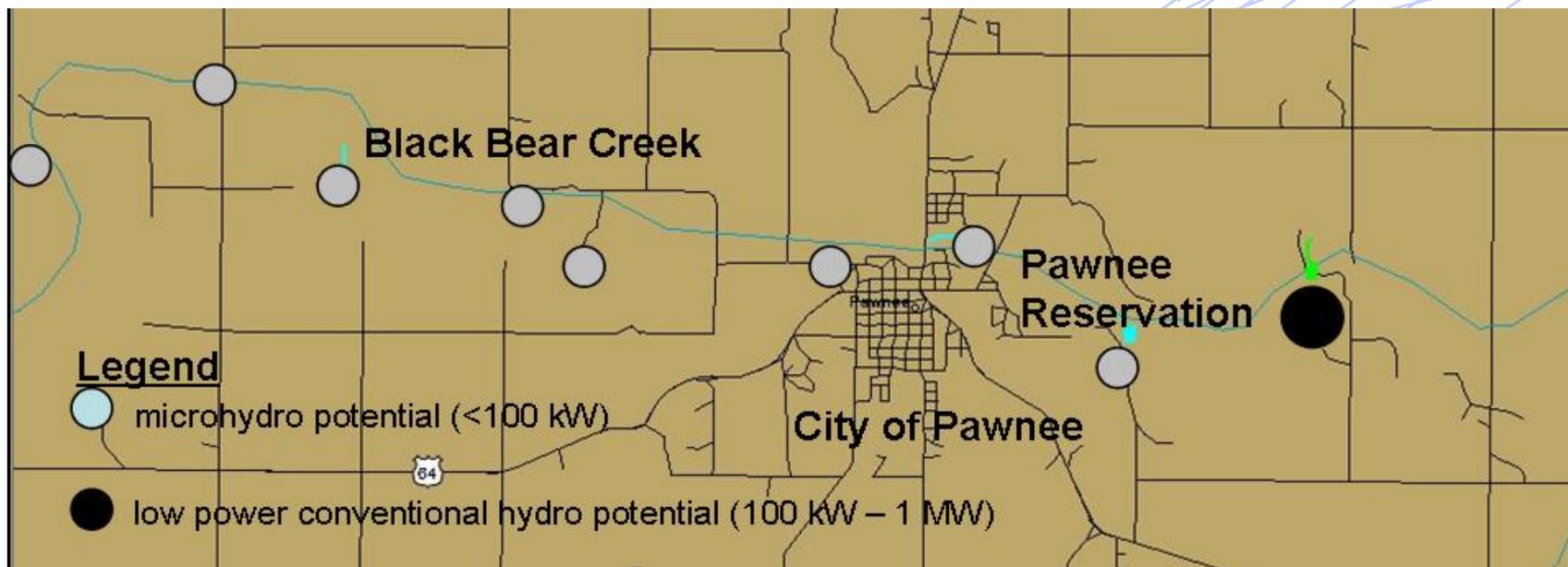


Source: OWPI, Wind Resource Map, 2000
www.ocgi.okstate.edu/owpi

Pawnee Wind Development Potential

- Resource not sufficient to support large-scale wind
- Small wind not economically feasible due to:
 - poor resource,
 - lack of good sites for net-metering, and
 - lack of financial incentives
- Small wind simple payback ~25-30 years.
- Next steps:
 - Small wind: Possible demonstration project if ID good net metering opportunity (i.e. purchase land around travel plaza), measure resource in target location, seek subsidized financing package.
 - Explore Chilocco site development potential in collaboration with other tribes.

Hydro Resource



Sites with microhydro or “low power” conventional hydro potential.

Source: Virtual Hydro Prospector, Idaho National Lab

Pawnee Hydro Development Potential

- Data show limited resource on reservation property.
- Pawnee Nation representatives report lower resource than indicated by data.
- Further pursuit of small hydro development not recommended.
- Cimarron / Arkansas Rivers border reservation and could hold large scale hydro potential. Review was outside scope of this project.

Energy Efficiency

- Implement simple efficiency measures in non-res buildings, focusing on building envelope and use of high efficiency equipment.
- Adopt Energy Code (ASHRAE 90.1 or Int'l Energy Code) to improve efficiency of new buildings.
- Specific recommendations provided.

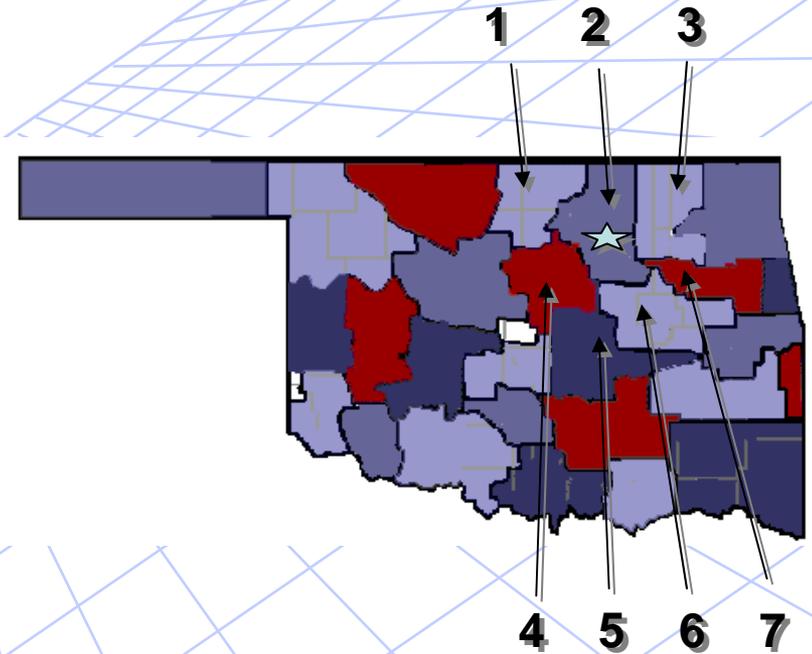
Electric Utility Option Review

- Background and Framework
- Electric Utility Assessment Data
- Electric Utility Service Options
- Option Analysis

Nearby Service Providers

Oklahoma Electric Coops:

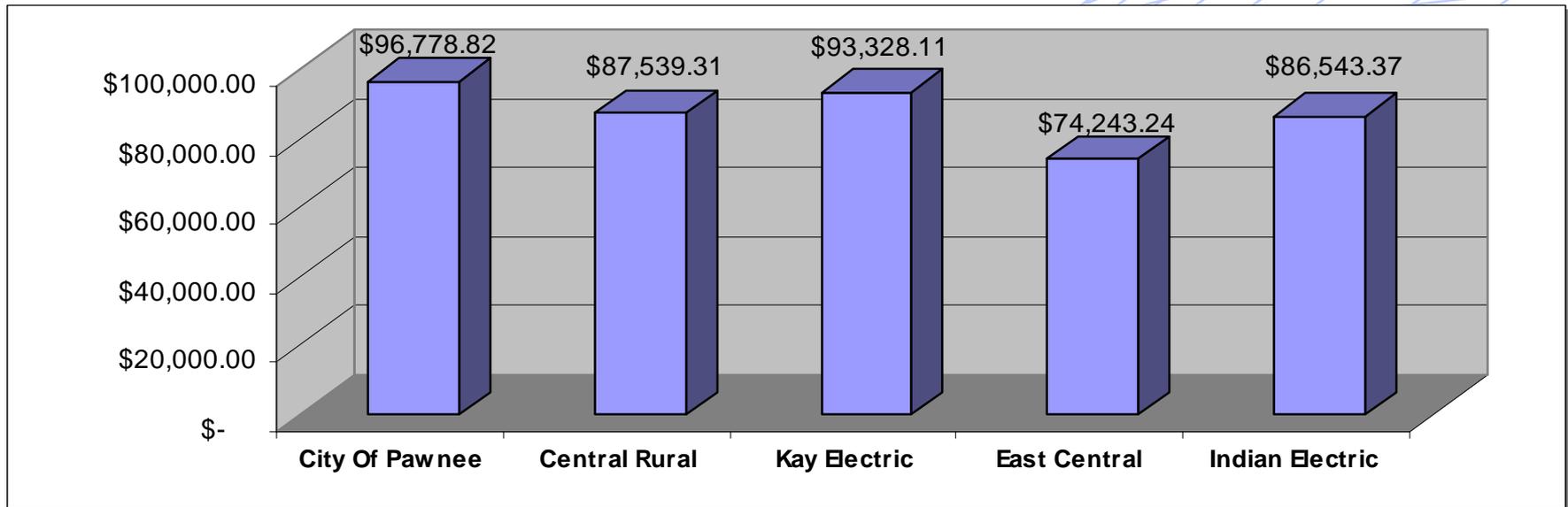
1. Kay Electric
2. Indian Electric
3. Verdigris Valley Electric
4. Central Rural Electric
5. Canadian Valley Electric
6. East Central Electric
7. Lake Region Electric



Comparative Electric Rates

	Average Commercial Customer \$ / kWh charge	Percent Lower than City of Pawnee
City of Pawnee	0.0895	N/A
Central Rural Cooperative	0.0810	10.6%
East Central Cooperative	0.0687	30.4%
Indian Electric Cooperative	0.0800	11.8%
Kay Electric Cooperative	0.0863	3.7%
State of Oklahoma	0.0557 (2006)	37.8%
United States	0.0578 (2006)	35.4%

Comparison of Nearby Provide Electric Rate Impacts



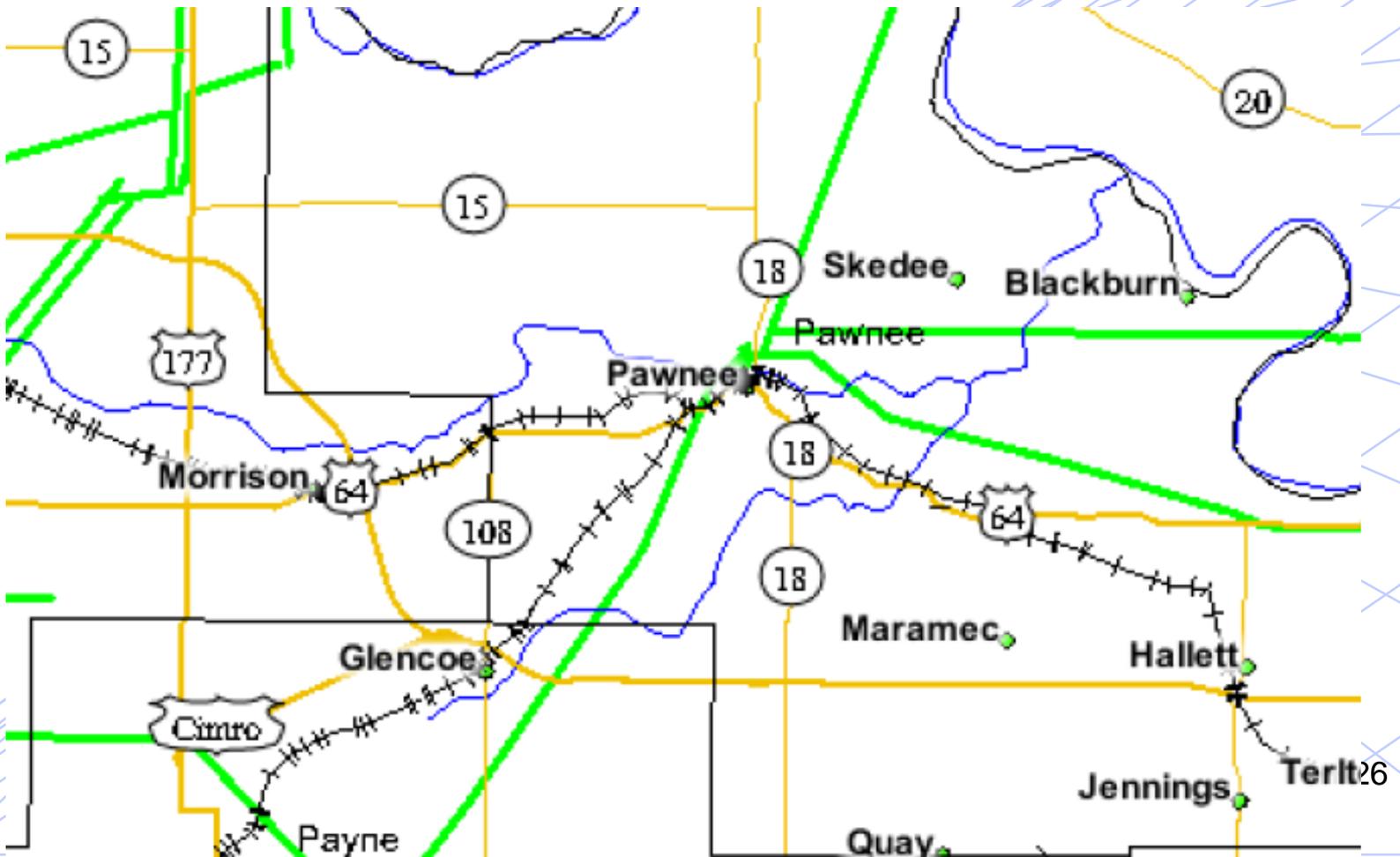
Electric Utility Service Options

- Business as usual
- Consider alternative supply options
- Negotiate lower rates with City of Pawnee
- Focus on reducing energy usage
- Develop electric utility organization

Key Drivers for Direct Purchase Decision

- Authority to purchase power from other suppliers
- Proximity to transmission system
- Proximity to existing substation/cost of lines to serve Pawnee
- Cost of new substation on Pawnee reservation
- Wholesale supply options

Proximity to Transmission System



Electric Utility Service Options

- Develop electric utility organization
 - Pawnee reservation Electric Utility Authority
 - Rates and services on reservation
 - Set standards of service
 - Reliability
 - Outages
 - Power quality
 - Customer services
 - Assess penalties for violations
 - Negotiate rates for Tribal facilities
 - Combine some accounts to increase loads?

Energy Utility Service Options

- Develop electric utility organization
 - Poles and wires operating utility
 - Acquire system and contract operations
 - Acquire system and develop internal capacity
 - Develop parallel system to support growth
 - Power supply >>Multiple options
 - Operations: >>Contract operations >> Develop internal capacity
 - Pawnee would need to study feasibility of various options

Overall Findings and Recommendations

- Limited RE development opportunities.
 - Monitor future market potential for bioenergy, conduct more detailed feasibility study.
 - Pursue wood-fired space heating at admin building, and solar hot water at gym.
 - Explore wind development activities at Chilocco School site.
- Utility Issues
 - Multiple options depending on Pawnee's relationship with the City; interest/ability to acquire and operate an electric utility; and ability to reduce current electric usage

Overall Findings and Recommendations

- Energy Efficiency:
 - Adopt Energy Code
 - Implement cost-effective improvements at existing buildings
- Other:
 - Consider establishing energy services business to complete on-going tribal energy improvements, leverage USDA funding, build tribal employment opportunities, educate and train tribe members on energy issues.

Questions?

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