National Outline Plan 10/B/1 – Solar Power Plants in Ashalim

Environmental Impact Assessment

Summary

According to the government's decisions on Sept. 23rd, 2007 (Resolution No. 2390) and Mar. 27th, 2008 (Decision No. 3338 (HCL / 38)), Ashalim site will integrate solar power plants. The plants will operate on solar-thermal and photo-voltaic technologies. Total production capacity of the plants will be approximately 250 megawatts.

This capacity will be divided into two solar-thermal power plants – with a capacity of 80-110 megawatts each, and a photovoltaic power plant – with a capacity of 15 megawatts, with an option for an extension of additional 15 megawatts.

Size of the area approved by the National Council for this power production is as follows:

A. Two areas of about 1,112 acre for each of the solar-thermal plants with an output of 80 to 110 megawatts. Complex one (Plot A) will be located north of Highway 211 and west of Ashalim settlement; Second complex (Plot B) to be located south of Highway 211 (south east of Plot A).
B. Area of 247 acre for photovoltaic plant (Plot PV) – with a capacity of 30 megawatts, and 124 acre will be allocated to

the plant with a capacity of 15 megawatts, and additional 124 acre more will be allocated to the possibility of expanding the plant with additional 15 megawatts. This area is located west of and adjacent to Plot A.

Total area required by the governments objectives and needs of the area as specified in the program amount to approximately 2,471 acre.

On Dec. 7th, 2010, the National Council decided to update the National Outline Plan, and increase the installed capacity of the two solar thermal plants to 150 megawatts each (Net power plant network port will be 110 megawatts), and not limit the production capacity of the photovoltaic plants in the area allocated to them.

Note: At the time of writing the assessment, the winners of the solar power plants tender were not selected. As a result, the authors of the assessment didn't have a detailed construction and operation plan of the plants. In order to complete the assessment, a principle design of the plants was conducted by the technical consultants of the project (Adan Company - Technology and Economic Consulting Ltd.), based on existing knowledge and that may be different than the future plan of the winning entrepreneur. It should be noted that all data in the report are correct for the fundamental design phase, and practice may be varied by the developers.

Chapter A: Description of the environment relating to the plan

Land Use

Sensitive land uses in the circle closest to the site, are Havat Bodedim on the north of Plot B, a student village in Ashalim, Ashalim settlement, an R&D agricultural farm on the east of Plot A, and a rehabilitation facility 'Rooach Midbar' on the north of Plot B.

Beyond this circle, at greater distances, there are other sensitive uses, such as the Bedouin village Beer-Hadage, the settlements of Tlalim and Mashabey Sadeh, a military base west of Tlalim junction and another base in Shivta.

In addition to these uses, around the site there are buildings scattered and agricultural areas (on the western edge of Plot A there are three poultry farms), nature reserves ('Holot Mashabim' is the nearest of them) and a national park. Bessor River passes on the eastern border of Plot A. On the western border of Plot B passes a rivulet of Bessor River. Large parts of the area are now military firing zones.

Land zoning

There has been an assessment of the land zoning in the area of the plan. Among the assessments are National Outline Plans, Regional Outline Plans (Regional Outline Plan TMM 14/4, a change of TMM 55, which its goal is to determine a touristic 'spice route' and change no. 23 in the TMM). In addition, Local Outline Plans were examined and are detailed, approved and submitted. The assessment range is approximately 5 kilometers from the solar power plants limits.

Local plan is under preparation, which is closer to the site, is a plan to expand the 'Holot Mashabim' nature reserve. Plot A infiltrates into the proposed expansion area in the north east.

Meteorological data - direct radiation in the site

Following radiation data were obtained after interpolation of measurements of multi-year (1989-2002) sun radiation. The measurements were performed in the Solar Radiation Research Center at Sde Boker, in the Jacob Blaustein Institute of Ben Gurion University in the Negev (11 kilometers south east of the designated plan) and other 8 stations in the Negev. Interpolation was based on the location of measurement stations and their height above sea level. Based on the data it was found that the annual value of direct perpendicular radiation (DNI) in Ashalim is about 2192 ± 57 kilowatt-hours per square meter.

Air Quality - Current Status

In tests conducted both by the Ministry of Environment and by the editors of the report it was found that:

A. There is no background data (measurements) that represent the state of air quality (including natural dust concentrations) in the vicinity of the site.
B. There were no anthropogenic sources that may cause concentrations of air pollutants in the region, except for air pollution caused by vehicles on route 211.

Consequently, maximum background concentrations of pollutants were calculated: PM10, NO2 and NOX, from vehicles traveling on the road. The model required by the guidelines and selected was

AERMOD certified by USEPA and recommended by them for calculating concentrations for gaseous pollutants and for particles.
On the basis of the model calculations it shows that:

1. There are no unexpected deviations from environmental standards for pollutants concentrations calculated for the receivers in the plan environment.
2. The maximum values calculated from transport are expected to be low relative to environmental standards.

Current noise

In order to define the current acoustic environment characterizing the designated plan area and the potential noise in specific, background noise measurement were were tested in the current status. The background noise measurements were taken so it would be possible to compare their results with the Abatement of nuisances Regulations (unreasonable noise – 1990).

The noise measurements were tested in 5 points representing the boundaries of the site and the nearby noise receivers. The noise levels measured were very low and range from 31.9 dB (A) (in the western border of Ashalim settlement) and up to 56 dB (A) (near route 211 which is the main noise source of the area).
And yet, there are some reports of noise nuisances in the Ashalim settlement, as a result of IDF artillery at the firing zone south of route 211.

The drainage system in the area

Ashalim site is located in the drainage basin of Bessor River, one of the biggest rivers in the Negev. Bessor channel flows generally from south to north, between Plot A and Plot B, and alongside the blue line of Plot A.

In addition to Bessor River, there are three rivulets of the Bessor River, forming sub-basins: Sdeh Pekua rivulet, secondary drainage artery – a small rivulet at the south of Beer Hayil River crossing Plot B and flowing north-west, and the Beer Hayil River. Evaluations of flow rates and flood spreading were calculated for the rivers that will be affected from the plan and affect it – Bessor River, Sdeh Pekua rivulet, and sub-basins arteries in Plot B.

The Bessor River – By calculations, the boundaries of Plot A do not penetrate the flood spreading of the Bessor River, that is, at a probability of 4%; it seems there won't be flooding of the site.

Sdeh Pekua rivulet – The boundaries of Plot A and PV site penetrate into the flood spreading of the rivulet, and rearrangement of the rivulet will be required in order to avoid flooding of the site.

The development of the site in Plot B will require rearrangement of the sub-basins arteries and other small rivulets crossing it from south to north.

Stratigraphy

The exposed stratigraphy column mentioned in the plan area includes units from the age of Torun, Xenon, Paleocene, Lower Eocene, Pliocene and Holocene.

Groundwater in the area and its quality

The site area is located in the vicinity of three main hydrological units (aquifers – from bottom up):

Kornov Group aquifer (Nubian sandstone), from the lower Cretaceous period, belonging to the Negev mountain basin; Yehuda Group aquifer from the Cenomanian Turonian period, belonging to the YARTA"N basin; Ovdat Group Aquitrad from the Eocene period.

The water in the Kornov group aquifer in the plan area is saline. Its salinity is measured between 1,887 to 3,558 milligrams of chlorine per liter in the years of 2001-2006. Since 2003 the salinity is rising and above 3,200 milligrams of chlorine per liter. The nitrate concentration is low.

The water in the Yehuda aquifer in the area of site is saline. Its salinity is stable since 2002 and ranges between 900 to 1,120 milligrams of chlorine per liter. The nitrate concentration is very low and stable.

The salinity in the Ovdat Group aquitrad ranges between 1,931 to 2,086 milligrams of chlorine per liter in the years of 1998-2000, the nitrate levels are medium, but allowable for drinking.

The geo-hydrologic sensitivity in the area

According to National Outline Plan 34 B4 (an integrated outline plan for the water sector – surface water pooling, disseminating, enrichment and protection of groundwater), the position is located in Area C, which has a low groundwater vulnerability.

In the site area there are five active water drills drawing low levels of saline water. Even if these drillings will evolve into drinking water drills, the site is not located in their protecting radius. In case

there will be contamination originating from the site, it will flow mostly in to the Bessor River, and some of it might reach the Ovdat Group aquitrad. In case there will be contamination originating from the site, there is a chance of contaminating of the Coastal aquifer on the west of the designated plan, mostly caused by the Bessor River flow. The potential of contaminating the Yehuda Group aquifer and the Kornov Group aquifer is very low.

Seismology

Ashalim site is located at the south eastern margins of the Revivim syncline and at the north western margins of Shivta shoulder and Boker ridge. The bare rock on the site consists of configurations of Netzer, Menuha, Mishash, Arab, Takia, Adullam, Ahuzam and Loess covers with quaternary sands. The site is located at an area with a seismic coefficient lower than 0.080 ((PGA (g)). The nearest active position is the Tzin Fauly, about 17 kilometers south east of the site. Most recent tectonic activity in the site is wrinkle, and there is no evidence of activities younger than 30,000 years ago. Through the last century, only one earthquake with a magnitude of 3 on the Richter scale was reported in the radius of 20 kilometers around the designated site. Other earthquakes over 5 were reported during this period, but they're all located in the Dead Sea rift. There is a risk of increased soil fluctuations on site, in the case of a strong earthquake affected areas (Dead Sea rift). There is no danger to topographic elevations and landslides. Due to low groundwater, the likelihood of soil liquefaction is very low.

Infrastructure

There has been a mapping of nearby existing infrastructure. Most of the existing infrastructure is located along route 211. Infrastructure necessary for power plants are electricity, natural gas, water and sewage.

Electricity - Electricity infrastructure will be shared between the three plants. The plants will connect (through a joint switch) in a high voltage and upper lines electricity corridor alongside route 211 to Mashabey Sadeh electricity power plant.

Detailed design of electrical infrastructure pipelines to and from the site shall be submitted separately. Environmental review of electricity transmission line will be submitted at the same time with this survey.

Natural Gas - Terrestrial infrastructure is planned to transport natural gas from the existing system (Ramat Hovav) to Ashalim. In principle, the route passes along the existing road system, and adjacent to it. Placing the line in the designated plan area, will be in the natural gas pipeline corridor and along Route 211.

Planned natural gas line, according to National Outline Plan 37 with specific instructions, by Net Gas Company, is commissioned by the government. For the detailed design of the gas transmission lines, a report will be submitted separately.

Water - According to a preliminary examination, it appears that there is a need for 2 more water lines from Mashabey Sade to Ashalim plant, in order to provide the plant's water consumption. Water lines shall be designed and carried out by Mekorot Company.

Sewage - Sewage generated in the plan only comes from human activities. The entrepreneurs will have three options for removing small amounts of sewage generated on the site. If the selected

option will be establishing a wastewater sewer line from the plants to purification stations, it will be demarcated along route 211.

Nature, landscape and heritage values

An ecological survey was conducted on the site. Flora and fauna values within the site surroundings do not have unique importance and the plan is not expected to significantly harm nature - beyond the local damage.

Most of the area is rich (at this point) with open lands. Therefore, the program will not harm the movement of animals that can bypass the area without special problems.

By the BioGis database, at the site area (at about 5 kilometers from the site) there are only few rare plant species and these species are not limited to this area only. By the Parks Authority, at the north of Plot A (expansion area 1), there is a population of the Negev Iris – a protected species with limited circulation to sandy habitats in the western Negev and near Sinai {by "The Red Book" (Shmida & Pollack 2007), most likely, most of the populations are at risk or extinct in Sinai}.

Heritage - Archaeological survey at the site area was carried out by the Israel Antiquities Authority, and commissioned by the government. Conservation and rescue of archaeological sites in the site area will be carried out in coordination with the Israel Antiquities Authority and in accordance with requirements.

Chapter B: The reasons for prioritizing the proposed program

In 2002, the National Council decided to establish an inter-ministerial committee of experts, headed by Dr. Aharon Zohar, to examine alternative locations for the establishment of a solar power plant in southern Israel. The committee was to find a suitable area in southern Israel, in order to build a solar power plant with a capacity of 100 megawatts in the first phase, and in the future, after lessons will be learned from the operation of the plant with a capacity of 100 megawatts, it would be reviewed to increase its capacity to 500 megawatts. In 2002, the Zohar committee examined a number of sites as alternative areas, while scanning the Negev, south of latitude 590.

After examining a number of sites, Ashalim site was selected as the preferred solar power plant construction area, at an area of about 4000 dunam north of route 211.

On Feb. 3rd, 2004, the National Council decided to adopt the recommendation of the professional committee, regarding selecting "Ashalim" as the preferred site for constructing a solar power plant, and so the Council gave an order to create a National Outline Plan for the solar power plant in Ashalim, accompanied by an environmental impact assessment.

After examinations and lengthy discussions on how to promote the project, the government decided on Sept. 23rd, 2007 (decision no. 2390) and on Mar. 27th, 2008 (decision no. HC/38)), to establish in Ashalim site a solar power plant, operated by solar thermal and photovoltaic technologies, that will produce a total capacity of 250 megawatts approximately.

This capacity will be divided into two solar thermal power plants with a capacity of 80-110 megawatts each, and a photovoltaic

power plant with a capacity of 15 megawatts, with the possibility to add 15 megawatts.

Space requirements to the plants, based on the latest technologies, that include heat retention, are these:

C. Two areas of about 4,500 dunam each, for each of the solar thermal plants with a capacity of 80-110 megawatts each.
D. An area of 1000 dunam for the photovoltaic plant with a capacity of 30 megawatts, 500 dunam will be allocated to the plant with a capacity of 15 megawatts, and 500 dunam will be allocated to the possibility of expanding the plants in 15 additional megawatts.

Total of area needed, by the government decision and new technologies for storing heat, add up to about 10,000 dunam.

Based on these demands, it was necessary to increase the area designated to the plant in Ashalim.

The starting point for developing the alternatives was the northern polygon after it was approved by the National Council. This polygon contains approximately 4,000 dunam contiguous territory, flat and rectangular, and is suitable for a solar power plant, both in solar thermal technology and photovoltaic technology. Since the space required for each solar thermal plant is wider (about 4,500 dunam each), it was decided to use it for solar thermal power plant, while searching for a suitable completion area with approximately 500 dunam. Therefore, two alternatives were examined for extension of 500 dunam in Plot A, and it was necessary to explore alternatives in the plant area of about 5,550 dunam.

<u>Expansion alternatives for Plot A (500 dunam)</u> - The addition of space to the solar thermal plant was examined in the north of Plot

A (Alternative 1) and the west of Plot A (Alternative B). After examining the alternatives based on engineering, planning and environmental criteria, it indicated that the preferable alternative is Alternative number 2.

Alternatives to extension area totaling 5,500 dunam for another solar thermal plant (Plot B) - After appropriate alternatives were identified for the solar thermal plant and the photovoltaic plant north of route 211; it was left to find a space of the second solar thermal plant. Different locations were examined for the solar thermal plant from the east, west and north of Plot A, but they were disqualified for various reasons.

The starting point for this was the recommendation of the Professional Committee that operated in 2002, to locate a site south of route 211, and that its recommendations were adopted by the National Council. After coordination with the Defense Ministry, an area south of route 211 was selected.

Plants site requirements and location were approved by the National Council.

Chapter C: Description of activities resulting from the execution of the proposed plan

Ashalim complex will be built with 3 solar power plants: 2 Plants in solar thermal technologies in Plots A and B (total area of about 9000 dunam), and one in a photovoltaic technology in the PV (approximately 1,300 dunam).

Solar Thermal technologies - One or two of the technologies will be implemented on site:

1. A heat absorption system with parabolic mirrors (basin) combined with a thermal power plant.
2. A heat absorbing system combined with a solar tower and a thermal power plant.

Photovoltaic technology – In the photovoltaic plant, the solar radiation converts into electric current using photovoltaic cells by the photoelectric process. This technology will not be a thermal power plant, but a transformation plant for increasing the power voltage only.

Electricity generation in the solar thermal plants is done by a steam turbine that runs a generator with a capacity of 125 megawatts.

Production of steam from the heat generated in the solar field will be done by a water-oil heat exchanger through which it heats the water feed and produces steam to run the turbine. The heat exchanger is a made out of shell and tubes.

At the same time the steam produced in the steam turbine, it may produce more steam and / or use a super heating auxiliary boiler by burning natural gas (the super heating is for raising the temperature and increase the efficiency of electricity production). The amount of electricity produced by the use of natural gas is limited to 15% of the electricity produced annually. Another use of steam generated auxiliary steam boiler, is to ensure the appropriate temperature and oil storage systems to prevent solidification of the molten salt that is used in the heat transfer to the storage system and prevention of faults in the oil system.

Electricity production can also be done by using gas turbines running a generator with a capacity of about 25 megawatts, in which case the steam turbine will power a capacity of 125

megawatts. It is possible to use the heat in the gas turbine exhaust gases to create more electricity in order to create more electricity on the basis of using heat exchangers. Exhaust gases after the heat returns, if it exists, is released into the atmosphere through a chimney.

The location of electricity production plants was limited to the center of the solar thermal plants (Power Block).

Observation Points

In order to expose the solar plants, producing green energy, to the widest possible sections of the public and increase awareness of the existence and the principles of operation, and to make them also a tourist attraction in Ramat Negev Region, two observation points will be established in the plants: One observation point will be constructed to the west of Plot A and from there one could watch Plants A and PV, and another observation point will be to the north of Plot B, combined with an existing observation point called The French Commando Lookout. The location of the observation points were approved by the Ramat Negev Regional Council. The observation points will be constructed by the tender winners of the solar thermal plants.

Construction Work

Construction work will include various earthworks, preparing foundations for heliostats, construction of the power plants, placing and positioning receiver systems and infrastructure lines in the plants.

Rigorous evaluation was made of the extent of earthworks on the three sites. Planning was conducted in full balance between excavation and filling, without the need for importing external dirt or removal of excess soil outside of the plan boundaries.

Plot A: Alignment of the surface will be required to a gradient of 0.5%. For earthworks at an area of 4,500 dunam, that includes the entire area proposed in the plan, earthwork balance was approximately 4.5 million cubic meters. For the scenario of a rectangular solar field, not taking advantage of all the space allocated to the plan, earthwork balance was approximately 3.6 million cubic meters.

Plot B: Alignment of the surface will be required to a gradient of 5%. Two alternatives were examined to earthworks on the plot, when in alternative one, earthwork removed from the plan included two hills located on the northeast side of the area, compared to alternative 2 which also included the hills above. Volume of earthworks in the limited alternative: 1.6 million cubic meters, and the full development alternative: 2.1 million cubic meters.

PV Plot: Earthworks include easy alignment of the surface. Volume of earthwork totals 500,000 cubic meters.

Target removal of excess earthworks

Tenders contestants were given guidance on the establishment of power plants that each plant will be a closed economy in terms of excess dirt and contestants will have to find a solution to excess earthworks on site.

Excess dirt from three plots, if any, will be moved to other plots, that in within the three plots, and so they will use any excess dirt without taking it out of the boundaries of the site.
As long as it may be advantageous utilization of surplus material, or finding an optimal solution within the sites, it will require the approval of the relevant authorities, including the Ministry of Environment.

Air pollution prevention measures

85% of the electricity supplied to the turbine is solar sourced and does not cause any pollution. 15% of the electricity produced in a year, is produced by burning natural gas and diesel fuel in emergencies. Accordance with the requirements of the tender, emissions from fuel burning will not pass the required values in the Abatement of Nuisances Regulations (Prevention of Air Pollution from Power, 2010), depending on the cycle of electricity generation and fuel type.

The planned operating regime

Operating regime of the power plant is dependent on the solar radiation during the day and the storage capacity, should be included in the facility plan. That means, system administrator must buy all the electricity produced in the plant during its production. The plant is not managed by the system administrator as in conventional plants. In the tender, in order to build and operate the plants, it was defined that the entrepreneur will provide at least 70% of the annual electricity during high and medium priority hours and that at least 55% of annual electricity will be

provided in high priority hours. High priority hours are defined in the tender documents.

Operation of the turbine and electricity generating begins when the amount of radiation is sufficient to start the turbine in a low load. To stay ahead of the operating hours, it can increase the amount of heat supplied to the steam generating system by burning a certain amount of natural gas (by tender restrictions). Heat storage is usually performed by heating molten salt and storing it in a hot tank. The hot salt is pumped through a heat exchanger system where it transfers heat to the water feed in order to generate steam, and then it is pumped back to the cold tank. The cold salt tank is heated by solar heliostats and stored after heating in the hot tank. Storage system size is dependent on the number of hours that the plant will work - estimated at about 4,000 hours per year. Combined with the storage plant it will also work some hours during the night.

Backup system

Backup system in the solar thermal plants is composed of burning natural gas and liquid fuel systems (diesel fuel #2) and is designed for super heating steam (bringing the steam temperature to a maximum of 390 degrees Celsius by using a steam boiler) and raising the efficiency of the turbine, preventing salt solidification in the storage system on cold days when there is not enough heat to ensure proper temperature of the molten salt, keeping temperature of fluids in the system (HTF, liquid storage), and the possibility of working in emergency situations when there is no sun.

The amount of natural gas burning is limited for generating electricity, as long it doesn't exceed 15% annually and not more than 50% of electricity daily on any given day.

Backup of liquid fuel will be allowed in case of failure of natural gas supply to the plant. In this case, it will be allowed to use of diesel No. 2 to prevent salt solidification in the storage system, and maintaining the required properties of the heat transfer fluid, under certain restrictions. Backup fuel will be used only for saving the system survivability and not for electricity production, in cases the entrepreneur is allowed the use fuel are rigorous assessment evaluated by 2% of the annual heat (if liquid fuel is used during the whole year).

Cooling systems at the plants

Heat from condensing steam emitted from the turbines is transferred to cooled water that is swirled through condenser tubes. Three options were examined for removal of heat from the condensed cooling water: cooling by evaporation, dry cooling through water-air heat exchangers and hybrid cooling that combines the two methods above.

The alternative selected is hybrid cooling that allows saving of about 50% of the amount of additional water while causing a minimal impact to the electrical power produced in the turbine.

Water systems on site

Annual water consumption of three solar power plants is estimated at 2.5 million cubic meters. Water required for cooling towers,

washing heliostats, boiler feed, drinking water and sanitary purposes.

Source of water for various uses is fresh water, from sources that will be treated on site, for use in various water systems. Water Authority approved the allocation of consumption for the plants.

Measures to prevent infiltration of surface runoff from the environment

Water runoff management plan was produced for all three plants. The plan provides basic drainage arrangement solutions required from the implementation of the plan.

Impact of truck traffic

There has been an evaluation of the impact of traffic volume in the plants, due to their activities.

Phase of construction works: earthworks will be balanced, so there is no expectation of truck traffic to and from outside the site boundaries.

At placing equipment phase: 9,000 trucks were taken into account throughout half a year (20 vehicles per day).

Impact of truck traffic on roads near the plants was examined: Route 40, 211 and 222. Impact of the movement following the placing equipment phase is negligible: the main roads to the plants will function properly and there is no need to expand roads or rebuilt them.

Chapter D: Details and assessment of environmental impacts

Air quality

To assess the impact of the plant's operations on air quality, emissions and polluting particles prediction was carried out and into 3 phases of activities:

1. Construction phase - Dust emissions due to earthworks carried out in preparing the three sites.
2. Placing equipment phase - The truck traffic to and from the plants, during the placing of the heliostat systems and equipment in the plant (after preparing the surface area phase).
3. Operational phase - Emissions following solar thermal operations in the plant (backup gas burning).

The three phases have taken rigorous assessment of **activities of three plants simultaneously**.

1. Construction phase – Worst case scenario was taken into account in the extent of earthworks at three plants: Total 7 MCM. After running the model, two-hour TSP concentrations were abnormal in a number of receptors in Ashalim settlement.
2. Placing equipment phase - In this scenario, taken into account all truck traffic to and from plants, while placing heliostat systems and equipment in the plants (after preparing the surface area phase). It was found that concentrations of NO2, NOx and PM10 are negligible, and there were no standard deviations.

3. Operational phase – During operational phase of the Ashalim power plant there are expected pollutants due to burning natural gas to backup the steam turbine in the solar thermal sites. An operational scenario was defined, and represents the worst case scenario in terms of the effect of the turbines on air quality in the environment. Running the model found negligible concentrations of NOx, PM10 NO2, SO2, CO, and no standard deviations.

Noise

Construction phase

A prediction of the noise levels following the construction works and placing equipment. The works include the use of heavy engineering equipment and truck traffic to and from the site. It was found that the work noise levels are **significantly** lower than the criterions recommended by the Environmental Protection Office which stands at 60 dB (A) for outdoor noise-sensitive buildings.

Operational phase

A noise distribution rights report was prepared, in order to examine the noise distribution rights in the three power plants react near the noise receivers, so the level of the noise from the three power plants together will be correspondent with noise regulations. In this way, the determination of the noise budget for each plot and for each separate noise receiver allows setting clear criteria and do not depend on measurable acoustic properties of noise sources or terrain. For Ashalim project, the Ministry of Environmental

Protection has decided that the allowable noise level, as a result of all noise sources in the plan, within noise-sensitive use, would be 35 dB(A) inside a building with an open window. Accordingly, each plot was determined that the maximum noise level will allowed within a specific noise receiver.

A principle test was conducted to test the significance of noise levels in the receivers in the noise sites themselves. Considering the area of each site from the noise receivers and sound opacity in the soil, showed that a sound level of 115 dB (A) in all sites, which enables compliance with the required criteria.

Conditions that may cause fuel leakage in the fuel storage site

Liquid fuel storage at the plants will be a volume of 600 cubic meters tank (in each solar thermal site).

The following cases may lead to situations that have the potential contamination of surface water and groundwater following a gas leak: earthquake, failure in the sealing of fuel tanks in its location, unloading point failure, infection at the unloading point. In the case of a leak, Bessor River will be polluted and the Ovdat Group aquitrad. There is a danger of infection through the Coastal aquifer flow from the Bessor River. Potential contamination of the Judea Group aquifer and the Kornov Group aquifer is very small.

Measures and procedures for detecting and monitoring oil spills on site

To reduce the risk of soil and groundwater contamination from leaking fuel, operating manual will indicate instructions for operation and control procedures for the storage containers /

facilities of the oil, gas, and hazardous materials. The manual will include instructions for periodic storage tanks, piping and monitoring measures inspections as mentioned in the Water Regulations (Prevention of Water Pollution) (gas stations) 1997.

Number of fuel tanks and their volume

Each solar thermal site will include the following tanks:
Backup liquid fuel tank (diesel No. 2) with a volume of 600 cubic meters.
Thermal oil storage tank with a volume of 1800 cubic meters.
In addition, in each solar thermal site there will be between 2 to 6 liquid storage tanks with a total capacity of 20,000 cubic meters (this is an estimate. Exact amount will be given in the detailed planning phase).
The tanks will be built upon Water Regulations (Prevention of Water Pollution) (gas stations) 1997, and by the Water Regulations (Prevention of Water Pollution) (fuel tank farms) 2004, and the technical specifications for the establishment of a new filling station, March 2006, after the detailed design is decided whether the containers will be aboveground or underground.

Natural gas

For the transportation of gas to the plants, there is need for gas pipeline infrastructure. There is a terrestrial infrastructure plan to transport natural gas from the existing national transmission system (Ramat Hovav) to the site. Natural gas system to Ashalim will include the following elements:

- A national transmission system connection in Ramat Hovav.

- Underground 18" diameter gas pipe with a length of 30 kilometers in general
- Valves station in Mashabey Sade area
- Reduction Station (PRMS) in Ashalim site
- Underground gas pipeline from the reduction station to plots A and B

Risk survey and determining safety distances between gas facilities and pipeline infrastructure upon NOP 37 guidelines will be done by NetGas, and separately from this document.

Land use may be harmed as a result of the plants activities

After examining the main effects of plants operations - Air quality and noise - while operating the plants, it appears that the activity of the plants will not affect land use in the environment. No abnormal noise and air quality standards during operation of the plants. Effects of radiation from the electricity generation facilities system will be tested during building permits phase, but they are not expected to extend beyond the blue line of the program.

Abnormal concentrations of particles were found in the air quality model in the construction phase of the plants. This deviation will not be allowed during the construction of the plants, and operator of the plants must meet all the required air quality standards, even during the construction phase. Detailed instructions in this regard can be found in E chapter of the report. If during the building permits phase, there will be environmental impacts that were not reviewed during the survey or beyond that described in this survey, plants operators will need to address the impact of the plant operations upon useful land uses around the plants.

Possible effects of aircraft blinded by heliostats

Aviation survey was conducted in November 2009 by Dr. Moshe Tshuva - Head of Department of Mechanical Engineering in Afeka College in Tel Aviv; Dr. Vered Aharonson - civil pilot and a senior lecturer at Afeka College in Tel Aviv; Oren Kind - aviation adviser to the tenders to Ashalim power plants and a Ret. Air Force pilot.

The Air Force defined the restrictions height of the project in light of Air Force operations in the region. The survey was given these restrictions as a fact.

After analyzing the variety of elements expected to affect air operations, it indicates that the main impact of the plant on landing at the airstrip is:

During daytime - Unpleasant glare to pilots during landing to the south, but some still allow a safe landing.

During nighttime – The inability to land at the airstrip by Journal (a night vision system) and due to the anticipated external lighting of the plant. This effect is relevant for two-way landing at the airstrip. The vast majority of landings at the airstrip are at night.

Thus, in order to maintain the activity of the Air Force at the airstrip safely alongside the solar power plant, the survey recommended a number of actions, including arrivals, departures and coordination between plant sites.

In addition, the thermal signature analysis of the solar power plant was conducted with various technologies. There is no significant effect of thermal radiation on pilot's night vision systems.

Potential impacts resulting from the emission of heat radiation and solar surfaces

In order to assess the environmental impact of power plants in Ashalim on the nearby micro climate, a literature review was conducted, consultation with Prof. David Faiman director of the Center for the Study of solar energy in Sdeh Boker, and Eldad Dagan co-founder of Luz, which built the largest solar thermal plant in California about 15 years ago.

Survey did not reveal related literature, and after consultation with these experts, they do not know any written materials or evaluations made on this topic.

In environmental impact survey NOP 10 H/2 (photovoltaic power plant in Ketora) conducted by Adama Company, a thermal solar panel was measured, and found that "the panel did not heat its environment, and in fact, has almost no effect on the ambient temperature during daytime" (ibid., section 4.6.5).

In light of these findings, we did not observe an effect of the solar panels on the micro - climate around Ashalim.

Appearance

Plants visual analysis included simulations and visibility stations.

Database for visual analysis of the planned plants are engineering schemes provided by the technical consultants for the project.

A five kilometers radius was tested, from the center of the site. The assumption is that beyond five kilometers it is not significant, except for the towers, which are a high and prominent element, and they have a larger observation radius of more than 30 kilometers.

Ashalim settlement and route 211 will be exposed to the various facilities and to heliostats technologies. The towers in Plot B would be seen for more than 30 kilometers.

The effect of changes resulting from the construction of the plant and construction and appearance on the area

Ashalim environment will go through a dramatic change due to the construction of the solar power plants. Locations of the plants are relatively in flat regions and their boundaries touch mountain ranges, reducing the visual radius of most installations between mountain ranges. The main impact will be felt within Ashalim settlement and along route 211 for a distance of 10 kilometers.
Most of the disturbed area will be covered with repetitive elements, uniform appearance, arranged in rows or radii and can remind morphology terms of an agricultural field.
Appearance can be spectacular or depressing - depends largely on the eye of the beholder.

Possible measures designed to reduce damage and visual / landscape environment

Landscape environmental compensation

In a negotiation between the Accountant General at the Ministry of Finance and the Ramat Negev Regional Council, it was decided for an environmental compensation granted by the Regional Council tender winners, in order to care for the environment around Ashalim, as a result of the damage to the landscape environment due to establishment of the plants. Environmental

compensation includes a budget for the treatment of landscape outside the plants.

The budget will be transferred to the regional council, by the winners of the tenders in Plot A and B, and the council will be responsible for planning, implementation and maintenance of the landscape. Landscape treatment focuses on specific areas between the Plots and Ashalim settlement.

The nature of landscape treatment will be examined at the detailed plans phase and meet the desire and needs of residents.

Colorfulness

To deal with the appearance of the industrial-power block area, it is important to keep the color blends with the surrounding background colors.

The developer will be required to perform final color of the buildings and facilities upon detailed instructions of a landscape architect.

The intention is to create colors that blends with the spectrum of a desert and disappears as possible in the existing background.

Solar towers

There is no doubt that solar towers will be a prominent element in the observed and surveyed area. It is extremely important to create a tower which is an aesthetically pleasing architectural element that will be a positive landmark and symbol of renewable energy. Tender documents require the operator of the plant for an architectural competition for the design of the tower.

Evaporation ponds

It is required to place the various evaporation ponds along the topography lines in order to avoid as much as possible earthworks during construction of the ponds.
More landscape solutions will be detailed in the design phase.

Impacts expected due to earthquake

In the event that there will be a high magnitude earthquake which will affect the site, there might be infrastructure failure of the sealing of fuel tanks and thermal oil, the main cause for infection. In the case of a leak, Bessor River will be polluted and also Ovdat Group aquitrad. There is a danger of infection of the Coastal aquifer by the flow from Bessor River. Potential contamination of the Judea Group aquifer and Kronov Group aquifer is very small.

Measures for the prevention and treatment of infections following an earthquake

Diesel fuel and thermal oil tanks are the main source likely to pollute the land, in which a large amount to operate the plants in case of emergency. Tanks will be built on top of containers sealed with 110% capacity and resistance to corrosion and built according to the latest standards for resistance to earthquakes. All other hazardous substances in small quantities at the plant will be held in small containers on the bases and there is no fear of air pollution. Pipeline will be installed with an automatic disconnection system that will stop the flow of gas in every case of loss of pressure in the pipeline. In case of gas leak due to earthquake the

gas flow stops immediately. Each plant will be built according to the latest earthquake regulations.

Recycling of water

Each of the solar thermal plants and the photovoltaic plant are allocated with 0.2 million cubic meters of water annually, for washing heliostats / PV cells. Some of this water will evaporate and some of it will contain mostly dust and suspended solids. The developers will be required to collect the rinse water and recycle it after filtering sediments. At this point, it is not yet known whether the franchisee will use recycled rinse water in the system, or elsewhere. This information will be provided in the detailed design stage.

Expected impacts caused to the natural environment as a result of the construction phase

The plan does not include any damage that goes beyond its boundaries, beyond the flora growing inside the blue line.

Flora and fauna values within the plan do not have unique importance and the plan is not expected to significantly harm nature - beyond the local damage. Area Expansion No. 1 proposed in examining alternatives of Plot A which is not included in the plan, and therefore there will be no impact on the Negev Iris.

The plan will not affect significantly the spread of invasive species and regional ecological corridors (there are wide open spaces on all sides of the plan. Dimensions of the open spaces around the plan far exceed the dimensions of the plan).

The planned site is near major bird migration: the migration of storks in the spring and autumn migration of raptors. Large birds (such as storks and raptors) may be electrocuted when they stand on power lines and touch some wires.

There are no plants on the land suitable for copying.

Barrier fences of the plan should be high enough so deer (probably few) in the area shall not enter into the plants and will be trapped inside.

Fence lighting will not affect significantly the native fauna. However, it is recommended to use limited distribution lighting (cut off) to reduce light pollution. There is precedence for bulbs with high pressure sodium.

Bird electrocuting - on visible power facilities will be installed measures to prevent electric shock.

Chapter E: Plant regulations proposal

Chapter E includes recommendations of regulation proposals in order to reduce environmental hazards following the establishment and operation of the plants.

The main topics included in this chapter: air quality, noise, appearance, groundwater pollution, storage of hazardous materials, earthwork, drainage systems, operating the plant and building permit conditions.