

LLW Management and Disposal Services

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General

Galson Sciences Limited is an international consultancy, specializing in radioactive waste management and nuclear decommissioning; risk and impact assessment; risk management and risk communication; nuclear safety; and earth science studies. The company was founded in 1992 and is based in Oakham (UK).

Principal LLW management service areas

GSL serves clients worldwide in the following **LLW management and disposal activities**:

- Best Practicable Environmental Option (BPEO) and Best Practicable Means (BPM) studies
 - Nuclear site and facility decommissioning
 - Waste and discharge management
 - Contaminated land management
- Inventory estimation and assessment
- Solid waste treatment and packaging
- Disposal and storage facility design and optimisation
- Development of site-wide Integrated Waste Strategies (IWS)
- Project management, programme planning, cost / benefit analysis
- Knowledge management and requirements management systems
- Development of Environmental Safety Cases and other regulatory submissions
- Dialogue with regulators
- Peer review and regulatory review
- Stakeholder consultation strategy and implementation of public stakeholder engagement
- Development and application of dose and risk assessment methodologies
- Model development, data compilation, and system and subsystem performance assessment for radioactive waste disposal
- Site characterisation and geological and hydrological interpretation
- Hydrogeological, geochemical and radionuclide transport modelling

Recent UK Project Experience: LLW Management and Disposal

- Environment Agency of England and Wales
 - **Regulatory assessment of safety cases for the National LLW repository (LLWR) near Drigg.** From 1997-2005 we were lead contractor to the Environment Agency for the regulatory assessment of the safety cases for the UK LLWR near Drigg. This was the first regulatory assessment of disposal facility safety made using the current regulatory guidance and standards. Our work involved review, assessment and audit of all areas of BNFL's Technical Programme and Safety Cases. We have a detailed understanding of the Conditions for Acceptance of waste at the LLWR and its relation to the Environment Agency's disposal authorisation. We are also familiar with LLW packaging and transport requirements.
 - **LLW disposal authorisation.** We developed guidance on linking the results from regulatory assessments of safety cases to authorisation conditions for radioactive waste disposal. We also provided advice on the future of the authorisation of the LLWR.
 - **Performance and safety assessment.** We developed and applied a probabilistic model for analysing the long-term safety of the LLWR. This tool is based on the GoldSim software, and sets a precedent for conduct of a probabilistic safety assessment of a LLW disposal facility.

Our work supporting the Environment Agency in review of its disposal authorisation is being examined carefully by other regulators and developers internationally. We have unequalled knowledge of what issues are important to regulation of LLW disposal.

- UKAEA Dounreay
 - **BPEO for LLW management.** In 2000-2004, we performed a wide range of tasks, including:
 - Radiological safety assessment of options for LLW disposal and storage at Dounreay, and transport of LLW from Dounreay to the LLWR near Drigg.
 - Evaluation of site geological and hydrogeological information, and development of site models and databases for use in safety assessment modelling.
 - International review of approaches to Engineered Barrier Systems (EBS) and requirements on the EBS of LLW disposal facilities.
 - Cost analysis of options for LLW disposal and storage, including the option of sending Dounreay LLW waste to the LLWR near Drigg.
 - Support for options appraisal for management of the wastes in the existing LLW disposal facility at Dounreay (the Pits).
 - Assessment of the Dounreay LLW inventory against the Drigg Conditions for Acceptance.
 - Review of LLW treatment and packaging options.
 - Development of database of site discharges and related environmental monitoring data.
 - Development of regulatory requirements management system.
 - Review and planning of site characterisation data and work programmes.
 - Preparation of non-technical presentational material for stakeholder consultation; planning for consultation and dialogue; facilitation and reporting of consultation.
 - **Development of Environmental Safety Case (ESC) for LLW disposal.** We are currently developing the ESC for submission to regulators under RSA93 for authorisation of proposed new disposal facilities to take solid LLW from operation and decommissioning of the Dounreay site. The first issue of the ESC was prepared in support of the planning application, and we are supporting UKAEA in dialogue on the ESC with the regulators and the planning authority. Work is ongoing to develop updates to the ESC, including:
 - Planning of further site characterisation.
 - Development of a site monitoring plan.
 - Update of the radiological and non-radiological inventories.
 - Support for BPM studies on design options, and alternatives for treatment and disposal of low-activity wastes.
 - Support for dialogue with local stakeholders.
 - Development of the radiological risk assessment to build on new design, inventory and site characterisation information.

For more details see: www.ukaea.org.uk/sites/dounreay_Proposed_llw_disposal_facilities.html

- British Nuclear Group/Magnox Electric/BNFL
 - **Active waste water (AWW) management.** In 2006, we compiled a site-wide AWW inventory for the Hinkley Point A (HPA) decommissioning site and made forecasts of abatement requirements during the decommissioning programme. We also reviewed arrangements for AWW management at HPA and the capability of the active effluent plants.
 - **LLW inventory and management.** In 2004-05, we reviewed the solid LLW at HPA, and compared it with LLW inventories and LLW management strategies at other Magnox decommissioning sites. Inventory estimates were provided for different waste management strategies at HPA.
 - **Environmental Impact Studies.** In 2005, we trained HPA staff on management of project risks connected with the environmental impacts of decommissioning projects. We prepared an interactive CD containing the original environmental study documents, summary documentation and hypertext links to underlying documentation.
 - **Disposal options for decommissioning wastes.** British Nuclear Group is investigating disposal options for decommissioning wastes with very low levels of activity. In 2005 we conducted preliminary radiological risk assessments for the options.
- UKAEA Windscale
 - **BPEO study for decommissioning Windscale Piles 1 and 2.** In 2005-06, we prepared BPEO studies of the management options for decommissioning the Windscale Piles. The studies covered issues such as what and when to decommission, and how to manage resultant wastes. We subsequently conducted a BPM study for management of fuel and isotopes wastes arising from the preferred decommissioning option.
 - **Development of optimised IWS.** In 2005-06, we carried out a BPEO study to support the development of an IWS for all decommissioning wastes arising at Windscale. We developed a methodology that conforms to the latest NDA guidance on IWS, and facilitated stakeholder workshops.
- Department of Trade and Industry (DTI)
 - **Development of review procedures.** In 2003-2006, we represented the UK Government at the International Atomic Energy Agency's ASAM Project, developing guidance on the Application of Safety Assessment Methods to the disposal of LLW in near-surface facilities.
- Department of Food and Rural Affairs (DEFRA)
 - **Radioactive wastes from the non-nuclear sector.** In 2006, we conducted a pilot project to identify the types and volumes of radioactive waste arising within non-nuclear sector, and assess the management and disposal of such wastes.
- Scottish and Northern Ireland Forum for Environmental Research (SNIFFER)
 - **Disposal of low-activity wastes at landfill sites.** In 2004-2006, we assessed and provided calculation tools for the regulation and management of low-activity wastes in accordance with the Special Precautions Burials disposal route.
 - **"Dustbin disposals".** In 2006-2007, we evaluated doses associated with disposals of low-activity wastes, and the need for any changes to current regulation.
- Scottish Environmental Protection Agency (SEPA)
 - **Safety of LLW disposals in landfill.** We evaluated the potential source of tritium in landfill leachates, and considered dose implications and management options.

Selected Clients

United Kingdom

British Nuclear Group
British Nuclear Fuels Limited (BNFL)
Committee on Radioactive Waste Management (CoRWM)
Department for Environment, Food and Rural Affairs (DEFRA)
Environment Agency of England and Wales
Magnox Electric
Scotland and Northern Ireland Forum for Environmental Research (SNIFFER)
Scottish Environment Protection Agency (SEPA)
Planning Inspectorate
UK Health and Safety Executive (HSE) and UK Nuclear Installations Inspectorate (NII)
UK Department of Trade and Industry (DTI)
UK Department of Environment, Transport and the Regions (DETR)
UK Atomic Energy Authority (UKAEA)
UK National Radioactive Waste Management Company (UK Nirex Limited)

Europe (non-UK)

Belgian National Radioactive Waste Management Company (ONDRAF/NIRAS)
French Nuclear Safety Authority (ASN), and Institute for Radiological Protection and Nuclear Safety (IRSN)
French National Radioactive Waste Management Company (ANDRA)
French Atomic Energy Commission (CEA)
Finnish National Radioactive Waste Management Company (POSIVA)
Swedish Nuclear Power Inspectorate (SKI)
Swedish Radiation Protection Institute (SSI)
Swiss National Radioactive Waste Management Company (NAGRA)

North America

Sandia National Laboratories (SNL), US Department of Energy (USDOE)
Westinghouse Electric Corporation, United States
US Electric Power Research Institute (EPRI)

Far East

Nuclear Waste Management Organisation of Japan (NUMO)
Japan Nuclear Fuel Cycle Development Institute (JNC)
Japan Nuclear Energy Safety Organization (JNES)
Support Organisation to the Japanese Nuclear Utilities (JANUS)
Radioactive Waste Management Funding and Research Center (RWMC) and Kajima Corporation
Japanese Institute of Nuclear Safety Systems (INSS)

International Organisations

European Commission (EC)
International Atomic Energy Authority (IAEA)
Organisation for Economic Cooperation and Development (OECD)
World Health Organisation (WHO)

For more information on our experience go to our website: www.galson-sciences.co.uk