OVERVIEW

YAN Demographics
Biomass Study Team
YAN Biomass Study Background
Project Rationale & Outline
Project Progress
Future
Q&A
YAN DEMOGRAPHICS

- YAN Population = 1800 Enrolled Members
- YAN Geography = 650 Acres in 5 Locations
- Projected location of a Biomass Facility
  - Located in Verde Valley of Central Arizona
    - Middle Verde (On reservation)
    - Drake (30 Miles from the Reservation)
YAN BIOMASS STUDY TEAM

- YAN Energy Director – Tracy Tudor
- YAN Program Consultant – Mark Randall
- YAN Utility Consultant – Leonard Gold
- YAN Technology Consultant – Al Dozier
YAN BIOMASS BACKGROUND

- YAN Energy Program 1999 resource assessment
- YAN has 41 kW of Solar Generation
- YAN is negotiating with local utility for procurement of Reservation electrical utilities
- YAN views Biomass as an opportunity for economic development
- 2001 DOE FEMP Pre-feasibility Study indicated biomass could be economic
Project Rationale

- Pyrolytic Steam Reforming Gasification

<table>
<thead>
<tr>
<th>Gasification</th>
<th>Incineration</th>
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<tbody>
<tr>
<td>Oxygen free gasification; converts feedstock to Syn Gas and benign ash</td>
<td>Thermal destruction with direct flame &amp; excess oxygen, Heat &amp; CO₂</td>
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<td>No air flow (extremely low NOX)</td>
<td>High air flow (high NOX)</td>
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<tr>
<td>No toxic emissions (no Furans or Dioxins)</td>
<td>Generates Furans and Dioxins</td>
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<tr>
<td>94-98% reduction in volume and weight of carbon in Feedstock</td>
<td>Maximum 85% to 90% reduction</td>
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<tr>
<td>Creates high quality Syn Gas (450 to 900 BTU/SCF) that is storable</td>
<td>Heat is only usable form of Energy and can not be stored</td>
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<td>Secondary air pollution control devices rarely required</td>
<td>Secondary air pollution control device <strong>always required</strong></td>
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Gasifier Technology

- Can process any carbonaceous material
- Supplies its own purified process water
- Produces “Syn-gas”
- BTU Energy can be from 350-900 BTU/SCF
- Process Residue is a benign Ash
Wide Range of Gasifiable Materials

- Forest Trimmings - Wood
- Agricultural Residues
- Animal Manures
- Human Biosolids
- Municipal Solid Wastes
- Carbonaceous Fossil Fuels
Gasifier Process

Proprietary Technology

Carbonaceous Feedstock

Pyrolytic Steam Reforming Gasifier (PSRG)

Purified Water

Process Water

Non-Chemical Water Purification (eOXIS™)

SYN-GAS

\[ CO \quad H_2 \]

Catalytic Ethanol Reactor (CATER)

Ethanol

August, 2004

ACT Technology Presentation
Denver Test Facility

Pilot Testing Facility

Rice Straw

Pilot testing facility allows short-term design testing of feedstock to optimize process design
Production Units

25 to 400 ton/day Custom-built Systems

25 ton/day wood waste to electricity system built for Government of Saskatchewan

August, 2004

ACT Technology Presentation
Project Outline

- Resource Availability Assessment
- Technology Review and Best Fit Analysis
- Preliminary Design and Cost Analysis
- Financing and Incentives
- Utility Interface
- Manpower Availability
- Business Plan
- Tribal Council Approval
BIOMASS STUDY PROGRESS

• Completed Fuel Availability Assessment
  – Forest Material
    - National Forests - 3 within 100 mile radius
    - USFS is preparing treatment plans
    - 300 Tons per day needed for economics of scale
    - 2006, Forest material will be available
    - Studying Transportation options
  – Sewage Sludge
    • Completed quantity and energy content study
  – Biofuel Crops
    • Studying suitability
Results to Date

- Human biosolids could provide up to 40%
- Gasifier could be a solution to local biosolids disposal problems
- Forest material availability and processes not yet established.
- Transportation of forest material has marginal economics.
- Relocation of plant improves economics of gas production and diminishes economics of power production
- Local resources such as energy crops and MSW need study
FUTURE

• Continue to explore other potential waste-streams

-- MSW

-- Human Waste Sludge

-- Horse/Cattle Manure

-- Local lumber mills
SUMMARY

• Feasibility Study is On-track
• Technology Validation is On-track
• Arizona RPS will be a factor in economics
• Multiple feedstocks will be necessary
• Project has potential to address a variety of waste disposal issues for the Verde Valley
Questions