

Headquarters U.S. Air Force

Integrity - Service - Excellence

Advancing Green Remediation Cleanup Practices in the Air Force



U.S. AIR FORCE

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12 May 2011, E2S2
New Orleans, LA

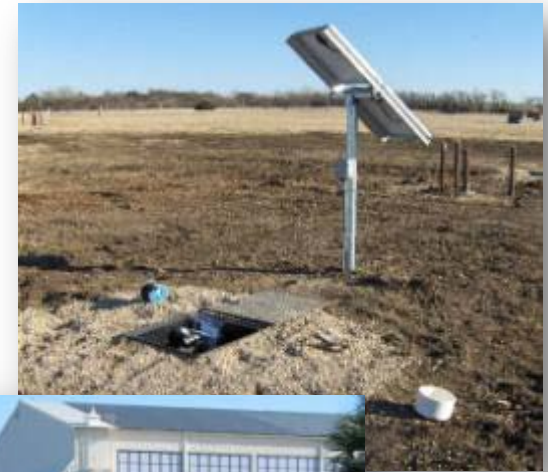
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Outline

- **AF sustainability goals and drivers**
- **“Green” status in the AF Environmental Restoration Program (ERP)**
- **Opportunities for Green and sustainable remediation in the AF ERP**
- **GSR tools**
- **GSR in AF contracts**
- **Case studies (active, ANG, BRAC) of GSR technologies and approaches**





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AF Overview – Mission of AF

- AF Mission: *Fly, fight and win* ... in air, space, and cyberspace
- AF Vision:
 - Be trusted and reliable joint partner with sister services
 - Known for integrity in all activities, including supporting joint mission first and foremost
 - Provide compelling air, space, and cyber capabilities for use by the combatant commanders
 - **Excel as stewards of all Air Force resources in service to the American people**, while providing precise and reliable Global Vigilance, Reach and Power for the nation





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AF Sustainability Goals/Drivers



*The mission of the DoD is more than aircraft, guns, and missiles...Part of the defense job is **protecting the land, waters, timber and wildlife, the priceless natural resources** that make this great nation of ours worth defending.*

- Former Chief of Staff of the Air Force Gen. Thomas D. White - An early visionary

*We are dedicated to the responsibility of finding solutions which support and enhance operations while **protecting natural resources**...We recommit to this responsibility by taking action today for a **greener tomorrow**... Through energy conservation and energy efficiency initiatives, we continue to work toward reducing usage and cost.*

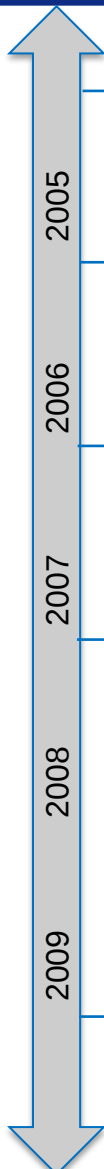
Terry A Yonkers, Assistant Secretary of the Air Force
for Installations, Environment and Logistics
27 March 2010





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AF Sustainability Goals/Drivers



Aug 2005 | **Energy Policy Act of 2005 (EPAct05)**

- New facilities, 30% more efficient than ASHRAE 90.1
- Use of advanced meters

Jan 2006 | **Federal Leadership in High Performance and Sustainable Buildings MOU (HPSB)**

- Establish *Guiding Principles* for new construction
- DoD was first voluntary signatory

Jan 2007 | **Executive Order 13423: Strengthening Federal Environmental, Energy and Transportation Management**

- Reduce energy consumption 30% by 2015
- Reduce water use 16% by 2015
- All new construction must incorporate HPSB principles
- 15% of existing buildings must be HPSB by 2015

Dec 2007 | **Energy Independence and Security Act (EISA)**

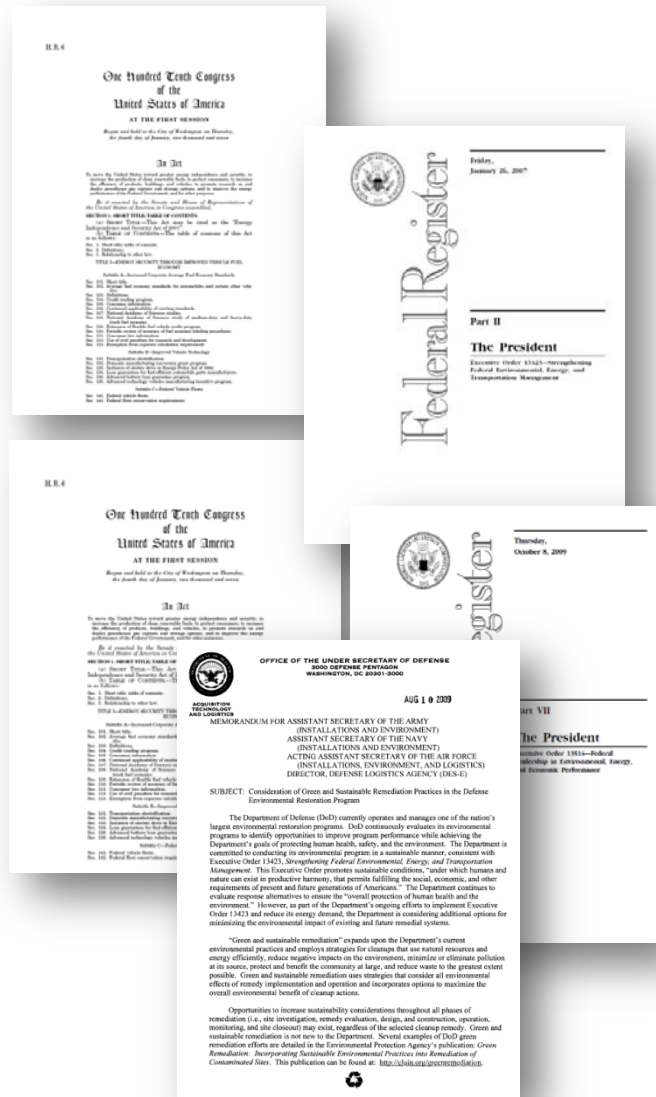
- New facilities reduce fossil fuel generated energy, 55% by 2010 – 100% by 2030
- 30% hot water supplied by solar water heaters
- Restore predevelopment hydrology
- Identification and use of a green building rating system

Aug 2009 | **OSD Green and Sustainable Remediation Memorandum**

- DoD components to consider green remediation opportunities when and where make sense

Oct 2009 | **Executive Order 13514: Federal Leadership in Environmental, Energy and Economic Performance**

- GHG reporting requirements for scope 1, 2, 3
- Each agency shall develop, implement, and annually update an integrated Strategic Sustainability Performance Plan





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AF Environmental Restoration Program

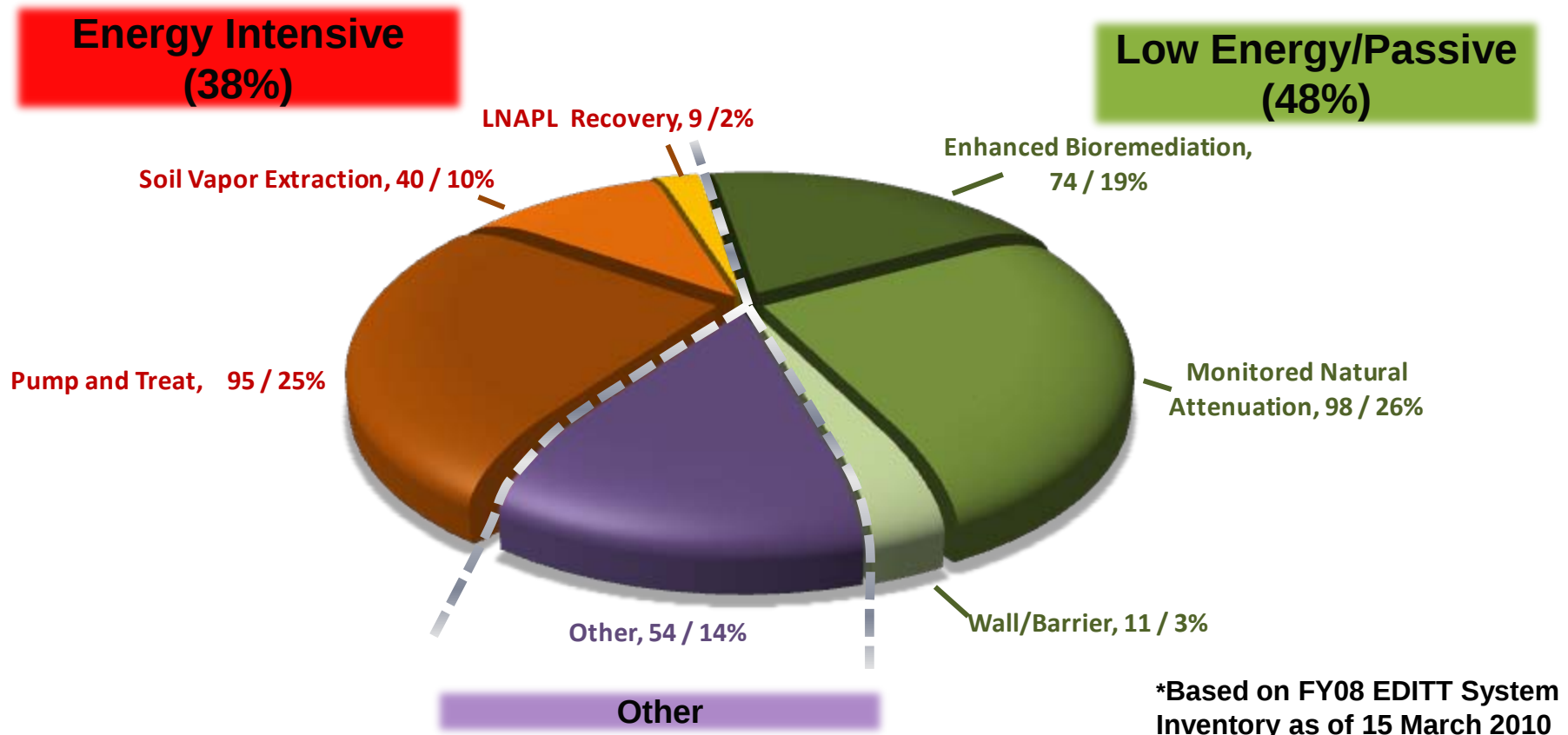
- **Installation Restoration Program (IRP) – 572 sites in 2010**
 - **6,078 sites closed, response complete, or RIP**
 - **Cleanup of pre-1986 contaminated sites**
 - **Achieve Remedy-in-Place (RIP) by 2012**
- **Compliance Restoration Program (CRP) – 952 sites in 2009**
 - **Compliance cleanup sites (post-1986 releases)**
- **Military Munitions Response Program (MMRP) – 455 open munitions response sites**
 - **Cleanup of non-operational ranges**
 - **Achieve RIP/Response Complete (RC) by 2020**
- **FY10 Budget: \$414M for 648 active projects**



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AF Environmental Restoration Program

System Inventory:
381 Remedial Systems in Operation*





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AF Environmental Restoration Program

System Inventory Costs 381 Remedial Systems in Operation*

38%

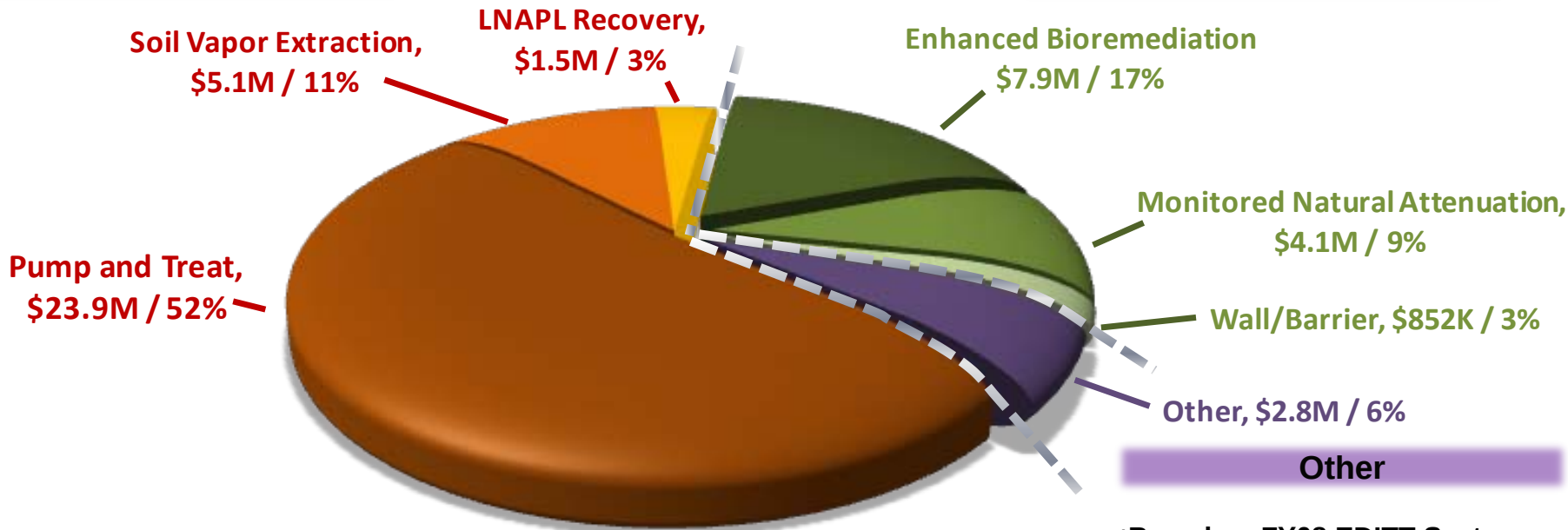


Energy Intensive
(66% annual costs)
(73% LCC)

48%



Low Energy / Passive
(28% annual costs)
(24% LCC)



*Based on FY08 EDITT System Inventory as of 15 March 2010



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GSR in AF ERP

- **Overarching goal – protect human health and environment**
 - **Practice of considering all environmental effects of remedy implementation and operation incorporating options to minimize the environmental footprint of a cleanup**
- **Key elements of the GSR initiative to minimize:**
 - *Energy use for treatment systems*
 - *Water use/impacts on water resources*
 - *Material consumption/waste generation*
 - *Impacts on land and ecosystem*
 - *Air emissions*
- **Objective – Incorporate GSR technologies as part of holistic approach to optimize cleanup**



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GSR in AF ERP

Goals

- Accelerate **greener** Remedy-in-Place (RIP)
- Augment current remedies to achieve Site Closure (SC)
- Lower capital and O&M costs
- Move from energy-consumptive to energy-efficient technologies
- Promote education and transfer of successful solutions and lessons learned



Environmental Restoration Program Optimization (ERP-O)

- A ***comprehensive and systematic*** review of an installation's cleanup activities
- Return natural infrastructure resources to ***beneficial use***
- Promote and incorporate ***sustainability principles***
- Ensure remedy ***effectiveness***, first
- Optimize remedy ***efficiency***, second



Focus is on PERFORMANCE ... which drives COSTS



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GSR Tool – EDITT

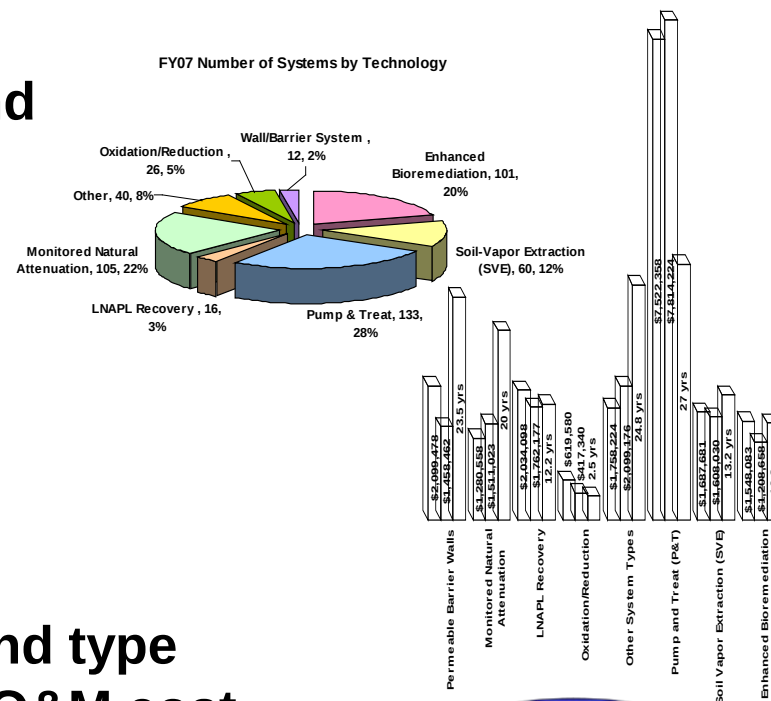
Environmental Decision Information Tracking Tool (EDITT)

■ AF enterprise database

- System & technology inventory and performance data
- Site inventory, green and sustainable transformation
- Land use control data
- Decision document inventory
- Optimization and emerging Issues

■ Results

- Better understanding of number and type of remediation systems/LTM, and O&M cost for each
- *Flags systems not GSR-oriented for focused optimization/evaluation*

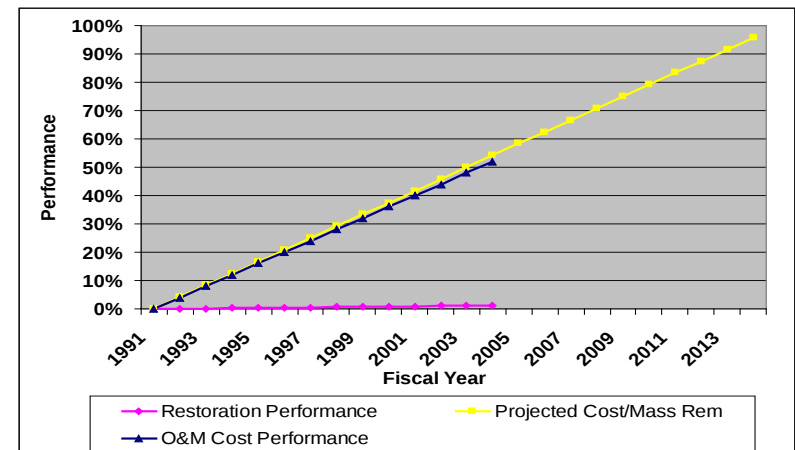
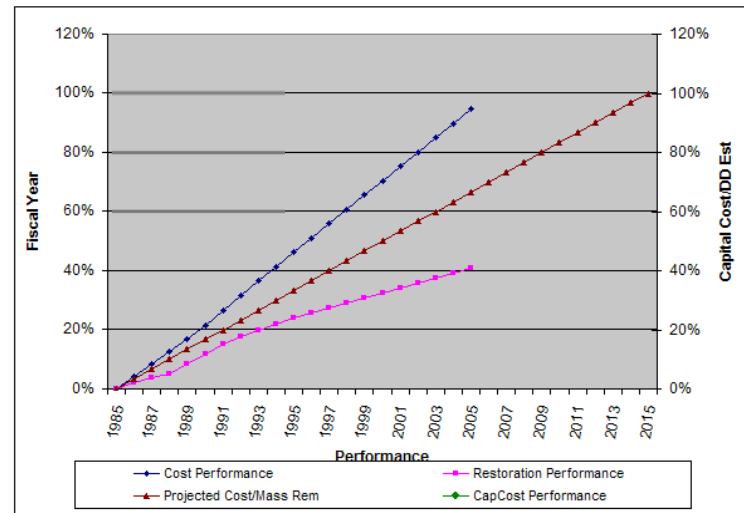




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GSR Tool – Performance Tracking Tool

- Analyzes performance sustainability of existing remediation systems
- Track remedy's performance and cost
- Normalized output for easy comparisons
- Example Technologies
 - Bioslurping
 - Monitored Natural Attenuation (MNA)
 - Surfactant Extraction
 - Soil Vapor Extraction (SVE)
 - Dual Phase – SVE & P&T





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GSR Tool – CleanSWEEP

- Design and decision tool for alternative energy use in site remediation: Clean Solar and Wind Energy in Environmental Programs
- Easily applicable to remote sites, systems with low energy requirements over long periods, systems which do not require continuous operation
- Help ER RPMs decide on use of renewable energy
- Simple enough to be used “out-of-the-box” with little training
- Sophisticated enough to make go/no-go and simple design recommendations for small to mid-sized systems
- Appropriate as screening tool for large and complex (\$\$\$) systems



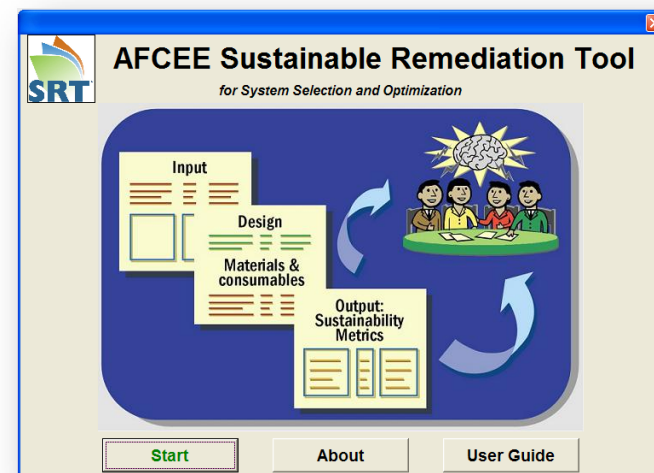


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GSR Tool – SRT

Sustainable Remediation Tool (SRT)

- Free, Excel-based tool developed by AFCEE
- Optimization tool as well as helps drive and influence GSR technology selection
- Used in future planning and optimization of existing systems
- Provides lifetime sustainability assessment
- Works in concert with PTT to evaluate performance and reduce time to site closure
- Technology module based: Excavation, SVE, P&T, EISB, ISCO, PRB, MNA/LTM, thermal





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GSR Tool – SRT

Design principles

- **No replication of design tools (simply calculate metrics)**
- **Develop with tiered approach for parameter inputs**
 - **Easy Tier 1 with Rules of Thumb for technology estimates**
 - **1 to 2 hours; most appropriate for FS**
 - **Tier 2 can estimate but not intended to replace design tools**
 - **1 to 2 days; most site-specific results, more overrides, most appropriate after FS, more appropriate for optimization**
 - **Allow user override of estimated values at any time to accommodate real design parameters**
- **Includes cost as a sustainability metric**



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GSR Tool – SRT

SRT Metrics

- Emissions to atmosphere
 - CO_2 , NO_x , SO_x , PM_{10}
- Total energy consumed
- Change in resource service
- Technology cost
- Safety / Accident risk

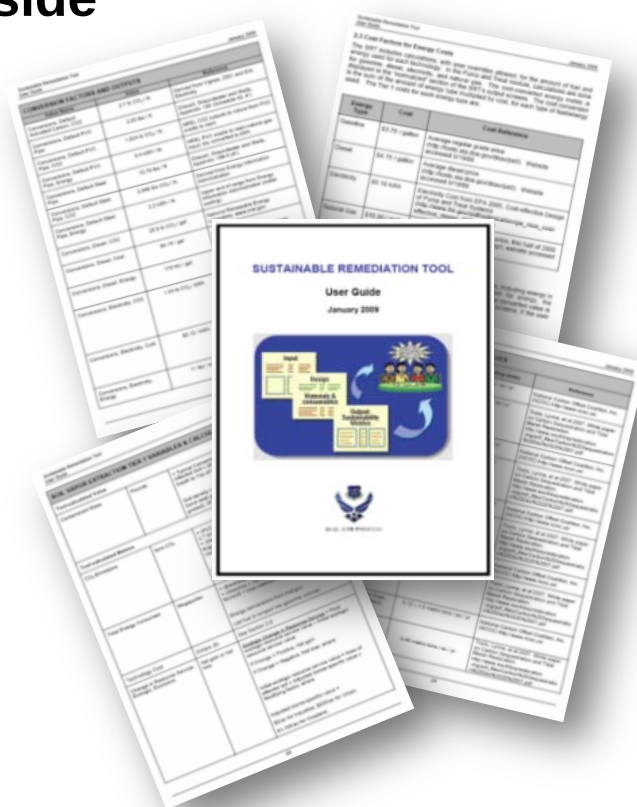


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GSR Tool – SRT

SRT Strengths

- **Screens / Compares technologies side-by-side**
 - **Up to 8 different technologies at once**
- **Scenarios feature**
- **Stakeholder roundtable feature**
- **Capable of using inputs from design tools**
- **Validated costing model (RACER™) interaction in next release**
- **Partnering with Environment Canada**
- **Proposed for Australian baseline**
- **Included in ANG GSR policy**
- **Download for free at**
www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation





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GSR in Contracts

- To date, GSR language in many AFCEE contract vehicles (4P-AE, GEITA, WERC, ECOS) and ANG efforts
- Concerted effort to include GSR language in upcoming PBR contracting actions from AFCEE
 - Factor 1, Subfactor 1 – Understanding of Work
 - Factor 1, Subfactor 2 – Risk Management Approach
 - Factor 1, Subfactor 3 – Sustainable Practices
 - Factor 2, Relevant Experience
 - Factor 3, Managerial Approach



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GSR in Contracts – Results

- General consensus amongst execution/contracting to include GSR
 - However, education needed and guidance needed
- Language going into contracts; developing matrix on how to measure results and reporting
- Tinker, Tyndall, Barksdale, Loring/Pease, Kelly, and FE Warren actions released
- Issues being worked:
 - How is sustainability tracked?
 - What is tracked?
 - Must have meaning toward AF sustainability goals
 - Incorporate into existing reporting deliverables

Score	Aggressiveness of targets*			
	Example GSR indicators and targets			
	Indicator	Reduction target**	Indicator	Increase target**
Exceptional	Examples: - Greenhouse gas emissions - Natural resource consumption - Accident risk - Energy consumption - Criteria pollutant emissions	e.g. 50-100%	Examples: - Debris and materials reuse/recycling - Renewable energy consumption - Materials extracted, manufactured and/or purchased locally - Local labor employment - Wastewater reuse/recycling	e.g. 10-100%
Good		e.g. 25-49%		e.g. 5-10%
Acceptable		e.g. 10-24%		e.g. 2-5%
Marginal		e.g. 5-9%		e.g. 1-2%
Unacceptable		e.g. 0-5%		e.g. 0%

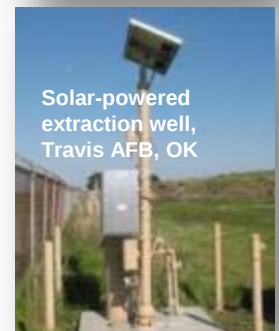
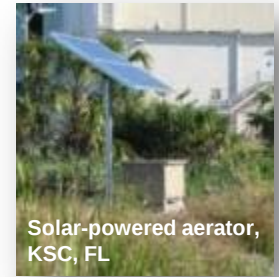


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GSR in AF ERP through Technology

Broad Agency Announcement (BAA) for USAF Environmental Restoration Program Innovation

- **Contract mechanism for dem/val of innovative technologies**
 - **Identify BETTER, FASTER, CHEAPER, & GREENER solutions**
 - **Awards based on: technical merits and broad spread application**
 - **\$3M-\$4M/yr AFCEE -- leveraged -- \$36M (total) SERDP/ESTCP**
 - **\$4M current funding focuses on/has GSR applications**
 - **Most recent release – Week of 14 March 2011**
 - **Appears in FedBizOps**





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AF GSR Case Study – Altus AFB, OK



Biowall

- **Primary objective – degrade TCE & other chlorinated compounds as pass through biowall**
- **Interim corrective action to replace P&T system**
- **Reductions in TCE averaging 86 percent**
- **System has been replenished**



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AF GSR Case Study – Travis AFB, CA



**Solar-powered
biological/chemical source
area treatment system –
in situ bioreactor**

- **Mix mulch, gravel, iron and gypsum promote reductive dechlorination and abiotic reduction**
- **Selected as GSR case study by EPA Region 9**
- **BAA demo in PBC environment**
- **Additional bioreactors to be installed on base**
- **Targeted for RIP**



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AF GSR Case Study – MMR (39% Renewable Energy)

Easy pickin's

- **Installed more efficient motors = >\$100K***
- **Replaced sodium vapor overhead lighting = \$53K***
- **Eliminated booster pumps and downsized pump motors = >\$45K***
- **Used bio-diesel = \$2K***
- **Reduced propane use = \$1.5K***
- **Installed low-wattage heaters = \$500***
- **Misc energy (motion sensors, lighting replacement, programmable thermostats, LED exit lighting, etc.) = \$170***
- **Signed up with load reduction program (demand response program)**

**Dollars Represent Estimated Annual Savings*





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AF GSR Case Study – MMR

Wind turbine construction ('07 – '09)

- **Contract awarded Sep 2007, \$4.6M**
- **Massachusetts Technology Collaborative (MTC) Grant of \$300K awarded to AF**
- **Contributed 1,642 MWHs of groundwater cleanup program's total 9,769 MWHs of electric usage (17%)**
- **MMR's goal – reach 100% net on-site renewable use in 2014 with combination of two additional wind turbines (coming on-line in 2011) and continued system optimization**





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AF GSR Case Study – Tucson, AZ

162nd Fighter Wing, Tucson, AZ

- **Groundwater extraction, treatment & recharge system**
 - **1997 – March 2010 P&T 708M gal to remove ~ 37 lb TCE (3 gal)**
 - **1 gal TCE removed for every 234,000,000 gal extracted**
 - **Apr 2009 – March 2010 influent ranges between 4.3 – 5.5 ug/L**
- **Averages based on 2008 GSR evaluation**
 - **Avg monthly energy consumption 22K kWh or 265K kWh per year (2.34% base annual consumption)**
 - **249 metric tons CO₂ equivalents (e) emitted based on energy use**
 - **14 metric tons (MT) CO₂ based on transportation**
 - **About 9 miles of polyethylene tubing (PET) used annually**





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AF GSR Case Study – Tucson, AZ

■ Assessment recommendations:

- Discontinue non-contributing wells**
- Switch from air stripper to GAC**
- Use passive treatment (e.g., ISCO) and sampling**
- Reduce sampling frequency and associated waste**
- Use solar power for GWETRS**
- Recharge aquifer**

■ GSR actions:

- Findings presented to USEPA Region 9, August 2009**
- In-situ Chemical Oxidation (ISCO) pilot test conducted in 2009**
- USEPA Region 9 and ANG working toward goal of shutting GWETRS down in favor of more sustainable approach**



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New AFRPA initiative

- **AFRPA partnering with AFCEE and AFCESA, investigating EUL opportunities on IRP sites**
- **Great opportunity to bring value back to Air Force and establish relationships/positive image with surrounding community**
- **Potential funding source for restoration clean up (in-kind consideration)**
- **Restoration sites may be best option for EUL projects on installations where open land is limited**
- **Solar projects require shallow foundations or can have footings created that sit on surface**
- **Great success story for AF to clean up hazardous sites and replace them with renewable energy projects**





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Wrap-up

- Nearly half remediation systems in place are passive, low-energy intensive technologies; however...
 - Large number of systems are not
 - Opportunities exist for optimization
 - Color of money prevents collaboration between programs
 - Remediation decisions not necessarily based on sustainability
 - Contracting language now calling for GSR considerations
 - DoD agencies, federal and state regulators more educated and generating policies defining/guiding/requiring GSR considerations
- SRT, PTT, SiteWise and other tools free and available for use





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Resources

- **PTT:** www.afcee.af.mil/resources/restoration/erp-o
- **SRT:** www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation/srt
- **SiteWise:** www.ert2.org/t2gsrportal/SiteWise.aspx
- **AFCEE:** www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation
- **Navy:** <http://www.ert2.org/t2gsrportal>
- **Army Framework:** www.environmental.usace.army.mil/pdf/IG%2010-01%2003_05_10%20doc.pdf
- **EPA:** www.clu-in.org/greenremediation
- **ITRC:** www.itrcweb.org/teampublic_GSR.asp
- **SERDP/ESTCP:** www.estcp.org & www.serdp.org
- **SURF:** www.sustainableremediation.org





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Questions?



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