The Decision of the Minister of Environment (45) of 2013 issuing the Management Rules of Natural Radioactive Waste resulting from the Oil and Gas Industry in the State

The Minister of Environment,
After reviewing the Decree-Law No. (31) of 2002 on Protection form Radiation,
The Emiri Decision No. (29) of 1996 regarding the Ministerial cabinet resolutions referred to the Emir for its ratification and issuance,
The Emiri Decree No. (16) of 2009 determining the Ministries competence,
The Emiri Decree No. (39) of 2009 on the Organizational structure of the Ministry of Environment,
And the Ministerial Cabinet adoption of the draft resolution in its ordinary meeting No. 25) of 2011 held on 10/8/2011,

We decided the following:

Article (1)

The natural radioactive waste management rules resulting from the Oil and Gas Industry in the State, annexed to the present decision, shall apply.

Article (2)

The existing facilities, personnel and others working in the field of Natural Radioactive Waste resulting from the Oil and Gas Industry and activities referred to in article (3) of the attached rules at the time of the issuance of this decision, shall adjust their status during the period of six months from the execution date of the provisions of these rules, and to submit report every two months clarifying matched sources until the matching of all sources on the time limit, and the time limit may be extended for three months by decision of the Minister in case of extreme need.

Article (3)

All competent authorities, each within its scope of competence, shall implement this Decision. It shall come into force starting from the date of its publication in the official gazette.

Abdulla bin Mubarak bin Ehboud AlMe'adadi

Minister of Environment

Date of issue: 23/4/1434 Hegira

Corresponding to: 05/03/2013

Management Rules of Natural Radioactive Waste resulting from the Oil and Gas Industry in the State

Article (1)
Definitions

In implementing the provisions of these rules, the following words and expressions shall have the meanings set forth to each of them unless the context requires otherwise:

Natural Radioactive Substances: Substances where the radioactive nuclides grow as a result of human activity.

Practice: Human activity leading to the introduction of sources or routes of exposure or increasing people's exposure to radiation.

Produced Water: The water flowing out from the well, which is contaminated with Radium radioisotope dissolved in water and upcoming to the surface.

Mud: The accumulation of solid substances contaminated with natural radioactive substances, heavy hydrocarbon, strongly associated emulsions, sand, and few of the erosion of drilling equipment into isolation containers, equipment at the wellhead, reservoirs and others.

Solid scaly residues: Solids contaminated with natural radioactive substances, most notably Radium radioisotope in the oil industry, lead-210 and polonium-210 in the gas industry, which are deposited on the inner surfaces of the lower slot of the pipeline inside the well and ground-based equipments, production equipments and oil and gas pipelines.

Decontamination: Reducing and complete disposal of radioactive material from the surfaces of equipment, people and the environment.

Exposure: The reaction of ionizing radiation with substances or human and may have resulted from a source outside the body (external exposure), or the result of the arrival of radioactive substance into the body (internal exposure).

Radioactive waste: Natural radioactive waste containing radioactive nuclides with concentration greater than the concentration determined by the competent licenser authority, and may be stored or kept for the purpose of its limited emission into the surrounding environment.

Objects superficially contaminated: Each solid object not itself radioactive, but bear a radioactive substance well distributed on its surface, and such object could be one of the two categories:

A-class I: Solid object characterized non permanent contamination (contamination which can be transmitted automatically or it can be removed easily from the contaminated surface during transport in normal circumstances) on an accessible surface, distributed over 300 cm2 (or all the area of the surface if less than 300 cm2) not exceeding (3.7) Becquerel /cm 2 for gamma rays emitters and beta particles and low toxicity alpha emitters, or (0.37) Becquerel /cm2 for all other alpha emitters.

B-class II: Solid object exceeds the permanent and non permanent contamination on its surface boundary defined for object superficially contaminated, where non permanent contamination on the accessible surface, distributed over 300 cm2 (or all the area of the surface if less than 300 cm2) not exceeding 400 Becquerel /cm2 for gamma rays emitters and beta particles and low toxicity alpha emitters, or 40 Becquerel/cm2 for all other alpha emitters.

Radiation surveillance: The process of radiation measurement for the purpose of evaluation or domination on the substance emitting radiation.

Transportation: All operations and conditions associated with or contributing to the movement of radioactive substances, including packaging design and manufacturing, maintenance and repair, in addition to radioactive substances preparation or packages and its expedition, loading, carriage and storage in the crossing discharge and reception final stage.

Vessel: Any means for maritime carriage or ship specified for the carriage of merchandise in internal water courses.

Vehicle: Land transport means including agricultural tractors and trailers and railcars, each locomotive is considered a vehicle in itself.

Exclusive usage: Usage restricted to one sender using a conveyance or big cargo container, where any related initial, intermediate and final unloading and downloading activities is not conducted, except in accordance with the instructions of the consignor or the consignee.

Low specific radioactivity substances: Substances of specific low radioactivity by nature or radioactive substances applying specific average radioactivity limits, but not taking into consideration the shielding substances surrounding the low specific radioactivity substance, when selecting medium quality effectiveness estimates.
Package: Radioactive substances with the packaging for the purpose of preparation for transport.

Transportation index: Number used to provide control over radiation exposure, ranging in value between 0-10 and showing the maximum value of the equivalent dose rate at a distance

(1 m) from the surface of the package, and wherever the transport index is higher, the dose rate is higher, and the index is placed on the transport warning sign.

Preparation: Operations set that convert radioactive waste into a suitable form for transport or storage or disposal, and may include waste transmutation into another form and reduce its volume and keep them into containers and provide additional casings.

Disposal: Put the radioactive waste into the allocated interment place with certain specifications to bury it definitely.

Background radiation: Radioactivity resulting from natural, cosmic and terrestrial radioactive sources.

Equipment: Materials and installations used in the oil and gas industry or activities referred to in article (3) of these rules like containers, pipes, tank trucks, and others.

Article (2)
Objective

These rules aim to protect workers during work into facilities where natural radioactive substances is concentrated in its equipment, also during decontamination and disposal of radioactive substances which can cause radiation exposure, external or internal, of radioactive substances by any means.

It also aims to protect human health and the environment from the inappropriate risks of exposure to ionized radiation resulting from natural radioactive substances, and identify key requirements and restrictions governing the management of wastes resulting from natural radioactive substances, and its dealer's functions.

Article (3)
Scope of Application

These rules apply to all those who deal with natural radioactive substances, or dispose of any of the sides stipulated in these rules, including the collection, transport, storage, and disposal of radioactive waste resulting from the oil and gas industry.

These provisions also apply to the management of radioactive waste resulting from mining activities and the production of phosphate fertilizers.

With the exception of radioactive substances in natural state (raw), such as geological formations or the dust concentrated without human interference.

Article (4)
Generation of Radioactive Waste

To generate radioactive waste, the procedures provided in these rules shall be followed, including the collection, transport, storage, decontamination, and disposal, once and for all and to be done under license from the Ministry of environment.

Anyone who generates radioactive substances is liable for any harm to human or damage to the environment resulting from its work.

Article (5)
Exemptions

Radioactive wastes, resulting from practices and subject to licensing and registration are exempted from the implementation of the provisions of the applicable regulations, if the radioactivity level of radioactive nuclides is less than the levels specified in annex (1) attached to the present rules.

If the radioactivity level of radioactive nuclides is above the level, it shall be considered radioactive pollutants and it shall be collected, transported, stored and disposed in accordance with these rules.

Article (6)
Pollution Detection

The equipments are considered contaminated with natural radioactive substances, if the radiation dose at the equipment surface is more than twice the radiation background in the State, and this during the radiometric survey routine at work or before turning off the equipment.

Article (7)
Collection of Radioactive Waste

At the time of collection of radioactive waste from oil and gas equipment that are in the form of mud or solid scaly residues or consumed contaminated equipment, the following shall be taken into consideration:

1. Delimit the work area putting a barrier around it, with written down radiation warning signs, in order to complete the work in a safe manner.
2. Provide containers or plastic bags to collect the protective clothing and contaminated waste when leaving the workplace.
3. Do not allow other than trained personnel to work in that area.
4. Cover the ground where contaminated equipment are placed with plastic material resistant to water leakage, and able to withstand the work without torn.

5. Moisten a dry contaminant by water to prevent the generation of airborne radioactive substance, provided that to also moisten it periodically during the collection works.
6. Close the equipment slots internally contaminated by natural radioactive substances, by means of suitable plastics material.
7. Remove contaminated protective clothing after the completion of the collection works and before leaving the workplace, scans the plastic ground for radiation and decontaminate by ordinary cleaning, then lifting up the barrier and warning signs of radiation.

Article (8)
Containers of Substances Contaminated by Natural Radioactive Substances

When contaminated substances collected are gathered in containers of radioactive waste, the following shall be considered:

1. The container must be in good condition, otherwise there are clear signs of no damage from the inside or from the outside, and be made from solid plastic material of the type that provides enough containment of radioactive waste during storage, and bear work ,safe loading and unloading.
2. Consist of materials that do not react with surface radioactive wastes, and to be able to resist to decomposition by UV rays, so as not to undermine the ability of the containers to keep them.
3. Affixed to them the radiation warning signs, and adhesives containing clear information about the radioactive substances, in terms of being, mud, or solid scaly residues, or scrap, and about, with an indication of the size and weight of wastes, the level of radioactivity per weight unit, and the site where the waste was generated, and any other information relevant to the origin.
4. To measure radioactive contamination on the surface of each container, if the superficial radioactivity emitted by beta particles and gamma rays is greater than 4 Becquerel/cm 2, the outer surface shall be washed by pressurized water, until the superficial radioactivity becomes less than 4 Becquerel/cm 2, and can also put the barrel into another barrel to reduce the superficial radioactivity.
5. To take samples of natural radioactive substances from each container and be measured by Gamma Spectroscopy Analysis device, if within the levels specified in attached annex (1), it can be thrown as industrial waste; otherwise it shall be transported to the storage places.

Article (9)
Transport of Radioactive Waste

1. To remove the limited quantities of radioactive substances, package or tanks or containers, with all transport requirements, the most important of these requirements is that the unstable superficial contamination does not exceed (0.4) Becquerel/cm 2 for beta

particles or gamma rays emitters, and low-lying toxic alpha particles and (0.04) Becquerel/cm 2 for all alpha particles emitters, the level of radioactivity does not exceed the package surface, (5) Micro Seifert /hour.

2. Pipe's end shall be packed to prevent the spread of contaminated radioactive substances, if the pipes are large enough, such as valves, pumps, packaging shall be fully, while taking all necessary precautions to the non proliferation of pollutants by using of closed flanges.
3. The relatively large quantities of solid pollutants resulting from sediment mud or solid scaly residues shall be transferred in tanks and separation containers, big decontaminated substances such as substances with low specific radioactivity in barrels or tanks according to industrial parcels. No other substances shall be transported in the vehicle transporting substances or equipment contaminated with natural radioactive substances.
4. When transporting natural radioactive substances in the sea, a suitable container specific for transport shall be used, where no leakage or spillage of pollutants are secured.
5. The licensee, when transporting in any vehicle, shall put a detailed written transport plan that includes steps to be taken under a State of emergency, provided that the plan is submitted to the Ministry of Environment for approval.
6. To transfer the components such as valves and non-radioactive pipes, if the surface is contaminated, such as surface polluted objects, depending on the level of the permanent and non permanent surface contamination emitting of beta and alpha particles.
7. Transportation index shall be designated on each barrel, by measuring equivalent radiation dose (Micro Seifert/hour) at 1 meter from the surface of the barrel, divided by 10. As well as measuring the equivalent radiation dose on the surface of the barrel directly to choose the appropriate warning sign to be attached to the barrel.
8. To transport the natural radioactive substances or contaminated with these substances, in an exclusive-use vehicles.
9. Boats used to transport substances or contaminated equipment from offshore platforms, shall use standard marked containers. Contaminated substances that cannot be stored in standard containers shall be protected in a controlled manner to ensure no leak or spill of radioactive substances during transport.
10. Before sending the natural radioactive substances, the receiving party shall be notified.
11. Vessel shall be provided with radioactive warning signs, transportation, guide and other specific stickers for transport, as a statement of the transferred substances shall include the following:

    A. Description of natural radioactive substances (contaminated equipment, and solid scaly residues, mud, waste, and others).
    B. Size/quantity of transported radioactive substances.
    C. Transport method.
    D. Destination.
    E. Facility where the radioactive waste was collected from.

Article (10)
Temporarily Radioactive Waste Storage

Natural radioactive substances shall be temporarily stored until final disposal in storage places, taking into consideration the following:

1. Not to be close to residential areas and corrosion substances and explosive or flammable substances.
2. To be built of brick or concrete, and large metal containers can be used for storage, with sufficient capacity to contain the radioactive waste and shall be surrounded by a barrier not less then 2 meters breadth representing the supervision area, with warning signs of radiation on the barrier.
3. To be stored in a ground covered with a piece of plastic, resistant to water leakage and able to withstand the works without torn.
4. To be equipped with ventilation devices with special filters not for the purpose of gathering radon.
5. To be equipped with fire protection equipment and radiation emergency equipment.
6. Holding a record that refers to the list of containers, date of storage and radioactivity of radioactive substances. The log shall be outside the store and nearby.
7. The radiation dose within the store (supervision area) shall not exceed 7.5 Micro Seifert/hour and beyond (supervision area) 2.5 Micro Seifert /hour.
8. Areas where radioactive containers of radioactive waste are stored shall be monitored regularly to detect signs of leakage from the containers and register the monitoring processes.

Article (11)
Decontamination of Solid Scaly Residues from Equipment

Specialists shall remove the contamination from equipment contaminated with natural radioactive substances. The appropriate method to be chosen depends on several factors including:

1. Provided means of action.
2. The cost value of such operations.
3. The value of the equipment subject to cleaning.

All necessary precautions and measures shall be taken to protect workers from radiation when conducting this business. And radioactive contaminants are removed from the equipment by one of the methods specified in annex (2) attached to these rules, with priority to a pressurized water in a closed circuit, and ventilated filters related to contain radioactive substances.

Article (12)
Disposal of Waste Containing Natural Radioactive Substances

1. Waste that contains natural radioactive substances shall be prepared before final disposal, to be more convenient.
2. The licensee shall dispose of waste containing natural radioactive substances, in accordance with the laws and regulations in force so as not to lead to exposure of workers and the public to radiation or pollution of natural resources such as groundwater or soil contamination that could become in the future residential or agricultural areas, if it is at the moment faraway or uninhabited.
3. To determine the primary selection criteria for disposal sites that contain natural radioactive substances based on the following:
   A. Risks.
   B. Technical feasibility.
   C. Cost.
   D. General acceptance by the public, and not contrary to the provisions of the law and these rules.
4. Disposal of waste containing natural radioactive waste shall be in accordance with the method set out in annex (3) attached to these rules.

Annex (1)

Levels of Exemption for Substances and Equipments Contaminated with Natural Radioactive Substances (NORM)

Contaminated Area	Level
Equipments	The radioactive contaminations from alpha particles emitters do not exceed (0.37 Becquerel/cm2 for alpha emitters and 3.7 Becquerel/cm2 for beta emitters) or the radioactive dosage do not exceed 0.5 Micro Seifert/hour including background radiation at any point can be accessed.
Contaminated soil and mud (sludge)	Exemption levels of soil contaminated by mud of natural radioactive substance as Ra 226 or Ra 228 less than 0.185 (picocurie / gram) for soil in 15 cm depth or 5.55 Becquerel for soil in depth of more than 15 cm on a space of 100m2 above the level of natural background, or the read of portable devices 0.25 Micro Seifert/hour above the level of natural background.
Solid scaly residues (SCALE) in oil equipments	The radioactivity of isotopes Ra 226 or Ra 228 does not exceed 1.1 Becquerel/gram in oil equipments.
Solid scaly residues in gas equipments	The radioactivity of isotopes Pb 210 or Po 210 does not exceed 0.2 Becquerel/gram in gas equipments.
Produced water	Radioactive contaminated water can be thrown directly into the environment if: 1. The concentration of alpha particles emitters at the point of throwing does not exceed 1.2 Becquerel/liter, and the thrown radioactivity for four successive weeks does not exceed 20 Kilo Becquerel 2. The concentration of beta and gamma particles emitters does not exceed 50 Becquerel/liter at the point of throwing, and does not exceed 1.2, and the thrown radioactivity for four successive weeks does not exceed 1000 Kilo Becquerel
Polluting gases	The concentration exempted totally of disposal of radioactive gases and obstacles to the air does not exceed 50 Becquerel/m3 for alpha particles emitters and does not exceed 5 Becquerel/m3 for beta and gamma particles emitters.

Annex (2)

Methods of Decontamination of Natural Radioactive Substances (NORM)

Method	Observations
Regular manual cleaning	It is an easy method not requiring mechanical equipment, and includes washing the equipments with water, this method is used to remove sand or mud from devices.
Method of expansion by drill	It is commonly used to remove the solid sedimentation from the contaminated equipment surface. The drill process has to be wet to reduce the radioactive particles spread in the air, and the water produced from this process shall be filtered out to avoid the passage of the solid sedimentation.
Cleaning with water under pressure (HPWJ)	This method used to remove the solid residues from the pipelines is too high, and equipments with contaminated surfaces to remove the solid residues and to reduce the radioactive dust.
Discharge method	This method may be wet or dry to remove the stuck contaminated particles.
Chemical cleaning method	Use of chemicals to melt the solid residues or remove the thin layers (FILM) from the gas pipelines.
Melting	Equipment are melted as surplus substances "Scrap" ,the most of (NORM) substances will be with the scum, but the radioactive volatile isotopes will be released from the other flue gases.
Scraping method	Scraping is a manual method to remove the solid contaminants from surfaces by using iron scrapers.

Annex (3)

Method of disposal of Radioactive Waste (NORM)

Type of Disposal	Details
Re- injection	**1.** Re-injection abandoned wells: The injection into the abandoned wells includes mixing the solid natural radioactive substances with cement, and should be between two plugs inside the well. **2.** Injection into wells by hydraulic ripping: The injection of mud and solid residues containing natural radioactive substances should be in the oil reservoir, or by hydraulic ripping method in basin geologically and mechanically separated from the groundwater sources used for drinking. These substances should be mixed with mud or cement within special mixing equipments, and then the radioactive waste (not dissolved in water) should be injected by a large amount of water, and get moving all together in the oil reservoir.