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Instructors:

Andria Benner, Region 9 Remedial Project Manager at the Apache Powder Superfund Site (benner.andria@epa.gov)

Monika O'Sullivan, Region 9 Remedial Project Manager at the Iron King/ Humboldt Smelter Superfund Site osullivan.monika@epa.gov)

Moderator:

Michele Mahoney, U.S. EPA, Office of Superfund Remediation and Technology Innovation (mahoney.michele@epa.gov)

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1

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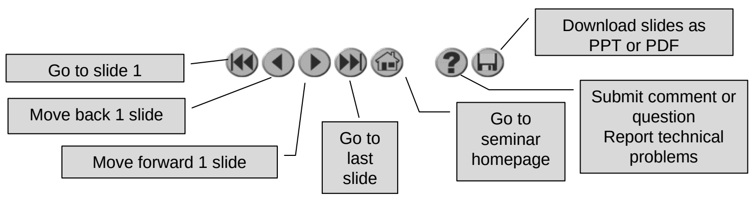

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2

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EPA
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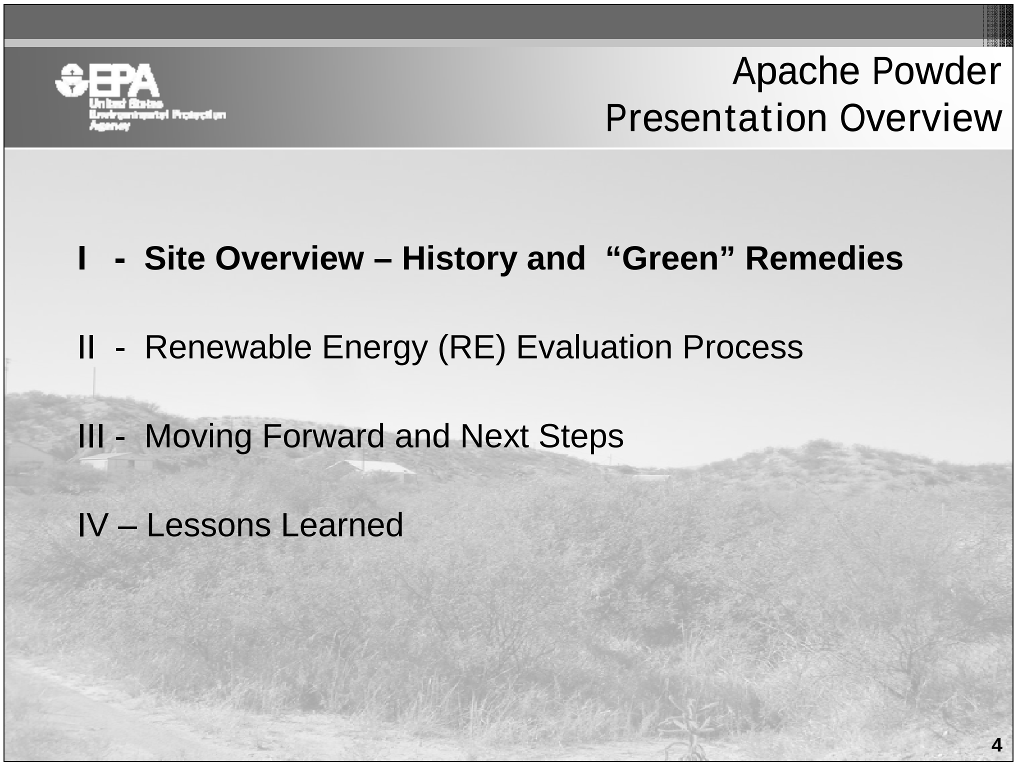
Renewable Energy Pre-Feasibility Analysis at Apache Powder Superfund Site

Andria Benner
Environmental Scientist /
Remedial Project Manager
U.S. Environmental Protection Agency, Region 9

Renewable Energy Pre-Feasibility Analysis
at Apache Powder
SRI Webinar
September 30, 2010

3

Good morning. My name is Andria Benner and I am based in EPA's western regional office, Region 9, in San Francisco. I am presenting today's discussion about Alternative Energy Pre-Feasibility Analysis at the Apache Powder Superfund Site.

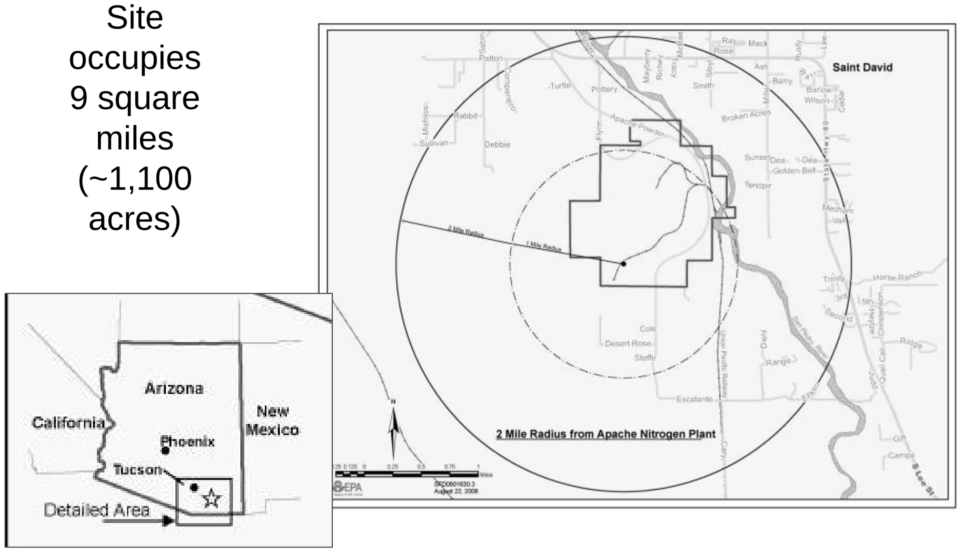


The presentation is divided into four sections.

I will provide an overview of the beginning stages of planning for a renewable energy project at the site. This discussion will include the site history and Superfund cleanup, EPA's introduction of the concept to ANPI, and the basic elements of the energy evaluation that EPA's contractors, E2 Inc., completed. I will also briefly discuss what ANPI plans for the near term, and also ANPI's long-term plans.

Site Location: Apache Nitrogen Products, Inc. (South of Benson, AZ)

Site occupies 9 square miles (~1,100 acres)



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The Apache Superfund site is located in Arizona, southeast of Phoenix and Tucson in Cochise County.

The site is approximately 1,100 acres (shown by the red line on the right and also shown by the star in the lower left map) and is bounded on the east by the San Pedro River, a protected riparian habitat and flyway for avian species migrating north from Mexico.

Background and Site History

- Apache Powder Company began explosives manufacturing operations in 1922
- Manufactured dynamite for mines & nitrogen fertilizers for local agriculture
- Closed powder line in 1980's & detonating cord plant in 1990's
- Ground water and soils contamination resulted from prior disposal practices

6

The Apache Powder Company (symbolized by this logo still found on old powder boxes hiding in antique stores) has quite a legacy in AZ. However, unfortunately, the historical management practices resulted in soils and groundwater contamination.

Superfund Construction Complete: Closed and Capped Infiltration Ponds

- Superfund clean-up activities completed in 2008
- Apache Nitrogen Products, Inc. (ANP), the former Apache Powder Company, continues to manufacture chemical products on the Site

7

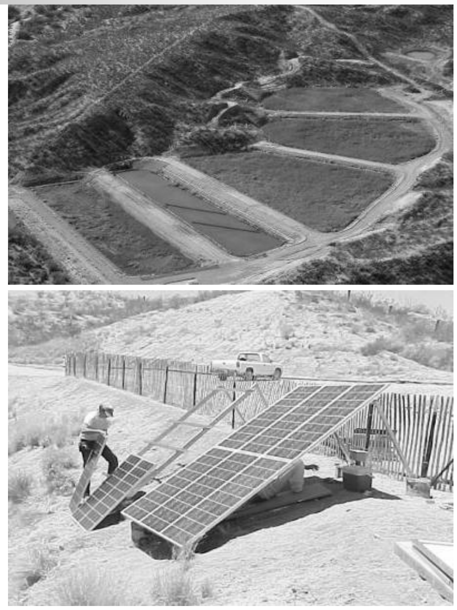
After extensive investigations and clean up activities were conducted at the site in the 1980s and the 1990s, a Preliminary Close Out Report was signed by EPA in September 2008 indicating that all the construction activities were complete.

This is a photo of the closed and capped infiltration ponds in the Southern Area of the site. ANP (the site owner) has removed all contaminated soils from the site, with the exception of the sediments and soils in several evaporation ponds that have been inactive since 1995. These contaminated soils were covered over, re-graded and capped in 2007 to eliminate any potential exposure. Subsequently, a deed restriction was placed on the ponds.

Currently, the facility is in routine operation and maintenance, Apache Nitrogen Products, Inc. (ANP), the former Apache Powder Company, manufactures ammonium nitrate (prill & liquid), aqua ammonia, and nitric acid for the southwest U.S. and Mexico markets.

Groundwater Remedy: Constructed Wetlands & Monitored Natural Attenuation

- Constructed wetlands system treats nitrate-contaminated groundwater (24/7 - 365/days year)
- Avoids chemical usage, energy consumption and waste generation associated with traditional treatment methods
- Solar power used to circulate water between the wetlands ponds



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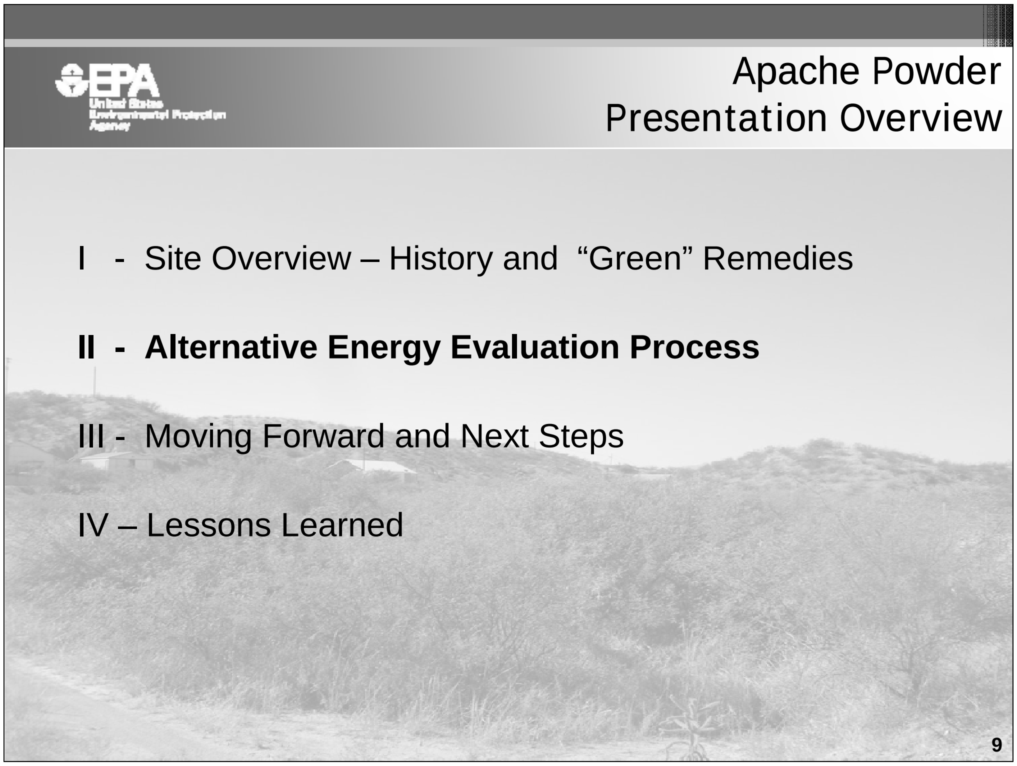
The other major remedy component was the constructed wetlands system used to treat the nitrate-contaminated shallow aquifer groundwater in the Northern Area of the site. The constructed wetland system has treated over 450 million gallons of ground water and removed over 500,000 pounds of nitrate-nitrogen.

In addition, ANP has used solar photovoltaics (PV) and wind-energy to enhance aspects of the ground water cleanup operations. For the first five years of the wetlands start-up, contaminated water was re-circulated through the wetlands cells for further treatment by using a 1.4 kilowatt (kW) PV panel to provide solar power. The PV panel powered a centrifugal pump that re-circulated the water at 5 gallons per minute.

Now that the wetlands are removing the nitrate to well below the drinking water standard for nitrate (24 hours a day, 7 days a week, 365 days a year), this PV system is no longer needed. However, a mini-solar PV panel is still being used on the flow meter to measure the volume of water moving through the wetlands system. In the southern area, a windmill was used to pump water to de-water a perched system underneath formerly-used evaporation ponds.



Now I'd like to walk you through the alternative energy evaluation process at Apache.

The purpose of the pre-feasibility study was to evaluate the suitability of solar energy generation as a reasonable future use at the Apache Powder Superfund site and identify key considerations for further evaluation.

RE Analysis Process

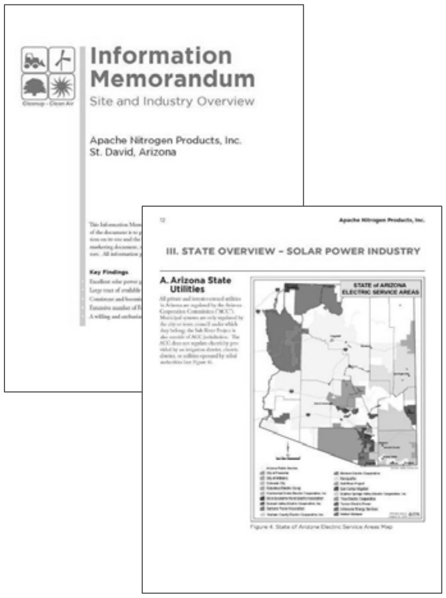
1. Evaluate the renewable energy resource
2. Assess site suitability
3. Consider technology specific criteria
4. Review market and incentives

10

The pre-feasibility study is designed to determine whether the site shows potential for renewable energy generation and warrants additional evaluation, such as a feasibility study.

The purpose of the study was to conduct a preliminary screening of the site, not an in-depth feasibility study which typically evaluates the financial viability of a specific project or projects.

EPA Region 9's 2008 Solar Energy Information Memorandum



The Memorandum provided:

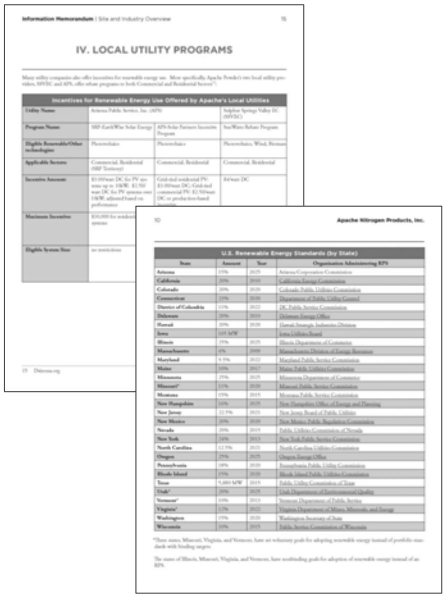
- An overview of renewable energy industry in Arizona
- An overview of relevant State and federal standards
- A summary of site history and operations, status of the site clean-up, and facility physical assets

11

The objective of this memorandum was to provide in one document (15 pages) an overview of the solar potential for the site that could be shared internally with ANP's decision-makers, including facility managers and executives, as well as the Board of Directors. It also could be shared by ANP with potential solar developers or manufacturers to provide interested parties an overview of the facility's assets and opportunities.

The first section provided a summary of the history and operations, status of the site clean-up, the land specifications (solar potential, climate, geography, etc.), ANP's power usage, and the facility infrastructure (sewer, water, proximity to power transmission lines and substations, access to rail and road, etc.)

Evaluating State/Federal/ Utility RE Policies



Memorandum also provided:

- An overview of U.S. renewable energy standards ("RES")
- Summary of federal and state tax incentives
- Local utility incentives
- While tribes may not be able to take the credits, subsidiary companies created by developers may be able to take credits

12

The objective of this memorandum was to provide in one document (15 pages) an overview of the solar potential for the site that could be shared internally with ANP's decision-makers, including facility managers and executives, as well as the Board of Directors.

Apache Energy Context

- On-site electricity use
  - 1-1.5 MW daily base use, 2 MW peak daily energy demand for operations
  - 2007 electrical consumption was ~14 million kilowatt hours (kWh)
  - Sulphur Springs Valley Electric Cooperative (SSVEC) is electricity provider

- Transmission Capacity
  - Existing substation rated at 69 kV
  - Transmission lines to Apache property are 10 MW, line capacity to substation is 40 MW
  - Future (2011-2012) 69 kV line will have 100 MW capacity

13

As a part of the assessment, the energy context was evaluated. EPA's contractor summarized ANP's peak daily demand and the price currently being paid for electricity to the local utility (Sulphur Springs Valley Electric Cooperative). The study also identified the capacity of the existing transmission lines and on-site substation, as well as noted the plans for an upgraded substation and new lines.

Apache Renewable Energy Evaluation

- Potential Solar Generation Scenarios for Site:
  - On-site Use:
    - Provide an on-site electricity source for all or a portion of facility’s electricity use
    - Provide on-site steam to support manufacturing operations
  - Grid Use:
    - Generate utility scale energy for the grid with potential revenue/financial benefits to Apache

14

Two scenarios were considered by the study: on-site use by ANP to supplement existing energy requirements (including onsite steam use) to run its ammonium-nitrate manufacturing operations; and grid-use where energy would be generated that could be sold back to the electricity grid in Arizona.

RE Analysis Process

1. Evaluate the renewable energy resource
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3. Consider technology specific criteria
4. Review market and incentives

15

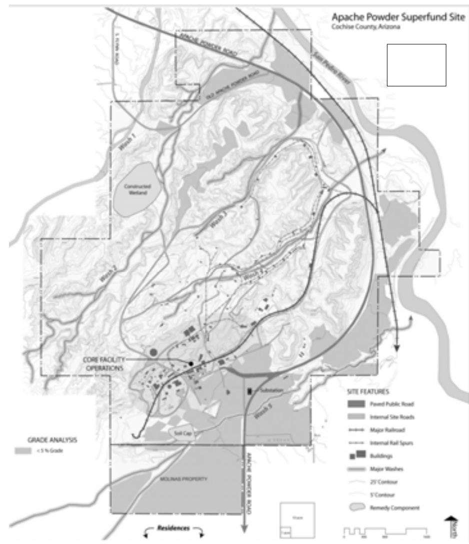
Mapping efforts were undertaken to identify areas of the site that, given the necessary criteria, could support solar projects.

Criteria for Evaluating Site Suitability

Criteria included:

- > 15 acres
- < 5% slope
- Road Access
- Proximity to infrastructure
- Areas with washes, remedy components and facilities excluded

Assessment identified large, flat contiguous areas that are unrestricted by natural or constructed features.

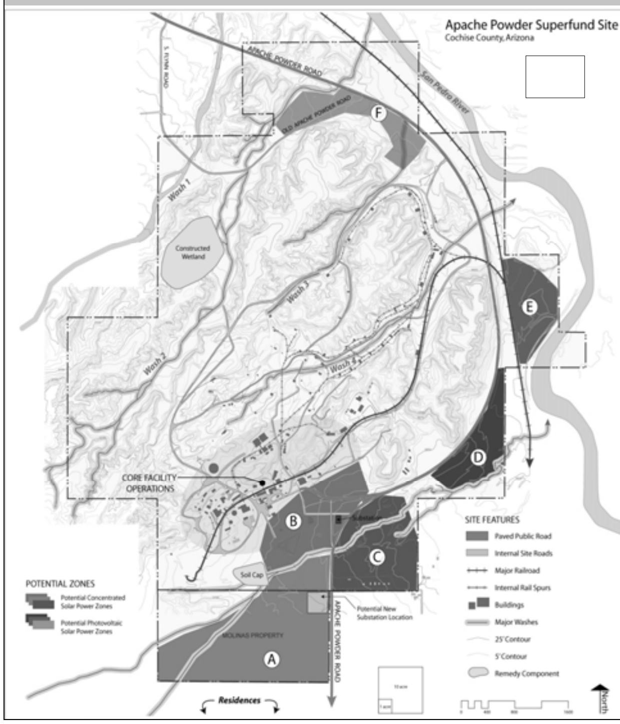


16

The topography and slope conditions were studied to identify large, flat areas on the facility that would be suitable for solar energy development.

Remedy components, specifically the onsite soil cap, were excluded from the initial analysis due to at-the-time IC and DEUR considerations.

Site Suitability



CSP Potential

Zone A = 70 acres

Zone B = 25 acres

Zone C = 35 acres

= **130 Total Acres**

PV Potential

Zones A+B+C = 130 acres

Zone D = 15 acres

Zone E = 20 acres

Zone F = 20 acres

= **185 Total Acres**

Net PV and CSP potential = 185 acres

17

Large contiguous areas (> 40 acres) may be best suited for CSP or PV

Outlying areas (>5 acres) may also be suited for PV (assuming > 1MW PV array)

Areas with grade > 5% excluded due to associated grading costs

Areas interrupted by Rail, Roads, Washes were excluded

RE Analysis Process

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18

The next step was to take a close look at CSP and PV solar technologies.

Solar Technology Assessment

Concentrating Solar Power (CSP) Versus Photovoltaic (PV)

Solar Technology Type	Acres per MW	Minimum Practical Acreage	Site Needs	Storage Capacity	Estimated* Annual Water Usage
CSP	3 – 8 acres / MW	40 – 50 acres	Large, contiguous, level area	Yes	Significant
PV	4 – 10 acres / MW	N/A	Flexible	No	Negligible

*Estimates can vary based on specific technology

19

There are two primary active solar technologies that convert sunlight into electricity – photovoltaic devices and concentrating solar plants.

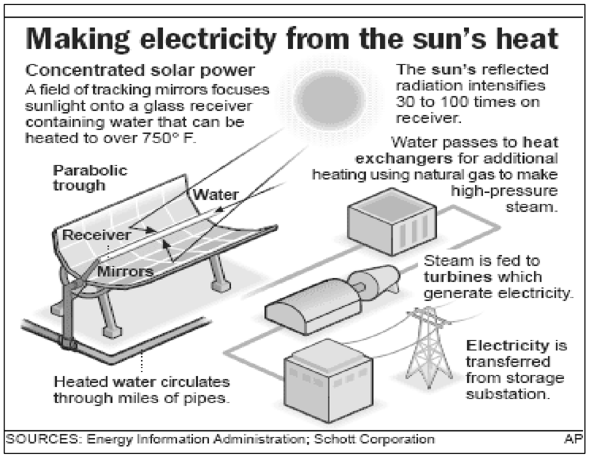
This chart provide an example of the type of comparative study conducted for CSP versus PV.

The availability of large amounts of water for a concentrating solar facility is crucial to its success. The southwestern states, including California, Nevada, Arizona, New Mexico, Utah, and Colorado, have the most abundant solar resources in the world; they are also arid. Large-scale solar production facilities would create additional stress on a region's aquifer and ground water supplies

In that ANP is located in the arid, dry southwest U.S. - - - water demand and needs play a major role in the selection of an appropriate technology.

Technology Overview

Concentrating Solar Power (CSP)



- CSP plants indirectly generate electricity
- Mirrors concentrate solar energy into high temperature heat or steam that powers a turbine
- Various solar thermal technologies at differing levels of commercial readiness

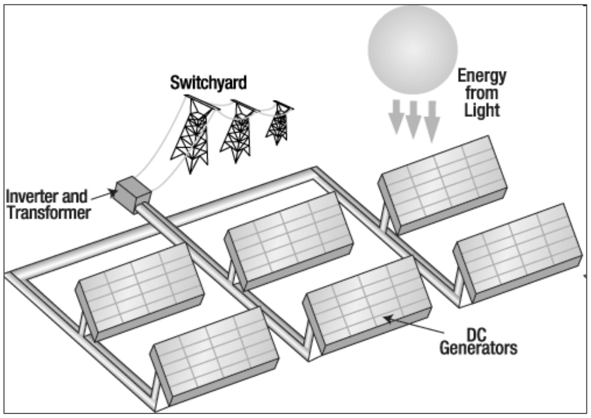
20

There are 3 predominant types of CSP technology - Parabolic Trough, Power Tower, and Dish Stirling

The analysis focused on parabolic trough technologies, because those were considered to be the most commercially and technically viable CSP options at the time. A trough plant, illustrated here, essentially consists of two parts: one part that collects solar energy and converts it to heat and the other that converts the heat energy to electricity. In addition, trough technologies can generate significant amounts of steam.

Because there were few operational power tower projects, reliable cost information was not available, so power tower technologies were not included in the analysis. Dish Sterling systems were not evaluated because of the potential need for on-site steam (dish sterling systems use no water in the power conversion process) and because there were no utility scale plants in operation during the assessment

Technology Overview



- Photovoltaic (PV) devices make use of highly purified silicon to convert sunlight directly into electricity
- PV can be expensive to operate on a kWh basis
- PV panel conversion efficiency typically between 10-20%

21

PV technologies convert sunlight directly into electricity. These systems are commercially available and in use nationwide for such applications as powering residential and commercial buildings, running irrigation pumps, powering remote telecommunications and bolstering utility grid stability.

Utility Scale PV: Installed Cost Estimates

Solar Photovoltaic Technology Type	Acres per MW	Estimated Facility Size (MW)	Estimated Land Area Needed (acres)	Estimated Capital Cost ($ 1000)	Estimated Annual O&M Cost ($ 1000)
Thin Film (fixed axis)	6-8	5	30-40	$25,000 – 30,000	$400 – 600
Crystalline Silicon (fixed axis)	4-5	5	20-25	$30,000 – 36,000	$450 – 600
PV Tracking	8-10	5	40-50	$35,000 – 40,000	$900 – 1,100


Tracking PV panels follow the sun to allow for increased solar capture.


Fixed axis PV panels aligned to be south facing.

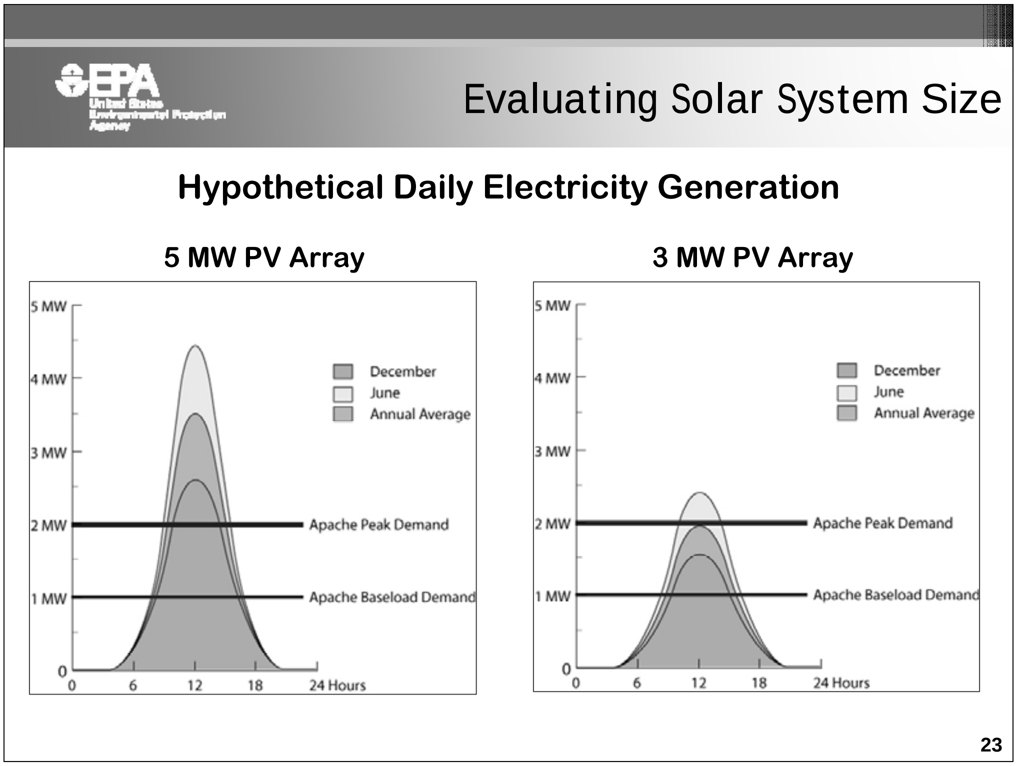
22

Additional cost analyses - - - looking at various types of PV (crystalline silicon fixed axis, thin film, tracking) at an estimated facility size of 5 MW. The total estimated installed costs for PV range from $25 to $40 million.

A fixed system means that the PV panels are installed at a set tilt and azimuth and will not move.

A tracking system is one that moves to track the sun.

Thin film is the least expensive and PV tracking the most expensive to install.



There is significant seasonal variation in total solar output Depending on goals, a PV solar system could be sized

1. to focus primarily on reducing peak electricity demand; or
2. to generate excess electricity to the grid

These two graphs are examples of the different outputs established by the 5 MW Array and the 3 MW Array. Later I will explain how on energy developers are hopeful the Apache Powder site can support a 5 MW Array.

Incentives, the ability to net meter, utility rates, would all help determine how best to size a PV solar array if the primary goal was to use electricity on-site

Summary of Site Opportunities

Potential Benefits of Solar	Potential Limitations for Solar
▪ Solar could help reduce peak electricity demand from grid ▪ CSP could generate on-site steam ▪ Solar could help hedge against conventional energy price volatility ▪ Opportunity to generate and sell RECs (additional income) ▪ Public relations benefits by use of renewable energy at an NPL site	▪ Not all on-site demand could be replaced due to intermittent electricity production ▪ Arid, southwest climate (no water) and acreage limits CSP viability ▪ Natural gas used in mfg. operations; solar would not impact natural gas use ▪ > 5 MW would require substation and transmission line upgrades

24

The technology assessment included a comparison of the advantages and benefits, as well as the limitations, of developing a solar energy project at the ANP facility.

PV outweighed CSP for several reasons (limited flat acreage, capital costs and water needs).

The benefits of generating renewable solar energy to an operating facility such as ANP are multi-fold, including providing buffer against price volatility of purchasing electricity from the market place, increasing ANP’s sustainability corporate profile, reducing demand on grid during periods of peak electricity need, and long-term potential to generate revenue or sell Renewable Energy Credits (RECs) if excess energy is generated.

RE Analysis Process

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Market Opportunities and Incentives

Solar Incentives / Market Drivers

- Federal Incentives
  - Business Energy Tax Credits (aka Investment Tax Credits (ITCs))
  - Clean Renewable Energy Bonds (CREBs)
- State Incentives
  - Renewable Portfolio Standards (RPS)
  - Commercial/Industrial Solar Energy Tax Credit Program
- Utility Incentives
  - Up-Front Incentives (Rebates)
  - Performance-based Incentives
  - Feed-in Tariffs

State Solar Deployment Trends

- Assess growth of PV solar from year to year
- Evaluate total PV capacity installed in a state relative to neighboring states or previous years

State	2009 Installed Capacity (MW)	2008 Installed Capacity (MW)	2007 Installed Capacity (MW)
California	220	178.7	91.8
New Jersey	257	22.5	20.4
Colorado	23	21.7	11.5
Arizona	23	6.4	2.8
Hawaii	14	8.6	2.9
New York	12	7.0	3.8
Nevada	7	14.9	15.9

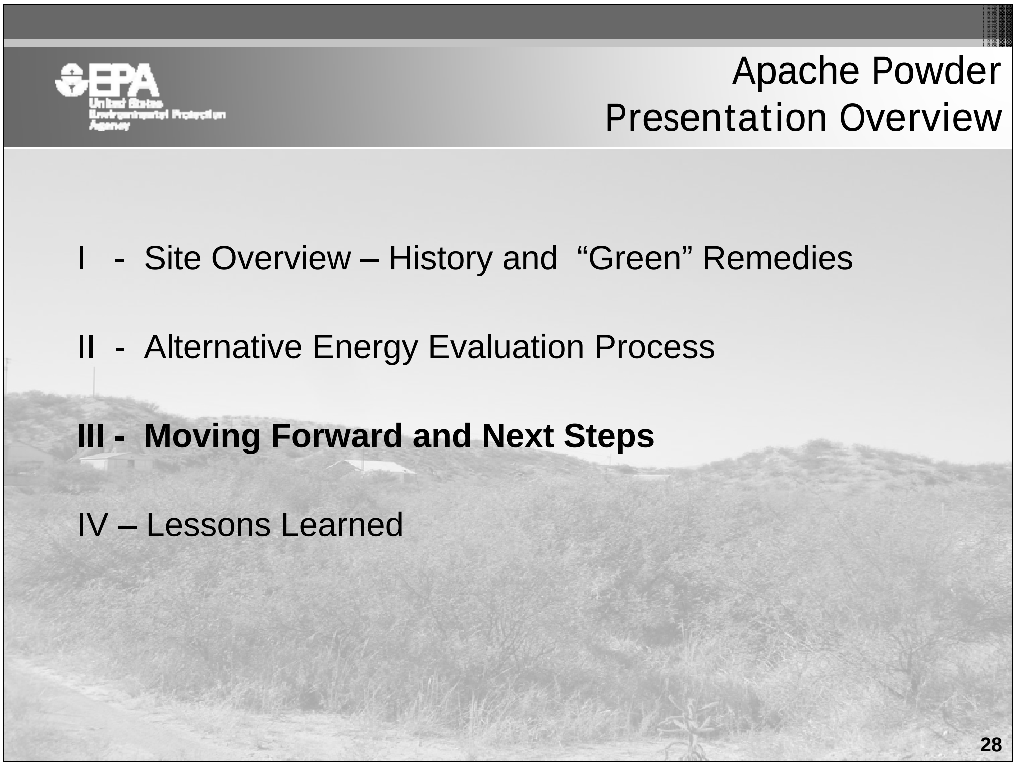
An additional part of a market analysis was to evaluate market trends for solar in Arizona

In general, Arizona has excellent solar resources statewide and there are expectations for growing market for renewable energy development that is based on a number of factors

• the state's dependence on natural gas for electricity and price volatility of natural gas

• the state's central location to nearby/large potential solar markets

•intellectual capital resources



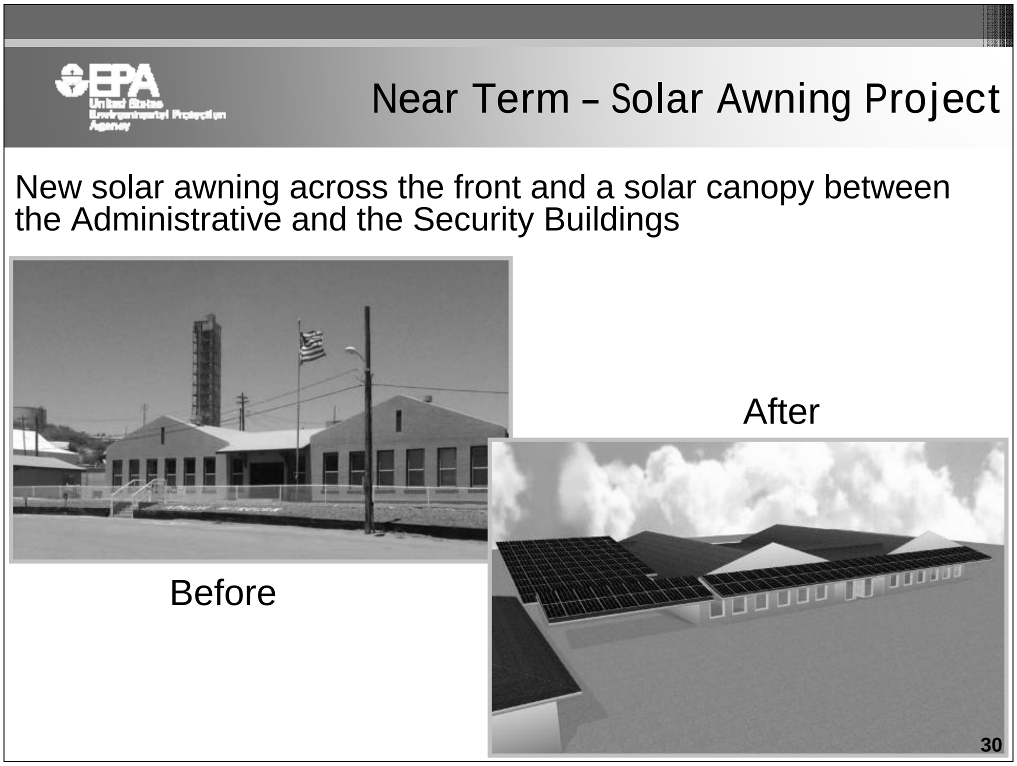
With the completion of the pre-feasibility study, ANPI has made some decisions about how they would like to proceed.

Plans Toward a Solar Future

- Apache pursuing utility-scale project
- Several solar applications in place:
  - Flow measurement at the wetland
  - Lighting, motion detector, security camera and gate control
  - Pump for contaminated perched water extraction

29

ANPI has been committed to utilizing solar power for multiple cleanup operations and other applications for more than a decade. The examples shown include the use of solar to power flow meters, security gates, and extract contaminated groundwater.



Most recently, ANPI has been in consultation with an architect and a solar contractor to use solar power to offset heating and cooling costs for the main administration building at the Apache facility. The expected annual cost savings to ANPI for this investment is $7-8,000 The capital costs are 100% covered by a combination of federal and state tax credits and utility incentives.

For a 31.88 kW system on free-standing steel beams the financial incentives include:

- 30% Federal Tax Credit
- 10% State Tax Credit (Maximum $25K)
- SSVEC Performance-Based Incentive (PBI)
  - $0.202/kWh up to 60%
- Payback in six years

Long Term - High Concentration PV (HCPV) Solar Technology

- Apache considering high concentration photovoltaic (HCPV) technology
- 2-axis tracking
- Uses 5 acres for 1 MW of rated capacity
- 72 feet wide and 49 feet high
- 3 foot pedestal with 18 foot installation depth

31

The technology being proposed by the perspective developer is high concentration photovoltaic (HCPV) technology. It is a 2-axis tracking system. This technology is preferable to CSP because it is low water use. (Amonix 7700; amonix.com)

ANP anticipates that 5 or more MW of power could be generated at the southern area of ANPI's facility.

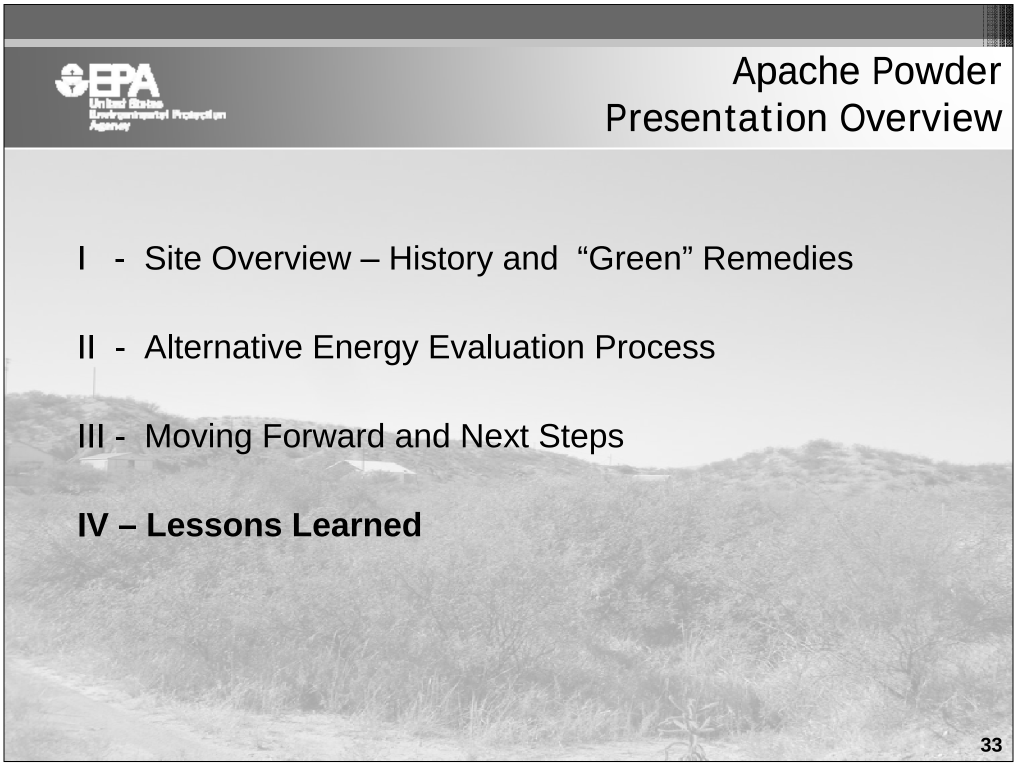
Opportunities and Obstacles

- + Developer has found two strong partners interested in developing a utility-scale solar project
- + Looking at two phases to align with SSVEC substation and transmission line upgrades
- − ANPI long-term contract with SSVEC makes solar delivery to the plant a challenge
- − SSVEC does not have a need for additional power in their distribution system
- − Need to find another utility to enter into a purchase agreement

32

The Developer has made progress, finding a strong local partner interested in sponsoring renewable energy projects and a manufacturer with a technology well-suited to the site.

As with any project, there are some obstacles to be overcome. The Developer is currently looking for a utility interested in an off-take agreement for the electricity that would be generated from the project.



I would like to conclude by summarizing what we learned about the ability of Apache site to support solar energy production from the pre-feasibility study.

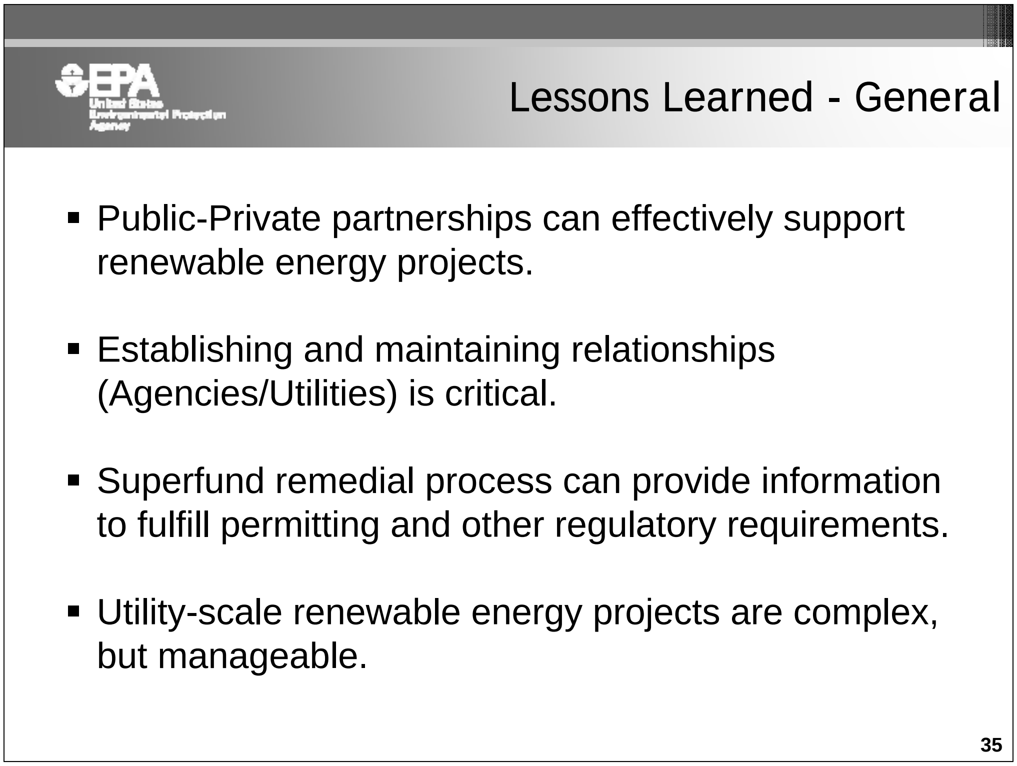
Lessons Learned - Apache

- Site has potential for direct use and utility-scale solar (PV preferred)
- Solar energy development is compatible with Site and Superfund remedy
- High upfront capital costs for both CSP and PV (5 MW - minimum $25M for PV and $35M for CSP)
- Ability to utilize incentives and obtain a long term power purchase agreement (PPA) likely critical for the economic viability of a utility scale project

34

Not only did the pre-feasibility study note that the site had potential for direct use and utility-scale solar facilities but it determined that solar energy would be compatible with the site.

There would be high costs for these alternative energy sources and the ability to use incentives and acquire a long term purchase agreement were critical for the project.

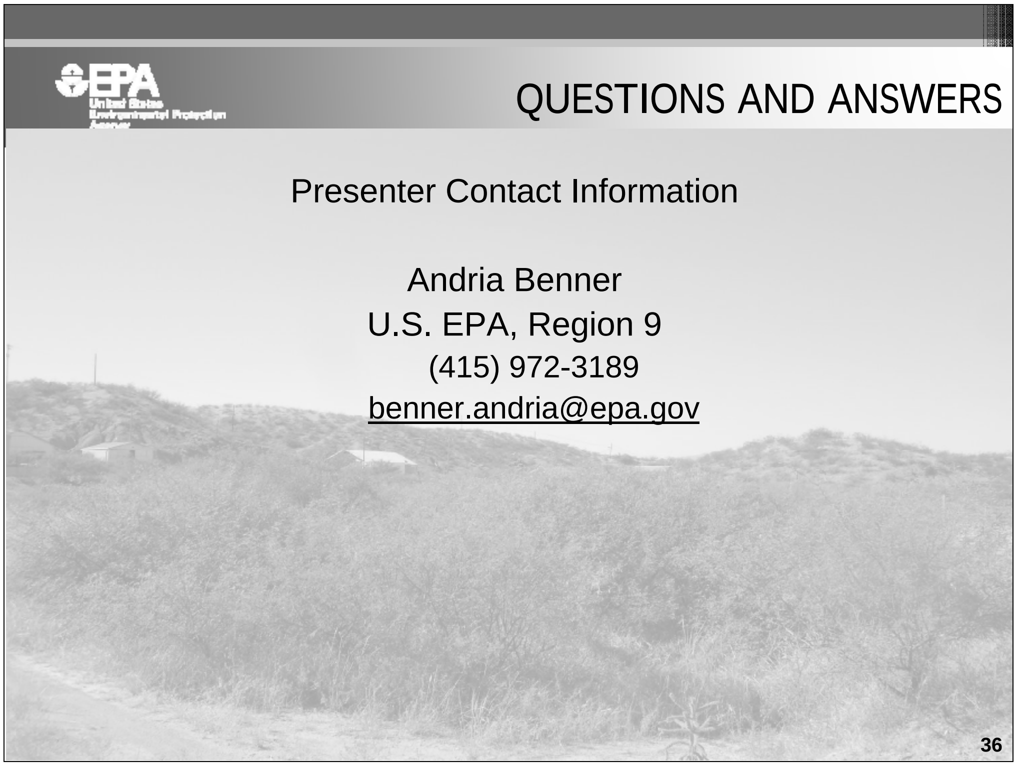


While these site specific lessons will ideally lead to a Concentrating PV solar project at the Apache site, there are also a range of broader lessons learned from this process that could help guide similar projects at contaminated lands across the country.

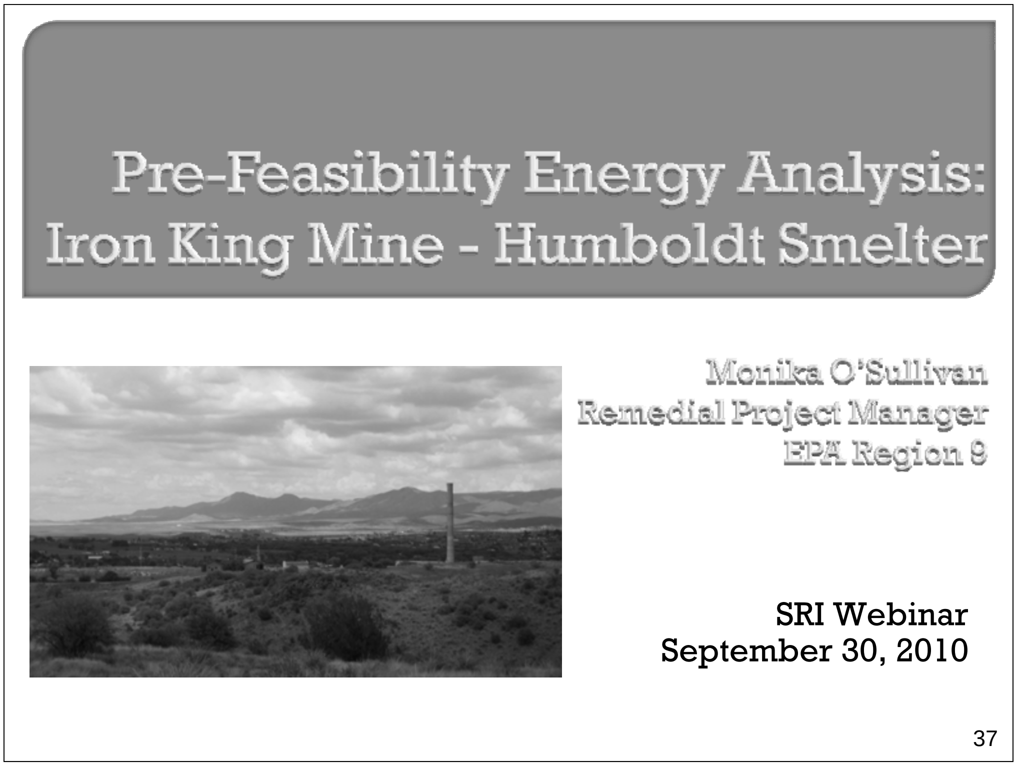
With EPA providing tools and resources to support Superfund reuse, communities and public and private sector organizations can then take information the next step and get projects moving forward.

detailed site investigation information from the Superfund process to address environmental permitting requirements for a renewable energy project at a site.

the development of the solar farm is a complex process reliant on available incentives, multiple parties, market conditions and other factors that have to be identified and managed throughout a project.



If you have any unanswered questions or would like to contact me about this project, here is my contact number and my e-mail address.



Hello, my name is Monika O'Sullivan and I am EPA's Regional Project Manager (RPM) for the Iron King - Humboldt Smelter Superfund Site. Today I am presenting the Pre-Feasibility Analysis of Renewable Energy Development that SRI supported at this former mining land located in the town of Dewey-Humboldt, AZ.

Presentation Overview

- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

Why conduct a reuse assessment at this site?

To identify a set of reasonable future use scenarios to inform remedy decisions and facilitate the safe and productive reuse and long-term stewardship of the Iron King Mine Site.

39

The purpose of the reuse assessment is to clarify reuse goals, understand the site's constraints and opportunities, and identify reuse considerations to inform cleanup activities and local planning efforts. The reuse assessment clarified future use goals, local planning goals, site context, and potential future use scenarios and remedial considerations.

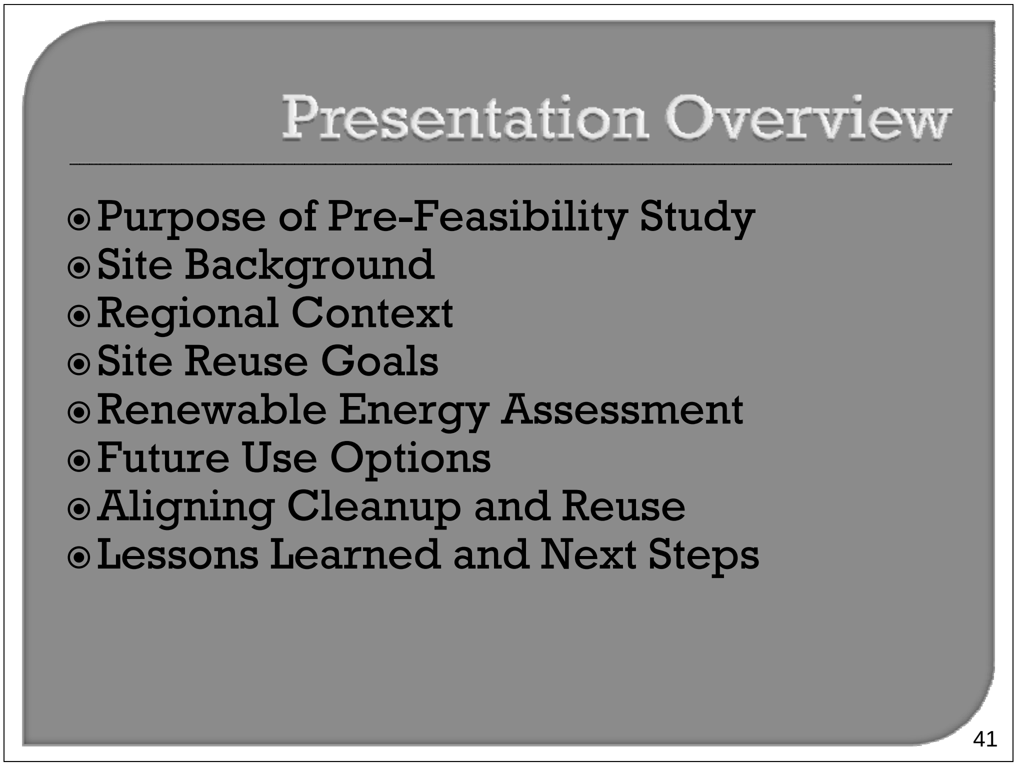
Conducting a reuse assessment that engages site owners and other stakeholders in evaluating future use options for a site can help facilitate site stewardship and support the long-term effectiveness of the site's remedy.

What is a renewable energy pre-feasibility study?

A preliminary assessment of the technical and economic viability of a proposed project, determining the most suitable alternatives for further analysis.

40

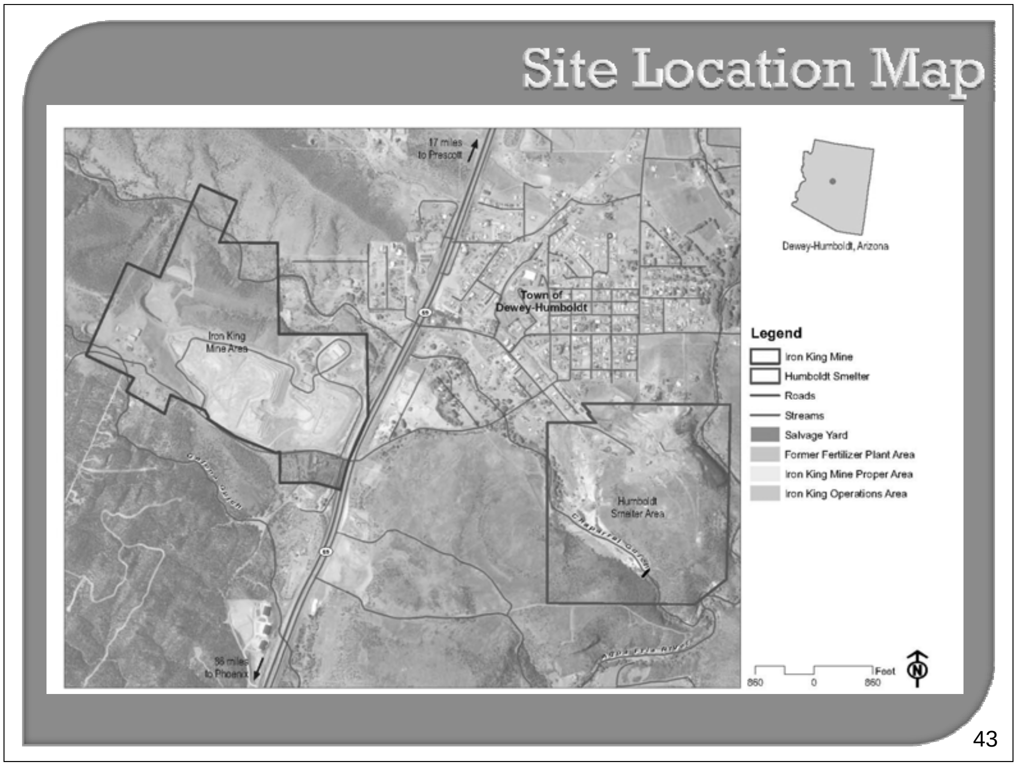
When EPA met with site stakeholders in 2009 fostering renewable energy opportunities was identified as one of the reuse goals and so conducting a renewable energy pre-feasibility study was included as part of the reuse assessment.



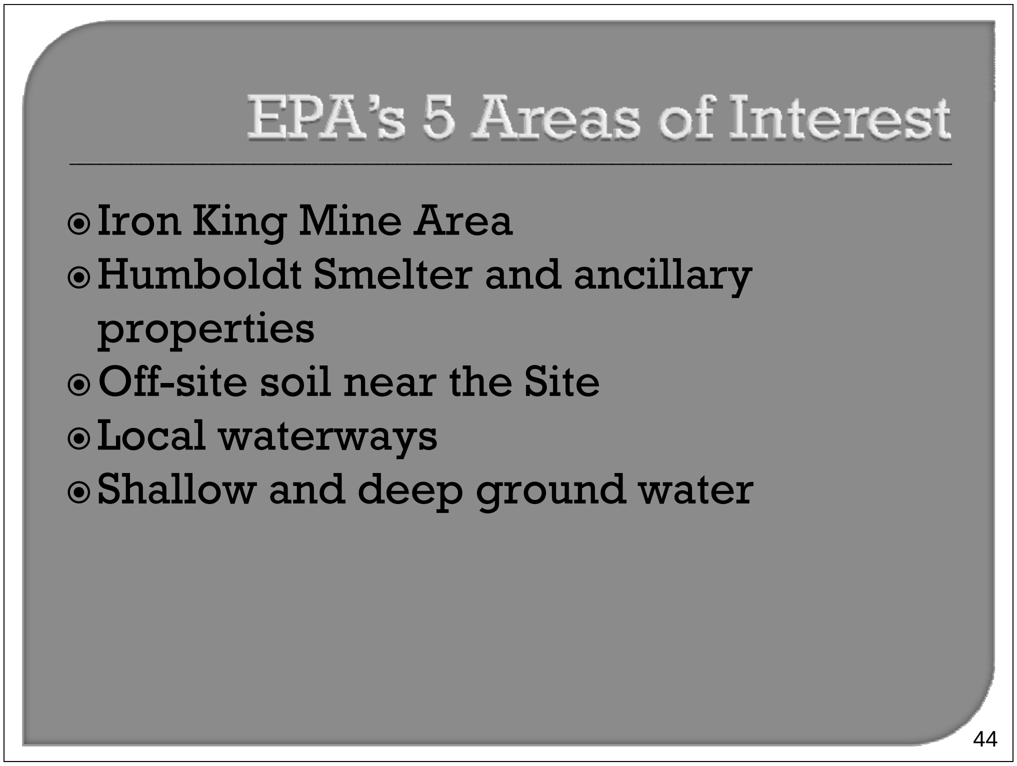
I'd like to continue by giving you a little background about this Iron King Mine/Humboldt Smelter site.

Iron King Mine and Humboldt Smelter

The Iron King Mine - Humboldt Smelter Superfund Site encompasses areas of contamination from two separate facilities: the Iron King Mine and the Humboldt Smelter. The Iron King Mine was an active mine beginning in 1906 until 1969. The Humboldt Smelter operated from the late 1800s until the early 1960s. Waste rock and tailings were deposited in large piles adjacent to actual mine property boundaries. More recently, the mine tailings from the Site have been used to create fertilizer. The smelter is situated 1 mile east of the Iron King Mine property. The Smelter property is bordered by the Town of Humboldt to the west and north, the Agua Fria River to the east, and the Chaparral Gulch to the south.



Due to past mining and smelting operations, arsenic, lead and other metals have contaminated soil, sediments, surface water and ground water at levels above background concentrations. The Iron King Mine facility covers 153 acres, the majority of which is covered by waste rock piles and tailings (the tailings pile measures approximately 62 acres). The smelter facility occupies approximately 183 acres and has approximately 185,000 cubic yards of tailings, 250,000 cubic yards of smelter ash and 1.7 million cubic yards of slag. On-site ponds, pits, and lagoons were reportedly used for the leaching of minerals from mined ore. This map gives you a sense of how the two sites are situated in relationship to each other.



A potentially responsible party (PRP)-lead removal action by Ironite was conducted in 2006 to remove contaminated soil from four residential properties. Staff from EPA's Office of Emergency Response supervised the sampling and removal of the contaminated soil.

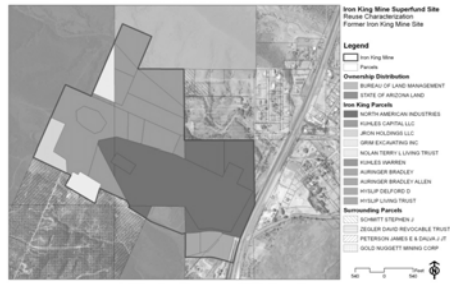
The full extent of soil and ground water contamination is being investigated under the Remedial Investigation and Feasibility Study (RI/FS) process under CERCLA. EPA has identified five Areas of Interest at the Site: Iron King Mine Area; Humboldt Smelter and ancillary associated properties; off-site soil near the Site; local waterways, including the Chaparral Gulch, Galena Gulch and Aqua Fria River; and shallow and deep ground water. A Remedial Investigation (RI) Report was completed in March 2010. In addition, EPA has conducted a Cultural Resource and Historic Building Survey and a Biological Evaluation for the Site. EPA is currently conducting a Feasibility Study (FS) to evaluate cleanup alternatives for the Site. Based on information from the RI/FS, a Record of Decision (ROD) will be issued that explains which cleanup alternatives will be used to clean up the Site.

It is expected that by 2018 the site should be able to return to use.

Site Context

Iron King Mine Reuse Characterization

- Access
  - Highway accessible
- Infrastructure
  - Phase 3 power lines available on site
  - Water available via on-site wells. Mine Shaft #7 potential water source.
- Zoning & Ownership
  - Zoned industrial and made up of several different land owners
- Surrounding Land Uses
  - Federal and State Lands and Low Density Residential



Ownership Distribution

Zoning

45

The site is made up of a variety of property owners and part of the purpose of the reuse planning was to see if there was commonality among their reuse interests. In general, these landowners are interested in returning or maintaining the land in a productive use. A range of opportunities have been identified that could provide employment and economic development opportunities, recreation and industrial heritage resources, as well as renewable energy generation opportunities. The different future land use types mentioned included continued industrial and manufacturing uses, mixed uses (residential and commercial), mining and smelting museum or library, open space, public recreational trails, and energy generated from solar or wind faculties. It was recognized that these uses might not be suitable sitewide, but certain parcels or areas might be better situated for certain uses.

Site Context

Humboldt Smelter Reuse Characterization

- Access
  - Primary access via residential street
  - Portions of site have limited access
- Infrastructure
  - Power lines on site may have limited capacity
  - Water supplied by private water company
- Zoning & Ownership
  - Zoned industrial and residential with one site owner
- Surrounding Land Uses
  - Federal and State Lands and Low Density Residential
  - Adjacent downtown Dewey-Humboldt

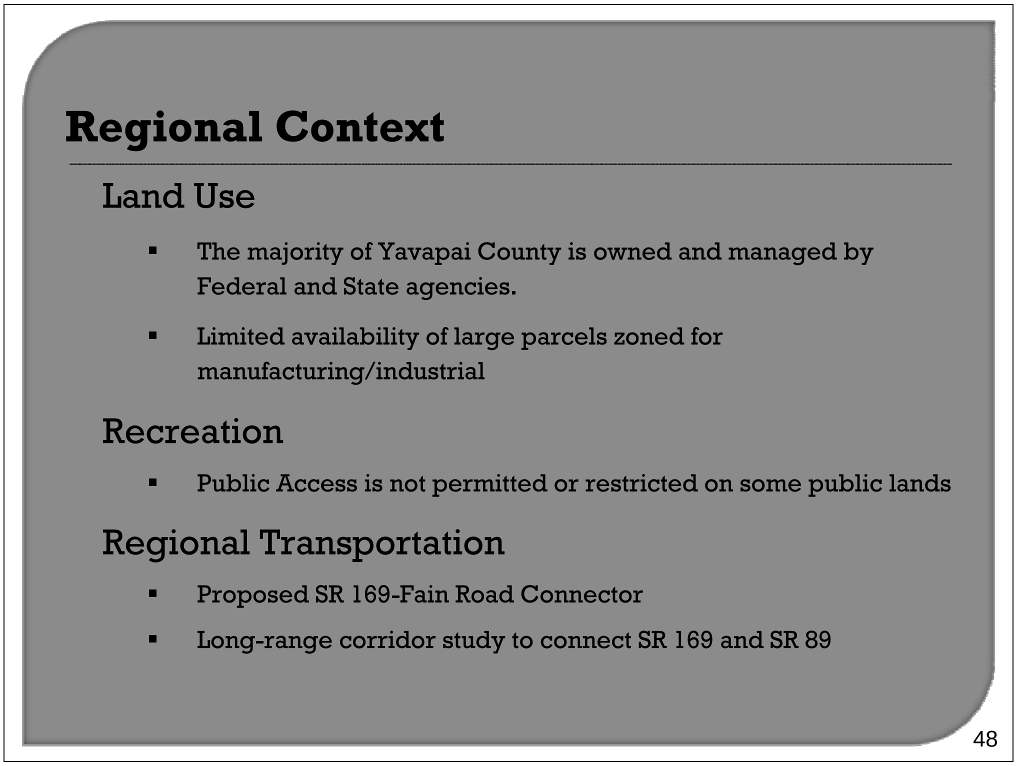
Ownership Distribution

Zoning

46

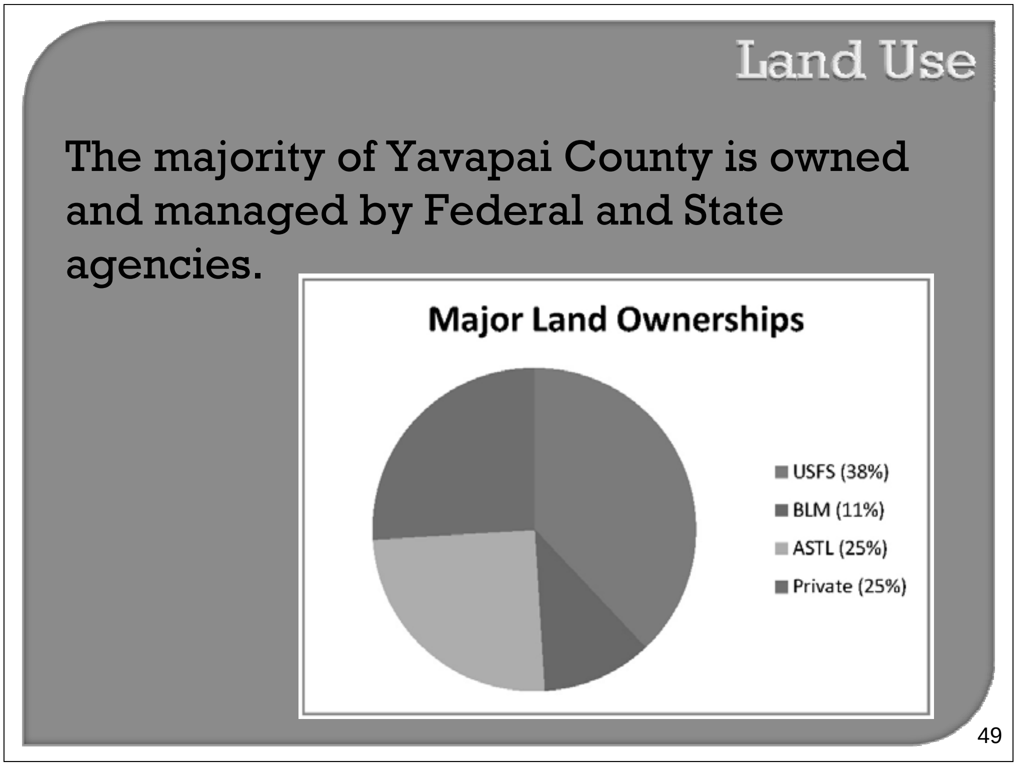
Presentation Overview

- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

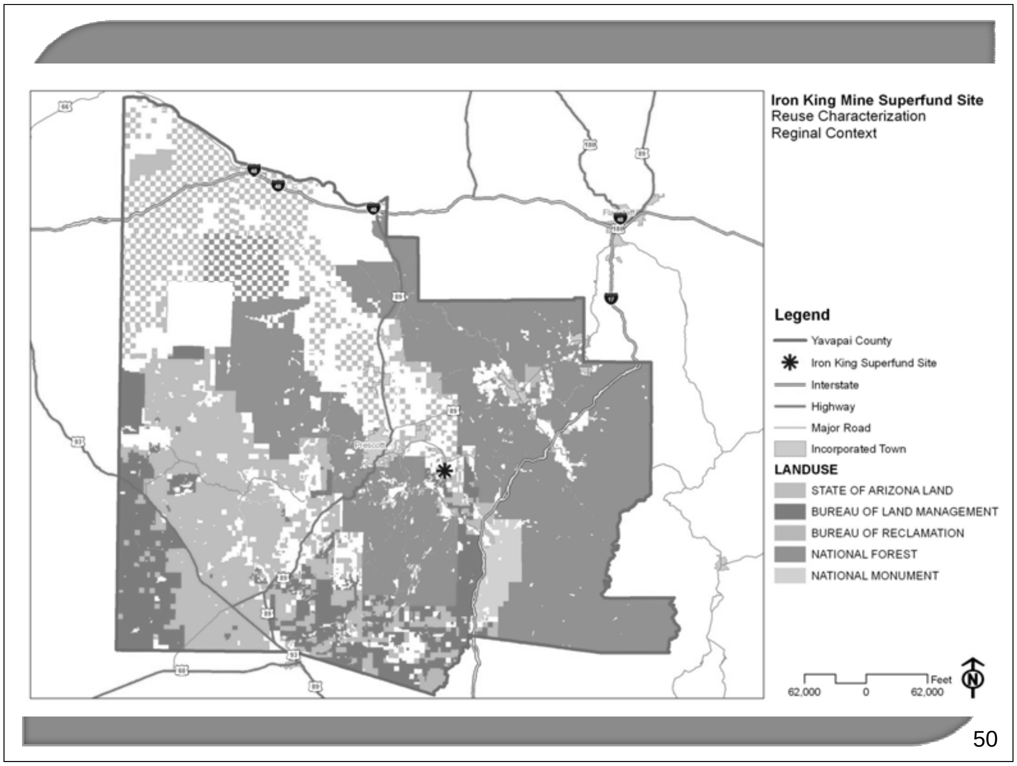


The Site is surrounded by a mix of land uses, including Bureau of Land Management and Arizona State Land Department lands that are currently providing open space views for the town. However, these lands do not currently allow for public access. Bureau of Land Management (BLM) lands may be designated for recreational purposes following a master planning and application process. Arizona State Trust Lands are held assets for Trust beneficiaries and could be sold or leased in the future for development with proceeds going to designated recipients, such as public schools.

A majority of Yavapai County is owned and managed by federal and state agencies and only 25 percent of the county is held by private land owners. The primary land holders are the US Forest Service (USFS) (38 percent), Arizona State Lands (25 percent), and BLM (11 percent). However, not all of this land is open space and recreational lands that is accessible to the public.



As this chart indicates, this site is made up of a variety of landowners.



In addition, the site represents the majority of the remaining land available for industrial use.

Zoning Informationustrial uses and 4.7% zoned Commercial use types.

• In the Town of Dewey-Humboldt and nearby incorporated towns (Prescott Valley and Prescott) there is limited availability of large parcels zoned for industrial uses. In the Town of Dewey-Humboldt, most of the land is rural residential and the Site contains some of the only large parcels zoned for industrial uses.

Presentation Overview

- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

On July 21 and 21, 2009, EPA Region 9 and E2 Inc. met with community stakeholders to gather a preliminary set of reuse goals and considerations. These preliminary stakeholder interviews included: current site owners, elected officials, Arizona Department of Environmental Quality (ADEQ), representatives for the town of Dewey-Humboldt, and interested community members from the Town Council Meeting on July 22, 2009.

During these initial community discussions, stakeholders generally agreed on the following set of reuse goals for the Iron King Mine – Humboldt Smelter Site. While the reuse assessment explored all of these goals, I'd like to focus on the renewable energy pre-feasibility study.

Presentation Overview

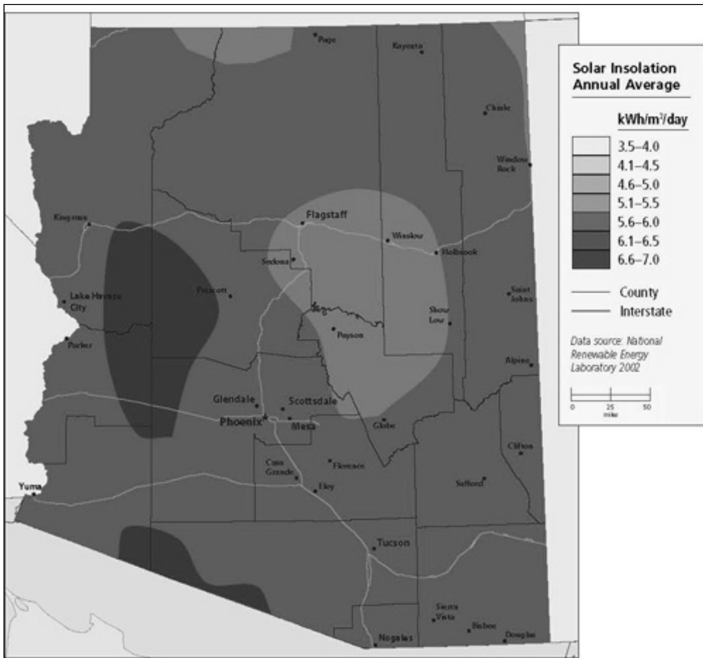
- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

Renewable Energy Assessment Process

- I. Evaluating the Renewable Energy Resource
- II. Assessing Site Suitability
- III. Identifying appropriate renewable energy technology options
- IV. Review Energy Markets and Incentives

54

Here’s a look at how the renewable energy feasibility process plays out.



Heat map depicting annual insolation averages in Arizona.

55

Photo: Heat map depicting annual insolation averages in Arizona.

To begin, the pre-feasibilty study took a broad look at Arizona and it's solar insolation annual average.

Arizona is expected to have a unique reliance on solar to meet future renewable energy requirements. Projections suggest upwards of 65 percent of the State's renewable energy demand in 2025 will be met by solar energy projects. On-site PV provides many options at the Iron King Mine - Humboldt Smelter Superfund Site due to its flexible installment options. Most of the United States has adequate to good PV resource quality and Arizona is defined as "excellent."

Some of the challenges solar installation projects face in Arizona include:

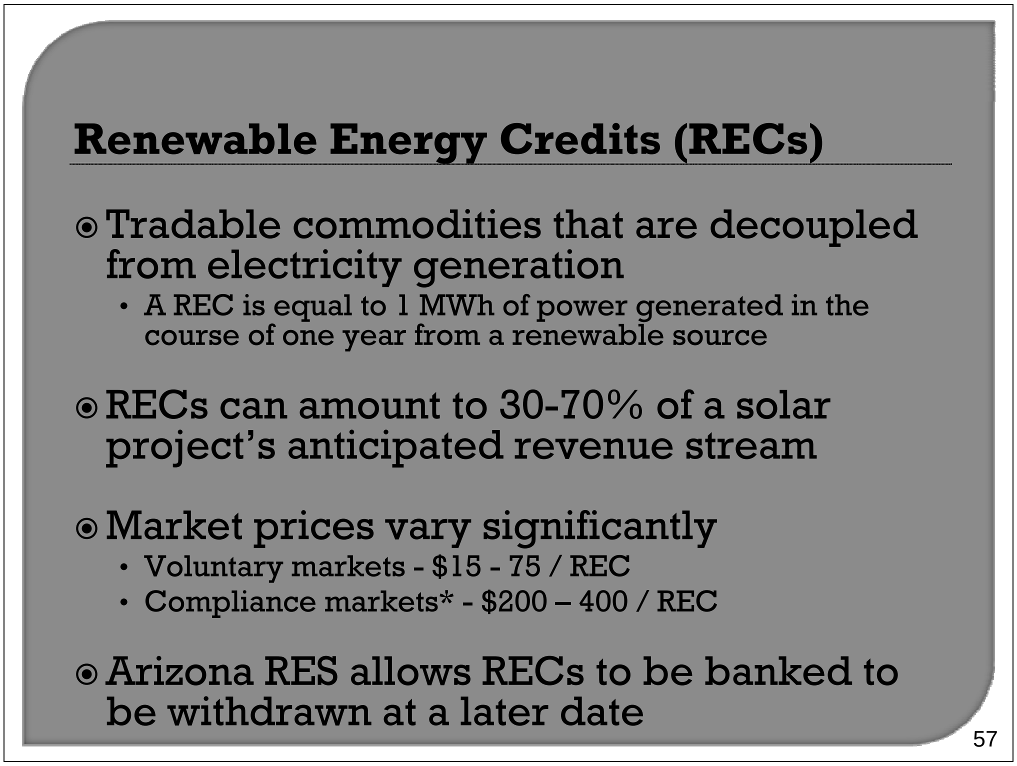
- High up-front capital costs
- Low utility rates relative to nearby states
  - ($0.08/kWh versus $0.12/kWh in CA)
- Increased water demand for an arid state with abundant solar resources
- Competition for solar projects and solar manufacturers from neighboring states (due to attractive tax incentives, manufacturing incentives in NM and CA)

Solar Energy Trends

- PV system installations more than doubled in Arizona between 2007 and 2008
- 6.4 MW (DC) of PV capacity installed in Arizona in 2008 (Up from 2.8 MW (DC) in 2007)
- AZ ranked 4th for installed capacity for 2009

State	2008 Installed Capacity (MW)	2007 Installed Capacity (MW)	% change
California	178.7	91.8	95%
New Jersey	22.5	20.4	10%
Colorado	21.7	11.5	88%
Nevada	14.9	15.9	- 6%
Hawaii	8.6	2.9	200%
New York	7.0	3.8	85%
Arizona	6.4	2.8	129%

Solar energy trends in Arizona were depicted, as shown above.



A number of policies and incentives are available to facilitate the development of renewable energy projects at the federal, state and local level.

Renewable Energy Credits (RECs) - RECs are tradable commodities, separate from the electricity produced, that bundle the "attributes" of renewable electricity generation. Because they are unbundled from electricity, RECs are not subject to transmission constraints. There are two primary REC markets - mandatory and voluntary. RECs generated in Arizona would be subject to voluntary REC prices, which are priced between $15 and $60 per REC. However, if a Power Purchase Agreement for electricity generated on site was signed with a regulated utility like Arizona Public Service (APS), any generated RECs would belong to APS and would not be available to be sold on the voluntary market.

Incentives include both policy-based incentives (e.g., renewable portfolio standards) and financial incentives (e.g., tax credits and rebates). Incentive highlights are below.

Federal Incentives

- Business Energy Tax Credits (also known as Investment Tax Credits (ITCs))
- Clean Renewable Energy Bonds (CREBs)
- Rural Business Enterprise Grants
- Section 9006 Rural Energy Loan Program
- Woody Biomass Utilization Grants

State Incentives

- Arizona Renewable Energy Standard (RES)
- Solar Energy Equipment Sales Tax Exemption
- Commercial/Industrial Solar Energy Tax Credit Program

Local/Utility (APS) Incentives

Renewable Energy Incentive Program

- **Up Front Incentives**
  - PV systems within APS area and tied to APS grid can receive a one-time incentive of up to $2.50 per installed Watt
  - Up-front Incentives cannot exceed $75,000 or 50 percent of the total system cost
- **Production Based Incentives**
  - Periodic payments made based on actual production of the PV system (10, 15, 20-year agreements)
  - Customers are obligated to provide Renewable Energy Credits to APS
  - Production based incentives payments cannot exceed 60% of the total system cost

58

These are incentives offered by APS, the local utility in Arizona.

In 2008, APS purchased or generated 609,926 MWh of renewable energy, or 2.1 percent of total retail sales. This figure exceeded the company's Renewable Energy Standard goals by 0.5 percent for the year. APS continues to seek proposals for utility-scale PV solar projects to meet a portion of their annual RES implementation requirements. For 2010, APS has issued an Request for Proposal for new renewable energy project proposals. Projects must be at least 15 MW in size, with a maximum of 50 MW.

Iron King Mine Area Site Considerations

Reuse Zone	Existing Site Considerations	Future Use Goals
Zone 1-A	Access via primary road Existing buildings and structures Zoned industrial Existing infrastructure Moderate contamination	Commercial Industrial Renewable energy generation note: residential opportunities might be limited due to underground mine workings
Zone 1-B	Access and infrastructure needed Minimal to no contamination	Same as Zone 1-A
Zone 1-C	Access via primary road Existing buildings and structures Zoned Industrial Existing infrastructure Associated with tailings Visible from Highway Minimal contamination	Continued Industrial Commercial Renewable energy, generation potential might be limited based on site characteristics, such as tailings stability, access, and dust control.
Zone 1-D	Access via primary road Existing buildings and structures Zoned Industrial Existing infrastructure Moderate contamination	Continued industrial Renewable energy (potential)

This table outlines the existing site considerations and related future use goals for the Iron King Mine area and how they may vary for each zone. Zones 1-A and 1-B include those areas of the Kuhles Capital LLC properties that are most suitable for development. Zone 1-B is delineated to represent portions of the Kuhles properties that might have access challenges. Zone 1-C represents the most suitable development areas of the North American Industry properties. Zone 1-D represents the most suitable development areas of those parcels south of Iron King Mine Road.

Humboldt Smelter Site Considerations

Reuse Zone	Existing Site Considerations	Future Use Goals
Zone 1-A	Access via primary road Existing buildings and structures Close proximity to downtown Zoned industrial Remedial considerations Moderate contamination	Commercial Industrial Mining heritage Residential opportunities might be limited based on cleanup approach selected
Zone 1-B	Access road extension needed Prominent views of surrounding area and highly visible from surrounding area Scattered concrete remnants Zoned industrial Minimal contamination	Commercial (access improvements needed) Industrial (access improvements needed) Residential (consistent with surrounding land use)

This table outlines the existing site considerations and related future use goals for the Humboldt Smelter area and how they may vary for each zone. Zone 1 was delineated into two separate areas based on potential remedial components and future use considerations. Zone 1-A includes the portion of the site that is accessed by a primary road and might be best suited for mixed uses that could include commercial or industrial uses due to close proximity to downtown and existing infrastructure. Denser uses in this area would blend with surrounding uses to the northwest and could provide an opportunity to cap the ash present in this area. Zone 1-B differs from Zone 1-A in that it has fewer remedial considerations and has limited access. This zone might be more suitable for less intensive uses such as residential or recreational uses.

Presentation Overview

- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

For the Iron King Mine area, several potential future use scenarios have been identified for the two major landowners of the site.

1. Continued Manufacturing / Light Industrial Future Use Scenario

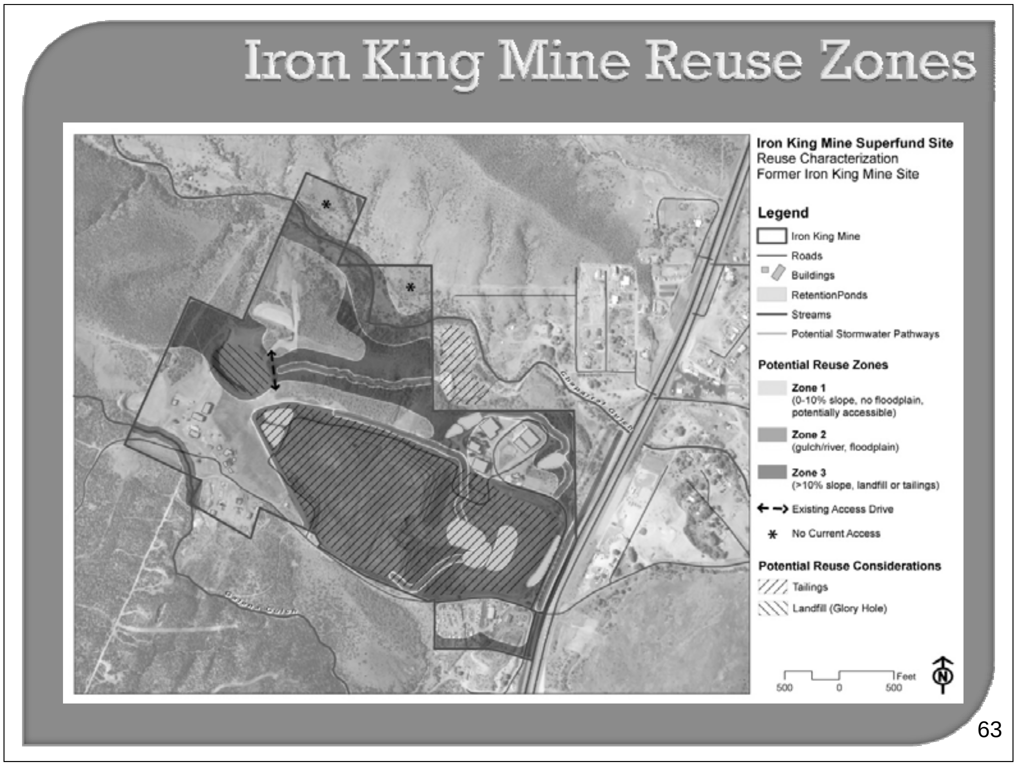
This scenario anticipates continued manufacturing and light industrial uses on a parcel by parcel basis with individual owners. Access and infrastructure improvements would be needed to develop the remote parcels located in reuse zone 1-B and noted on Figure 18 with an asterisk.

2. Recreational Access to Surrounding Trails and Open Space

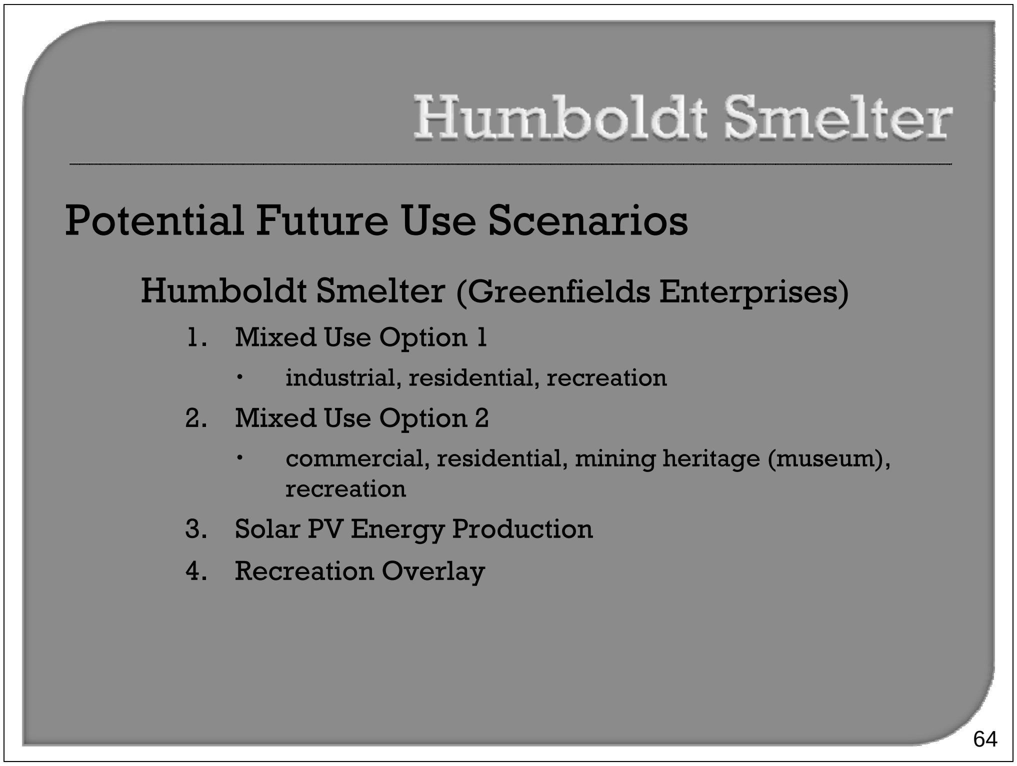
The Town of Dewey-Humboldt's Master Plan identifies a potential trail along Galena Gulch that would cross the southern portion of the area and another trail along the Chaparral Gulch (see Figure 21 on page 29). These potential recreation access points are highlighted on Figure 18. Recreational access might be a suitable future land use component to the future use scenarios described in this section.

3. Renewable Energy

With 300 days of sunlight a year, average solar insolation measured at over 6 kWh/m2/day, and sitting at an elevation of 4,500 feet, the Iron King area has very good solar resources. In addition, transmission access is readily available at the site, with three-phase power3 already in place; a 69kV transmission line runs to the Poland Junction Substation located approximately 5 miles south of the site; the Iron King Mine area sits on top of ground water resources; and local topography suggests that sizeable portions of the mine area lie within 10 percent grade and could be to support various PV options.



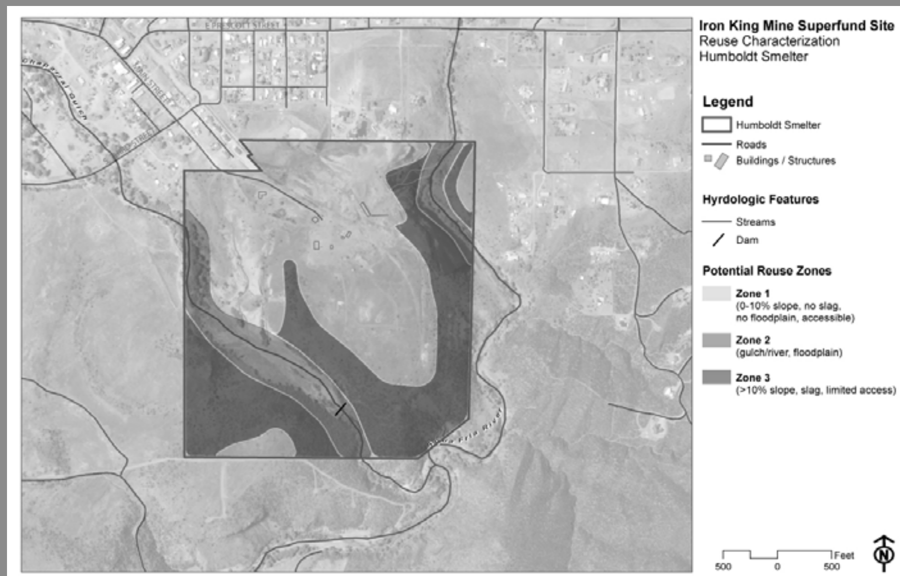
Here’s a look at a reuse characterization map



Several potential future use scenarios for the Humboldt Smelter area that have been identified. A significant portion of the smelter site could potentially accommodate solar energy projects given topography and aspect. However, because of the potential number of mixed-use opportunities presented by the smelter area, how visible much of the area is to the surrounding community, and the site's proximity to Main Street and potential plans to revitalize Main Street toward and onto the site, these other areas (Zone 1-A, northern part of Zone 1-B) may not be ideal renewable energy development areas.

The Humboldt Smelter area could also serve as a good potential location for a biomass energy facility. The area offers relatively flat topography and available acreage, which could support the infrastructure (e.g., plant, feedstock storage) of a biomass facility. Because of the proximity of the Smelter area to Main Street and the visibility of Nob Hill and the former smelting process area, some additional research would probably be needed to evaluate the compatibility of a biomass facility with other mixed use opportunities at the Smelter area.

Humboldt Smelter Reuse Zones



65

Presentation Overview

- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

Iron King

Potential Remedial Components	Potential Remedial Considerations that Could Inform Future Use	Potential Future Use Considerations
Landfill Closure *Potential remedial components could include a cap, stormwater management and monitoring system*	•Stability •Stormwater and drainage •Cap protection •Final grade and compatibility with surrounding grade	Area might be suitable for supporting uses, such as parking or storage **Potentially compatible for siting PV solar arrays**, though grading might be necessary to achieve proper solar orientation
Tailings Area *Potential remedial components could include containing tailings in place with a vegetative cover*	•Stability •Stormwater and drainage •Cap protection •Compatibility with surrounding grade	•Maintain cover protection •Heavy uses might not be suitable •Open space and recreational uses might have access restrictions •Access to tailings for reprocessing might require special arrangements to ensure remedy protection
Surface Soil	Extent of treatment area locations Cleanup approach (could include cap in place, consolidation on site and cap, or excavate and remove off site)	If surface soils are treated on site, remedy protection will be a long-term future use consideration. Cap or containment areas might be suitable for development. For example, buildings or parking areas could be located on top of a containment area and serve as a cap to prevent exposure.

The Iron King Mine contains several areas of concern, including a former landfill, a large tailings area, and surface soils with elevated levels of heavy metals. Figure 22 overlays potential remedial considerations over potential future use areas. This table describes the potential remedial components and remedial considerations that could inform future uses at the Iron King Mine.

Humbolt Smelter

Potential Remedial Components	Potential Remedial Considerations that Could Inform Future Use	Potential Future Use Considerations
Tailings Containment Area *Potential remedial component could include containing tailings in place with tailings from gulch*	•Stabilization •Stormwater management and drainage •Cap protection •Final grade and compatibility with surrounding grade •Height and size of containment area	•Open space, limited access •PV potential •Top of slope might allow for supporting uses, such as parking, for adjacent uses •Size and location of containment area might impact future development areas
Ash Containment Area *Potential remedial component could include containing in place*	•Stormwater management and drainage •Cap protection •Height and size of containment area •Compatibility with surrounding grade •Existing buildings	•Maintain cap protection •Lightweight uses such as parking or recreation might be suitable on top of cap, but heavy uses might be best located elsewhere on the property •Existing building stability and safety •Cap footprint would increase if tailings included •Size and location of containment area might impact future development areas
Consolidation *Potential remedial component could include consolidating scattered ash piles and debris into containment cell*	Depth and distribution of material	Potential for no use restrictions

68

Areas of concern at the Humboldt Smelter include the slag area along the Aqua Fria River, tailings in and along Chaparral Gulch, ash piles, tailings piles, and debris piles. Potential remedial components for the ash and tailings piles include containing the materials in on-site repositories with protective caps. The sizes and locations of these repositories will greatly inform the future use opportunities available at the site. A containment cell in this area would bisect this area. The containment cell cap might be suitable for a range of uses including parking to support new development or for an RV facility, lightweight structures, or recreational uses such as soccer fields. A tailings containment cell adjacent to Chaparral Gulch might be suitable for PV solar as described the previous section. Depending on the grade, the northern portion of the cell might allow for lightweight uses on top of the cap, such as parking or recreational uses. Consolidating scattered ash and debris into one area might create a large area in Zone 1-B that might not require land use restrictions.

Presentation Overview

- Purpose of Pre-Feasibility Study
- Site Background
- Regional Context
- Site Reuse Goals
- Renewable Energy Assessment
- Future Use Options
- Aligning Cleanup and Reuse
- Lessons Learned and Next Steps

Lessons Learned and Next Steps

70

A 1 to 2 MW solar PV project would be currently possible at the Iron King Mine area if the right financial arrangement between land owners, project developers and APS could be reached. APS periodically issues RFPs for in-state renewable energy projects to help the company meet its RPS goals. APS is currently focusing on 2 to 15 MW projects as part of the company's 2010 RFP solicitations, and typically looks for projects with a levelized cost of $150 per MWh of electricity generated.

Longer term, given where the Site currently sits in the Superfund process, additional information on site cleanup requirements and potential site limitations (e.g., weight limits for potential containment cells) would help to clarify the extent to which large-scale PV development, particularly in the Smelter area, is feasible.

Cleanup activities at the Site could also take advantage of the solar resources at the Site and potentially incorporate solar technologies as part of a green remediation strategy.

Questions?

Presenter Contact Information

Monika O'Sullivan
EPA, Region 9
(415) 972.3111
Osullivan.monika@epa.gov

71

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72