Planning for Energy Development

Strategic Energy Plan – DOE First Steps Program

Renewable Energy Demonstration Center Concept

Mecca, CA

Awardee:

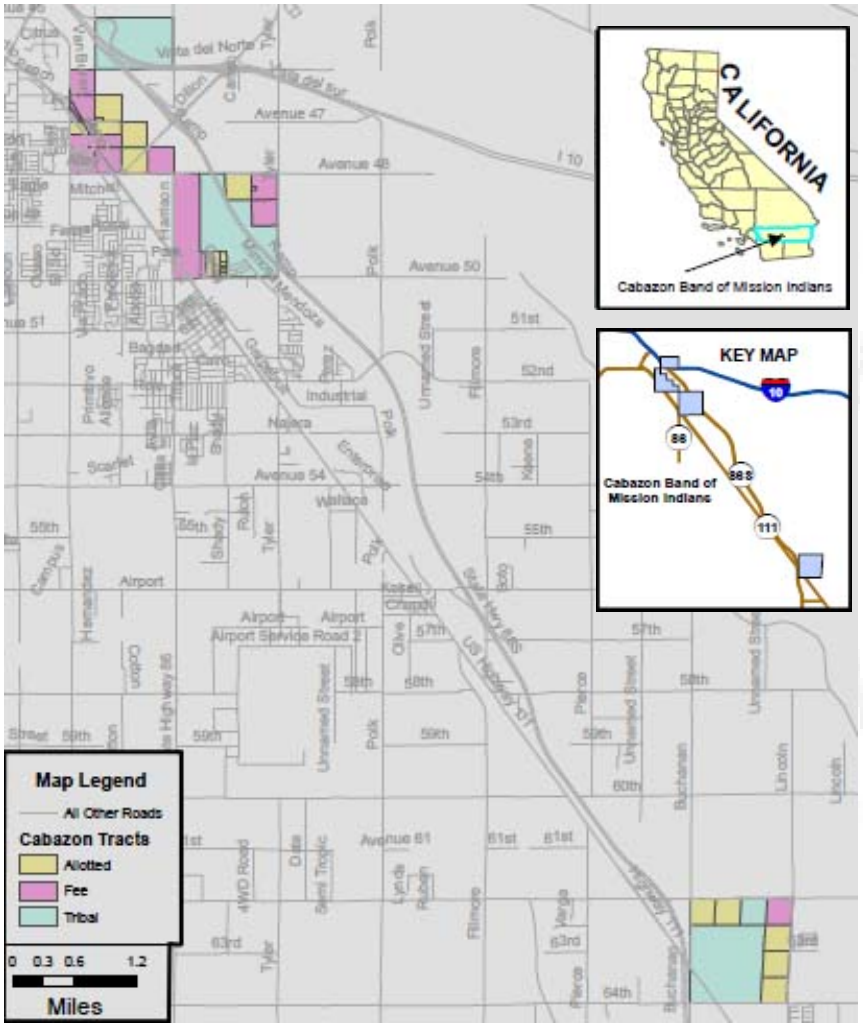
Cabazon Band of Mission Indians

Chairman: Douglas Welmas

Presenter: Becky J. Ross, Compliance Manager

March 24, 2014

CBMI Reservation



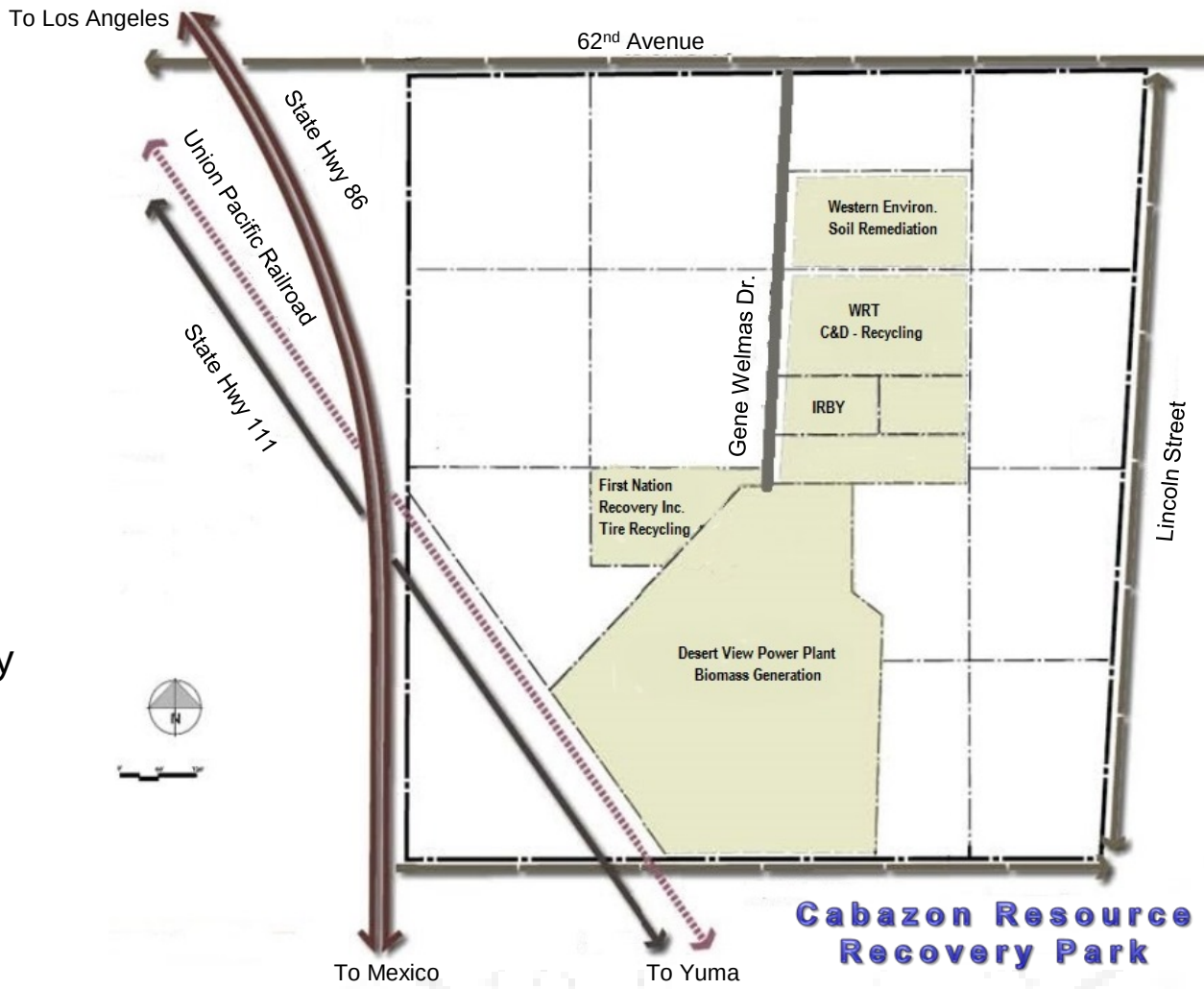
- **East Coachella Valley, CA**
  - 1,182 Acres
    - Trust
    - Allotted
    - Fee: 272 Acres
- **Four Main Sections of Land**
  - Casino – Resort – Golf Course
  - Housing
  - Cabazon Resource Recovery Park (CRRP)
- **Two Major Highways**
  - Interstate 10
  - State Hwy 86
- **Major Union Pacific Rail line**

Background

- Long-range goals of CBMI
  - Create local jobs, job advancement, career opportunities, introducing new sectors of jobs,
  - Supply educational opportunities for both Tribal members and the surrounding community,
  - Improve the well being of both Tribal members and the nearby community,
  - Foster economic diversity.
- CBMI will not sacrifice their commitment to the careful stewardship of the environment.
- CBMI believes that renewable energy based on conversion technology offers a path to achieving its goals. The foundation was set 20 years ago with the creation of the Cabazon Resource Recovery Park (CRRP).
- CBMI was one of many tribes to enter the gaming industry and now aspires to be one of the many tribes to develop renewable energy enterprises at its CRRP.

Existing CRRP

- 590 Acre Site
- 20-year history as a resource recovery & energy park
- An approved PEIS since 1999 for the entire park
- Existing operations:
  - 47 MW Biomass Energy Plant
  - Tire Recycling
  - Soil Remediation
  - C & D Waste Recycling
- Room for More



CRRP Approved Programmatic Environmental Impact Statement (EIS)

- **In 1999 the CBMI submitted and received approval to develop the CRRP for a variety of waste conversion and recycling technologies to usable commodities.**

- **Incoming Waste Streams such as:**
  - Wood, Municipal Solid Waste (MSW), Biosolids, Rubber, Metals – Nonferrous/Precious/Ferrous, Plastics, Paper, Cardboard, Green Waste, Organic, Soils, C&D Waste, and Waste Oil

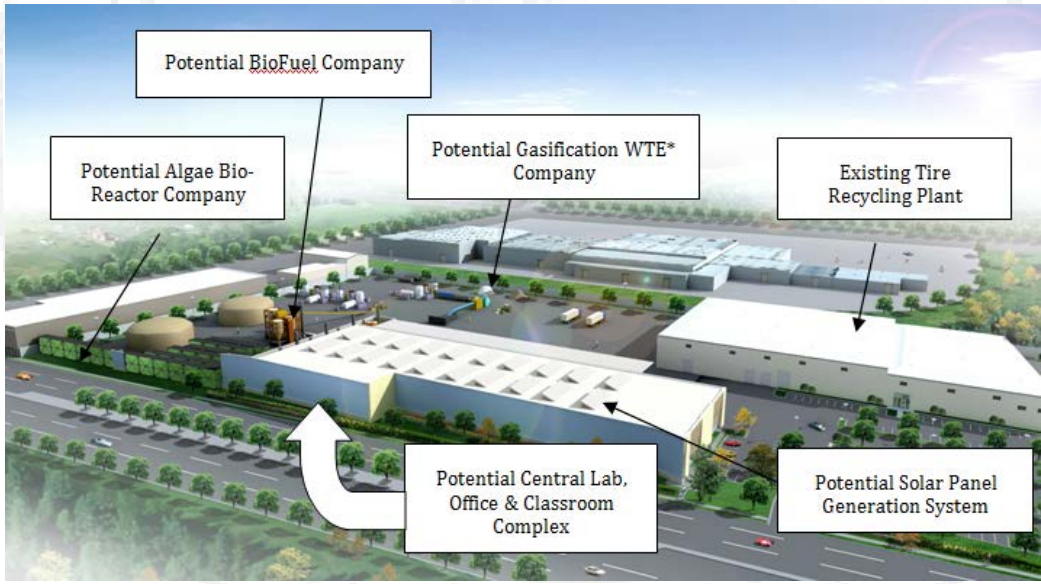
- **Projects & Facilities such as:**
  - Biomass Power, Organic Recycling, Metals Recovery/Processing, Waste-to-Energy, Biomass Gasification, Material Recovery, Rubber Recycling, Used Oil Refining, and Soil Remediation

CBMI's DOE Tribal Energy Grant

- Awarded under DOE's First Steps Program
- Part of the Tribe's Strategic Energy Plan - addition of waste to energy/fuel conversion technology at the CRRP.
- A Renewable Energy Demonstration Center (REDC) concept - presented as a means to attract waste conversion technology to CRRP.
- The DOE grant funding:

  Assess the viability of a REDC as part of the Tribe's Strategic Energy Plan for the CRRP.

  Develop an Action Plan for the REDC.



REDC Assessment – Task 1

The REDC Baseline Assessment was composed of the following subtopics:

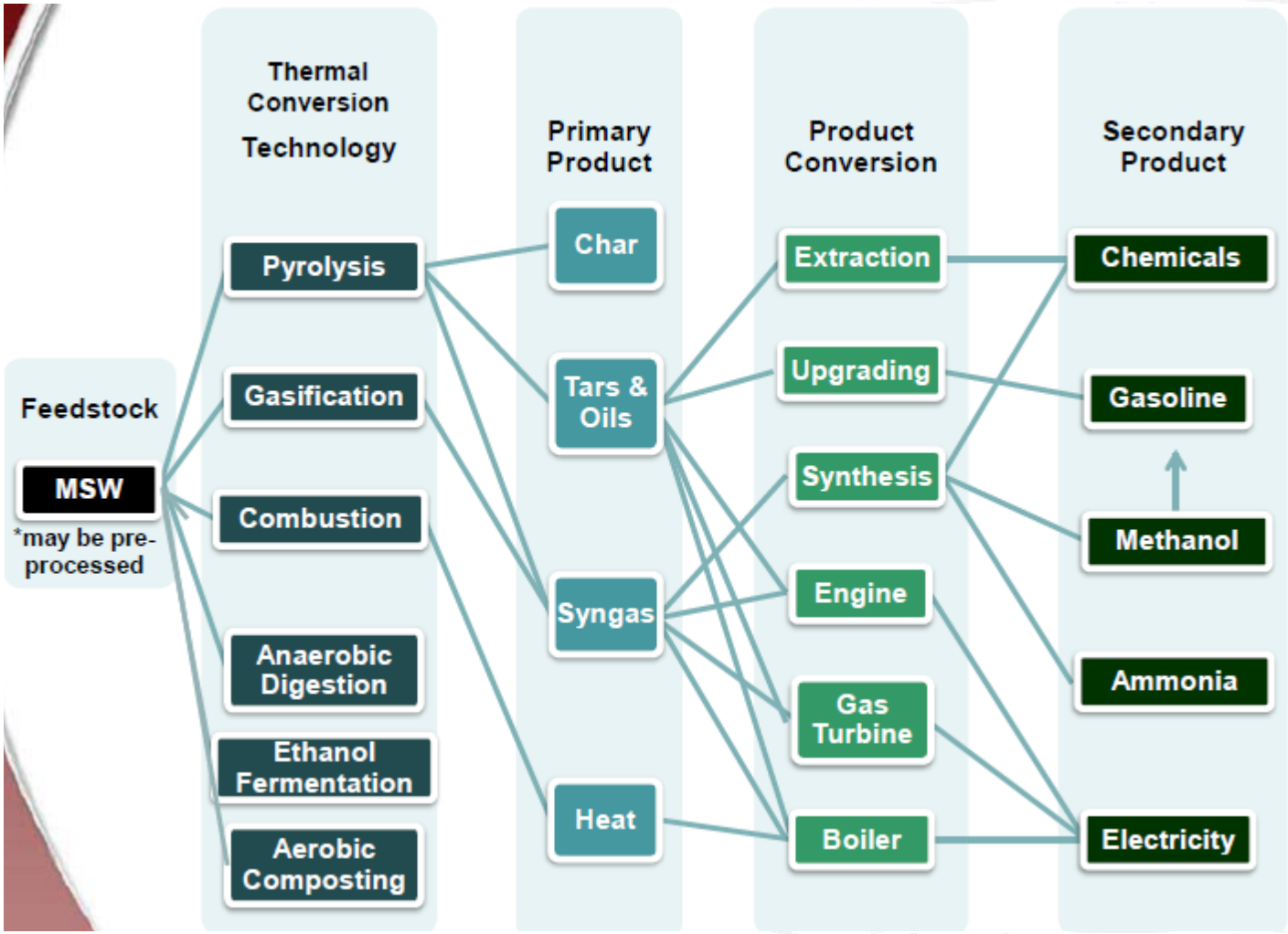
- Vision Statement
- Needs and Forecasts
- Energy Resource Options
- Preliminary Choices
- Setting Priorities

While the Assessment was being prepared, Tribal Staff began educating each other on the basics of waste to energy conversion technology.

DOE - TECNOLOGY READINESS REVIEW

Relative Level of Development	Level	TRL Definition	Description
System Operations	TRL 9	Actual system operated over the full range of expected conditions.	The technology is in its final form and operated under the full range of operating conditions. Examples include using the actual system with the full range of wastes in hot operations.
System Commissioning	TRL 8	Actual system completed and qualified through test and demonstration.	The technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. *(More)* An ORR has been successfully completed prior to the start of hot testing.
	TRL 7	Full-scale, similar (prototypical) system demonstrated in relevant environment.	This represents a major step up from TRL 6, requiring demonstration of an actual system prototype in a relevant environment. *(More)* Final design is virtually complete.
Technology Demonstration	TRL 6	Engineering/pilot-scale, similar (prototypical) system validation in relevant environment.	Engineering-scale models or prototypes are tested in a relevant environment. This represents a major step up in a technology's demonstrated readiness. *(More)* The major difference between TRL 5 and 6 is the step up from laboratory scale to engineering scale and the determination of scaling factors that will enable design of the operating system. The prototype should be capable of performing all the functions that will be required of the operational system. The operating environment for the testing should closely represent the actual operating environment.
Technology Development	TRL 5	Laboratory scale, similar system validation in relevant environment.	The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. *(More)* The major difference between TRL 4 and 5 is the increase in the fidelity of the system and environment to the actual application. The system tested is almost prototypical.
	TRL 4	Component and/or system validation in laboratory environment	The basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared with the eventual system. *(More)* TRL 4-6 represent the bridge from scientific research to engineering. TRL 4 is the first step in determining whether the individual components will work together as a system. *(More)*
Research to Prove Feasibility	TRL 3	Analytical and experimental critical function and/or characteristic proof of concept.	Active research and development (R&D) is initiated. This includes analytical studies and laboratory-scale studies to physically validate the analytical predictions of separate elements of the technology. *(More)* At TRL 3 the work has moved beyond the paper phase to experimental work that verifies that the concept works as expected on simulants.*(More)*
Basic Technology Research	TRL 2	Technology concept and/or application formulated.	Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. *(More)* The step up from TRL 1 to TRL 2 moves the ideas from pure to applied research. Most of the work is analytical or paper studies with the emphasis on understanding the science better. Experimental work is designed to corroborate the basic scientific observations made during TRL 1 work.
	TRL 1	Basic principles observed and reported.	This is the lowest level of technology readiness. Scientific research begins to be translated into applied R&D. *(More)*

CONVERSION TECHNOLOGY: PROCESSES & PRODUCTS



Pg. 17, GBB Solid Waste Management Consultants presentation entitled "Waste-to-Energy and Alternative Conversion Technologies – Experience & Opportunities", Municipal Waste Management Association 2012 Fall Summit.

Comparison - Conversion Technology Characteristics

Conversion Technologies	Pyrolysis	Gasification	Anaerobic Digestion
Feedstock	Plastics	MSW[2]	Food, yard, and paper wastes
Primary End Product(s)	Synthetic Oil, Petroleum Wax	Syngas, Electricity, Ethanol	Biogas, Electricity
Conversion Efficiency[1]	62–85%	69–82%	60–75%
Facility Size (Capacity)	10–30 tons per day	75–330[3] tons per day	10–100[5] tons per day
Product Energy Value	15,000–19,050 BTU/lb	11,500[4]-18,800 BTU/lb	6,000–7,000[5] BTU/lb (estimated)

[1] Conversion efficiency is defined as the percentage of feedstock energy value (e.g., btu/lb) that is transformed to and contained in the end product (e.g., syngas, oil, biogas).

[2] Only certain MSW fractions can be input to a gasifier. Glass, metals, aggregate, and other inerts are not desirable and may cause damage to the reactor.

[3] Total capacity permitted based on vendor communications. Geoplasma's St. Lucie, FL plasma gasification plant is permitted up to 686 tons/day, but the vendor could not be reached for confirmation. [Note: as of September 2012, the St. Lucie facility is no longer in development]

[4] LHV of ethanol.

[5] Estimated. AD facilities can span a wide range of sizes, input feedstocks, and designs.

MSW as a Feedstock – Waste Classifications

- Biodegradable waste: food and kitchen waste, green waste, paper (can also be recycled).
- Recyclable material - paper, glass, bottles, cans, metals, certain plastics, fabrics, clothes, batteries etc.
- Inert waste - construction and demolition waste, dirt, rocks, debris.
- Composite wastes - waste clothing, Tetra Packs, waste plastics such as toys.
- Medical waste.
- Electrical and electronic waste (WEEE) - electrical appliances, TVs, computers, screens, etc.
- Hazardous waste - including most paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and containers.
- Toxic waste - including pesticide, herbicides, fungicides.

REDC Concept - Assessment

- Even after the Tribal Staff reviewed two draft versions of the REDC concept assessment, there were still many unanswered questions relating to the demand for the concept.

- Even though the viability of the REDC concept could not be determined, the Tribal Staff had acquired a greater understanding of waste conversion technology.

- The Tribal Staff developed an Action Plan that could help attract waste conversion technology in the development of the CRRP,

Action Plan – Waste Conversion Technology

Actions for Near-Term Initiation/Execution:

Recommendation #1: Development of a Conversion Technology Informational Checklist.

Recommendation #2: Attend Conversion Technology related Conferences/Training Events.

Recommendation #3: Perform a Study of the Waste Streams of the Coachella Valley.

Action Plan – Waste Conversion Technology – Cont.

Actions for Further Study/Longer-Term Initiation:

Recommendation #4: Partner with a University-College Involved in Conversion Technology Research and/or Development.

Actions for Continued/Future Monitoring:

Recommendation #5: Continue Monitoring for Studies, Assessments, Reports on Waste Conversion Technology.

Lessons Learned

Though waste conversion technologies have been around for quite some time, recent renewed increased interest in the technologies can be contributed to:

- Federal renewable energy policy and funding;
- Local governments desire to be greener and to divert more from landfills;
- Source for local jobs; and
- Increase in disposal fees and transportation costs.

Not all information on ‘new’ waste conversion technology concepts is forthright.

The renewed interest in waste conversion technology might be limited until there is a widespread landfill disposal crisis in the United States.

Conclusion

- At this time, the Tribe does not consider the REDC concept as a viable option at this time for inclusion in the Tribe's Strategic Energy Plan.
- Based on Tribal Staff's research, there are other avenues to pursue to make waste to energy conversion technology a part of the Tribe's Strategic Energy Plan.

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