

Update on Enterprise•SRS Initiative: *Next Generation Cleanup Technologies*

June 2013



*Update to Citizens Advisory Board, Strategic and Legacy Management
Subcommittee*

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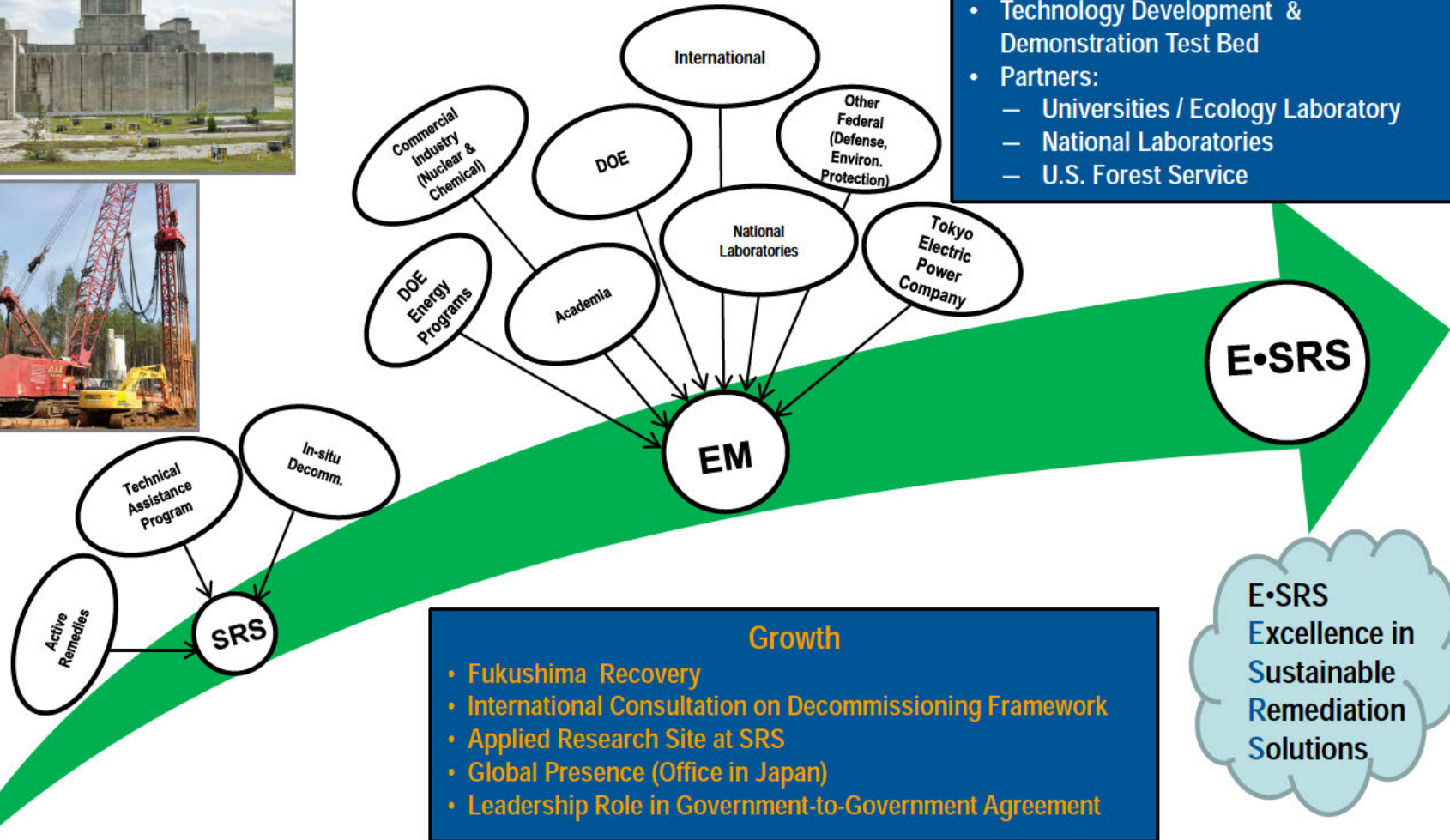
Strategic and Legacy Management Work Plan

- Subcommittee's 2013 Work Plan requested an update on support to Fukushima
- SRS's support to Fukushima is part of its Enterprise•SRS *Next Generation Cleanup Technologies* Initiative
- Briefing provides update on Fukushima support as well as other potential growth areas identified for this E•SRS initiative
- Will point out for each area whether it is part of DOE-EM work scope or being done with external funding as Work for Others



Reminder: Next Generation Cleanup Technologies Vision

Today

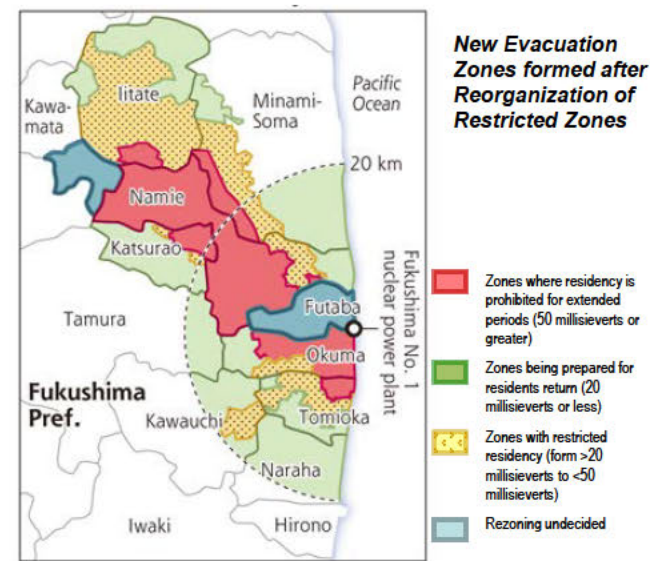


Vision

- EM Strategic & Technical Authority
- International Technical Ambassador
- Technology Development & Demonstration Test Bed
- Partners:
 - Universities / Ecology Laboratory
 - National Laboratories
 - U.S. Forest Service

Reminder: Fukushima Daiichi Reactor Accident

- March 11, 2011 earthquake and subsequent tsunami damaged the Fukushima Daiichi Nuclear Power Station
 - Resulted in airborne release of radioactive material that settled and caused contamination of a large land areas, within the Fukushima Prefecture and extending to adjacent prefectures
 - Tokyo Electric Power Company responsible for on-site cleanup of Fukushima Daiichi Nuclear Power Station (~3 ½ sq. miles)
 - Japan's Ministry of the Environment responsible for decontamination of lands beyond power station
- Overall remediation effort includes:
 - Treat and stabilize radioactive sea water introduced into Fukushima Daiichi reactors for emergency cooling
 - Remediate large volumes of contaminated groundwater within and beyond power station
 - Remediate cesium-contaminated soils within and beyond power station
 - Dispose of radioactive wastes generated within and beyond power station
 - Decommission reactors within power station



Update: Fukushima Recovery

- Building on successful development & deployment of cost effective remediation:

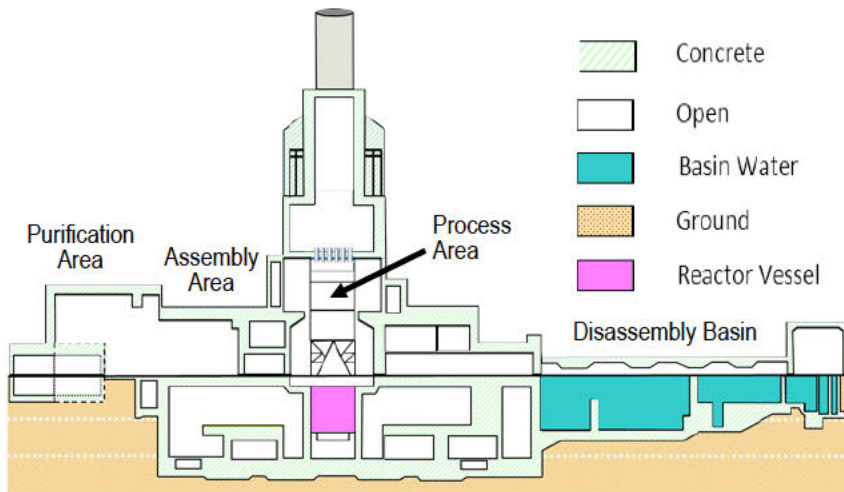
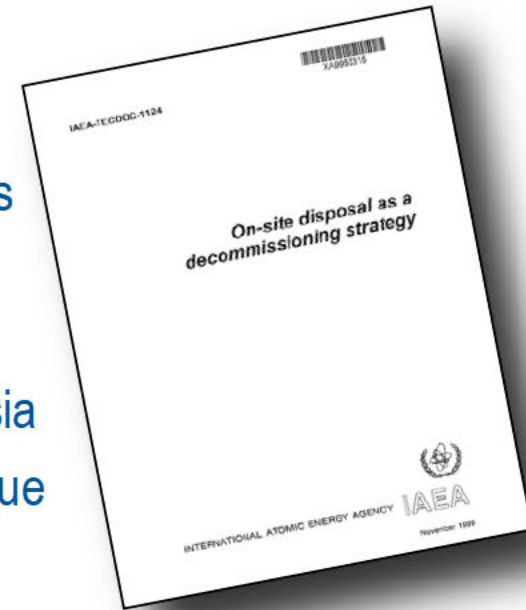
Initiative Element	SRS Success	Fukushima Support
Active to Passive	Initially Pump & Treat; Install reactive barrier; implant sensors in area(s) of interest	Groundwater Bypass approach implemented
In-situ Decommissioning	3 reactors	Develop & deploy grout to stop water leakage between reactor and turbine buildings, off gassing considerations
Long-term Monitoring	Blend of typical & rapid data collection techniques	Place sensors & electronically send data to offsite receivers Develop & deploy analytical laboratories (e.g. mobile initially converts to modular over time)

- **Tokyo Electric Power Company**

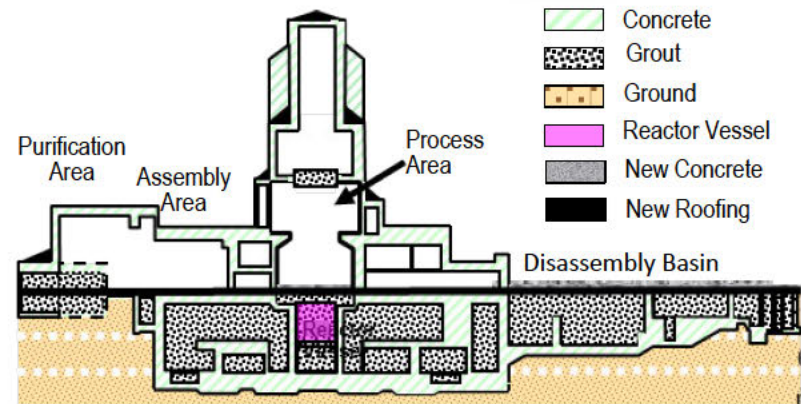
- Successfully completed first six-month contract with Tokyo Electric Power Company
 - Aided definition of cleanup scope, matching DOE capabilities and technologies to needs
 - Identified specific groundwater modeling tools/approaches to help characterize contaminants
 - Developed risk-based decision tools for waste management and reactor building remediation
- Working now to establish second contract
 - Builds on initial contract scope to refine areas of needed support within power station
 - Focuses specifically on grout formulation and testing, fuel debris characterization and criticality, tritium in water and decommissioning strategies and options

Update: International Consultation on Framework

- International Atomic Energy Agency continues to address on-site decommissioning/disposal options:
 - Discuss experience/lessons learned from entombment projects
 - Develop requirements that entombment decommissioning comply with internationally agreed regulatory standards
 - Part of US delegation, working with Belgium, France and Russia
 - Just participated in May 2013 Trilateral Nuclear Energy Dialogue among Korea, Japan, and the United States



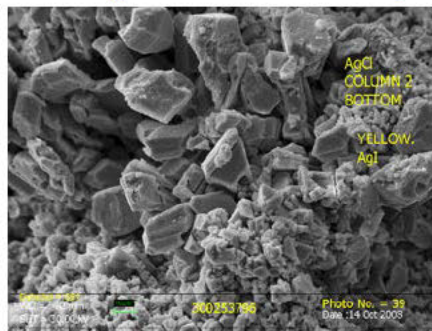
P Reactor before decommissioning



P Reactor after decommissioning

Update: SRS EM's Groundwater Applied Field Research Site

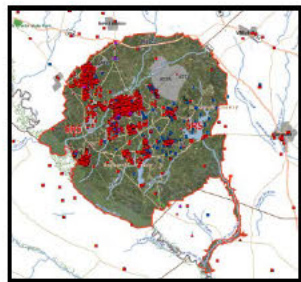
Developed and deployed Silver Chloride technology for sequestering Iodine-129 – Deployed 2011



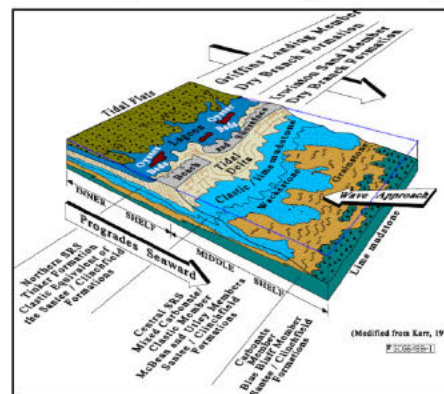
Radioactive iodine replaces chlorine molecules, to bind mobile iodine within soils

Developed innovative paradigm for long term monitoring of residual contamination

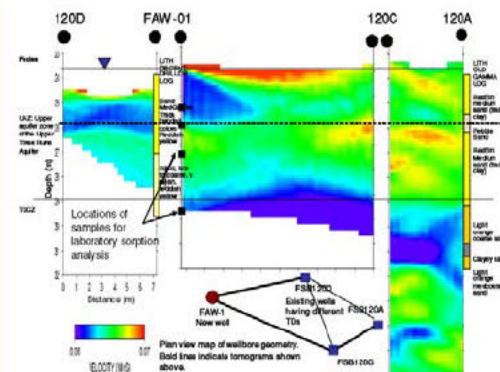
Identify "leading" indicators of plume behavior (e.g., water pH, elevation and flow rates) to improve monitoring effectiveness and lower cost



Developing "reactive facies approach" to model complex underground plumes



Augment limited subsurface well data with surface tomography to better model and predict contaminant migration



Cross-hole radar tomography



U.S. DEPARTMENT OF
ENERGY



SRNL
SAVANNAH RIVER NATIONAL LABORATORY

enterprise·srs

Update: Global Presence (Office in Japan)

• Embassy Science Fellow

- Completed 2-month U.S. Embassy Science Fellow assignment
 - Provided on-the-ground expertise on remediation technologies and techniques
 - Promptly responded to over 15 Government of Japan requests for specific information on DOE & SRS experience in soil decontamination, radiation monitoring, cesium in the environment, etc. applicable to Fukushima cleanup
- Finalizing report for Japanese Ministry of Environment on cleanup beyond power station
- SRNL, Ecology Lab and Forest Service developing joint proposal on bioremediation in the exclusion zone – using SRS laboratory assets to analyze contamination, crops, and energy sources

• Pacific Northwest National Lab Collaboration

- Partnering to augment SRNL's technology deployment expertise with Pacific Northwest's groundwater modeling capabilities to craft specific solutions for Fukushima cleanup

市町村名	福島市	二本松市	伊達市	本宮市
除染計画 除染作業状況	5/21 策定済	10/1 策定済	8/10 策定済	11/2 策定済
公共施設 (施設数)	532 666 679	78 79 82	74 79 82	90 90 90
住宅 (戸)	3774 20806 20806	18 %	1399 4358 5002	28 %

Public Information Board at the Decontamination Information Plaza in Fukushima City



Laboratory Partnering on Fukushima Cleanup



Update: Leadership Role in Govt-to-Govt Agreement(s)

- **China**

- SRS hosted delegation from China Atomic Energy Authority in October 2012
- SRS sent delegation to Beijing in April 2013 as part of US-China *Peaceful Uses of Nuclear Technology* joint convention
- Exploring potential for collaboration with Chinese on soil and groundwater technologies, liquid waste treatment and waste forms, and reactor entombment

- **Russia**

- SRS hosted delegation from Rosatom, Russia's equivalent to DOE

- **Japan**

- Supporting DOE Office of Environmental Management role in the US-Japan government-to-government collaboration
- Participating in Spring 2013 Bilateral Commission Working Group on decommissioning
- Focusing on decommissioning concepts, especially risk-informed basis for consideration of in-situ decommissioning/entombment



Conclusion on *Next Generation Cleanup Technologies*

- Progress has been steady
- SRS has become key participant in many DOE and EM international activities
- SRS remains positioned to provide assistance to Japan in the cleanup of Fukushima and the surrounding countryside
- Embassy Science Fellow participation has delivered contacts and a venue within the Government of Japan for proposing SRS expertise and technology in bioremediation

