Welcome to the CLU-IN Internet Seminar

US and EU Perspectives on Green and Sustainable Remediation, Part 4

Sponsored by: U.S. EPA Office of Superfund Remediation and Technology Innovation

Delivered: March 6, 2012, 10:00 AM - 12:00 PM, EST (15:00-17:00 GMT)

Instructors:

Carlos Pachon, U.S. EPA Office of Superfund Remediation and Technology Innovation, pachon.carlos@epa.gov, (703) 603-9904

Dietmar Müller, Environment Agency Austria, dietmar.mueller@umweltbundesamt.at, +43-(0)1-313 04/5913

Paul Bardos, r3 Environmental Technology Limited, paul@r3environmental.co.uk, +44 (0)118 378 8164

Andria Benner, U.S. EPA Region 9, Benner.Andria@epa.gov, (415) 972-3189

Jan Vaněk, DEKONTA, vanek@dekonta.cz, 420235522255

Moderators:

Carlos Pachon, Dietmar Müller, and Paul Bardos

Visit the Clean Up Information Network online at www.cluin.org

1

Although I'm sure that some of you have these rules memorized from previous CLU-IN events, let's run through them quickly for our new participants.

Please mute your phone lines during the seminar to minimize disruption and background noise. If you do not have a mute button, press *6 to mute #6 to unmute your lines at anytime. Also, please do NOT put this call on hold as this may bring delightful, but unwanted background music over the lines and interupt the seminar.

You should note that throughout the seminar, we will ask for your feedback. You do not need to wait for Q&A breaks to ask questions or provide comments. To submit comments/questions and report technical problems, please use the ? Icon at the top of your screen. You can move forward/backward in the slides by using the single arrow buttons (left moves back 1 slide, right moves advances 1 slide). The double arrowed buttons will take you to 1st and last slides respectively. You may also advance to any slide using the numbered links that appear on the left side of your screen. The button with a house icon will take you back to main seminar page which displays our agenda, speaker information, links to the slides and additional resources. Lastly, the button with a computer disc can be used to download and save today's presentation materials.

With that, please move to slide 3.

US and EU Perspectives on Green and Sustainable Remediation, Part 4

6 March, 2012

EPA United States Environmental Protection Agency

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

3

Agenda

Introductions and Background

Carlos Pachon, U.S. EPA Office of Superfund Remediation and Technology Innovation

Greening Superfund Cleanups, Apache Powder Project, Arizona

Andria Benner, U.S EPA Region 9 Remedial Project Manager

TRIANGLE Zatec

Jan Vaněk, DEKONTA

Austria's New MCEA-Tool

Moritz Ortmann, Kommunalkredit Public Consulting GmbH
Gernot Döberl, Environment Agency Austria
Werner Frühwirth, denkstatt GmbH

EPA Greener Cleanup Developments

Carlos Pachon

Updates on International Initiatives

Paul Bardos, r3 Environmental Technology Limited (UK)

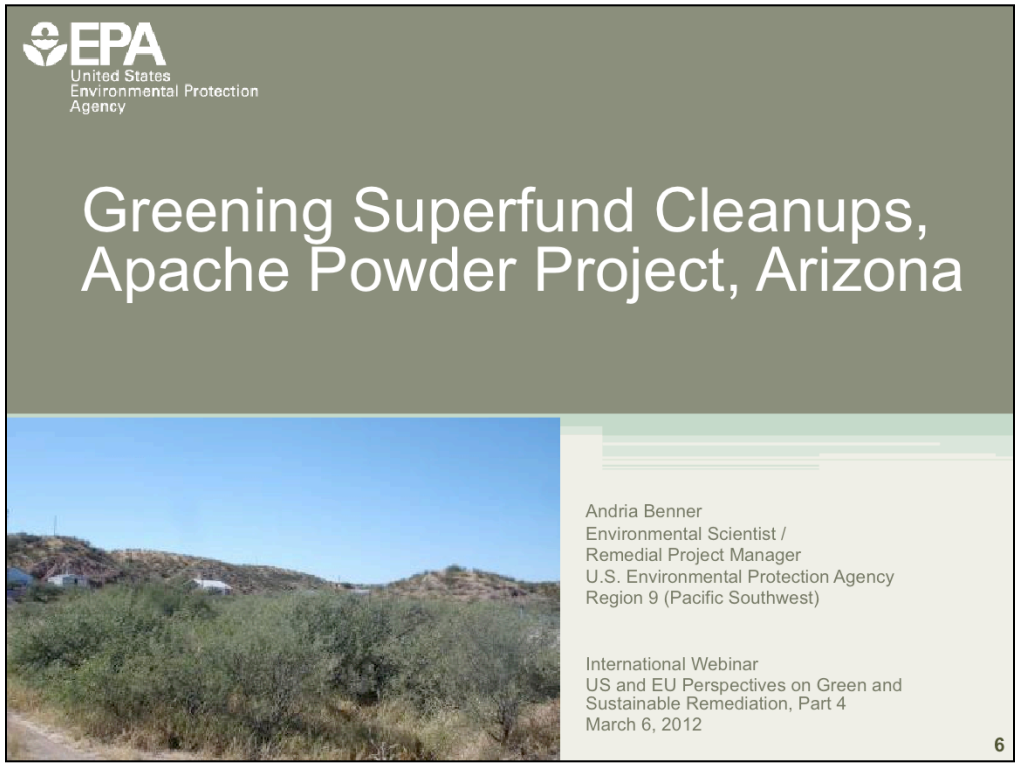
2nd International Conference on Sustainable Remediation 2012

Dietmar Müller, Environment Agency Austria

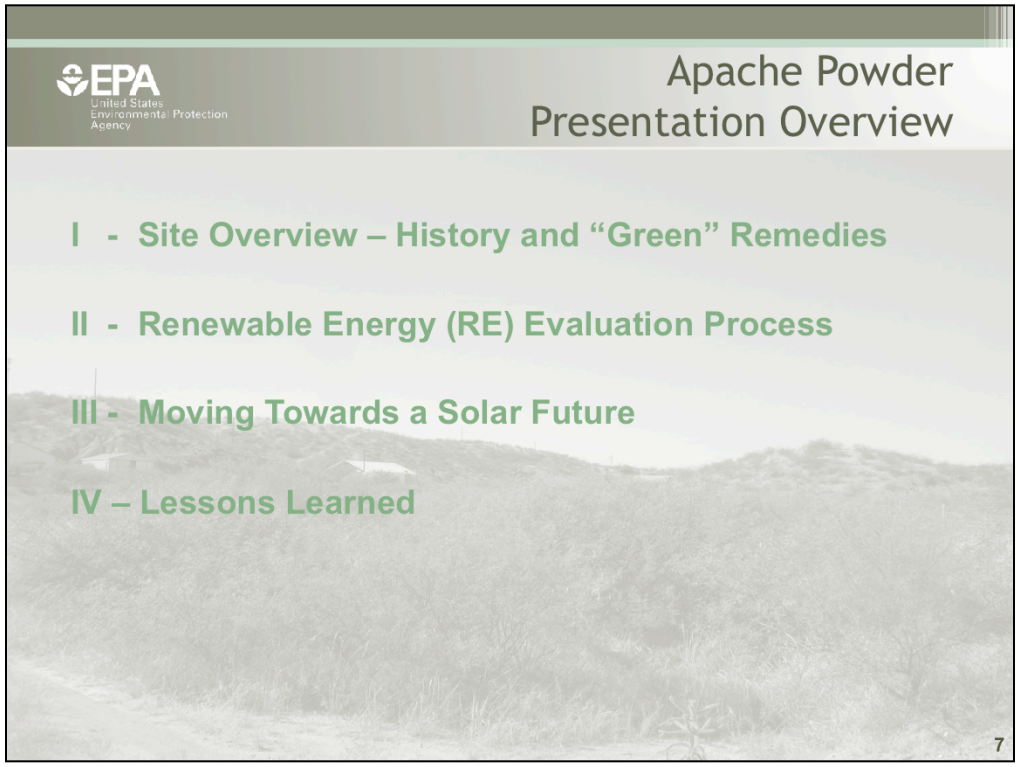
History: US and EU Perspectives on Green and Sustainable Remediation*

- 2008 ConSoil: Opening the dialogue on technical and policy fronts
- 2009 Copenhagen: First International Forum on the specific topic of green remediation
- 2010 ConSoil: First comprehensive summary of International Developments in Sustainable and Green Remediation
- Internet Webinars on US and EU Perspectives on Green and Sustainable Remediation
  - 1: July 12, 2010: Groundwork for ConSoil 2010
  - 2: March 15, 2011: Comparing and contrasting perspectives on GSR
  - 3: October 26, 2011: Case studies, part 1
  - 4: March 6, 2012: Case studies, part 2

*Cluin.org/global

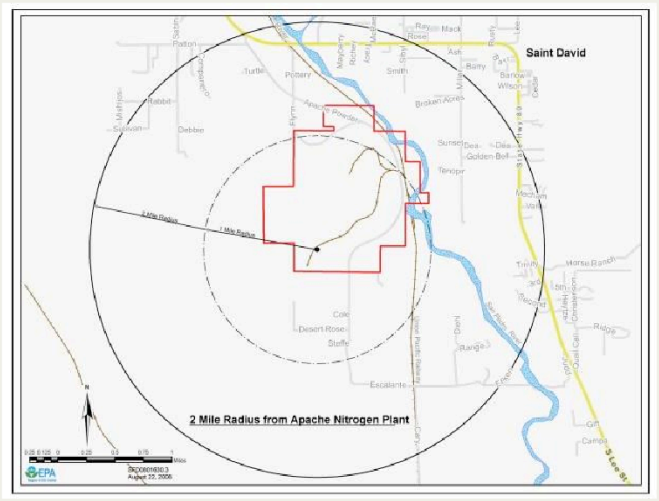


US and EU Perspectives on Green and Sustainable Remediation


EPA
United States
Environmental Protection
Agency
Apache Powder
Presentation Overview
I - Site Overview – History and "Green" Remedies
II - Renewable Energy (RE) Evaluation Process
III - Moving Towards a Solar Future
IV – Lessons Learned
7

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

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



8

EPA United States Environmental Protection Agency

Background and Site History

- Apache Powder Company began explosives manufacturing operations in 1922.
- Manufactured dynamite for mines & nitrogen fertilizers for local agriculture; currently still manufacturing ammonium nitrate.
- Groundwater and soils contamination resulted from prior disposal practices. Listed on EPA's Superfund list of contaminated sites in 1990.

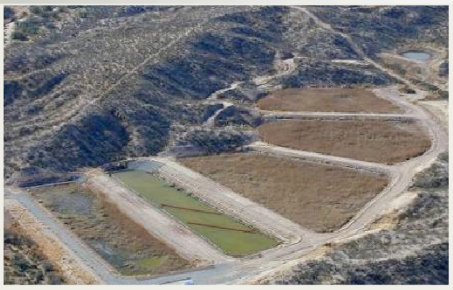
Soils Remedy: Closed and Capped Infiltration Ponds

- Superfund "construction complete" in 2008 for soils and groundwater cleanup activities
- Apache Nitrogen Products, Inc. (ANPI), the former Apache Powder Company, continues to manufacture chemical products on the Site

10

Groundwater Remedy: 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



11

EPA United States Environmental Protection Agency

Renewable Energy Analysis Process

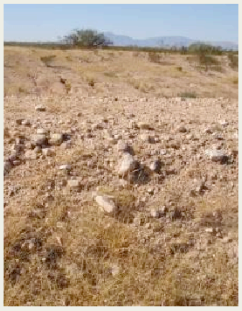
1. Evaluate the renewable energy resource
2. Assess site suitability
3. Consider technology specific criteria
4. Review market and incentives

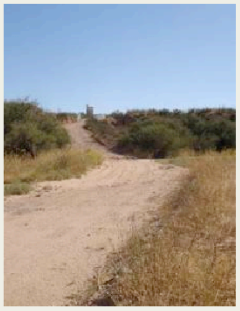
12

EPA United States Environmental Protection Agency

Purpose of Pre-Feasibility Solar Assessment

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





13

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 local electricity provider (utility)
- 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

14

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

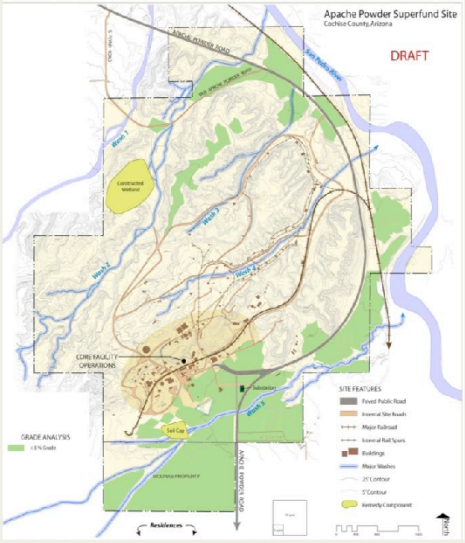
15

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.

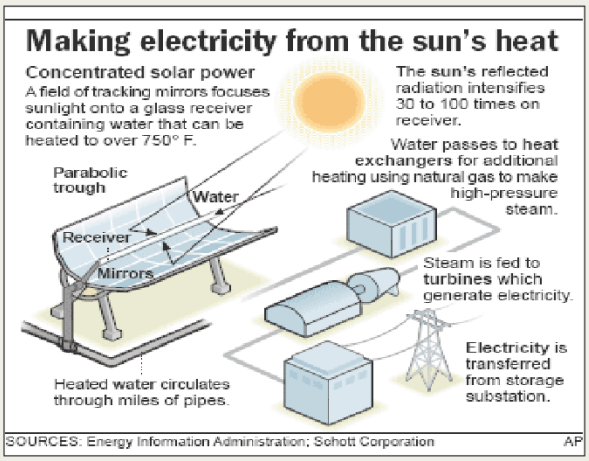


16

EPA United States Environmental Protection Agency

Technology Overview

Concentrating Solar Power (CSP)

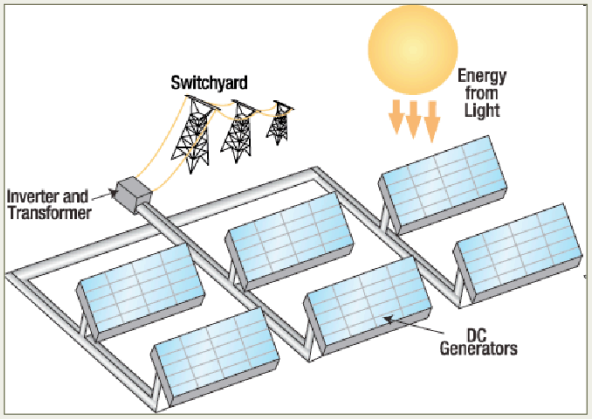


- CSP plants indirectly generate electricity
- Mirrors concentrate solar energy into high temperature heat or steam that powers a turbine
- Various solar thermal technologies at differing levels of commercial readiness

17

EPA United States Environmental Protection Agency

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%

18

EPA United States Environmental Protection Agency

Solar Technology Assessment

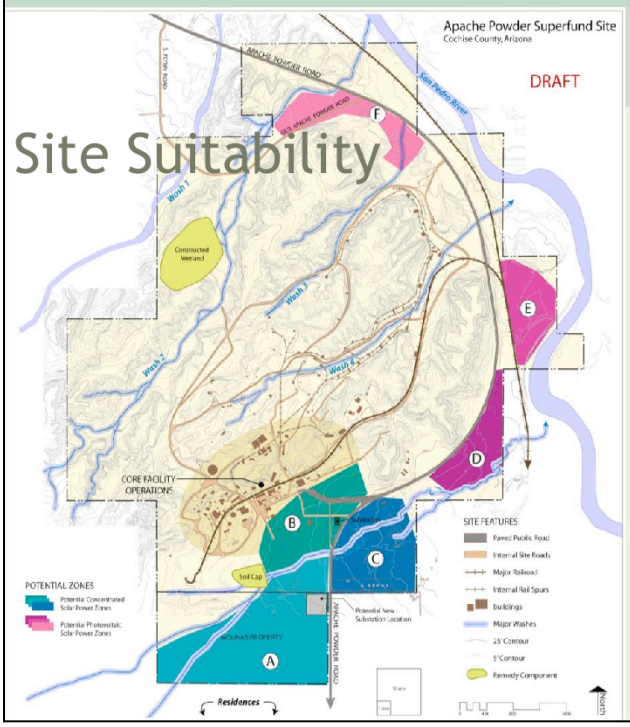
Concentrating Solar Power (CSP) Versus Photovoltaic (PV)

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

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

20

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.

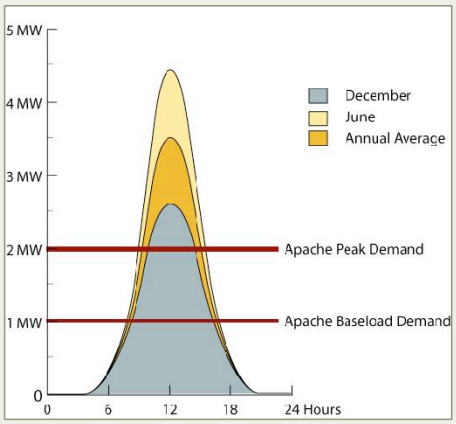
Fixed axis PV panels aligned to be south facing.

21

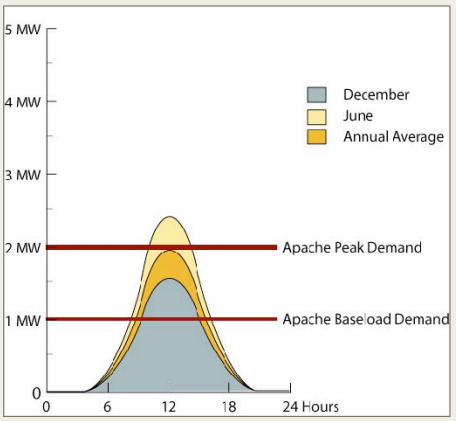
PV Output - Sizing to On-site Demand

Hypothetical Daily Generations

5 MW PV Array



3 MW Array



22

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 Renewable Energy Credits (RECs) for additional income ▪ Public relations benefits by use of renewable energy at a Superfund site	▪ Not all on-site demand could be replaced due to intermittent electricity production ▪ Arid, southwest environment (water issues) and available acreage limits viability of a CSP facility at site ▪ Natural gas used in manufacturing operations; solar would not impact natural gas use ▪ A solar project exceeding 5 MW would require substation and transmission line upgrades

Market Opportunities & Incentives

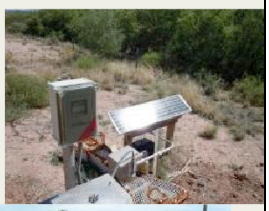
Solar Incentives / Market Drivers

- 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 (FITs)

24

Plans Toward a Solar Future

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



25


EPA
United States
Environmental Protection
Agency
Solar Canopy Installed with
Water Harvesting - Nov 2010
26

EPA United States Environmental Protection Agency

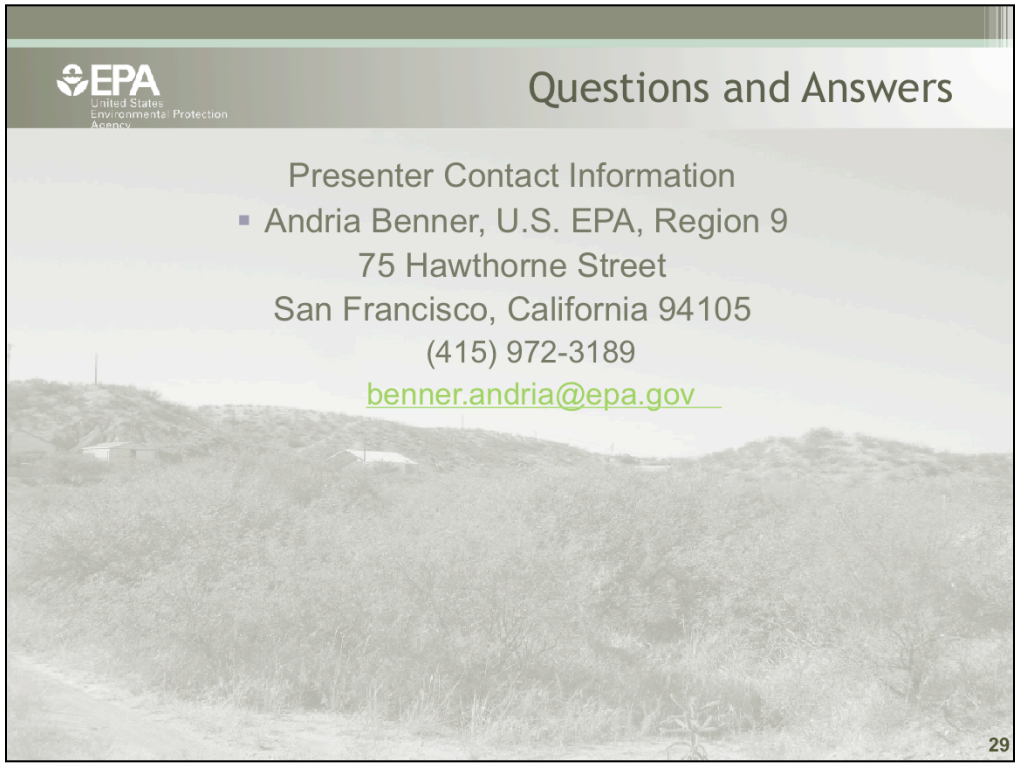
Lessons Learned - Apache

- Solar energy development is compatible with Site and Superfund remedy
- Site has potential for direct use and utility-scale solar (PV preferred)
- 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) critical for the economic viability of a utility scale project

EPA United States Environmental Protection Agency

Lessons Learned - General

- Public-Private Partnerships can effectively support renewable energy projects
- Establishing and Maintaining Relationships (Agencies/Utilities) is critical
- Superfund remedial process can provide information to fulfill permitting and other regulatory requirements
- Utility-scale renewable energy projects are complex, but manageable


EPA
United States
Environmental Protection
Agency
Questions and Answers
Presenter Contact Information
Andria Benner, U.S. EPA, Region 9
75 Hawthorne Street
San Francisco, California 94105
(415) 972-3189
benner.andria@epa.gov
29

TRIANGLE Zatec
Transforming a former military airport into the largest industrial zone of the Czech Republic

Jan Vanek
DEKONTA, Co.

6 March, 2012

EPA United States Environmental Protection Agency

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

30

Site description

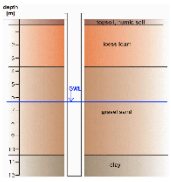
History:

- former military airport, operating before World War II until 1992
- approx. 350 hectares

Contamination:

- jet fuels, light fuel oil, engine and hydraulic oils
- unsaturated zone: ~ 10 hectares (TPH max. 7.000 mg/kg)
- saturated zone: ~ 30 hectares

Geological profile:



Site-remediation activities realized in a framework of development the largest industrial zone in Central Europe - TRIANGLE Zatec

Target limits for site remediation:

- unsaturated zone: 2,000 mg/kg TPH (Total petroleum hydrocarbons)
- groundwater: removal of oil phase from groundwater table
  - 4 mg/l dissolved TPH

Applied remedial techniques:

- **bioremediation ‚on-site'** (184,000 tons of contaminated soil)
- **bioremediation ‚in-situ'** (157,000 tons of contaminated soil)
- **P & T of contaminated groundwater** (area of 300,000 m^2)
- **monitoring** of remediation process

Participating subjects:

- investor: **Usti Region (regional authority)**
- general contractor: **DEKONTA, a.s.**
- supervisor: AQUATEST, a.s.
- guarantee: CZECHINVEST (Czech Investment and Development Agency)

Main project activities - scheduling

2003

- elaboration of project implementation documents and permitting
- site investigation (drilling works), setting out of contaminated places
- preparatory work (decontaminated plate)

2004

- clean-up - bioremediation ‚on-site'
- construction works (demolition, soil excavation, backfilling)
- sampling of groundwater and soil
- laboratory works (monitoring biodegradation process, model laboratory tests) incl. evaluation of laboratory analysis results

2005 - 2008

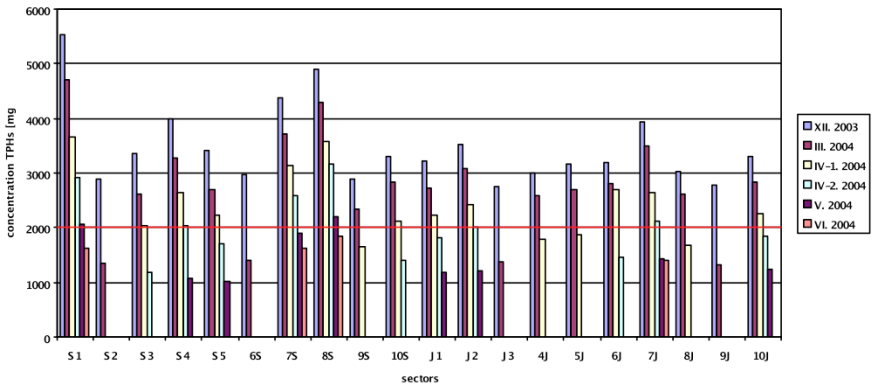
- clean-up works - biodegradation ‚in-situ' (till 2006)
- GW treatment, operation of a hydraulic barrier (till 2008)
- sampling, laboratory works (postremedial monitoring till 2013)

Bioremediation ‚on-site' (1)

- **soil cultivation**
  - in order to ensure aeration, equal application of biopreparation, additives and homogenisation of materials
- **application of bacterial preparation**
- **Time:** 4 - 8 months
  - according to the contamination level, soil characteristics and climatic conditions
- **Backfilling**: 184.000 tons
  - Decontaminated material was continuously placed back to excavated places as backfilling after achievement of TPHs target limit (control sampling by a supervisor)
- **Contaminant mass**: 411 tons

Bioremediation ‚on-site' (2)

Overview of concentration TPHs during clean-up process „on-site" in separate sectors of decontamination site



Bioremediation ‚in-situ'

- up-grade of a biotechnological equipment (storage tanks, pumps, compressors), set up for permanent operation
- installation of electric cables, pipelines for distribution of water and solutions (-bio, -mineral), drainage layers and infiltration systems at bottom of pits
- installation of equipment for treatment of groundwater
- capacity of the biocenter was 60 m^3 of biopreparation per day and 35 m^3 of mineral additives per week
- system was completed by wells for injecting of air (bioventing)
- stage of clean-up process – bioremediation ‚in-situ' started in September 2004 and was operated for 22 months (until June 2006)
- soil and groundwater monitoring was realized during ‚in-situ' bioremediation

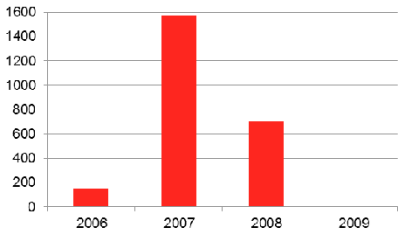
Clean-up of saturated zone (groundwater treatment)

- operation of the **outside hydraulic barrier (30 wells)** includes groundwater quality **monitoring**
- **total area** of contaminated groundwater: more than **300,000 m^2**
- **average volume** of groundwater extracted daily: 302 m^3 (**3.5 l/s**)
- **entire volume** of extracted and treated groundwater: 173 998 m^3
- **3 water treatment stations** equipped with a gravitation separator and an adsorption filter with fibroil
- TPH concentration infiltrated back: approx. 0.01 mg/l

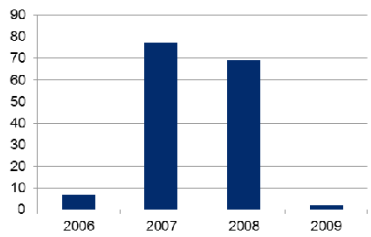
Groundwater remediation – summary

- **2 420 l of free phase petroleum hydrocarbons** removed from groundwater table
- **11 188 kg of dissolved petroleum hydrocarbons** removed from extracted groundwater
- **Target limits achieved** at the entire remediated area 300,000 m^2

Volume of removed oil product (l)



Average TPH concentration in pumped wells (mg/L)



Environmental benefits (1)

➔ no formal sustainability assessment, neither during the design phase nor during the implementation

REFERENCE SCENARIO *(TPH-contamination)*

- bioremediation ‚off-site' (Czech Republic: ~ 90 %)
  - transport distance: 100 km

CHANGED PRACTICES (Qualitative characterisation)

Treatment on-site and in-situ

- reduced energy
- reduced CO2-emissions
- reduced dust and noise disturbance
- lowered risk of accidental release of contamination

Closed cycles (reuse/recycling treated soil & groundwater)

- minimization of water consumption
- minimization of waste production

Environmental benefits (2)

Semiquantitative accounting for transports

(Reference scenario: Off-site biological treatment, distance 100 km)

energy savings:

- On-Site: approx. 150.000 l fuels, (~ 5 Mio. kWh)
- On-Site & In-Situ: 275.000 l fuels (~ 9 Mio. kWh)

CO2-savings:

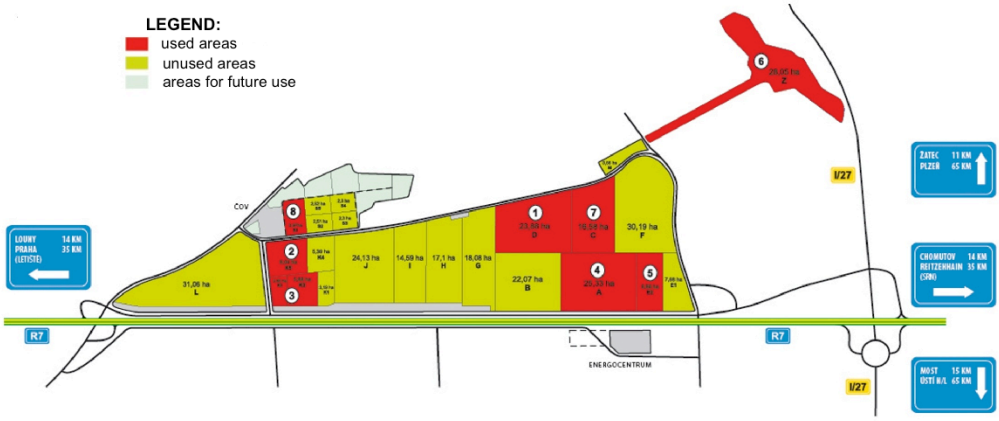
- On-Site treatment: 385 t
- On-Site & In-Situ: 720 t

Further benefits:

➔Cost savings: 10 – 15 %

➔Time savings: 3 – 4 years

Current status of land use (1)



Current status of land use (2)

Investors in the industrial zone - Triangle Zatec:

- Panasonic Liquid Crystal Display Czech s.r.o. (JPN)
- Solar Turbines EAME s.r.o. (USA)
- JC Interiors Czechia s.r.o. (USA)
- Gestamp Louny s.r.o. (ESP)
- Hitachi Automotive Systems Czech s.r.o. (JPN)
- FVE Triangle a.s. (CZE)
- Panattoni Czech Republic Development s.r.o. (USA)
- HARGO a.s. (CZE)

Socio-economic aspects

reuse of the site:

- first investments starting 2006
- until 2009: > 2.000 new jobs

Regional impacts (SWOT-analysis 2008):

- development of business and foreign trade
- decrease of high unemployment rate
- enhancement of low education
- development of associated infrastructure and services
- expected GDP increase at the range from min. 2.8 % to max. 11.7 %
- fiscal contributions on VAT, health insurance

SUMMARY

- clean-up design is the driver of environmental impacts in remediation
- on-site and in-situ approaches and working in closed cycles (reuse) bring many benefits like reduction in energy consumption, emissions, risk levels, costs
- to design projects in a more sustainable manner, it would be crucial to develop practicable and commonly accepted assessment tools (e.g. MCA, LCA)
- future European policies should aim to reduce preferences ex-situ & off-site solutions
- transforming a site means “creating value”: Socio-economic aspects and embedding projects locally or regionally is fundamental

Austria's new MCEA-Tool

integrating sustainability into effectiveness assessment

Moritz Ortmann
Kommunalkredit Public Consulting GmbH

Gernot Döberl
Environment Agency Austria

Werner Frühwirth
denkstatt GmbH

6 March, 2012

EPA United States Environmental Protection Agency

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

45

How it got started

- **Federal funding guidelines for Remediation: "Maximal ecological effect under acceptable cost"**
- **Obligatory for funding: Ecological-economic assessment of remediation alternatives; criteria and assessment-tools have not been standardised until now**
- **Project "Ecological-economic assessment of remediation measures" 2010 ➔ Recommendation: Modified Cost-Effectiveness-Analysis (MCEA) as standardised assessment-tool**
- **Project "Modified Cost-Effectiveness-Analysis (MCEA) for Remediation" 2011**

  Client: Federal Ministry of Environment

  Contractors: Environment Agency Austria, Kommunalkredit Public Consulting GmbH, denkstatt GmbH

Reasons for choosing MCEA

☺ Established, commonly used, simple, flexible (CEA = basis for many different applications)

☺ Similar approaches have already been applied in studies on remedial alternatives (in Austria)

☺ Clear definition of priorities ➔ hierarchy of goals (criteria)

- ☺ (Private) costs as separate parameter (contrary to MCA)
- ☺ High transparency!

Principles of (M)CEA

- **Costs: Private costs of alternative**
- **Effectiveness: "Degree of achieving specific goals" ➔ definition of goals (criteria)**
- **Result of a (classical) CEA: Cost-Effectiveness-Matrix**
- **Result of a MCEA: Effectiveness/Cost-Ratio**

Alternatives	Costs	Effectiveness		
		Criterion 1	Criterion 2	Criterion 3
1	C1	E11	E12	E13
2	C2	E21	E22	E23
3	C3	E31	E32	E33

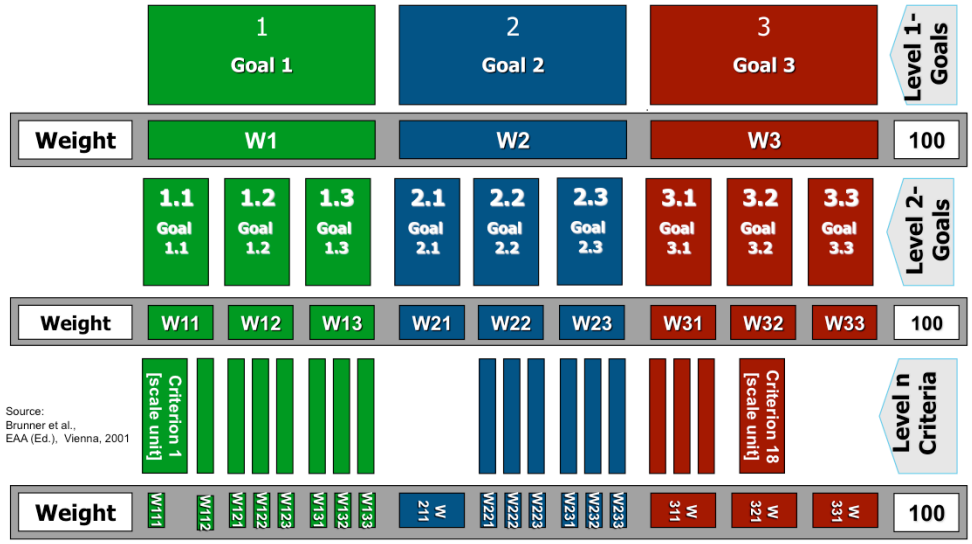
After IFIP (1999) and Hanusch (1986)

Further reading on MCEA – Theoretical background and application in waste management

Döberl et al. (2002): Waste Management & Research, 20, 311-327.

VDI (The Association of German Engineers): Guideline on Assessment Tools (incl. MCEA): 2012?

Hierarchy of goals (schematic)



Source:
Brunner et al.,
EAA (Ed.), Vienna, 2001

Constructing a hierarchy of goals – main principles

- The goals of the uppermost level ("overall objectives") and their weighting should be derived from national laws, guidelines and other relevant international documents
- The goals of the lowermost level ("level of criteria") should be represented by criteria which should be measureable (quantitatively or qualitatively)

- The hierarchy of goals and its weighting should be defined in a consensus based discussion process including all stakeholders
- Upper-level goals and their weighting should be pre-defined by the public funder

Constructing a hierarchy of goals – considering sustainability

- **Starting point: New Mission Statement on Contaminated Site Management in Austria released in 2009:**
  Remediation measures shall be sustainable and increase the environmental status permanently.
- **Clear statement on the implementation of sustainability into remediation of contaminated sites**

➔ **Criteria reflecting or integrating the principles of sustainability are needed**

➔ **A suitable assessment methodology is needed (MCEA)**

Constructing a hierarchy of goals – considering sustainability

- **Discussion process**
  - **Several "inner-circle"-meetings (6-7 people)**
  - **2 workshops with all relevant stakeholders (30 people; authorities, consulting, site owners, real estate development, spatial planning, science)**
- **Relevant documents Level-1-goals are derived from: Water Act, Mission Statement, Guidance on Funding, National goals on environmental quality, international documents, e.g. published by SURF UK**
- **Three Level-1-goals (main objectives): (1) Ecology, (2) local development, (3) project stability**

„Goal 1" at Level 1: Ecology

Level 1	Weight	Level 2	Weight	Level 3	Weight
Ecology	60	Primary ecological effects (i.e. "goal of remediation")	40	Effect on source of pollution	20
				Effect on threatened subject (e.g. groundwater)	15
				Remediation period	5
		Secondary ecological effects	20	Other subjects of protection	4
				Climate protection	4
				Energy	4
				Waste	4
				Natural Resources	2
				Local ecosystem	2

Level 4: Criteria

„Goal 2" at Level 1: Local development

Level 1	Weight	Level 2	Weight	Level 3	Weight
Local development	20	Site development	10	Public interests	7
				Private interests (property owner/ investor)	3
		Increase in property value	5		5
		Decrease of new land consumption	5	Area	2
				Potential of decrease	3

Level 4: Criteria

„Goal 3" at Level 1: Project stability

Level 1	Weight	Level 2	Weight	Level 3	Weight
Project stability	20	Local impacts	6	Impacts on neighbors	3
				Restrictions to infrastructure	3
		Duration of permanent remediation measures	4		4
		Safety and stability	10	Experience with remediation technology	2
				Incidents	2
				Workers safety	2
				Technical flexibility	2
				Economic and legal flexibility	2

Level 4: Criteria

Considering sustainability – summary

- 3 pillars of sustainability addressed
  - Environment ➔ ecological criteria
  - Economy ➔ site development, site value, stability
  - Society ➔ impacts on regions, neighborhoods, workers; stakeholder involvement
- Priority of ecology compared to local development / project stability
- Priority of primary ecological effects compared to secondary ecological effects
- Increase in site value (one of the major driving forces for remediation) vs. public benefit?

Algorithms MCEA (main principle)

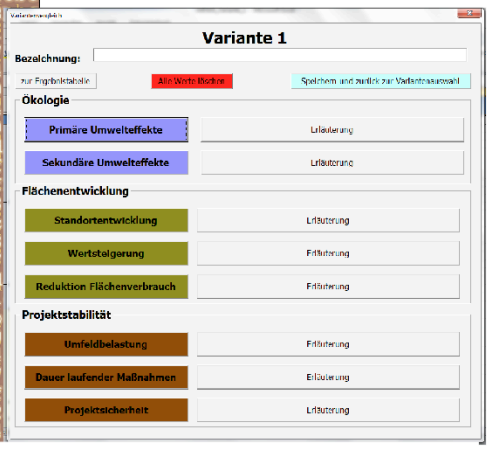
				Alternative A		Alternative B		Alternative C	
Level 1	Weight	Level 2	Weight	Effectiveness 0-10	Effectiveness x Weight	Effectiveness 0-10	Effectiveness x Weight	Effectiveness 0-10	Effectiveness x Weight
Goal 1	50	G11	25	3	75	4	100	8	200
		G12	15	6	90	7	105	10	150
		G13	10	9	90	0	0	5	50
Goal 2	30	G21	15	1	15	1	15	7	105
		G22	10	0	0	10	100	10	100
		G23	5	7	35	7	35	3	15
Goal 3	20	G31	10	5	50	8	80	6	60
		G32	6	4	24	3	18	9	54
		G33	4	4	16	6	24	4	16
Total	100		100	Total-effectiveness	395		477		750
		Cost	Mio.		19,2		9,5		13,3
Effectiveness/Cost-Ratio			E/C		20,6		50,2		56,4
			Rank		3		2		1

Manual

Modifizierte Kosten-Wirksamkeits-Analyse in der Altlastensanierung

Handbuch für Variantenstudien

Software tool



- **MCEA implemented in January 2012**
- **Obligatory for studies on remedial alternatives (when applying for national funding)**

EPA

EPA Greener Cleanup Developments:

(1) EPA *Methodology for Understanding & Reducing a Project's Environmental Footprint*

(2) ASTM Standard Practice for Greener Cleanup

Carlos Pachon,

US EPA Office of Superfund Remediation and Technology Innovation (OSRTI),

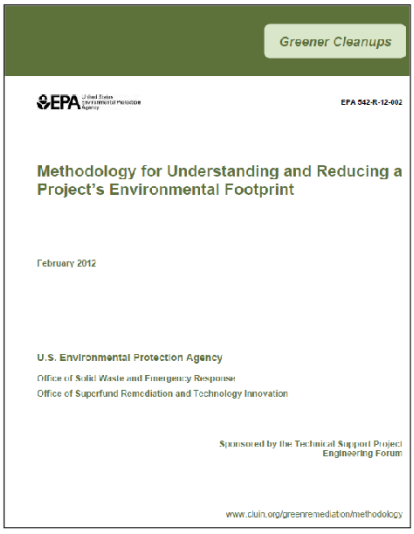
US and EU Perspectives on Green and Sustainable Remediation, Part 4
March 6, 2012
Cluin.org/global

59

Methodology for Understanding & Reducing a Project's Environmental Footprint

- Built around five core elements of a greener cleanup, as identified in OSWER's "Principles for Greener Cleanups"*
- Remedy selection process remains the same in all cleanup programs
- Footprints are not required, but if conducted this is the preferred approach

*http://www.epa.gov/oswer/greenercleanups



Methodology for Understanding & Reducing a Project's Environmental Footprint (2)

- Provides common footprint metrics and a process to quantify them
- Designed to be compatible with existing "footprinting" tools
- Based on lessons learned from multiple projects

- Goal of an assessment – Identify the most significant contributors to a project's environmental footprint and better focus efforts to reduce it
- Includes common conversion factors, contents of materials frequently used for cleanup, and typical energy demands of equipment deployed in the field

Methodology Protocol

- Based on pilot analyses, the cost of a footprint analysis ranges from $5-$15k
- Lower costs if done concurrent with other planning and design activities
- Less expensive to build footprint reduction measures into design than to retrofit

Step 1:	Set Goals and Scope of Analysis
Step 2:	Gather Remedy Information
Step 3:	Quantify Onsite Materials and Waste Metrics
Step 4:	Quantify Onsite Water Metrics
Step 5:	Quantify Energy and Air Metrics
Step 6:	Qualitatively Describe Affected Ecosystem Services
Step 7:	Present Results

Methodology Applicability

Does the methodology call for life-cycle assessment (LCA)?

- It calculates the green remediation metrics but does not apply an "impact assessment" as typically needed in a full LCA
- Materials and waste target the on-site use and generation rather than off-site (boundary difference)
- Energy, emissions, and water have fairly broad system boundaries

Does the methodology consider social and economic factors?

- The methodology focuses on the environmental footprint
- Social and economic factors are addressed in EPA cleanup programs through existing processes such as community involvement requirements and EPA's Superfund Redevelopment Initiative

Green Remediation Metrics

Energy

- Total energy used
- Total energy voluntarily derived from renewable resources

Air

- Greenhouse gases
- Criteria pollutants (NOx, SOx, PM)
  - On-site emissions
  - Total emissions
- Hazardous air pollutants (HAPs)
  - On-site emissions
  - Total emissions

Water

- On-site water use (including public/potable water)
  - Quantity
  - Source of water
  - Fate of used and treated water

Green Remediation Metrics

Materials & Waste

- Refined (including manufactured) materials used on-site
  - Quantity and % from recycled materials
- Bulk, unrefined materials used on-site
  - Quantity and % from recycled materials
- Waste
  - Hazardous waste generated on-site
  - Non-hazardous waste generated on-site
  - % of total potential waste generated on-site that is recycled or reused

Land & Ecosystems

- Currently qualitative evaluation

Methodology Applicability

Where and when is the methodology used?

- The methodology process and results are of value . . .
  - For all types of cleanup projects
  - For all cleanup programs
  - Throughout the various phases of a cleanup project

How will EPA use the methodology?

- Train EPA technical staff on ways to understand and reduce the footprint
- Conduct footprint analyses at its own sites when and where appropriate
- Standardize Environmental Footprint Analyses
- Facilitate the evaluation of Environmental Footprint submitted to EPA by outside parties

EPA

Join us for a Webinar on the Environmental Footprint Evaluation Methodology

April 18, 2012

http://cluin.org/greenremediation

ASTM Standard Practice for Greener Cleanup (Draft)

- Initiated in 2008 with cross-sector workgroup participating in the development
- Focuses on evaluating and implementing activities to reduce the environmental footprint of a cleanup project
- Provides a process to identify and implement approaches to reduce the environmental footprint of a cleanup through;
  - Best Management practices; and
  - Quantitative evaluation

ASTM Standard Practice for Greener Cleanup (Draft)

- A voluntary standard practice that includes a robust documentation process
- Currently in draft form and in "Balloting", with final anticipated in approximately one year
- For more information:

http://www.astm.org/WorkItems/WK23495.htm

or Contact John Simon at Jsimon@gnarusllc.com (Task Group Leader)

Updates on International Initiatives

Paul Bardos
r3 Environmental Technology Limited

6 March, 2012

United States Environmental Protection Agency

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

70

- **Risk-informed & sustainable land management (11th ICCL-meeting, Washington, D.C; 4.10.2011)**
  - *Aims at developing a position paper to transform and complement RBLM towards a 4th generation policy concept*

NEXT STEPS:

- »Non-paper»:
  - First Draft (April 2011)
  - 2 feedback & discussion loops (until September 2012)
  - Revision, presentation & discussion (November 2012)
- Joint Paper with NICOLE and possibly other networks

Nicole Sustainable Remediation Working Group – Activities 2012

- Background work to the road map to be published in March 2012 (series of standalone research chapters)
- Looking for examples of projects where sustainable remediation has been documented, or NICOLE roadmap has been applied
- Looking into a possibility of a joint statement with the Common Forum and other European networks working in the area
- Preparing a summary paper of work to date
- Supporting the conference organised by Eurodemo

- Organising committee – Olivier Maurer, Lucy Wiltshire, Sarah MacKay

SUstainable Remediation Forum

- New Technical Initiatives:
  - Sustainable Remediation and Redevelopment
  - Sustainable Remediation Site Rating
  - Site of Sites
- Recent Meetings: SURF 19, Univ. Calif. San Diego
- Upcoming Meetings:
  SURF 20, Colorado State University, Fort Collins, CO
  SURF 21, National Academy of Sciences, Washington D.C.
- Two New Student Chapters with 2 more underway

www.sustainableremediation.org

Follow us on LinkedIn and Twitter @SR_Forum

SuRF ANZ (nee Australia)

- Large interest indicated by the industry
- Steering Committee continues to meet. Chair is Garry Smith of AECOM
- Agreed to change name to SuRF ANZ to include New Zealand
- SuRF ANZ website is www.surfanz.com.au
- Admin support by Australian Land and Groundwater Association
- Various presentations have been made at conferences
- Input to the development of a National Remediation Framework by CRC CARE
- A set of workshops around Australia and New Zealand have been held on Green and Sustainable Remediation
- SuRF ANZ meeting will be held at Ecoforum, 8 March, Sydney. This meeting will confirm a work plan for the coming year, and will set up working groups
- Our thinking on sustainable remediation continues to develop!

SURF-NL

- **Participants: (>30!)** Ministry I&E, R&D institutes (Deltares, RIVM), consultancies, contractors, authorities (municipalities and provinces), Shell, Port of R'dam, Dutch Railways etc.
- **Not only Remediation**; Sustainable management of soil and groundwater Quality (future: also soil protection)
- **Goal SURF-NL:** transition in the soil sector to a transparent and integral way of working based on sustainability principles and integration with spatial planning
- **Position Paper** ready and launched during National Soil Conference end November 2011
- **"Business plan 2012"** workshops, hands-on!, SURF-NL as discussion platform with policy makers and industry on developments new Environment Law NL (2015 onwards, integration of Soil Protection Act in overarching Environment Law)

SuRF-UK

SuRF-UK published the Annex 1: SuRF-UK Indicator Set for Sustainable Remediation (SR) in Nov 2011. www.claire.co.uk/surf-uk

It is hoped that Phase 3 will start in April 2012 to:

- develop and publish illustrative case studies;
- develop guidance on generic 'best management practices' that can be applied to remediation projects to encourage use of more sustainable approaches;
- develop guidance for assessors on good practice for qualitative sustainability appraisals;
- provide a 1-hour long webinar on tiered SR appraisal (with an emphasis on Tier 1 = initial qualitative weekend)

All work will be developed with industry through a series of workshops and open consultation.

The 2nd International Conference on

Sustainable Remediation 2012

November 14 – 16, 2012 in Vienna, Austria

www.sustainableremediation2012.org

Dietmar Müller

Environment Agency Austria (EAA)

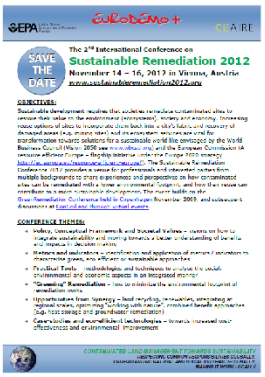
EPA United States Environmental Protection Agency

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

77

CONFERENCE THEMES

- **Policy, Conceptual Framework and Societal Values**
- **Metrics and indicators**
- **Practical Tools**
- **"Greening" Remediation**
- **Opportunities from Synergy**
- **Case-studies and eco-efficient technologies**



PROGRAMME OVERVIEW

Wednesday, 14 November 2012 (afternoon)

- Conference Opening, Plenary Session
- *Welcome Reception*

Thursday, 15 November 2012

- Technical and Scientific Sessions
- Thematic and Project Workshops
- Conference Dinner

Friday, 16 November 2012

- Plenary Session, Poster Session
- Roundtable Discussion and Summary

KEY DATES

- 27th April 2012: Deadline for abstract submission, proposals on thematic or project workshops
- 4th June 2012: 2nd Announcement and Provisional Program
- 31st August 2012: Final announcement and Program
- ***19th September 2012: Green and Sustainable Remediation Internet Seminar***
- 3rd October 2012: End of registration
- **14 – 16 November 2012**

  Sustainable Remediation Conference

CREATING A MEETING PLACE

PARTNER ORGANISATIONS:

- **Common Forum on Contaminated Land in the European Union**
- **NICOLE** (Network on Industrially Contaminated Land)
- **US EPA** (Office of Superfund Remediation and Technology Innovation)
- **EURODEMOplus**
- **CL:AIRE** (Contaminated Land: Applications in Real Environments)
- **Chinese Academy of Sciences** (Institute of Soil Science)

FURTHER PARTNERS (tbc)

- **RELASC (Latin America), CRC Care (Australia)**

REGIONAL ORGANISERS



- **EAA** (Environment Agency Austria)
- **BOKU** (University of Natural Resources and Life Sciences, Austria)

Discussion

Carlos Pachon

OSRTI/OSWER

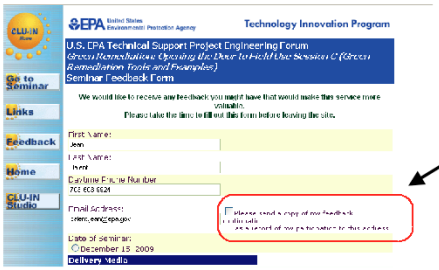
United States Environmental Protection Agency

umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

82

Resources & Feedback

- To view a complete list of resources for this seminar, please visit the **Additional Resources**
- Please complete the **Feedback Form** to help ensure events like this are offered in the future



Need confirmation of your participation today?

Fill out the feedback form and check box for confirmation email.