Multilateral Investment Guarantee Agency
World Bank Group

Environmental and Social Review Summary

Kenya Olkaria III Expansion

This Environmental and Social Review Summary (ESRS) is prepared by MIGA staff and disclosed prior to the date on which MIGA's Board of Directors considers the proposed issuance of a Contract of Guarantee. Its purpose is to enhance the transparency of MIGA's activities. This document should not be construed as presuming the outcome of the decision by MIGA's Board of Directors. Board dates are estimates only.

Any documentation that is attached to this ESRS has been prepared by the project sponsor, and authorization has been given for public release. MIGA has reviewed the attached documentation as provided by the applicant, and considers it of adequate quality to be released to the public, but does not endorse the content.

Country:	Kenya
Sector:	Power
Project Enterprise:	OrPower 4, Inc.
Environmental Category:	B
Date ESRS Disclosed:	August 3, 2011
Status:	Due Diligence

A. Project Description

Ormat Holding Corporation has requested MIGA to extend their coverage for the Olkaria III geothermal project to include an expansion contemplated under the Second Amended and Restated Power Purchase Agreement between OrPower 4 and Kenya Power and Lighting Company. This proposed new investment of approximately US $200 million is to expand the geothermal power plant with an additional capacity of 36 MW ("Plant 2") to the existing 48 MW facility (Phase 1 - 13MW and Phase 2 - 35MW, respectively, together: "Plant 1"). The Project will have a combined generation capacity of 84 MW once completed (consisting of Plant 1 and 2).

The Project consists of an electrical power generation complex, a geothermal energy production field, a geothermal gathering piping system and a geothermal condensate re-injection system. The expanded plant will be at a single dedicated site within the geothermal license area connected to the wells by pipelines conveying single or dual phase steam and water. The main generating units will consist of the 6 (six) existing OECs (Ormat Energy Converter) of Plant 1, which will undergo minor modifications, plus 3 (three) additional OEC units which are to be built at the same site and which conform Plant 2. In addition, the expanded plant will include other required auxiliary systems, such as the compressed air system, motive fluid and fire protection systems. Approximately, eight additional production wells will be connected (in addition to the wells to Plant 1), and additional pipelines will be added from the well pads to the separation station. With Plant 1 already commissioned and operating, the basic project infrastructure has already been developed, including access roads and power and water supply, as well as the required transmission and electrical facilities to support Plant 2 facilities. The development of the Olkaria III expansion project will be carried out by OrPower 4, Inc, which is a wholly owned subsidiary of Ormat.

The project is located south of Lake Naivasha, about 90 km northwest of Nairobi off the main highway to Nakuru. The Olkaria III project site is located within Hell's Gate National Park in an area gazetted for geothermal power production before the park was established. The park is divided into two sections: the western section in which geothermal production is permitted, and the eastern section in which hiking and recreational activities (primarily bird watching) are encouraged. Geothermal field development and activities are closely coordinated with the Kenya Wildlife Service (KWS), which is responsible for park management and protection. All geothermal operations within the park are required to enter into an Environmental Management Agreement with the KWS.

Background

MIGA has insured the Olkaria III project since 2000, first as part of the project's initial construction and operations, and then again for a subsequent interim expansion. The EIA (2000) reviewed as part of the initial due diligence in 2000 covers this proposed additional expansion as the project was envisioned to be built in stages to 100 MW capacity. Since the initial EIA report, other supplemental environmental and technical reports/findings have been developed both around geothermal development within the project area and the project itself. These include: a supplement to the initial EIA (2001), a revised environmental management plan, environmental audits of the existing Olkaria project operations. MIGA's environmental and social monitoring mission of February 2010 confirmed that the project sponsor is operating their project in a manner consistent with MIGA's Performance Standards.

B. Environmental and Social Categorization

The key environmental issues are: management of geothermal fluids, noise, and non-condensable gases (NCG); and location within a designated national park. There are no significant social issues because the Kenya Wildlife Service has been managing human use of the park since it was established in 1984, ensuring that human use is limited to tourism in the eastern sector and predominantly geothermal development in the western sector (although tourism is permitted in the western sector), and habitat protection throughout. The client's environmental performance/compliance has been satisfactory throughout the implementation of the previous phases. Recent environmental audits, MIGA's site visit and the project design indicate that no significant adverse environmental or social impacts of the expansion that cannot be addressed by continuation of current practices are expected. Therefore, the project is a Category B under MIGA's environmental and social sustainability policy because the impacts are site-specific, limited in number, and mitigation measures are readily identifiable.

C. Applicable Standards

While all Performance Standards are applicable to this project, current information indicates that the project will have impacts that must be managed in a manner consistent with the following Performance Standards:

- PS1: Social and Environmental Assessment and Management Systems
- PS2: Labor and Working Conditions

- PS3: Pollution Prevention and Abatement
- PS4: Community Health, Safety & Security
- PS6: Biodiversity Conservation & Sustainable Natural Resource Management

Performance Standards 5, 7, and 8 do not apply to this proposed expansion as no land acquisition is expected and indigenous peoples, and/or cultural heritage will not be directly impacted. The designation of Hells Gate as a National Park in 1984 and the geothermal developments since 1971 has impacted the Maasai communities. The creation of the park and its management has placed some constraints on their grazing within the Park, but they still able to herd animals along traditional migratory routes through the Park to other grazing areas. The Maasai communities have benefited directly and indirectly from the project through OrPower 4's community development programs.

D. Key Documents and Scope of MIGA Review

The following documents were reviewed by MIGA:

- *Environmental Audit Report, Olkaria III Geothermal Power Plant 2010* prepared by Prof. Mwakio P. Tole and Colleagues, Pwani University College, Kilifi, Kenya (January 2011)
- *Environmental Impact Assessment for Olkaria III Geothermal Power Plant,* by M. P. Tole and Associates, June 2000 (EIA)
- *Supplementary report to the EIA of August 2000, regarding High Tension Transmission Lines and Well Pads for the Olkaria III Geothermal Development,* by M. P. Tole and Associates, May 2001.
- *Environmental Management Plan* prepared by Prof. Mwakio P. Tole and Colleagues, Pwani University College, Kilifi, Kenya, August 2007
- *Environmental Audit Report, Olkaria III Geothermal Power Plant 2009* prepared by Prof. Mwakio P. Tole and Colleagues, Pwani University College, Kilifi, Kenya, (November 2011)
- *OrPower 4 – Environmental Self-Audit Report*, 2009
- *Olkaria III Geothermal Power Energy Project: Project Report,* (May 2007)

MIGA carried out a monitoring site visit to the existing project in February 2010 and met with staff at OrPower 4, Kenya Electricity Generating Company (KenGen), Kenya Wildlife Service (KWS), the Park warden at Hell's Gate National Park and with World Bank colleagues as part of the monitoring mission.

E. Key Issues and Mitigation

<u>PS1: Social and Environmental Assessment and Management Systems</u>

A project Environmental Impact Assessment was finalized in June 2000. This EIA covered all phases of the project (up to 100MW) and was submitted for the National Environmental Management Authority's (NEMA) review and approval. The EIA License was further revised on 21 May 2010 to account for modifications required to carry the expansion works (an increase from 48MW to 100MW). A supplementary EIA report regarding High Tension Transmission

Lines and Well Pads for the Olkaria III Geothermal Development was prepared in 2001. A revised Environmental Management Plan was prepared in 2007. The EMP has been monitored over the years through Environmental Audits carried annually from 2004 – 2010. The company holds regular consultations with the KWS, the Lake Naivasha Riparian Association, and the local community representatives to address issues of environmental and community concerns.

Health and safety concerns are addressed through the company's "Environmental, Health and Safety Policy" document, the "Safety Manual", the designation of an Environment Officer, a Health and Safety Officer, and a Health and Safety Committee. Training and sensitization of workers on environmental as well as on health and safety issues are undertaken as continuous and ongoing processes.

There is a signed Memorandum of Understanding between OrPower 4, Inc. and KWS that covers environmental management and research and confirms OrPower 4, Inc.'s support to KWS's park management team in Hells Gate Park. The MoU is monitored through monthly review meetings where emerging issues are addressed. The MoU includes measures concerning the protection, conservation and management of flora, fauna and soil, management of air quality, noise levels, waste disposal, roads, and fire prevention, and the planning of tourism, aesthetics and human and animal traffic. Monitoring of environmental and health and safety issues like incidents and accidents is adequate, as it is adopted as a continuous activity.

With few permanent operators (approximately 28) needed to run and maintain the plant a simple EHS Management System has been set up to address the environmental, health and safety matters as well as community relations. There is an environmental/community relations officer and a safety officer, who both have other production related functions. The EHS system is based on ISO 14000 and 18000 requirements. While the plant operations apply the standard guidelines, they have not been audited for compliance with these standards.

The first plant modifications and the second plant are designed and will be constructed in a manner to comply with WBG Environmental, Health and Safety Guidelines for Geothermal Power Projects.

PS2: Labor and Working Conditions

OrPower 4 employs approximately 28 workers for plant operations. There are different sections that include the following: plant operators, mechanical department, IT department, environmental health and safety, electrical section, instrumentation section and secretary. All plant management and staff are locally hired. During the construction period, it is expected that approximately 1,000 contractors and sub-contractors (in phases) will be employed for the expansion construction.

OrPower 4 applies human resources procedures that cover working conditions and terms of employment, including occupational health and safety conditions (fire and life safety), recruitment standards, grievance mechanism, performance evaluation procedures, training plan, etc. OrPower 4 will contractually require that all contractors and subcontractors respect Kenyan labor laws and working conditions in accordance with WBG's Environmental, Health, and Safety General Guidelines.

The main health and safety risks are potential fires and explosions of pentane, exposure to high levels of H_2S, electrical hazards, noise and general accidents. The general level of housekeeping is of good standard. The plant is well designed and open to the atmosphere so that any escaping gases will be rapidly diluted. Compared with many gas and steam turbine power plants noise levels are relatively low and would not present a hearing hazard to operators and maintenance personnel. Non-condensable gases (NCGs) are piped to the Oserian Development Company and the risk of H_2S exposure is minimized.

Firefighting equipment was noted at strategic locations throughout the OrPower 4 plant site as well as safety warnings of electrical hazard. A dedicated building housed all the switch gear for the plant, where areas of the plant could be isolated in case of breakdown and need for maintenance.

The Occupational Safety and Health Act (OSHA) 2007 came into force on 26th October 2007. Employers are required by OSHA to ensure that a place of work is safe and free of risks to health, to immediately stop any operation where there is an eminent and serious danger to safety and health and evacuate all persons employed. The occupier of a work place also has a duty to prepare a general safety and health policy statement and set out ways of carrying it out. In addition, the employer is required to establish a safety and health committee at the workplace and to cause a safety and health audit of the workplace to be carried out every 12 months by a safety and health advisor. The audits are report on the incidents and accidents during each review period. A monthly accident report board is set up at the plant and while there have been accidents in 2010, not of them were fatal. The Employment Act, 2007 sets the fundamental rights of employees and provides the basic conditions of employment of employees. The Work Injury Benefits Act (WIBA), 2007 provides for compensation for employees for work related injuries and diseases contracted in the course of employment. It requires all employees to be insured by the employer against injuries in the work place unless exempted by the Minister. In addition, an employer carrying on business in Kenya should be registered with the Director of Occupational Safety and Health Services (the “Director”). WIBA came into force on 2nd June 2008. Standards of The Kenya Bureau of Standards (KEBS) and of the Ministries of Works, Industry, and Labor are used for plant and work environment requirements. NEMA and the Ministry of Water have gazetted Water Quality Regulations (2006) with standards for emissions of waste waters in Kenya. Further, NEMA has gazetted Waste Management Regulations (2006). Other standards include those of the WHO for environmental emissions. Plant safety regulations conform to the United Sates Occupational Safety and Health Administration (OSHA) requirements, where Kenyan requirements are lacking.

OrPower 4, Inc. has constructed approximately 36 housing units for use by plant operators. These houses are constructed at a 7.5 acre site near the shores of Lake Naivasha.

It is expected that the Project will comply with PS 2 as well as WBG’s Environmental, Health, and Safety General Guidelines which cover all aspects of human health and safety (EHS), including EHS Guidelines for Geothermal Power.

PS3: Pollution Prevention and Abatement

During project operations the wastes generated by the technical process include: the spent geothermal fluid, waste geothermal gas, waste heat, electromagnetic radiation, waste water, garbage and sewage. Once the geothermal resource has been proved and the plants set up, activity outside the main plant location consists of occasional inspection and testing of wells by contracted parties. The power plant consists of a vaporizer in which pentane is evaporated using heat from the geothermal fluid. The pressure of the vaporized pentane drives turbines that are connected to a generator that converts the mechanical motion of the turbine into electrical energy. The electrical energy is transformed into appropriate voltage and transported via high- tension conductors to the KPLC distribution n network. All the technical processes are controlled from a central control room.

Other operational impacts are associated with: soil erosion, volcanic/seismic hazards, noise, fire hazards, water resources, electromagnetic radiation, air quality, brine discharge, and dust emissions. The environmental management plan sets out mitigation measures to address these issues and the latest environmental audit of 2010 confirms that air, noise and effluent levels are within the national and WBG guidelines. However, the latest audit recommends that OrPower 4, Inc. should continue to regularly monitor concentrations of H_2S, noise levels and leakage from brine and steam. The Olkaria Hill is a volcanic feature and the literature indicates that there is little risk of a potentially destructive earthquake occurring within the geothermal field. However, given the magnitude of the investment, the audit recommends that earthquake monitoring be conducted regularly. Liquid drilling and wastes will be ponded. Residuals of the liquid and solid wastes will be treated and removed to site restoration. Drainage of the surface water will be arranged to avoid the risk of erosion of the light volcanic soils. Spent geothermal water will subsequently be re-injected into the ground with minimal disturbance to the geothermal reservoir.

None of the Olkaria III plants will generate NOx or SOx and emission of other greenhouse gases (GHG) is minimal. Some of the CO_2 contents in the non-condensable gases ("NCG") of the existing 48 MW plant is captured and directed through a pipeline to neighboring flower farm greenhouses, thus enabling the benefits of sequestration of the CO_2 as well as enabling improvement of the flower farm's productivity. Furthermore, water vapor and gases will be dispersed to avoid concentrations at the ground level that are unacceptable to personal safety.

Ormat's proprietary technology, which involves re-injection of geothermal fluids back into the reservoir and far below natural aquifers, is considered environmentally friendly. 36 MW out of Plant 1 capacity built between 2007-2009 are registered as a CDM project with the Executive Board of the UNFCCC. The Project was registered on March 2010 with expected annual CO_2 reductions of 180,000 ton per year (CERs). The Company plans to commercialize the CERs from Plant 1 and also to develop Plant 2 as a CDM project, with an approximate contribution of an additional 180,000 CERs per year. Any CDM proceeds will be treated as Project cash flow and will be paid into the securitized accounts that the project will maintain under the loan documents.

All equipment will be designed to minimize environmental impacts. The plant shall comply with environmental requirements regarding the air quality, liquid and solid wastes, land disturbance, visual aspects and noise. With regard to land disturbance, well sites will be fenced but pipelines will be designed to allow the movement of animals across the area. As far as practicable, visual changes to the landscape shall be minimized to blend in with the background landscape.

Potential impacts related to the installation of the expanded plant will be addressed through environmental contract clauses with contractors and subcontractors to ensure health and safety of workers and surrounding communities and wildlife impacts. Contractors are registered by the District OHS Officer and there are regular meetings and visits by the Kenya Wildlife Service personnel. They advise and inspect the disposal of waste, discharge of water and movement within the park among others. For example, vehicle movements after 1830hrs are restricted to only urgent/emergency situations to ensure that the animals foraging in the park are undisturbed.

PS4: Community Health, Safety & Security

Communities in the immediate vicinity of the project are most likely to be directly impacted. The Maasai community at Narasha, KWS, KenGen, Oserian Development Company, Kongoni Game Conservation Ranch and the Lake Naivasha Riparian Association were selected as part of an on-going stakeholder consultation process.

Maasai Communities: There are Maasai communities in the project area that engage in traditional pastoralist activities. The designation of Hells Gate as a National Park in 1984 and the geothermal developments since 1971 has impacted on their way of life. The Kenya Wildlife Service reached an agreement with the nearby Maasai communities that allowed them to cross the national park along traditionally used routes to and from traditionally used grazing areas. It is significant to note that the Maasai are protectors of wildlife as it is taboo in their culture to kill and eat wild animals and fish with scales. Hence the areas in Kenya that have been designated as National Parks to protect wildlife have mainly been areas where the Maasai have been the dominant tribe. Relocating the Maasai to areas outside the Parks has limited their pasture areas but has provided a buffer between them and other tribes which may have exploited the wildlife through poaching. The Parks have also provided employment for Maasai as game and security wardens and guides/drivers/cooks, etc for the thriving tourism industry that has grown up to provide access and accommodation in the Parks for Kenyan and foreign tourist.

The company now enjoys a cordial relationship with the Maasai groups near the plant site. There are approximately 300 households in these groups and OrPower 4 provides direct as well as indirect assistance to these groups. The company employs 22 full time personnel in general service positions and hires some 20 Maasai on a part time, as needed basis. Some of the key support from OrPower 4 include: school building development, financial support for 5 teachers at the 385 children public school for Maasai community, financial support for 100 needy school children to allow them to continue their education, community health and cultural/sporting activities.

KenGen supplies water to the Maasai communities within the Park as there is no groundwater due to the hot rocks that are a short depth below the surface. A committee of 11 community elders represents the community in project-community matters and organizes the selection of community members to benefit from the part time employment opportunities. The socio-economic status of the local Maasai community is monitored every year. Regular consultations with community members will continue. Consultations with KWS and Lake Naivasha Riparian Association are held also monthly.

Security Arrangements: A registered contractor provides security at the plant. The Government does not allow security firms to arm their employees. The contract has a proviso that ensures at least 50% of the staff employed to secure the premises is from the local community. They are currently 29 guards covering the plant and construction sites day and night.

PS6: Biodiversity Conservation & Sustainable Natural Resource Management

The Olkaria III project site is located within Hell's Gate National Park, which is designated as a Category II protected area by IUCN; however, the park was established after the Olkaria geothermal fields had been gazetted for geothermal power production, and the first power plant (Olkaria I) had been built. The park is divided into two sections: the western section in which geothermal production is permitted, and the eastern section in which hiking and recreational activities (primarily bird watching) are encouraged. The expansion is located within the western sector of the park in which geothermal field development is allowed. The project area is located in a semi-arid landscape occupied predominantly by savanna grassland. The project area itself is characteristic of geothermally altered soils, with sparse vegetation. Hell's Gate National Park is the only national park in Kenya in which hiking is encouraged, given the absence of large predators such as lion and leopard. The primary habitat and recreational value for the park is bird nesting and birdwatching, especially large raptors and a large colony of swifts. A gorge separates the eastern and western sectors of the park, and topographical features west of the gorge (i.e., Olkaria Hill, Hobbley's Volcano, and Hell's Kitchen) effectively isolate the Olkaria III geothermal field from viewers in the eastern sector of the park.

The initial EIA for Olkaria III considered the cumulative impacts of the three existing geothermal fields in the park, including the proposed expansion of Olkaria III. Geothermal field development and activities are closely coordinated with the Kenya Wildlife Service (KWS), which is responsible for park management and protection. All geothermal operations within the park are required to enter into an Environmental Management Agreement with the KWS. The Olkaria III project's Environmental Management Plan will continue to be implemented as part of their Environmental Management Agreement with the KWS.

Biological impacts: The development of the OrPower Geothermal Plant has a number of impacts on the biological environment. Construction of the first power plant site, the road, accommodation camps for workers, site for storage of equipment, drilling pad sites, and pipe ways have resulted in clearing of vegetation in virgin areas of Hell's Gate National Park. There is limited wildlife presence in most of these sites for feeding and breeding, due to the power plant operations. Lighting, noise, airborne effluents (e.g. dust, hydrogen sulphide, carbon dioxide, sulphur dioxide etc.), liquid effluents, thermal discharges and power transmission lines have changed the environment in the vicinity of the power plant.

Hydrogen sulphide (H_2S) is the main airborne effluent of real concern in the Olkaria geothermal fields. Although H_2S is a poisonous gas at high concentrations, the main problem in geothermal development is objectionable smell. As H_2S is a heavy gas, it tends to concentrate around geothermal plants in enclosed areas. It becomes a health hazard at concentrations of over 10 ppm. Since OrPower Geothermal Plant is sited on a hill, this is less of an issue, as the H_2S will likely have been oxidised to SO_3 by the time it reaches ground level at the bottom of the hill.

OrPower 4, Inc. continues to have an agreement with the Oserian Flower Company, in which the power plant supplies most of the non-condensable gases (e.g. CO_2, SO_3, H_2S), a byproduct of geothermal energy production, to the flower company. The gases are used for heating and "foliar fertilization" of the flower. The Oserian Flower Company management has noted improved flower growth as indicated by stronger clean leaves, stems and flowers. The use of the non-condensable gases (e.g. CO_2, SO_3, H_2S) for heating and "foliar fertilization" of the flower in greenhouses removes the greenhouse gases from the atmosphere.

Mitigation: To ensure the co-existence of the power plant and the game park, the following mitigation measures are recommended to address potential adverse biological impacts.

- Significant and unique natural sites e.g. the Hobbley Volcano and the Hell's Kitchen need to be gazetted as "Protected Areas of National Importance",
- Enforcement of the Kenya Wildlife Service and OrPower 4, Inc Environmental Management Agreement,
- Kenya Wildlife Service should map out important breeding and nesting sites for rare and important migration routes for wildlife in all of the Hell's Gate National Park,
- Monitoring of the significant impacts should be carried out on a long-term basis, and
- Frequent meetings between all stakeholders – KWS, KenGen, Lake Naivasha, Riparian Association and the local Maasai communities.

Recent vegetation survey (September 2010) show that the sensitive floral habits had not been affected and the gorges are wet because of adequate rainfall in the area. The vegetation around the gorges and steam vents appear to be the same. Steam vents, drainage areas, and gorges are unique habitats with rare plant associations not normally found in Agro-Ecological Zone 5 of Kenya. Steam vents create peculiar geological soil and rock formations. Very high temperatures and sauna-like high humid conditions allow for the presence of several species of pteridophytes and orchids, which normally are not associated with this ecological zone.

Mitigation: in terms of Flora, the following measures have been proposed:

- Areas with endemic and/or rare plant species e.g. some selected steam vents/fumaroles need to be set aside as "Protected Areas" where development of geothermal power plants should not be allowed,
- Clearing of drilling pad sites, pipe ways, plant station, and access ways should be kept to a minimum,
- The areas cleared for the drilling campsite and storage of pipes should be rehabilitated,
- Replanting of the indigenous species were cleared should be done immediately, to avoid invasion by opportunistic pioneer species,
- Exotic species should not be introduced into the area,
- Floral species should be investigated every 2 years to monitor any changes in species composition and abundance of vegetation in the area,
- Investigation of the long-term effects of consistent exposure of the local natural vegetation to the gaseous effluents e.g. H_2S, SO_2, NH_3 and CO_2, and the possibility of formation of acid rain near the OrPower Geothermal Plant should be started,
- The proposed expansion phase should be restricted within the perimeter of the fenced and already cleared area to further mitigate on the impacts, and

- The Tree nursery at OrPower Geothermal plant needs to be improved.

Both OrPower 4, Inc. and KWS concur that measures aimed at sustaining the environment should be implemented for their mutual coexistence in the area.

Wildlife impacts: Geothermal development in the park has many potential impacts on the wildlife in the park. The most significant is the loss of natural habitat and migration route areas which have been used for the construction of the access roads, drilling pads, camp sites, pipe lines, power transmission lines and sites for storage of construction material. It is possible that some important wildlife feeding and breeding/nesting sites have been disturbed. In summary the likely impact of the geothermal power plant on fauna include:

- Loss of some habitats of some rare wildlife species,
- Noise during construction,
- Transmission power lines and steam pipes are likely to interfere with wildlife migration routes,
- High-voltage transmission lines are likely to have adverse effects on wildlife and human beings in the area,
- Gaseous effluents e.g. H_2S, SO_2 and NH_3 which may cause or exacerbate certain diseases in human beings are likely to have similar effects on wildlife around the power plant,
- Loss of unique sensitive habitats and scenic natural sites, and
- Reduction of the aesthetic and natural value of the landscape.

Mitigation: in term of Fauna, the following measures have been proposed:

- Sensitive habitats e.g. Hell's Kitchen and the Olkaria Hill should be preserved and avoided as sites for construction,
- Identified animal movement/migration pathways should be kept open. Routes have been identified by Kenya Wildlife Service in collaboration with OrPower 4,
- Overhead power transmission lines should be well coordinated and planned so as not to disturb the natural scenery of the park and not to interfere with movements of birds,
- Pipes should be painted with natural camouflage colors so that they blend with the surrounding,
- Pipes should be insulated so as not to scald animals,
- Power transmission line routing should be planned in such a way as to reduce their impact on the wildlife migratory routes,
- Dust reduction measures on roads should be implemented,
- Limit the speed of vehicles to 40 km/hour within the park area,
- Limit noise, especially at night,
- Limit light shining away from the plant operations at night. All lights face towards the plant,
- Areas where animals can be exposed to drilling or geothermal fluids should be fenced, and
- Animal species composition and abundance should be monitored at least every two years.

Both OrPower 4, Inc. and KWS concur that these measures should be implemented for their mutual coexistence in the area.

Impacts on Aquatic Environments: Prominent water bodies around the project site include: Lake Naivasha (a Ramsar site), and Oloiden and Crater lakes, and the seasonal Narasha wetland (located 4 km from the project site). The Lake Naivasha Riparian Association, of which OrPower 4, Inc. is a member, has been enforcing sustainable ecosystem management. An analysis of the Narasha wetland waters in July 2010 by Chemical and Industrial Consultancy Unit of the University of Nairobi showed that there were high values of fluoride (2.90 ppm), sulphur (2.60 ppm), potassium (30.35 ppm) and silicon (20.5 ppm). Monitoring of these parameters is important to secure the health of people and animals that use the water of the wetland. The high levels could be attributed to evaporation, surface flow through volcanic soils. Mitigation measures include:

- Proper treatment of wastes from the staff houses,
- Staff houses should not be constructed too close to the water edge,
- No waste should be disposed of near the lake, and
- Waste storage facilities should be designed to cope with periodic breakdown in municipal or private waste collection systems.

The environmental management agreement between OrPower 4 and KWS covers environmental issues such as park management, environmental protection and management, tourism planning and aesthetics, as well as revenue collection. A Memorandum of Understanding (MOU) between Kenya Power and Lighting (KPLC) and KWS has guided geothermal operations at the Olkaria geothermal field, so that exploitation of the geothermal resource is carried out under conditions that protect the wildlife. OrPower 4 is also guided by the terms of the MOU between KPC and KWS, and the terms of its agreement with the KWS with respect to the field and plant management.

OrPower 4 has been supporting the KWS with yearly funding since it stated operations. Proposals are made to KWS management for the use of these funds each year and if approved are paid from a special account. OrPower 4 has contributed KS 1,036,171 in January 2011. The calculations are based on the MOU with KWS which became effective in 2001, when we contribution was KS 700,000. The amount has increased by 4% per year. In addition OrPower 4 provides other support to the park warden such as computer, overhead projector, and salary of a park education officer. The park warden also confirmed that the presence of OrPower 4 in the more remote western section of the Park helps to improve security in the area and likewise the presence of park rangers also improves security at OrPower 4's facilities. OrPower 4 also participates in the yearly census of the park's animals over a 3-4 day period each year and provides food and water to the park's road crews when maintaining the roads in the OrPower 4 section of the park.

F. Environmental Permitting Process and Community Engagement

The Environmental Management and Coordination Act (1999) established the National Environmental Management Authority to manage all matters dealing with the Environment in Kenya, including the conduct of Environmental Impact Assessments and Environmental Audits

for projects deemed to have potential adverse impacts on the environment. Geothermal Energy Projects are listed under subsection 4(d) of the Second Schedule, as among projects that are required to undergo Environmental Impact Assessment. The Environmental (Impact Assessment and Audit) Regulations (2003) have been gazetted to guide the conduct of Environmental Impact Assessments and Environmental Audits in Kenya. Other relevant regulations by NEMA include: The Environmental Management and Coordination (Conservation of Biological Diversity and Resources, Access to genetic Resources and Benefit Sharing) Regulations (2006); The Environmental Management and Coordination (Water Quality) Regulations (2006); and The Environmental Management and Coordination (Waste Management) Regulations (2006).

The Water Act (2002) established the Water Resources Management Authority with powers to conserve and allocate water resources. Discharge of trade effluents requires a permit from the licensed Water Services Provider for the given area. The Kenyan environmental authorities (NEMA) have on 21 May 2010 amended the 14 September 2007 EIA license to approve the final expansion to 100 MW, as originally proposed in the 2000 EIA.

The company holds regular consultations with the KWS, the Lake Naivasha Riparian Association, and the local community representatives to address issues of environmental and community concern.

G. Availability of Documentation

The following listed documentation is available electronically as PDF attachments to this ESRS at www.miga.org as well as Ormat's website www.ormat.com

- *Environmental Audit Report*, *Olkaria III Geothermal Power Plant 2010* prepared by Prof. Mwakio P. Tole and Colleagues, Pwani University College, Kilifi, Kenya (January 2011)

- *Environmental Impact Assessment for Olkaria III Geothermal Power Plant*, by M. P. Tole and Associates, June 2000 (EIA)

- *Supplementary report to the EIA of August 2000*, *regarding High Tension Transmission Lines and Well Pads for the Olkaria III Geothermal Development*, by M. P. Tole and Associates, May 2001.