

2023

Environmental Report



צילום: יוסי וייס

Israel Electric Corporation



חברת החשמל

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Introduction

Introduction

The Israel Electric Corporation (IEC) operates as an integrated and coordinated system that engages in all stages of the electricity supply chain, starting from the production of electricity, through its transmission and transformation, and ending with its sale and distribution to its customers. As a result, the IEC considers itself committed to the supply of available and high quality electricity from a variety of production sources available to the national electricity market, both by the IEC production system and by the production of independent power producers operates under to the Electricity Market Law that entered into force in 1996.

The Company has five primary fields of activity, which are known as segments in the Financial Statements:

- 1. Generation of Electricity in power plants activity** – The operations of the Company in this field includes all of the operations that are involved in the generation of electricity at the sites of the company.
- 2. Generation activity in the transmission and transformation of electricity segment** – The operations of the Company in this field include the transmission of electricity from the Company's generation sites and the independent power producers generation sites, using Electric over-voltage transmission lines (400 KV), to the company's switching stations, where the process of transformation to extra-high voltage (161 KV) is carried out and from there the continuation of the transmission of electricity is carried out via extra-high voltage (161 KV) lines to the substations. An additional second transformation from extra-high voltage (161 KV) to high voltage is carried out in the substations, and the energy is transferred to high-voltage grid through output transformers. In addition, they include supervision, Management, and control of the transmission and transformation system through the Transmission Supervision Unit, and operating, maintenance, and malfunction handling.
- 3. Generation activity in the electricity distribution segment** – The operation of the company in this field includes the transfer of electricity from substations to consumers via high-voltage lines and low-voltage lines, including metering of consumed energy at the customers' installations (electricity meters). This segment includes transformation from high voltage to low voltage, through tens of thousands of transformers.
- 4. Electricity supply** – The operations of the company in this field includes the collection and service system of the company, which is responsible for the preparation and production of invoices, collection activities and consumer services, including customer call service centers, customer reception and customer file coordinators.
- 5. Other activities** – Include the operations of the company as part of business entrepreneurship and the company's operation in the IBC communications enterprise.

We hereby respectfully present to you our annual environmental report for the year 2023. This report has been published voluntarily since the year 2000.

The report covers the principles of our environmental policy and our environmental indicators and goals, among other matters. Please note that the principles, indicators, and goals presented in this document are based on fundamental assumptions that may not materialize, or may materialize partially or differently than foreseen, due, among other matters, to circumstances beyond the Company's control (such as regulatory decisions, the composition of fuels, etc.). Accordingly, the principles, indicators, and goals may be updated from time to time.



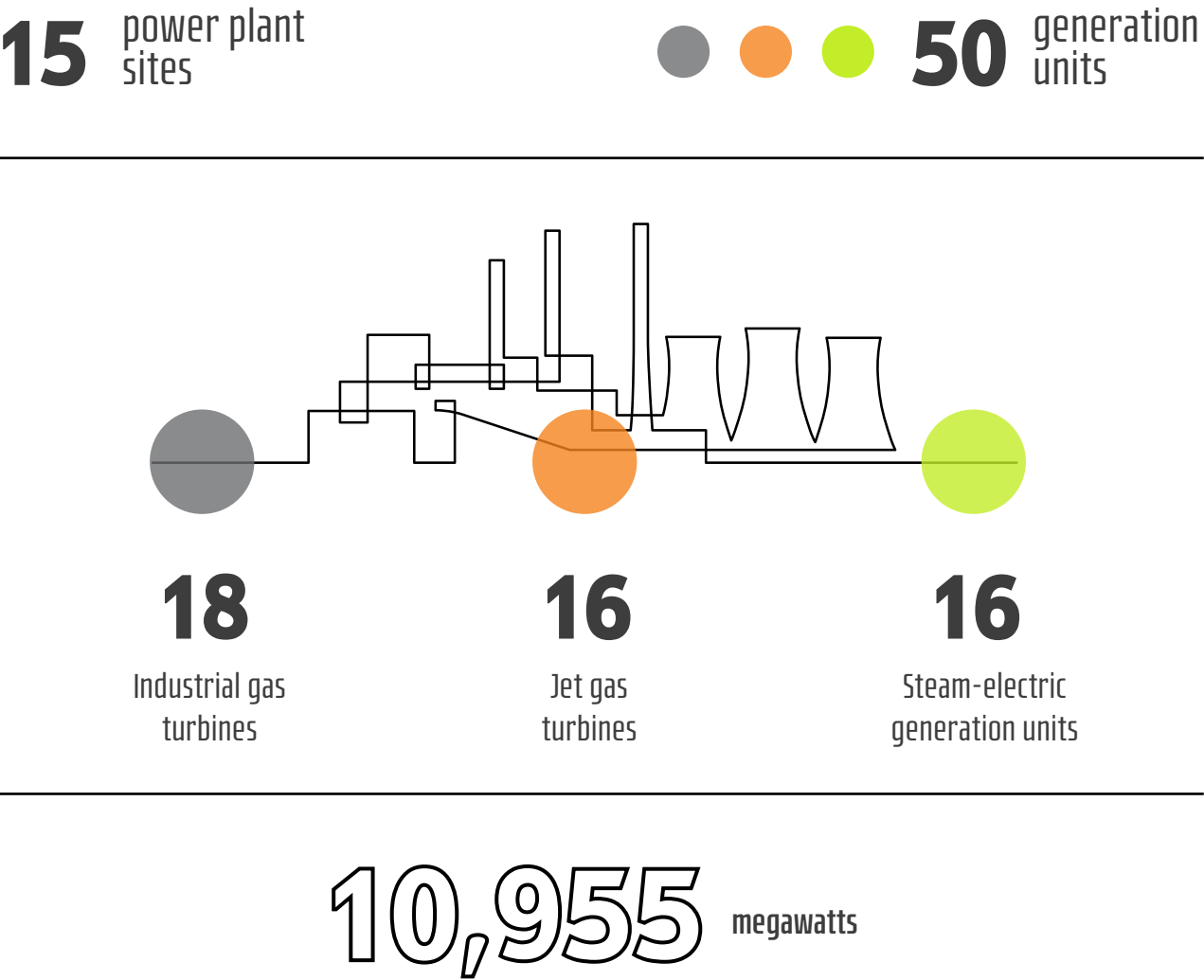
Chapter 1

The Electricity Generation Segment

The Electricity Generation Segment

The IEC’s electricity generation system is based on steam power plants and on jet gas turbines and industrial gas turbines, mostly combined-cycle gas turbines (CCGT).

The IEC generates, transmits, distributes, and supplies most of the electricity consumed by the Israeli economy, and holds an essential service provider license.



Steam-electric generation units:

The IEC's steam-electric generation units generate electricity using steam turbines (Orot Rabin, Rutenberg, Reading, Eshkol). All generation units are "dual fueled", except for Reading, which is exclusively operated by natural gas, and was shut down at the end of 2022. Some of the power plants are operated using coal as the primary fuel and heavy fuel oil as a secondary fuel, while others use natural gas as the primary fuel and heavy fuel oil as a secondary fuel.

In 2023, the IEC operated 16 steam-electric generation units.

Gas turbines:

These generation units generate electricity by the rotation of turbines with emission gases (gas turbines). Most gas turbines are "dual fueled," and can be operated using natural gas as the primary fuel source and with diesel fuel as a secondary fuel source. The gas turbines are divided into two categories, jet gas turbines and industrial gas turbines:

In 2023, the IEC operated 34 gas turbines, with the following breakdown:

16 jet gas turbines:

Gas turbines with a low installed capacity. At the IEC, each of the jet gas turbines' nominal capacity is up to 50 MW.

Because these generation units can be turned on and off relatively quickly, they serve as a quick, acute solution for surges in electricity demand. All jet gas turbine generation units are operated using diesel fuel only, and are considered as backup units.

18 industrial gas turbines:

Gas turbines are based on the same operation principles as the jet gas turbines, but their structure is different, so they can generate electricity at a larger scale.

The industrial gas turbines are divided into two categories:

- **Open-cycle gas turbines:** most units of this type use natural gas as the primary fuel source and diesel fuel as the backup fuel source.
- **Combined cycle gas turbines (CCGT):** a combination of an industrial gas turbine and a steam turbine. In the CCGT, the industrial gas turbine generates electricity as usual, and the residual heat from the emission gases is used to generate steam that moves the steam power turbine, to generate additional electric energy without using more fuel. This method improve fuel efficiency.

Table 1 below presents the breakdown of the generation sites and the installed generation capacity at each site:

Table 1: List of the IEC electricity generation units with their generation capacity (Megawatt on December 31,2023)

Unit Type	Site	Number of units	Installed capacity (megawatts)
Steam-driven power plants generation units			
Coal-powered units			
Coal - primary fuel Heavy fuel oil - secondary fuel (for Unit 5 and unit 6 only)	Orot Rabin (Maor David A, B)	6	2,590
Coal - primary fuel Heavy fuel oil - secondary fuel	Rutenberg	3	,1675
Total coal-powered units		9	4,265
Units converted to natural gas			
Natural gas - primary fuel Heavy fuel oil - secondary fuel	Eshkol	4	912
Natural gas - primary fuel Coal - secondary fuel	Rutenberg	1	575
Natural gas - primary fuel	Reading	2	428
Total steam units converted to natural gas		7	1,915
Total steam driven power plants generation units		16	6,180
Gas turbines			
Industrial gas turbines			
	Zafit	2	220
	Eilat	1	34
	Atarot	2	68
	Gezer	4	592
Total industrial gas turbines		9	914
Jet gas turbines			
	Hartuv	1	40
Jet gas turbines	Eitan	1	40
	Raanana	1	11
	Caesarea	3	130
	Haifa	2	80
	Kinarot	2	80
	Orot Rabin	1	15
	Rutenberg	2	40
	Eshkol	1	10
	Eilat	2	58
Total Jet gas turbines		16	504
Total gas turbines		25	1,418
Combined cycle gas turbines	Hagit	2	734
	Eshkol	2	771
	Gezer	2	744
	Zafit	1	360
	Haifa	2	748
Total IEC generation units		50	10,955

The Israel Electric Corporation's Environmental Protection Policy

The IEC considers itself responsible for and committed to adopting measures to preserve the environment and reduce environmental hazards throughout the electricity supply chain.

The Company operates in accordance with its strategic policy and environmental vision.



The IEC's environmental vision

The Israel Electric Corporation will act responsibly towards society and the environment, from a sustainable, long-term, forward-looking perspective. The Company will minimize the environmental impacts arising of its activity and demonstrate leadership in preventing hazards and reducing environmental footprint.

Principles of the Environmental Protection Policy

The Israel Electric Corporation operates according to the environmental protection policy principles first approved in 1997, as revised from time to time. These principles include:

1. Integrating environmental considerations across all fields of activity, as well as decision-making processes:

- Integrating environmental considerations while preparing the Company's development plans.
- Preparing environmental protection policy guidelines documents for main projects and activities.
- Integrating mandatory environmental parameters in the Company's procurement tenders.

2. Planning and operating the facilities while ensuring continuous mitigation of environmental impact, taking into account the sustainable development principles, while adopting the best proven and most cost-effective technologies:

- Adopting the best available techniques (BAT).
- Promoting the use of high-quality environmentally fuels – mainly natural gas.
- Promoting the installation and operation of facilities preventing and mitigating environmental impacts, such as the installation of air pollution control facilities at the coal-fired power plants for the reduction of sulfur dioxide emissions (FGD) and the reduction of nitrogen oxide emissions (SCR).
- Adopting the “prudent avoidance” principle to reduce electric and magnetic fields in the electricity transmission and distribution grids.
- Expanding the use of environmentally friendly materials.
- Carrying out regular monitoring and control on the environmental impact of land, air, water, and the sea.

- Performing monitoring data in real-time and information transparency for public access.
- Implementation of quality standards and an ISO 14001-compliant environmental management and control system.

3. Adopting advanced and proven environment protection standards:

- Deploying work teams to promote the perennial work plans and implementing them according to the environmental protection strategy policy of the company.
- Following national and global legislation and regulation and evaluating their future trends.
- Promoting active involvement in environmental legislation and regulation processes.
- Promoting the organization of the company management in the environmental protection field, using hierarchical supervision and establishing, inter alia, appropriate manpower and budget allocations, and writing of the relevant internal procedures.

4. Integrated management of natural resources and raw materials: land, air, water and fuels:

- Protecting air quality by mitigating pollutant emissions.
- Reducing land use when designing and building new facilities, optimizing its use in existing sites and promoting integration with other infrastructures.
- Performing routine activity for the purpose of saving fuels.
- Saving and integrating water resources.

5. Reducing and recycling waste and by-products:

- Waste management at the Company level and at the site level (reduction of waste production, increase of recycling, and reduction of waste disposal).
- Promoting beneficial uses of by-products: FGD gypsum, and coal ash.
- Promoting the uses of self-treated effluents and concentrate, and the use of poor-quality water from external sources.

6. Incorporating landscaping, spatial and environmental considerations in the design of new facilities and in the maintenance of existing facilities:

- Promoting activities for improving aesthetic aspects of existing facilities.
- Building new generation facilities, transmission facilities and transformation facilities, while taking in consideration the landscape and the environment.
- Including the participation of a landscape architect in the design of new projects already at the beginning of the process, for ensuring proper consideration for nature and landscape conservation.
- Rehabilitating the landscape and the natural environment within the project wrap-up.

7. Conducting an open and transparent dialogue with the public regarding plans that have environmental impacts:

- Ensuring the information transparency for the public with regard to our activities that have environmental consequences.
- Sharing and maintaining dialogue with the public with respect to planning procedures, concerning the location and licensing of projects.
- Working in cooperation and coordination with the environmental authorities at national, regional and local levels, in order to reach agreements in a continuous work process.
- Tightening and nurturing the existing relationships with environmental organizations.
- Maintaining contact with environmental NGO's -public and private associations.
- Publishing environmental reports annually.

8. mitigation of greenhouse gas emissions (GHG), in agreement with the principles of the international conventions signed by the State of Israel, by increasing the efficiency of power plants, expanding the use of environmentally friendly fuels and energy sources, and encouraging saving of electricity:

- Integration the usage of natural gas, which is considered as a clean fuel, as the primary fuel in existing power plants – in order to reduce the emission of pollutant , including reducing greenhouse gas emissions.
- Establishing high-efficiency generation facilities such as combined cycle technology power plants (CCGT), based on natural gas as the primary fuel. These power units are characterized by particularly low emissions of air pollutants, including greenhouse gases.
- Promoting activities for improving energy efficiency, both at the IEC sites and by advising the Company's customers regarding energy saving and wise use of electricity. These activities contribute to the reduction of the electricity demand thereby reducing the consumption of fuels used for generating electricity, and consequently reducing the emission of pollutants , including of greenhouse gases.

9. Joint activities in the field of environmental protection with academic institutions at national and international levels, including participation in researches and development of advances technologies:

- Assisting the State of Israel to fulfill commitments as part of international environmental protection conventions.
- Promoting and executing projects in the renewable energy sector, subject to the regulatory restrictions that apply to the IEC.
- Developing relationships with electric companies abroad.
- Allocating research and development budgets for environmental protection issues.
- Monitoring new technologies and their implementation.
- Promoting environmental innovation by supporting and guiding environmental research.
- Collaborating with research and academic institutions.

10. Integrating environmental values in the organizational culture, increasing environmental awareness and commitment of the Company's employees and integrating environmental issues in its activities in the community:

- Integrating environmental policy principles as part of the IEC organizational culture.
- Fostering awareness and commitment among the Company's employees to environmental issues and to the Company's activities and goals in this field.
- Integrating environmental issues in courses in the Company's training system.
- Initiating conferences, workshops, tours of power plants, seminars and activities on the Company's website.

The IEC has a management committee dealing with the environment, headed by the VP of engineering projects, with the role of updating the Company environmental policy from time to time.

The Company performs a dynamic process of setting goals and objectives in the environmental field. These objectives are set in order to operate in accordance with the requirements of environmental laws and regulations, and with consideration to environmental global trends, all that in view of its technological capability and the unique conditions in the surrounding the Company installations.

Environmental protection constitutes an integral part of the operation, maintenance, design and development of IEC facilities.

The Company activities are subject to extensive regulation in this field.

The Company **studies** the consequences of environmental laws, **acts** to prevent or mitigate the environmental risks that may connected with its activities, **makes preparations** to deal with the financial, legal and operational impacts of these environmental laws, and **allocates budgets** to fulfill the requests of environmental laws, existing or expected in the future.

צילום: אמיר ליבנה



Incorporation of quality standards and environmental management and control system

The management of environmental protection in the Company is based, inter alia, on a control system that operates through supervision and role definition, and includes, among other, staffing the required and relevant personnel, allocating required budgets and writing appropriate procedures.

In addition, the company has divisions certified for integrated management systems, as detailed below:

	ISO 9001	ISO 45001	ISO 14001	ISO 9301
Generation and Energy Division				
Logistics and Property Division				
Transmission Projects Division				
Generation Projects Division				
Transformation Projects Division				

ISO 9001 | Quality management system

ISO 45001 | Occupational health and safety management system

ISO 14001 | Environmental management system

ISO 9301 | Land transportation and shipping safety and quality management system

Promoting Environmental Awareness Among Employees

The IEC works to raise employees' awareness of the environment and sustainability, and conducts activities for its employees on various levels, including:

- Raising awareness at all work sites of the prudent use of water and electricity, through means including signage, indication of quantities of water saved through prudent use, and guidance on preventing blockages and damage of sewage systems at the various sites.
- Raising awareness of recycling and waste separation, including through encouraging the use of reusable dishes and through signs at the Company's sites encouraging recycling and waste separation.
- Development and implementation of curriculum on the topic of the environment for Company employees and managers, in order to raise awareness of this subject and to impart knowledge.
- Encouraging innovative projects for improvement of the environment and more efficient environmental performance in the Company's systems and processes.

Transparency: Public access to information regarding Environmental Issues



In accordance with the Free Access to Information Regulations (Providing Environmental Information For Public Review, 2009), the Israel Electric Corporation publishes on its website environmental information it has.

[Recent announcements published on the Company's website](#)

More information is available on the Israel Electric Corporation's website, among others in the following publications:

[Annual environmental reports since year 2000](#)

[Reporting within the framework of the voluntary mechanism on recording and reporting greenhouse gas emissions, mainly as a result of fuel combustion for electricity generation](#)

[A carbon dioxide calculator](#), allowing electricity consumers to calculate the quantity of carbon dioxide (CO₂) emitted into the atmosphere as a result of their electricity consumption for a given year and compare between different years. This calculator is based on the emission coefficients of fuel combustion for electricity generation, and refers to Israel Electric Corporation power plants only.

[Current financial statement for 2023](#)

[Environmental air pollution monitoring reports](#)

[Real-time environmental air monitoring data from the Ministry of Environmental Protection website](#)

[Reports in accordance with emission permits](#)

Relations with Stakeholders

For many years, the Israel Electric Corporation has engaged in a fruitful relationship and dialogue with stakeholders, including environmental organizations in Israel, and it considers maintaining this relationship of the utmost importance. The cooperation between stakeholders in general and the environmental organizations in particular and the IEC is carried out through a number of channels; among other things, the Company conducts roundtable discussions and special meetings with environmental organizations on various issues.

At the same time, the IEC works to raise employees' awareness of the environment and sustainability, and initiates activities for its employees on various levels.

Dialogue with environmental organizations

The Company started a tradition of roundtable discussions with the environmental organizations a few years ago. In this context, over the years, discussions are held on environmental issues related to the IEC's operations.

In 2023, the dialogue concerned, among other things, the Spreading Wings project described below, within a collaboration with the Nature and Parks Authority and the Society for the Protection of Nature in Israel.

Dialogue with the community on environmental issues

The Dialogue with the environmental community initiated by IEC is a strategic tool in creating shared value - social and/or environmental value for stakeholders together with business value. It reflects the Company's core values and its commitment to act with corporate responsibility, while listening to the needs that arise from the community.

In the first part of 2023, several interfaces on environmental topics were created with partners located near the Orot Rabin power plant in Hadera and the Rutenberg plant in Ashkelon:

- 2 dialogue sessions of IEC managers with students at Sami Shamoon College in Ashdod.
- A tour for the management of the Ashkelon municipality at the Rutenberg power plant.
- A meeting with the management of the Pardes Chana municipality.
- A tour for IEC personnel at Kibbutz Zikim.
- A roundtable on the closure of Units 1-4 at the Orot Rabin power plant, attended by the CEO of the Company, VPs, and representatives of the Sharon-Shomron Municipal Association.

Compliance with Environmental Regulation

The Company activities are legally exposed as a result of the various environmental effects due to these activities, like pollutants emission to the air due to fuel combustion, storage and use of hazardous substances and fuels, soil and water sources pollution, discharge of industrial effluents, asbestos, coal ash, noise, non-ionizing radiation, etc.

Therefore, the Company activities are subject to extensive environmental protection regulation. In recent years, the environmental regulation requirements (or in stages of legislation) applicable to the Company's operations are becoming much more stringent, as well as supervision and enforcement of these environmental requirements. The Company estimates that this trend is expected to continue and become even more stringent in the coming years, in accordance with awareness and international requirements, as well as, among other things, based on customary practice in Western countries.

The environmental protection laws that apply to the Company's operations include, among other things:

- The Prevention of Sea Pollution from Land-Based Sources Law
- The Hazardous Materials Law
- The Protection of the Coastal Environment Law
- The Clean Air Law
- The Prevention of Hazards from Asbestos and Harmful Dust Law
- The Freedom of Information Law
- Protection of the Environment (Environmental Emissions and Transfers - Reporting and Registers Requirements) Law And in addition the regulations promulgated under these laws; and various bylaws.

The Company studies the consequences of environmental laws, acts to prevent or minimize the environmental risks that may occur during its operations, prepares for the economic, legal and operational consequences arising from environmental laws, and allocates budgets in order for complying with the provisions of the applicable environmental laws and those that may apply to it.

The Company acts in accordance with an environmental vision, out of a sense of responsibility for the environment, from a long-term and forward-looking perspective, to minimize the environmental ramifications arising from its operations and to prevent hazards that may result from its activities.

Failure to comply with the provisions of the environmental laws and the terms and conditions of permits and licenses granted to the Company under them, may expose the Company and its managers to criminal and administrative risks, including the imposition of fines and sanctions, as well as to incurring costs for clean-up and restoration. In the Company's opinion, as at the date of this Report, it substantially complies with the essential legal provisions with

respect to the environment. The Company holds the environmental licenses required for its activities and where they are missing, it works to obtain them.

Environmental Costs and Investments of the Company in environmental protection

The following table presents information about the investments made by IEC in the environmental protection field for the years 2016 - 2023:

Table 2: Data on environmental protection costs and Investments made by IEC in the Environmental Protection field (NIS million, current prices after remeasurement deducted)] – for the twelve months ended on December 31

Year	2016	2017	2018	2019	2020	2021	2022	2023
Total investment in environmental protection facilities	765	831	610	465	470	427	482	761
Current costs (without depreciation)	105	88	82	142	156	170	177	157

Costs and Sums have rounded to the nearest ILS million measure

Investments in 2023

In 2023, the Israel Electric Corporation invested approx. **NIS 490 million** in the environmental aspects of the generation segment (with also approx. **NIS 270 million** invested in the transmission and distribution segments and in special projects), including by the installation of devices for reduction of emissions to the air at the Orot Rabin and Rutenberg power plants (such as "primary measures," FGD scrubbers, and catalytic SCR systems) and in conversion to natural gas at coal-fired Units 1-4 of the Rutenberg Power Plant and at coal-fired Units 5-6 of the Orot Rabin Power Plant .

In addition to the foregoing investments, in 2023 the Company spent, as part of the costs of operating the power plants and fuel related expenses, an amount of approx. NIS 154 million in order to comply with the requirements arising from environmental protection in the generation system (with also approx. NIS 3 million not attributed to the generation system). The Company estimates that most of the environmental costs incurred by the Company in 2023 were invested in future prevention and reduction of environmental damage, and the rest was invested in environmental clean-up and rehabilitating the environment.

Budget for 2024

The Company sets aside funds in its budgets to comply with pro-environmental conditions and legislation. In 2024, the Company allocated, within the framework of routine operating and development budgets, a total amount of approx. NIS 1027 million (deducted from measurement and depreciation) for the purpose of complying with environmental protection requirements, including activities for the protection of fauna and flora, the air, soil, groundwater and surface water, asbestos disposal, treatment of effluents, noise reduction, protection against radiation and waste treatment.

Conversion to Gas Budget

As part of the seven-year budget approved by the Board of Directors in November 2023, the Company allocated approx. NIS 1.75 billion to converting the coal-fired power plants to gas (6 generation units) for the entire said period. In 2024, an amount of approx. NIS 509 million was allocated for converting to gas.

The estimations of the IEC management regarding the planned scope of investment in environment protection are “forward-looking information”, as defined in the Securities Law, and are based on the Company's budget and work plans. These estimations might not be materialized, or be materialized partially, or in a different manner, as a result of factors not controlled by IEC. These factors include changes in the regulatory requirements applicable to the IEC, changes in the scope of generation activities of IEC and in fuels purchased by IEC for generation operations, and other events; including those resulting from the realization of the Company's risk factors.



Environmental Incidents in 2023

In 2023, a small number of environmental incidents occurred at the IEC, which were reported to the Ministry of Environmental Protection in accordance with the requirements of the permits and licenses issued to the Company.

Material environmental incidents are described in detail in the financial statements.



Chapter 2

Air

Use of Materials, Energy Consumption, and Energy Efficiency

The main raw materials that are used by the Company for the purpose of generating electricity are different types of fuels: coal, natural gas, liquefied natural gas, heavy fuel oil, and diesel fuel; In addition, the Company owns a fleet of vehicles that use gasoline and diesel fuel.

In the context of the use of raw materials (fuels) – it should be noted that for the electricity generation process, recycled input materials are currently not used. Projects investigating this possibility in the past are not relevant today because of the preparation toward the termination of the use of coal and the transition to using natural gas as the primary fuel source at coal-fired power plants.

Table No. 3 shows a breakdown of the fuel consumption and raw material consumption data in thousands of tons/thousands of liters and in Terra-Joule energy measurement units.

Most of the Israel Electric Corporation's fuel consumption is used to generate electricity.

According to the breakdown in the table, in recent years, a significant decrease occurred in the amount of coal used, and a significant increase occurred in the amount of natural gas used. This trend contributed to the significant reduction in air pollutant and greenhouse gas emissions, as described in the "Main Air Pollutant Emissions" chapter below in the report.

For information on the effort to reduce the consumption of gasoline and diesel fuel for transportation (for the Company's vehicle fleet), see details in the "Transportation and Distance Traveled" chapter, below in the report.

צילום: יוסי וייס



Table 3: Consumption of fuel by IEC for the generation of electricity and for the fleet of Vehicles, and consumption of raw materials 2017-2023

	2017	2018	2019	2020	2021	2022	2023
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Coal (based on financial reports publications data)

Thousand metric tons	8,200	7,800	8,300	7,200	6,400	6,300	5,200
TJ	205,001	194,994	207,504	180,003	160,003	157,503	130,002

Natural gas, including LNG (based on financial reports publications data)

Thousand metric tons	3,700	3,900	3,600	3,800	3,200	3,400	3,300
TJ	185,002	194,975	179,981	189,980	159,983	169,982	164,982

Diesel fuel (based on financial reports publications data)

Thousand metric tons	115	55	107	30	16	31	27
TJ	4,906	2,370	4,625	1,297	692	1,341	1,168

Heavy fuel oil (based on financial reports publications data)

Thousand metric tons	26	22	20	13	9	21	15
TJ	1,025	864	760	494	342	798	570

Limestone for use in FGD scrubbers

Thousand metric tons	44	66	78	73	59	68	50
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Gasoline for transportation (vehicle fleet of the company only)

Thousand metric tons	3,340	3,562	3,431	2,206	2,214	2,256	2,240
TJ	115	123	118	76	76	77	76

Diesel fuel for transportation (vehicle fleet of the company only)

Thousand metric tons	7,882	9,528	10,034	9,780	10,081	9,960	10,263
TJ	287	347	365	356	367	363	374

Tables No. 4 and 5 below present data on the summarized energy consumption by IEC and data on energetic efficiency, expressed as specific heat consumption for electricity generation. The improvement in the organization's energy consumption is due to combination of lower electricity generation volumes, and a respective decrease in the volume of fuel consumption to generate electricity, as independent power producers entered; and a simultaneous improvement in the energy intensity, i.e., the energy required to generate one MW per hour (MWh), as a result of the transition from generating electricity from coal to highly efficient combined cycle generation units operated mostly with natural gas.

Table 4: Total energy consumption by IEC, 2017 - 2023

	2017	2018	2019	2020	2021	2022	2023
Coal							
TJ	205,001	194,994	207,504	180,003	160,003	157,503	130,002
Natural gas, including LNG							
TJ	185,002	194,975	179,981	189,980	159,983	169,982	164,982
Diesel fuel							
TJ	4,906	2,370	4,625	1,297	692	1,341	1,168
Heavy fuel oil							
TJ	1,025	864	760	494	342	798	570
Gasoline for transportation (vehicle fleet of the company only)							
TJ	115	123	118	76	76	77	76
Diesel fuel for transportation (vehicle fleet of the company only)							
TJ	287	347	365	356	367	363	374
Power plants self - consumption of electricity							
TJ	6,666	6,501	6,614	6,294	5,776	5,922	5,171
Estimation of self - consumption of electricity in administrative and other sites							
TJ	216	216	216	216	216	216	216
Total (TJ)	403,218	400,390	400,183	378,716	327,455	336,201	302,560

Table 5: Energy Efficiency in the Electricity Generation segment:
Energy Intensity – Heat rate for Electricity Generation, 2015 - 2023

Year	Total thermal energy consumption for electricity generation (TJ)	Total electricity generation (MWh*1000)	Energy intensity – specific heat consumption for electricity generation (GJ/MWh)
2015	420,192	50,641	8.30
2016	397,706	48,718	8.16
2017	395,934	48,788	8.12
2018	393,203	47,905	8.21
2019	392,870	47,810	8.22
2020	371,774	44,363	8.38
2021	321,020	38,248	8.39
2022	329,624	39,286	8.39
2023	296,723	35,708	8.31

Table 6: Electricity self- Consumption of Power Plants, 2015-2023

Year	Actual generation (MWh*1000)	Self –consumption of electricity in power plants (MWh*1000)	Self – consumption from total generation (%)
2015	50,641	1,919	3.79%
2016	48,718	1,890	3.88%
2017	48,788	1,852	3.80%
2018	47,905	1,806	3.77%
2019	47,810	1,837	3.84%
2020	44,363	1,748	3.94%
2021	38,248	1,604	4.19%
2022	39,286	1,645	4.19%
2023	35,708	1,437	4.02%

Improving energy efficiency at IEC facilities

As part of the IEC's measures to improve energy efficiency, with the aim of maximizing cooperation as well as removing barriers, raising awareness of the importance of this issue among employees and managers, and allowing uniform reporting to Company management, an administrative unit was established in 2014, where a Company-wide team promotes energy efficiency projects. The team brings together all of the functions engaged with this issue within the Company. Some of the energy efficiency processes it has led at the Company's sites in recent years include the following:

- Improving energy efficiency in existing generation units
- Replacing old air conditioners with modern air conditioners with a high energy rating
- Replacing light fixtures with modern and energy-efficient fixtures

The unit operates based on a five-year plan for 2020-2024, at an estimated implementation cost of approx. NIS 23.6 million; the plan is expected to lead to a decrease of approx. 4.65% in electricity consumption, in comparison to the baseline year of 2013. Cumulative cost savings of approx. NIS 26 million are expected.

In 2023, NIS 4.29 million was invested in energy efficiency projects at the IEC, generating overall energy savings of more than 2.2 million kWh per year. The annual monetary savings are expected to reach NIS 1.8 million. The energy efficiency rate (the aggregate saving) compared with the baseline year 2013: 4.8%, of which 0.32% in 2023.

Within its five-year plan, the Company approved a budget of NIS 4.04 million for energy efficiency in 2024.

Environmental Emissions

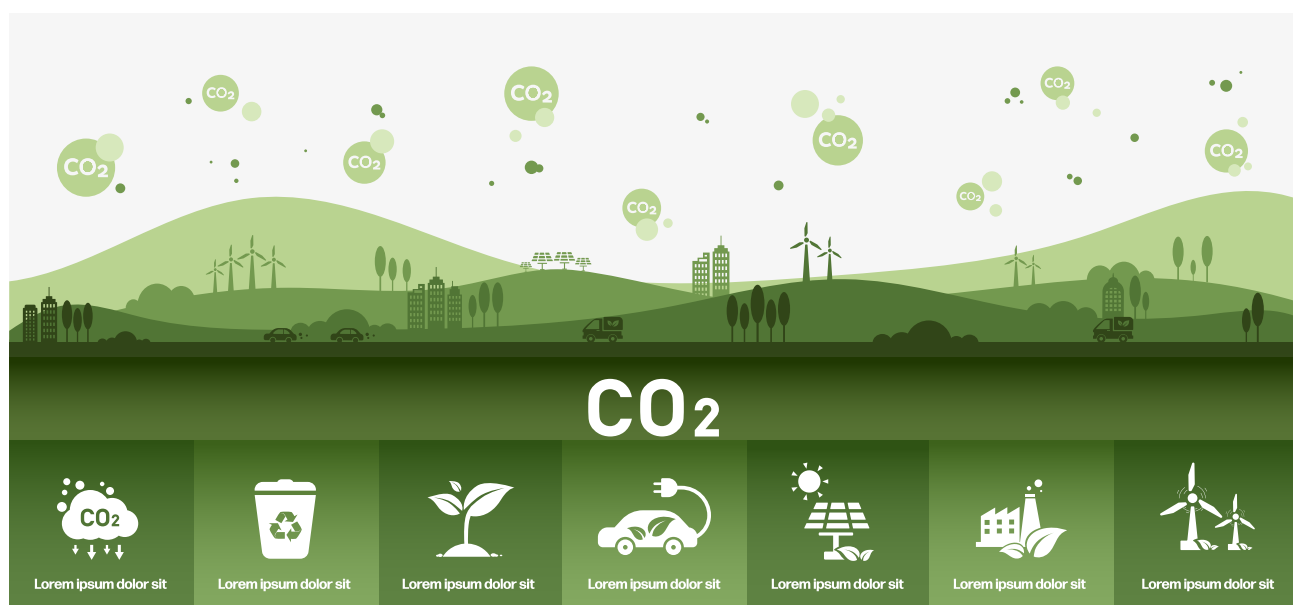
The Israel Electric Corporation recognizes that it is important to design and operate its facilities while making sure it continuously reduces the environmental impact and considers the sustainable development principles, while adopting the best technologies, environmentally and economically.

This chapter will survey the issue of air emissions from electricity generation sites, a fundamental issue for the Company in the context of environmental emissions.

Additional information is available in the report to the Ministry of Environmental Protection pursuant to the Protection of the Environment (Environmental Emissions and Transfers - Reporting and Registers Requirements) Law, 2012, submitted in 2023, on the data for 2022, for the 14 Israel Electric Corporation sites subject to the duty to report, through the digital form. The reports submitted in 2024, on the data for 2023, are expected to be published in the second half of 2024.

- [PRTR reports in the Israel Electric Corporation website](#)
- [Also published on the Ministry of Environmental Protection's PRTR website](#)

The report among other things, covers the quantities of materials emitted into the air, water sources, and to the soil (above the threshold values defined in the technical manuals); including the quantities of pollutants transferred in waste water to the environment routinely and during malfunctions, as well as the quantities of the different types of waste transferred off-site.



Main Air Pollutants Emissions

During the electricity generation process different types of gases are emitted to the atmosphere, as a result of fuel combustion. The main gases emitted are:

- sulfur dioxide (SO₂)
- nitrogen oxides (NO_x)
- particulate matter (PM)
- carbon dioxide (CO₂)

There is a trend of continuous reduction of air emissions due to the main following factors:

- expansion of use of natural gas, the sulfur content of which is negligible.
- Successful completion of the air pollution control project at the Orot Rabin site
- Successful completion of the air pollution control project at the Rutenberg site
- Beginning of conversion of coal-fired generation units to natural gas
- Operation of the CCGT units with particularly high efficiency
- Reduction in the use of coal according to the instructions of the Minister of Energy and according to emission permits instructions.
- Use of low sulfur liquid fuel only for backup.



Table 7: Data on electricity generation by fuel in the years 2012-2023

Year	Percentage of generation using coal	Percentage of generation using natural gas	Percentage of generation using liquefied natural gas LNG	Percentage of generation using diesel fuel	Percentage of generation using heavy fuel oil
	%				
2012	63.4	14.3	0.0	15.2	7.1
2013	56.2	36.5	4.1	2.6	0.6
2014	58.2	41.1	0.6	0.1	0.0
2015	57.6	40.3	1.3	0.7	0.1
2016	49.6	46.3	3.6	0.4	0.1
2017	45.2	48.5	5.0	1.1	0.2
2018	43.0	49.1	7.4	0.4	0.1
2019	45.8	45.1	8.0	1.0	0.1
2020	42.7	50.9	6.0	0.3	0.1
2021	44.3	53.1	2.4	0.1	0.1
2022	42.6	56.3	0.6	0.3	0.2
2023	36.8	62.9	0	0.2	0.1

The shift of electricity generation from coal and liquid fuels to natural gas can be seen in Table 7. It contributed to a significant reduction in emissions of air pollutants and greenhouse gases.



Table 8: Comparison of actual air emissions reduction rates (2023) versus the emission reduction targets for 2030

Pollutant emitted to the air as a result of fuel combustion for electricity generation	Emission reduction target (gr/kwh): 2030 compared to 2015	Actual emission reduction (gr/kwh): 2023 compared to 2015
Nitrogen oxides (NO _x)	-65%	-48%
Sulfur Dioxide (SO ₂)	-85%	-71%
Particulate Matter (PM)	-40%	-32%
Carbon Dioxide (CO ₂)	-30%	-12%
Carbon footprint (Co ₂ eq)	-30%	-12%



Table 9: Emissions of pollutants to the air as a result of Fuel Combustion for electricity generation by IEC in the years 2010-2023 (gram/kWh generated)

Year	Electricity generation (thousands of MWh)	NO _x emissions (gram/ kWh generated)	SO ₂ emissions (gram/ kWh generated)	PM emissions (gram/ kWh generated)	CO ₂ emissions (gram/ kWh generated)	CO _{2eq} emissions (gram/ kWh generated)
2010	56,102	1.60	1.50	0.051	699	702
2011	57,146	1.70	1.60	0.053	707	709
2012	61,074	1.80	1.68	0.056	754	757
2013	57,119	1.59	1.47	0.047	674	677
2014	51,726	1.42	1.36	0.035	659	661
2015	50,641	1.32	1.34	0.046	667	669
2016	48,718	1.07	1.08	0.042	635	637
2017	48,788	0.92	0.77	0.038	614	617
2018	47,905	0.88	0.63	0.032	605	608
2019	47,810	0.75	0.45	0.028	618	620
2020	44,363	0.75	0.41	0.030	615	617
2021	38,248	0.65	0.42	0.029	622	624
2022	39,286	0.64	0.39	0.028	614	616
2023	35,708	0.68	0.39	0.031	586	588
2023 vs 2015	-29%	-48%	-71%	-32%	-12%	-12%
2023 vs 2022	-9%	+7%	-1%	+13%	-5%	-5%

Table 10: Emissions of pollutants to the air as a result of Fuel Combustion for electricity generation by IEC in the years 2010-2023 (metric ton/year)

Year	Electricity generation (thousands of MWh)	NO _x emissions metric ton/ year)	SO ₂ emissions metric ton/ year)	PM emissions metric ton/ year)	CO ₂ emissions metric ton/ year)	CO _{2eq} emissions (metric ton/ year)
2010	56,102	92,324	82,860	2,873	39,214,127	39,375,206
2011	57,146	95,419	93,051	3,028	40,373,568	40,543,180
2012	61,074	109,920	102,648	3,403	46,035,963	46,240,061
2013	57,119	90,680	84,167	2,661	38,500,369	38,655,755
2014	51,726	73,577	70,423	1,835	34,069,079	34,207,232
2015	50,641	66,925	67,636	2,336	33,757,748	33,893,752
2016	48,718	51,888	52,663	2,041	30,938,165	31,055,231
2017	48,788	44,800	37,592	1,856	29,978,814	30,087,822
2018	47,905	41,957	29,951	1,516	29,006,456	29,109,700
2019	47,810	35,876	21,425	1,327	29,525,691	29,634,047
2020	44,363	33,116	18,198	1,317	27,300,821	27,387,896
2021	38,248	24,839	16,154	1,096	23,793,248	23,870,304
2022	39,286	25,094	15,435	1,089	24,120,681	24,197,590
2023	35,708	24,397	13,885	1,117	20,918,606	20,981,610
2023 vs 2015	-29%	-64%	-79%	-52%	-38%	-38%
2023 vs 2022	-9%	-3%	-10%	+3%	-13%	-13%

Table 11: Total Air Pollutant Emissions in relation to Sales Turnover 2012-2023

- NO_x Emissions Intensity (tons/USD million sales)
- SO₂ Emissions Intensity (tons/USD million sales)
- PM Emissions Intensity (tons/USD million sales)

Year	Total emission of NO _x from IEC power plant sites (metric tons per year)	Total emission of SO ₂ from IEC power plant sites (tons per year)	Total emission of PM from IEC power plant sites (tons per year)	Intensity of NO _x emission (tons/USD million sales)	Intensity of SO ₂ emission (tons/USD million sales)	Intensity of PM emission (tons/USD million sales)
2012	109,920	102,648	3,403	14.52	13.56	0.45
2013	90,680	84,167	2,661	11.40	10.58	0.33
2014	73,577	70,423	1,835	11.35	10.86	0.28
2015	66,925	67,636	2,336	11.33	11.45	0.40
2016	51,888	52,663	2,041	8.79	8.92	0.35
2017	44,800	37,592	1,856	6.65	5.58	0.28
2018	41,957	29,951	1,516	6.67	4.76	0.24
2019	35,876	21,425	1,327	5.03	3.01	0.19
2020	33,116	18,198	1,317	4.48	2.46	0.18
2021	24,839	16,154	1,096	3.49	2.27	0.15
2022	25,094	15,435	1,089	3.82	2.35	0.17
2023	24,397	13,885	1,117	3.58	2.04	0.16



The air pollution control project at coal-fired generation units of “Orot Rabin” and “Rutenberg” Sites

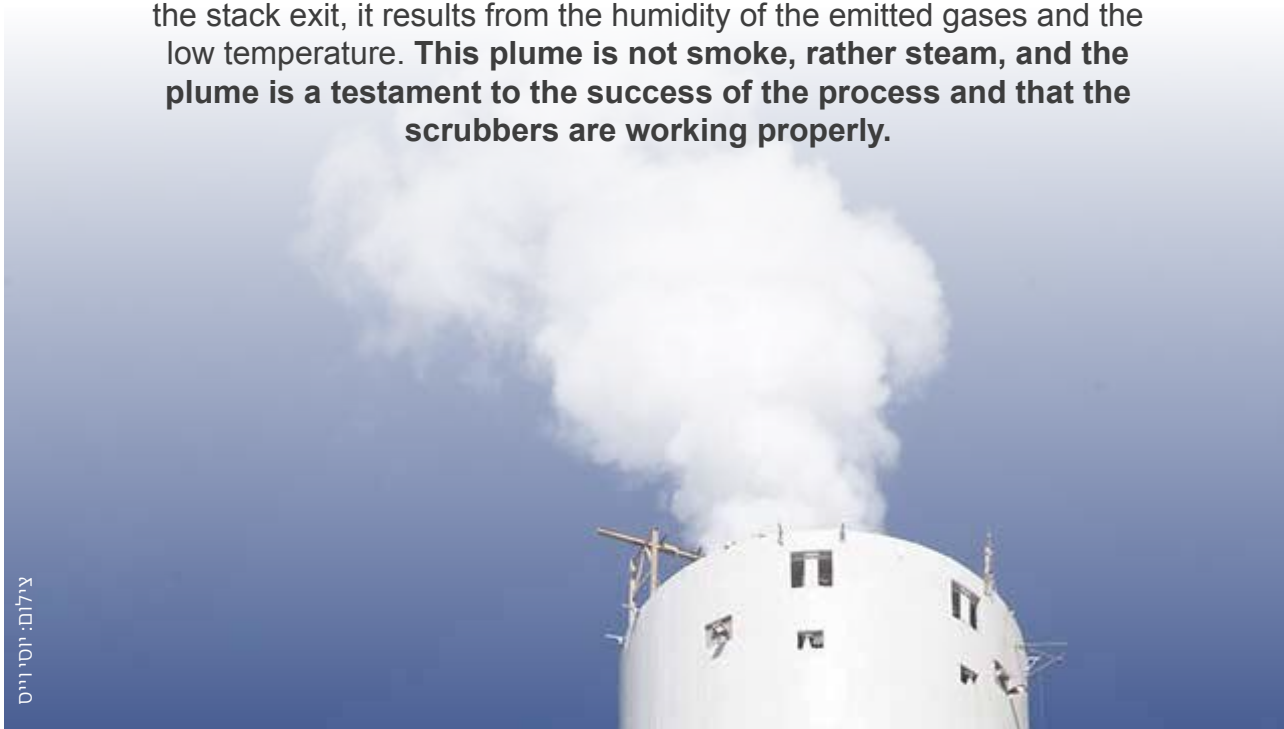
In the recent years, the Israel Electric Corporation has completed the building of facilities to reduce emissions at the coal-fired units at Orot Rabin site in Hadera (5-6 units) and at the coal-fired units at Rutenberg site in Ashkelon (1-4 units). This was a complex project that took several years to establish at a cost of approx. NIS 7 billion (not including interest during the construction period).

The projects at the Orot Rabin power plant in Hadera and Rutenberg power plant in Ashkelon, included an upgrade of all existing systems in these units (primary measures), and installation of flue gas desulfurization scrubbers (FGD), and the installation of selective catalytic reduction (SCR) systems for further reduction of nitrogen oxide emissions. The operation of the FGD scrubber is based on the reaction of the sulfur dioxide in the flue gas with limestone suspension in water. As a result of the "wet" reaction process, the treated gases are saturated with water vapors, and therefore a white plume can be observed from the stack exit, it results from the humidity of the emitted gases.

A by-product of the sulfur oxide elimination process is high-quality gypsum, which is appropriate for the cement and construction industry to which it is directed and for the manufacture of gypsum dry-wall.



As a result of the "wet" reaction process, the treated gases are saturated with water vapors, and therefore a white plume can be observed from the stack exit, it results from the humidity of the emitted gases and the low temperature. **This plume is not smoke, rather steam, and the plume is a testament to the success of the process and that the scrubbers are working properly.**



צילום: יוסי וייס

With the completion of this project, which is a milestone in the IEC's environmental investment, and the concurrent completion of the development of the natural-gas reservoirs and transmission system in Israel, in view of the principles of the Minister of Energy's policy of gradually converting coal-fired generation units to natural gas, the IEC began an additional project aimed at reducing emissions by converting coal-fired generation units to the use of natural gas. The project takes advantage of the investment made to upgrade all of the existing systems at the units (primary measures) and continuous operation of selective catalytic reduction (SCR) devices for further reduction of nitrogen oxide emissions.

Progress of the pilot project for the conversion of Rutenberg Unit 1, the first unit to convert to the use of natural gas, continued in 2023. Acceptance tests were also conducted to examine the work of the unit using natural gas (these tests have not been completed yet, due to the effects of the Iron Swords War). Concurrently, Unit 2 was shut down for the purpose of its conversion to the use of natural gas. The units will be operated using natural gas as the primary fuel, while retaining the capability to use coal in an emergency or during a shortage of natural gas.

Once this project is complete, based on the scope to be approved, the State of Israel will benefit from further reduction of emissions and alignment with its obligations to reduce emissions under the Paris and Glasgow Agreements, while maintaining a reliable and available power supply for the residents of Israel.

The Company has also started to examine technologies and long-term projects for carbon capture and for the use of hydrogen as a fuel in its generation units.

The IEC's Air Monitoring System

The IEC established and operates an air quality monitoring system, through which 25 air quality and meteorological monitoring stations operated in 2023 across various regions of Israel. The monitoring system is part of the national air monitoring network under the Clean Air Law, in which the Association of Cities for the Environment (Haifa, Hadera, Ashdod and Ashkelon) and the Ministry of Environmental Protection, industry representatives and the Israel Electric Corp participate.

IEC monitoring stations operated in the vicinity of the following power plants in 2023: 3 stations in the Haifa area, 3 stations in the Hadera area, 7 stations in the Tel Aviv area, 3 stations in the Ashdod area, 3 stations in the Ashkelon area, 4 stations in the Gezer area, and 2 stations in the Eilat area.

The air pollutants (all of them or some of them) that were measured in the Israel Electric Corporation monitoring stations in 2023 were: sulfur dioxide (SO₂), nitrogen oxides (NO_x), nitrogen dioxide (NO₂), ozone (O₃), and inhalable particulate matter (PM₁₀) and inhalable fine airborne particulate matter (PM_{2.5}). Measurements are also made of wind direction and speed, and other meteorological parameters at a number of sites.

Findings from the air quality measurements obtained from IEC monitoring stations in 2023 indicate that sulfur dioxide concentrations (a typical pollutant of coal, fuel oil or diesel fuel fired power plants) are declining, and are significantly lower than the environmental air pollutant standards pursuant to the Clean Air Regulations (Air Quality Standards) (Temporary Order), 2011. This is consistent with the reduction of emissions from the IEC's power generation units, as outlined above.

With regard to other air pollutants, in 2023 the various monitoring stations of the IEC recorded occasional concentrations of nitrogen oxides, nitrogen dioxide, ozone and particulate matter, which were relatively high and sometimes even higher than the air quality standards. These cases appear are not directly related to emissions from power plants. High concentrations of nitrogen oxides and nitrogen dioxide are associated with transportation sector, high concentrations of ozone are attributed to photochemical processes in the atmosphere, and high concentrations of fine airborne particulate matter were measured during dust storms and hazes.

During 2023, IEC continued the upgrading of monitoring devices, as well as the buildings and infrastructure at all existing monitoring stations.

This activity ensures the reliability and availability of the data.

The IEC's air monitoring laboratory is certified according to the ISO 17025 standard for monitoring and calibration of instruments and systems for monitoring environmental air quality.



Figure 1: Air Quality Monitoring Stations – National Distribution

■ Steam Power Plant ● Gas Turbine ● Air Quality Monitoring Station



Table 12: List of IEC air quality monitoring Stations and meteorology stations - 2023

Station name	Station address	Altitude above sea level (meter)	Measured parameters
Haifa area			
Carmel Central	Hugim High School, 4 Yair Katz St., Haifa	274(+20) m	SO2 NO2 NOX O3 w/s w/d
Carmel Park	Carmel Park office, Haifa	507 m	SO2 NO2 NOX O3 PM2.5 w/s w/d
Einstein	135 Einstein St., Haifa	363 m	SO2 NO2 NOX O3
Hadera area			
Katzir	Katzir Community Settlement	390 m	SO2 NO2 NOX O3 PM10 w/s w/d
Orot Rabin	Orot Rabin power plant site	13(+13) m	PM10 w/s w/d
Caesarea	Caesarea gas turbine site in front of Or Akiva	19(+7) m	PM10 w/s w/d
Tel Aviv area			
Yad LaBanim	Beit Yad LaBanim, 15 Maale HaBanim St., Ramat Gan	77(+14) m	PM2.5
Fire department	Fire station – 13 Ben Eliezer Street, Ramat Gan	50(+10) m	SO2 NO2 NOX O3
Bitzaron	Technical Center, 7 Krimnitzky St., Tel Aviv	17(+16) m	w/s w/d
Petach Tikva Road	Old Central bus Station, 13 Petach Tikva Road, Tel Aviv	28(+20) m	SO2 NO2 NOX O3 PM2.5 w/s w/d
Antokolsky	People's University, 4 Antokolsky, Tel Aviv	34(+20) m	SO2 NO2 NOX O3 PM2.5
HaMashtela	HaMashtela, Meteorology Tower, National Supervision, Ramat HaSharon	65(+10+65) m	NO2 NOX O3. SO2 Temp at two altitudes + w/s w/d
Shikun Lamed	Aran School, 25 Burla St., Tel Aviv	17(+15) m	PM10
Ashdod area			
Nir Galim	Nir Galim village	20 m	SO2 O3 PM10 NO2 NOX w/s w/d
Gan Darom	Gan Darom village	45 m	SO2 NO2 NOX O3
Yavneh (City)	Clalit health maintenance organization, HaDekel Street, Yavneh	38(+15) m	SO2 NO2 NOX O3 PM10 w/s w/d

Station name	Station address	Altitude above sea level (meter)	Measured parameters
Ashkelon area			
Bat Hadar	Hof Ashkelon Regional Council	59(+4) m	SO2 NO2 NOX O3 PM10
Kfar Menahem	Tzafit High School, Kfar Menahem	119 (+11) m	SO2 NO2 NOX O3 w/s w/d
Luzit	Luzit village, Farm 14	189 m	SO2 NO2 NOX O3 w/s w/d
Gezer area			
Beit Hashmonai	Herzog High School, Beit Hashmonai	103 m	SO2 NO2 NOX O3 w/s w/d
Karmeit Yosef	Commercial Center, Karmeit Yosef	260 m	SO2 NO2 NOX O3 w/s w/d
Modiin	Mekorot Facility, Modiin	267 m	SO2 NO2 NOX O3 PM10 w/s w/d
Achisamakh	Achisamakh village	80 m	SO2 NO2 NOX O3 w/s w/d
Eilat			
Eilat Office	IEC regional office, Eilat	68(+10) m	w/s w/d
Eilat Goldwater	Goldwater High School, Eilat	49(+15) m	SO2 NO2 NOX O3 w/s w/d

Sulfur dioxide – SO₂
 Nitrogen oxides – NO_x
 Nitrogen dioxide – NO₂
 Ozone – O₃
 Respirable airborne particulate

matter – PM₁₀
 Fine respirable airborne particulate matter – PM_{2.5}
 Wind direction – w/d
 Wind speed – w/s



IEC monitoring and Sampling system of Pollutant Emissions from the Stacks of Power Generation Units

In accordance with the emission permit requirements for the Company's generation sites, the IEC operates systems for continuous monitoring of pollutant emissions from the stacks of the generation units. The data is transmitted online and in real time to officials of the Ministry of Environmental Protection. In addition, various operational data are also transmitted.

The Company also operates a manual sampling system in accordance with the stack sampling procedure and work plan approved by the Ministry of Environmental Protection. The manual sampling is also used to calibrate the continuous air pollutant monitoring systems, which are installed in the stack.

Sampling is performed by the Laboratory for Sampling Pollutants at Source, at the IEC's Department of Environmental Monitoring, which is ISO 17025 certified for sampling pollutants and calibrating the continuous monitoring systems in the stack.



Climate change mitigation and adaptation

In 2016, the state of Israel signed the Paris Agreement, according to which, the government policy for reducing greenhouse gas emissions was established. For the purpose of implementing this mitigation policy, several national targets were set, **including electricity generation target from renewable energies, which was revised in 2020 and stands at 30% out of the total electricity generation in the Israeli sector by 2030.**

According to State of Israel Governmental [Resolution No. 171](#) dated July 25, 2021) “Transition to low carbon economy”:

State of Israel – National Targets:

Reduction of absolute annual greenhouse gases emissions:

- By at least 27% by 2030, from the annual quantity measured in 2015.
- By at least 85% by 2050 from the annual quantity measured in 2015.

Sectoral targets for Electricity including IEC and IPP's

(IPP'S= independent power producers)

Reduction of absolute annual greenhouse gases emissions from electricity generation:

- By approx. 30% by 2030, from the annual quantity measured in 2015.
- By at least 85% by 2050 from the annual quantity measured in 2015.



The Israel Electric Corporation is joining the national effort to achieve these targets, focusing its effort in the following areas:

- 1. Expanding the use of natural gas** – the Israel Electric Corporation expanded the use of natural gas from approx. 14% of the electricity generated in 2012, to approx. 63% of the electricity generated in 2023. The combustion of natural gas is characterized by significantly lower emissions of carbon dioxide as compared with the combustion of coal and liquid fuels.
- 2. Minimizing the use of coal** – since 2016, restrictions were imposed on electricity generation from coal combustion, according to the instructions of emission permits under the Clean Air Act, and in accordance with the Ministry of Energy's instructions. In 2023, electricity generation from coal-fired power plants was reduced by approx. 55% compared to 2015.
- 3. Constructing combined cycle generation units CCGT** – combined cycle generation units generate additional electricity from the steam-electric turbine by utilizing the residual heat from the gases emitted from the gas turbine with no need for additional fuel consumption. Meaning, the units utilizing this technology have an extremely high efficiency rate, resulting lower air pollutants and lower greenhouse gas emissions. In addition to the combined cycle generation units that are already operational, two combined cycle generation units using the extremely efficient state-of-the-art H technology, are currently under construction at the "Orot Rabin" site near Hadera. These units will be operated with natural gas as the primary fuel and diesel fuel as a backup fuel, and are expected to emit substantially lower quantities of air pollutants and greenhouse gases than the four old coal-fired units at the Orot Rabin site.
- 4. Conversion of coal-fired units to the use of natural gas as a primary fuel** – A pilot project for the conversion of Rutenberg Unit 1 to the use of natural gas was promoted in 2023. Subject to the results of the pilot project for the conversion of Rutenberg Unit 1 to natural gas, and the approval of the relevant officials, the large coal-fired units will make the transition to the use of natural gas as their primary fuel, retaining the ability to use coal only for emergencies and during natural-gas shortages. Once this project is complete, if and according to the amount approved, a further reduction in emissions is expected, as well as cooperation with the State of Israel's obligations under the Paris Agreement, while maintaining a reliable and available power supply for Israeli residents that is, at the same time, cleaner and more environmentally friendly. The government's target is to stop using coal to generate electricity till 2030.



צילום: יוסי וייס

Integration of renewable energy in the power grid

The IEC is preparing to upgrade its network to allow the intake of 30% of generation using renewable energy by 2030.

Although the IEC is prohibited from generating electricity from renewable energies due to the regulatory restrictions that apply to it, the Company contributes to the implementation of the above-mentioned governmental targets by connecting renewable energy generation facilities of independent power producers to the power grid. These independent power producers sell the excess electricity that they produce to the IEC, and thus, through an electricity transmission and distribution grid, more "green" electricity reaches all electricity consumers.

The IEC is conducting comprehensive analyzes regarding the implications of integrating the renewable energies generation facilities into the electricity system in all the segments, including the implications for the development plan required in preparation for meeting government goals. Furthermore, NOGA (the independent system operator) and the IEC published, in accordance with the guidelines of the Israeli Electricity Authority, a large number of feasibility studies regarding various initiatives in the sector and even updated the master plans accordingly.

In 2023, the IEC connected private generation facilities using renewable energies with an installed generation capacity of 912.6 MWp in distribution system and 269.2 MW in transmission system.

We shall note that as of the end of 2023, the total installed capacity of the renewable energy means of electricity generation was approx. 6,067 MWp

(including facilities in the Palestinian Territories), an annual consumption capacity equal to approx. 14.6% of the annual average consumption.

In addition, it is noted that the actual overall consumption of means of electricity generation using renewable energy totaled approx. 8,970 million kWh [GWh] in 2023, or approx. 12.5% of the total actual energy consumed in the electricity sector (the IEC and independent power producers).



צילום: יוסי וייס

The Company is preparing to continue the upgrade and the development of the grid to allow the intake of renewable energies on a large scale. A substantial investment of resources in the transmission and transformation segment and in the distribution segment is necessary in order to meet the targets for the integration of renewable energies into the power grid. As the transition from centralized to decentralized production, in addition to increased generation capacity, requires the expansion and renewal of these systems.

The IEC is conducting comprehensive analyzes regarding the implications of integrating the renewable energies generation facilities into the electricity system in all the segments, including the implications for the development plan required in preparation for meeting government goals.

The Company is formulating a long-term development plan for the electrical grid for 2030, including:

- Development of the transmission and transformation segment - by upgrading the transmission lines and the transformation capabilities.
- Development in the distribution segment such that it supports the expansion of the incorporation of independent power producers, an increase in the number of decentralized generation facilities to the grid and other projects.

Energy storage

The Energy Storage Administration was formed in 2019, as a professional team acting in accordance with the guidelines of a steering committee headed by the Deputy CEO, VP of Network Services. The administration performs comprehensive activities to compile information regarding global trends in storage, technologies, and regulation; formulate business models for the promotion of plans to integrate electrical energy storage; create collaborations with academia; and conduct feasibility tests, including simulations and system analyses, develops and provides assistance to construction projects of IEC's storage facilities.

On January 25, 2023 the Israeli Electricity Authority published a resolution that provides details as to the principles according to which the Company will be allowed to build storage facilities through 2030, and the volume of such storage; this pertains only to facilities to be built within substations and subject to receipt of a storage license. The resolution stipulates that the Company's market share will not exceed 15% of the total volume of storage promoted by the private sector in the previous year; the resolution also stipulates that as a general rule - the deployment of the storage facilities shall be made in accordance with a plan that will be approved by NOGA (the independent system operator) and under its guidance, supervision and controls. The volume of storage allocated to the Company shall be calculated by the authority every first quarter of each calendar year starting in 2024 and until 2030, and will remain unchanged until the end of each calendar year. However, the authority has set a preliminary quota for the building of storage facilities, with a capacity of 150 MW (AC), such that the Company will not be allocated further storage volume until the aggregated storage

volume that is promoted by the private sector shall exceed 1,000 MW (AC). In addition, it was stipulated that both the Company and the system operator shall issue an annual report that includes data for the purposes of monitoring of and control over the implementation of the principles of the resolution.

The extensive activities conducted in this area over the last year covered a range of topics, applying methods at the forefront of the technologies currently used in storage facilities across the world. This is done in order to study, promote and implement the best technologies in the field of storage, while incorporating pilot facilities using various technologies that will constitute an essential basis and a solid component for the survivability and stability of the grid.

Among other things, these activities included:

- Promotion of a tender for the acquisition of 5 storage facilities for substations in the southern district;
- Mapping and search for potential stations for the setup of additional permanent storage facilities;
- Activity with NOGA (the independent system operator) and the Israeli Electricity Authority;
- Work on optimal locations for the setup of storage facilities;
- Examination and promotion of a pilot project on mobile storage stations, and additional pilot projects.

The Israel Electric Corporation's Activities to Climate Change adaptation and deal with its consequences

Alongside the targets set and measures taken to reduce emissions of greenhouse gases, as described above, the Company is working to contend with climate change. Periods of extreme weather (unusually severe winters or hot summers) may affect the extent of demand for electricity, as well as the reliability and continuity of supply for customers. The Company is continually preparing, based on an ordered methodology, to deal with such extreme conditions; preparations for summer are conducted in accordance with Company procedures, in terms of the availability of generation units as well as an available inventory of fuels. The Company also prepares for peak periods in the summer and winter seasons through maintenance and renovation of generation units at a level that ensures their reliability. In addition, at the end of 2021, the Company's CEO appointed a steering committee charged with preparedness for extreme weather. The committee is headed by the CEO, and each sub-committee is headed by the relevant VP. At the same time, the CEO named preparedness for extreme weather as a main topic of the work plans for 2022.

The committee defined the weather phenomena that might put the Company's infrastructures in danger, and prepared a preliminary list of activities that each committee (division) will wish to execute. The activities were divided into ones that may be executed in the short-term (up to 5 years) and long-term activities (over 5 years).

In 2023, the Company received national scenarios for extreme weather phenomena. In response, the Company's divisions - as part of their activity in the steering committee - are creating work plans to prepare for the changes in weather, in each of their respective fields.

Concurrently, the Company conducts drills for extreme weather incidents, creates work plans toward handling such events to increase its preparedness, purchases suitable equipment, and maintains a dialogue with the Ministry of Energy, the Israeli Electricity Authority and other infrastructure entities, to coordinate activities and enhance our ability to provide operational continuity in the electricity sector, if these stress events take place.



Greenhouse Gases Emissions – Israel Electric Corporation Reports to the: “Voluntary mechanism project for registering and reporting Greenhouse Gas Emissions”.

Since 2010, the IEC has taken an active part in the Ministry of Environmental Protection: “Voluntary mechanism project for registering and reporting Greenhouse Gas Emissions”. This mechanism, established by the Ministry of Environmental Protection, allows participating companies to be partners in the formulation of reporting regulations, as well as to get experience in gathering and processing the necessary information for reporting.

Details of the different calculation methodologies determined within the registry are available on the [Samuel Neaman Institute website](#).

Since 2000, the IEC continuously reports about GHG emissions resulting from fuel combustion for electricity generation, as part of its environmental reports. These emissions account for about 99.5% of all direct GHG emissions resulting from the IEC's operations.

Reports of the IEC to the [“Voluntary mechanism project for registering and reporting Greenhouse Gas Emissions”](#) can be found on the Israel Electric Corporation (IEC) website.

Note: The report for 2023 is made according to the Ministry of Environmental Protection request, and it will be published accordingly later in 2024.

Table 13 shows the distribution of greenhouse gas emissions in the reports to the “Voluntary mechanism project for registering and reporting Greenhouse Gas Emissions” for 2021 to 2023. It confirms that the vast majority of direct greenhouse gas emissions by the Israel Electric Corporation are due to fuel combustion for electricity generation.

Table 13: Distribution of direct greenhouse gases emissions by sources, reported to the framework of the voluntary mechanism reporting project of the Israel Ministry of Environmental Protection 2021- 2023

Year	Source of greenhouse gas emissions – direct emissions (Scope 1)		Measurement units
	Total direct emissions as a result of fuel combustion for electricity generation	Total direct emissions <u>not resulting</u> from fuel combustion for electricity generation *	
2021	23,870,304	119,327	Metric ton CO ₂ eq
	99.50%	0.50%	% of total direct emissions
2022	24,197,590	126,132	Metric ton CO ₂ eq
	99.48%	0.52%	% of total direct emissions
2023	20,981,610	119,596	Metric ton CO ₂ eq
	99.43%	0.57%	% of total direct emissions

* Mainly emissions from:

- Vehicle fleet emissions
- Sulfur Hexafluoride emissions
- Emissions from the chemical process in the FGD scrubbers

Table 14: IEC'S greenhouse gases emissions reported to the framework of the voluntary mechanism reporting project of the Israel Ministry of Environmental Protection for the years 2010-2023

Year	Scope 1 CO ₂ eq emissions [metric tons]	Scope 2 CO ₂ eq emissions [metric tons]	Scopes 1+2 CO ₂ eq emissions [metric tons]
2010	39,467,669	1,568,718	41,036,387
2011	40,661,709	1,558,797	42,220,506
2012	46,366,484	1,838,728	48,205,212
2013	38,762,789	1,547,592	40,310,381
2014	34,312,517	1,811,959	36,124,476
2015	33,997,496	1,476,177	35,473,673
2016	31,152,001	1,429,760	32,581,761
2017	30,188,779	1,386,878	31,575,657
2018	29,227,942	1,349,698	30,577,640
2019	29,761,504	1,391,330	31,152,834
2020	27,513,268	1,318,812	28,832,080
2021	23,989,635	1,228,350	25,217,985
2022	24,323,722	1,257,361	25,581,083
2023	21,101,205	1,078,577	22,179,783

Table 15: IEC'S greenhouse gases emissions reported to the framework of the voluntary mechanism reporting project of the Israel Ministry of Environmental Protection for the years 2010 to 2014 – breakdown of the direct emissions according to the types of the greenhouse gases

Type of gas	2010 emissions [metric ton CO ₂ eq]	2011 emissions [metric ton CO ₂ eq]	2012 emissions [metric ton CO ₂ eq]	2013 emissions [metric ton CO ₂ eq]	2014 emissions [metric ton CO ₂ eq]
CO₂ (carbon dioxide)	39,272,597	40,440,866	46,108,389	38,554,817	34,123,738
N₂O (nitrous oxide)	150,993	158,381	188,309	145,145	128,097
CH₄ (methane)	10,930	12,178	16,770	10,904	10,684
SF₆ (sulfur hexafluoride)	33,149	50,283	50,519	51,922	49,998
Total metric ton CO₂eq	39,467,669	40,661,709	46,363,988	38,762,789	34,312,517

Table 16: IEC'S greenhouse gases emissions reported to the framework of the voluntary mechanism reporting project of the Israel Ministry of Environmental Protection for the years 2015 to 2023 – breakdown of the direct emissions according to the types of the greenhouse gases

Type of gas	2015 emissions [metric ton CO ₂ eq]	2016 emissions [metric ton CO ₂ eq]	2017 emissions [metric ton CO ₂ eq]	2018 emissions [metric ton CO ₂ eq]	2019 emissions [metric ton CO ₂ eq]	2020 emissions [metric ton CO ₂ eq]	2021 emissions [metric ton CO ₂ eq]
CO₂ (carbon dioxide)	33,810,454	30,983,438	30,027,557	29,070,696	29,596,988	27,366,625	23,852,085
N₂O (nitrous oxide)	125,834	107,533	99,394	94,042	99,030	77,263	68,626
CH₄ (methane)	10,773	10,107	10,169	9,846	9,984	10,385	8,962
SF₆ (sulfur hexafluoride)	50,435	50,923	51,659	53,359	55,501	58,994	59,962
Total metric ton CO₂eq	33,997,496	31,152,001	30,188,779	29,227,942	29,761,504	27,513,268	23,989,635

Type of gas	2022 emissions [metric ton CO ₂ eq]	2023 emissions [metric ton CO ₂ eq]
CO₂ (carbon dioxide)	24,184,865	20,973,722
N₂O (nitrous oxide)	68,220	55,413
CH₄ (methane)	9,218	8,189
SF₆ (sulfur hexafluoride)	61,419	63,882
Total metric ton CO₂eq	24,323,722	21,101,205

Table 17: Global Warming Potentials of the various greenhouse gases, as set out in the calculation methodology of the voluntary mechanism

Type of gas	Global warming potential (GWP) – until 2013	Global warming potential (GWP) – 2014 - 2019	Global warming potential (GWP) – starting from 2020
CO ₂ (Carbon Dioxide)	1	1	1
N ₂ O (nitrous oxide)	310	298	265
CH ₄ (methane)	21	25	28
SF ₆ (sulfur hexafluoride)	23,900	22,800	23,500



Table 18: Total IEC direct greenhouse gases emissions and specific emissions (GHG Intensity) with relation to the sales turnover and with relation to the electricity generation for the years 2010 - 2023

Year	Scope 1 CO ₂ eq emissions [metric tons]	GHG Intensity [metric tons CO ₂ eq/ USD million sales]	GHG Intensity [metric tons CO ₂ eq/ gross MWh*1000]
2010	39,467,669	6945.84	703
2011	40,661,709	6120.25	712
2012	46,366,484	6124.14	759
2013	38,762,789	4874.66	679
2014	34,312,517	5292.77	663
2015	33,997,496	5755.46	671
2016	31,152,001	5278.93	639
2017	30,188,779	4478.58	619
2018	29,227,942	4644.96	610
2019	29,761,504	4175.78	623
2020	27,513,268	3720.04	620
2021	23,989,635	3368.29	627
2022	24,323,722	3703.81	619
2023	21,101,205	3100.30	591

Table 19: Specific emission factors for the various greenhouse gases in gram/net-kwh (transmitted to the electricity transmission and distribution grid from the power plants, i.e., after deduction of the electricity self-consumption of the electricity generation equipment) for the years 2010 - 2023

Year	Gram CO ₂ /net-KWh	Gram N ₂ O/net-KWh	Gram CH ₄ /net-KWh	Gram CO ₂ eq/net-KWh
2010	726	0.00899	0.00940	729
2011	733	0.00925	0.01021	737
2012	783	0.01030	0.01329	787
2013	700	0.00848	0.00936	703
2014	685	0.00860	0.00856	688
2015	693	0.00863	0.00881	696
2016	661	0.00767	0.00860	663
2017	639	0.00707	0.00864	641
2018	629	0.00680	0.00850	631
2019	642	0.00718	0.00865	645
2020	641	0.00679	0.00867	643
2021	649	0.00702	0.00869	651
2022	641	0.00679	0.00870	643
2023	610	0.00604	0.00849	612

Table 20: Specific emission factors for the different greenhouse gases in gram/gross kWh (gram/kwh produced) for the years 2010 to 2023

Year	Gram CO ₂ /gross-KWh	Gram N ₂ O/gross-KWh	Gram CH ₄ /gross-KWh	Gram CO ₂ eq/gross-KWh
2010	699	0.00865	0.00905	702
2011	707	0.00891	0.00984	709
2012	754	0.00991	0.01278	757
2013	674	0.00817	0.00901	677
2014	659	0.00827	0.00823	661
2015	667	0.00830	0.00848	669
2016	635	0.00737	0.00827	637
2017	614	0.00680	0.00831	617
2018	605	0.00655	0.00818	608
2019	618	0.00691	0.00831	620
2020	615	0.00653	0.00833	617
2021	622	0.00672	0.00832	624
2022	614	0.00651	0.00834	616
2023	586	0.00580	0.00815	588

Table 21: Greenhouse gases Indirect Emissions (Scope 2) resulting from the self – consumption of electricity in power plants and in administrative/other sites for the years 2010 - 2023

Year	CO2eq Indirect SCOPE 2 emissions from self- consumption of electricity in power plants [metric tons]	CO2eq Indirect SCOPE 2 emissions from self- consumption of electricity in administrative / other sites [metric tons]	Total: CO2eq Indirect SCOPE 2 emissions [metric tons]
2010	1,489,936	78,782	1,568,718
2011	1,488,828	69,969	1,558,797
2012	1,751,380	87,348	1,838,728
2013	1,448,455	99,137	1,547,592
2014	1,680,614	131,345	1,811,959
2015	1,406,606	69,571	1,476,177
2016	1,391,053	38,707	1,429,760
2017	1,352,746	34,132	1,386,878
2018	1,299,959	49,739	1,349,698
2019	1,341,086	50,244	1,391,330
2020	1,272,963	45,849	1,318,812
2021	1,185,003	43,346	1,228,350
2022	1,214,014	43,346	1,257,361
2023	1,035,231	43,346 (estimation)	1,078,577

Table 22: Emissions of carbon dioxide, electricity generation, and Specific emission of Carbon dioxide for whole IEC

Total IEC	2017	2018	2019	2020	2021	2022	2023
Annual CO2 emissions [metric tons]	29,978,814	29,006,456	29,525,691	27,300,821	23,793,248	24,120,681	20,918,606
Annual gross electricity generation (MWh*1000)	48,788	47,905	47,810	44,363	38,248	39,286	35,708
Carbon intensity (Gram/KWh)	614	605	618	615	622	614	586

Table 23: Emissions of carbon dioxide, electricity generation, and Specific emission of Carbon dioxide for Coal-Fired Power Plants

Coal power plants - IEC	2017	2018	2019	2020	2021	2022	2023
Annual CO2 emissions [metric tons]	19,574,308	18,447,933	19,486,999	17,020,507	15,198,929	15,036,992	11,988,993
Annual gross electricity generation (MWh*1000)	22,052	20,599	21,885	18,943	16,944	16,736	13,146
Carbon intensity (Gram/KWh)	888	896	890	899	897	898	912

Table 24: Emissions of carbon dioxide, electricity generation, and Specific emission of Carbon dioxide for natural gas-fired power plants

Natural gas +LNG Power Plants - IEC	2017	2018	2019	2020	2021	2022	2023
Annual CO2 emissions [metric tons]	10,036,806	10,411,997	9,721,492	10,202,474	8,564,442	9,005,949	8,841,178
Annual gross electricity generation (MWh*1000)	26,102	27,066	25,373	25,243	21,228	22,393	22,442
Carbon intensity (Gram/KWh)	385	385	383	404	403	402	394

Greenhouse Gases Emissions (GHG) - Electricity Transmission Segment

In recent years, the Israeli electricity sector has been undergoing a structural change. Among other things, this includes a change in the mixture of energy sources and types used for electricity generation.

The amount of electricity generation by independent power producers that use fossil energy sources (mostly natural gas) and by independent power producers that use renewable energy sources (mostly solar energy) has been increasing over the years. At the same time, the rate of electricity generation by the Israel Electric Corporation, out of the total energy generated in the economy, is declining, so that in 2022, the Israel Electric Corporation generated approx. 51% of all electricity, and independent power producers generated approx. 49% of all electricity, using fossil energy sources and renewable energy sources.

The greenhouse gas emission coefficients in the Israel Electric Corporation's electricity generation segment are only affected by the Israel Electric Corporation's electricity generation technology, and their values are stated above in Tables 19 and 20.

The electricity transmission segment is the segment that transmits the electricity generated in Israel by different companies, not only the electricity generated by Israel Electric Corporation itself. Meaning, as opposed to the greenhouse gas emission coefficients for the Israel Electric Corporation's electricity generation segment, the greenhouse gas emission coefficients in the electricity transmission segment are calculated as the weighted average of the Israel Electric Corporation's and the independent power producers' emission coefficients. We note that the electricity mixture that flows through the electricity transmission system is supplied to the Israel Electric Corporation consumers and to consumers who are not IEC customers. Therefore, the Israel Electric Corporation finds it appropriate to present greenhouse gas



emission coefficients of the Israeli national power grid in its environmental report.

The greenhouse gases emission coefficients in the transmission segment (the weighted annual emission coefficient for the national electrical grid, including the Israel Electric Corporation's coefficients and the independent power producers' coefficients) are calculated and published by the Ministry of Environmental Protection.

Note: As of this report's publication date, the greenhouse gas emission coefficient data for the transmission segment in 2023 were not yet published by the Ministry of Environmental Protection.

Table 25: Weighted average of Annual Emission factors for the National Electricity transmission Grid – The Israel Electric Corporation (IEC) and Independent Power Producers (IPPs) for the years 2010 to 2022, as Published by the Israel Ministry of Environmental Protection

Year	Gram CO ₂ /net-KWh	Gram N ₂ O /net-KWh	Gram CH ₄ /net-KWh	Gram CO ₂ eq /net-KWh
2010	726	0.00899	0.0094	729
2011	733	0.00925	0.01021	736
2012	783	0.0103	0.01329	786.5
2013	700	0.00848	0.00936	702.8
2014	685	0.0086	0.00856	687.8
2015	693	0.00863	0.00881	695.8
2016	600	0.00767	0.0152	602.7
2017	567	0.00522	0.00782	568.8
2018	537.5	0.006	0.0071	539.5
2019	543	0.00595	0.00703	545
2020	496	0.00414	0.00663	497
2021	469	0.00362	0.00624	470
2022	469	0.00362	0.00624	470

Source: The Voluntary Mechanism's Operation Rules File, Part 3, Table 3, page 8.



Gas Emissions from Air Conditioning Systems, Including Gases harmful to the Stratospheric Ozone Layer

The Israel Electric Corporation uses air conditioning systems and cooling systems in the office buildings and for cooling the operational equipment in the Company's facilities.

The Israel Electric Corporation operates in this field according to the Hazardous Substances Regulations (Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer), 2004. Refrigerant gases that deplete the ozone layer are not used in the large and medium air conditioning systems introduced since 2000, and in the small air conditioning systems introduced since 2005.

In the past few years, the Israel Electric Corporation conducted surveys to characterize the inventory of air conditioning systems and the types and quantities of cooling gases (refrigerants) used.

The annual release percentage and the global warming potential were calculated according to the methodology set out in the voluntary mechanism for reporting GHG emissions. The damage potential to the ozone layer for the R22 gas (ozone depletion potential) was set out according to the Montreal Protocol regulations.



Table 26: Data regarding the emissions of air conditioner refrigerants:
Amounts emitted, ozone depletion and global warming potential. For power plants as reported to the PRTR - 2023 Data

Name of refrigerant refrigerant/ mix	CAS number	Chemical formula	Global warming potential GWP	Ozone depletion potential ODP	Total amount of refrigerant released in 2023 (metric tons)	Total amount of refrigerant released in 2023 as CFC-11eq [metric tons] [ODP of CFC-11=1]	Total amount of refrigerant released in 2023 [metric tons of CO ₂ eq]
R22=HCFC-22	75-45-6	CHF ₂ Cl	1760	0.055	0.191	0.011	336
R-407C	Refrigerant mix:	Refrigerant mix:	1624	0	0.02053	0	33
	75-10-5	CH ₂ F ₂					
	354-33-6	C ₂ H ₂ F ₅					
	811-97-2	C ₂ H ₂ F ₄					
R-410A	Refrigerant mix:	Refrigerant mix:	1924	0	0.457737	0	881
	75-10-5	CH ₂ F ₂					
	354-33-6	C ₂ H ₂ F ₅					
R-134A	811-97-2	CH ₂ FCF ₃	1300	0	0.03241	0	42
R-404A	Refrigerant mix:	Refrigerant mix:	3943	0	0.005	0	20
	354-33-6	CHF ₂ CF ₃					
	420-46-2	CH ₃ CF ₃					
	811-97-2	CH ₂ FCF ₃					
Total					HCFC 0.191 HFC 0.516	HCFC 0.011	1312

Transportation and Distance Traveled

The Company strives to continuously improve transportation and the employees' commute. Among other things, this is done to minimize air pollutant and greenhouse gas emissions; mitigate road congestion; change the driving culture for employees, such as encourage them to use resources reasonably, sparingly, and environmentally; and foster a supportive and empathetic work environment for environmental, economic, and energetic efficiency.

Within this, various measures are taken, such as:

- Providing ways to arrive to work without using a private car and encouraging public transportation use, emphasizing Israel Railways, to minimize individual use of private cars.
- Increasing use of teleconferencing systems for meetings, leading to a shorter distance traveled.
- An official publicity campaign on proper tire air pressure, to minimize fuel consumption.
- Providing training on efficient and ecological driving.
- Providing comparative information for Company car owners, on fuel consumption and distance traveled (milage), to increase awareness of wise car usage issues among Company car drivers.
- Transition to a hybrid work model, which contributes to shorter distances traveled and reduced road congestion.
- Using hybrid, plug-in, or electric vehicles for fuel consumption mitigation.
- Using heavy vehicles and machinery with advanced technological systems such as urea injection, to reduce emissions and save fuel.
- Adding electric vehicles to the fleet and creating infrastructure for charging stations at the Company's sites for electric vehicles used by its employees.



Data on vehicles consuming Gasoline and electric vehicles:

Table 27: Administrative vehicles (including car leases), 2019-2023

Year	Total Number of electric vehicles	Total Number of gasoline fueled vehicles	Total Number of hybrid vehicles	Total Number of hybrid plug-in vehicles	Total Number of micro-hybrid vehicles	Total gasoline consumption [liter]	Annual traveled distance [kilometer]	Kilometer per liter of gasoline
2019	9	514	417	0	0	2,114,051	36,904,373	17.5
2020	9	478	565	1	0	1,811,493	39,779,252	22.0
2021	9	455	596	25	0	2,155,714	43,324,119	20.1
2022	24	404	600	71	0	2,240,169	42,102,193	18.8
2023	184	312	431	91	188	2,225,897	34,904,301	15.7

Table 28: Information on Commercial Vehicles, Light Commercial Vehicles, and motorcycles (including car leases) Consuming Gasoline in 2019 to 2023

Year	Number of vehicles (commercial + light commercial + motorcycles that consume gasoline)	Total gasoline consumption (liter)	Annual traveled distance (kilometer)	Kilometer per liter of gasoline
2019	286	1,316,586	15,037,839	11.42
2020	88	394,236	4,422,143	11.22
2021	55	58,041	794,135	13.68
2022	42	16,242	311,771	19.20
2023	61	14,500	260,096	17.93

Diesel fuel powered vehicles:**Table 29:** Information on the number of Diesel-Fueled Vehicles (including car leases) and their fuel Consumption, in Diesel-Fueled Vehicles Other than Mechanical Engineering Equipment, 2019-2023

Year	Number of diesel fuel vehicles	Total diesel fuel consumption (liters)	Annual traveled distance (kilometer)	Kilometer per liter of diesel
2019	1,885	6,900,132	52,599,419	7.62
2020	2,092	7,802,460	65,969,409	8.45
2021	2,292	8,034,016	73,572,518	9.16
2022	2,267	8,005,715	73,051,917	9.12
2023	2,437	8,025,092	63,172,880	7.9

Table 30: Information on diesel fuel consumption and annual Traveled Distance of the Mechanical Engineering Equipment in 2019-2023

Year	Total diesel fuel consumption of mechanical engineering equipment (liters)	Annual traveled distance (kilometers)
2019	3,133,982	1,737,091
2020	1,977,870	927,535
2021	2,046,199	1,123,516
2022	1,953,865	1,277,608
2023	2,187,820	1,275,181



Chapter 3

Water and effluents

water usage and water conservation

IEC promotes careful water consumption in all its sites.

In 2023, the process of promoting the wise use of water at the Company's power plants and administrative sites continued. This objectives is achieved, among other things, by improving and monitoring processes and increasing the recycling of effluents.

The Israel Electric Corporation extensively uses poor quality water sources, both internally and externally sourced, as detailed in the data tables below in the report.

The fresh water supplied to the IEC's power plants through a national water supply system includes a mixed ratio of aquifer water (wells), water from Sea of Galilee (the national carrier), desalinated seawater, desalinated brackish water and surface water from various sources.



Use of Industrial Effluents and Boron Enriched Water in Sulfur Dioxide flue gas desulfurization (FGD) as an Alternative to Using fresh Water

Within projects to reduce emissions from the coal-fired generation units, scrubbers were installed in the Israel Electric Corporation's coal-fired generation units in recent years, to minimize sulfur dioxide emissions from combustion gases (hereinafter - the "FGD System"). The core of the system is an absorber column used to absorb sulfur. The principle of the FGD System is the reaction of the sulfur dioxide in the combustion gases using an alkaline suspension containing water and limestone and injecting air into the absorber's bottom, to complete the oxidation process. Conditions at the bottom of the absorber allow gypsum crystals to crystallize out of the suspension. Removing the gypsum crystal containing suspension to the byproduct treatment system that separates solids and liquids in the suspension results in gypsum of a quality suitable for to manufacture gypsum wall or for the cement industry. The water remaining after the suspension is removed is emitted from the stack, forming a white plume of water vapor.

The process requires using a limestone suspension and massive water evaporation, meaning it consumes a large quantity of water. As part of the national effort to save water resources and the effort to lower the quantities of purified industrial effluents discharged into the sea according to a permit and to minimize the consumption of drinkable water (fresh water) at power plant sites, part of industrial waste water is used for the FGD system. In addition, brine from the desalination facility near the Orot Rabin coal-fired power plants in Hadera are used. This water, known as "boron enriched water", comes from the final stages of the desalination process; this is high quality water that the desalination facility only discharges into the sea because of a high boron content that damages agricultural crops, but there is no obstacle to using this water industrially, in the process of reducing power plant emissions. **In 2023**, the consumption of low-quality water for use in the FGD systems, from internal source (industrial effluents purified at the power plants) and from external source (boron enriched water from the desalination plant) **amounted approx. 845 thousand cubic meters.**

Use of treated sanitary effluents from an external source for the cooling towers at the combined cycle (CCGT) power plant

At the Gezer power plant site, there are combined cycle CCGT electricity generation units, cooled via wet cooling system using cooling towers. This is a water-based cooling method, unlike the prevalent air-based cooling method. The water source for the cooling towers is treated sanitary effluents from a regional wastewater treatment facility. **In 2023, using wastewater for this purpose saved over 3 million cubic meters of potable water.**

Use of treated sanitary waste water and brine for irrigation of gardening areas

Part of the power plants treat sanitary wastewater using an internal treatment plant. The treated wastewater are used for irrigation the gardening areas within the site, as an alternative to using fresh water, according to permits issued by the Ministry of Health. Power plant sites also reuse brine (also called “concentrate water”) originating from the reverse osmosis facilities (intended for the production of salt-free water) is reused inside the site for irrigation of gardening areas. **In 2023, the use of treated sanitary wastewater and brine for irrigation, saved hundreds of thousands of cubic meters of fresh water across the Company’s various sites.**

Environmental targets for water usage

Water consumption reduction targets in relation to base year 2013 (prior to the emissions mitigation projects)

	2030 Targets in relation to base year 2013	2024 Targets in relation to base year 2013
Total water consumption from all sources (fresh and poor quality water)	-30%	-10%

Effluent water usage targets in relation to base year 2013 (prior to the emissions mitigation projects)

	2030 Targets in relation to base year 2013	2024 Targets in relation to base year 2013
Enhancement of effluent water usage (self – produced and external sources)	+2%	---

Table 31: Summary of fresh Water Consumption by the IEC for the years 2013-2023 (m³)

* Does not include water consumption by substations, switching stations, logistics sites and administrative sites

Year	Total fresh water consumption by IEC's power plants sites (m3)
2013	5,096,584
2014	4,285,882
2015	4,866,935
2016	4,565,698
2017	4,797,440
2018	4,851,136
2019	5,341,845
2020	4,910,415
2021	5,503,905
2022	5,485,340
2023	*4,985,746

*** In 2023, there was a decrease in the fresh water consumption, mostly due to the following:**

Decrease in operation of the electricity generation units at the Rutenberg site, which are equipped with FGD scrubbers to remove SO₂ from combustion gases.

Table 32: Summary of poor-quality water consumption by the IEC for the years 2013-2023 (m³)

Year	Total poor – quality water consumption by the IEC (m ³)	Total boron - enriched water consumption (from external origin) (m ³)	Total reuse of self- treated industrial effluents and self- treated concentrate water (m ³)	Total consumption of self - treated sanitary effluents for gardening areas irrigation (m ³)	Total consumption of external origin treated sanitary effluents used for cooling towers (m ³)
2013	5,096,641	0	652,162	94,643	4,349,836
2014	4,850,895	0	536,563	101,850	4,212,482
2015	4,608,788	0	643,934	97,039	3,867,815
2016	4,820,337	0	649,884	102,502	4,067,951
2017	5,510,430	410,946	554,362	101,774	4,443,348
2018	6,599,836	637,867	686,161	103,140	5,172,668
2019	5,663,860	768,715	663,795	87,241	4,144,109
2020	3,392,194	587,051	542,993	102,881	2,159,270
2021	4,401,829	565,276	699,694	71,566	3,065,293
2022	4,720,775	751,930	564,920	83,392	3,320,533
2023	4,545,309	609,311	430,288	85,399	3,420,311

Note:

* An additional site where wet cooling with sanitary effluents was used for cooling towers is the Alon Tavor power plant site.

This power plant was sold as part of the electricity sector reform at the end of 2019. In view of this fact, the use of sanitary effluents from external sources for cooling towers was reduced, and the total amount of poor-quality water used by IEC was reduced accordingly.

Table 33: Summary of the consumption of water from all sources by the IEC for the years 2013-2023 (m³)

* Does not include seawater consumption for main cooling of coastal power plants.

Year	Total consumption of water from all sources by the IEC (m3)
2013	10,193,225
2014	9,136,777
2015	9,475,723
2016	9,386,035
2017	10,307,870
2018	11,450,972
2019	11,005,705
2020	8,302,609
2021	9,905,733
2022	10,206,115
2023	9,531,055

*** In 2023, there was a decrease in the fresh water consumption, mostly due to the following:**

Decrease in operation of the electricity generation units at the Rutenberg site, which are equipped with FGD scrubbers to remove SO₂ from combustion gases.

*** Note regarding consumption of poor quality water:**

An additional site where wet cooling with sanitary effluents was used for cooling towers is the Alon Tavor power plant site.

This power plant was sold as part of the electricity sector reform at the end of 2019. In view of this fact, the use of sanitary effluents from external sources for cooling towers was reduced, and the total amount of poor-quality water used by IEC was reduced accordingly.

Table 34: Percentage of poor quality water out of all water sources consumed by the IEC for the years 2013-2023 (%)

Year	Percentage of poor quality water out of all water sources consumed by the IEC (%)
2013	50%
2014	53%
2015	49%
2016	51%
2017	53%
2018	58%
2019	51%
2020	41%
2021	44%
2022	46%
2023	48%

* An additional site where wet cooling with sanitary effluents was used for cooling towers is the Alon Tavor power plant site.

This power plant was sold as part of the electricity sector reform at the end of 2019. In view of this fact, the use of sanitary effluents from external sources for cooling towers was reduced, and the total amount of poor-quality water used by IEC was reduced accordingly.

Table 35: Summary of seawater consumption for main cooling of coastal power plants, by the IEC for the years 2013-2023 (m³)

Year	Total consumption of seawater for main cooling of coastal power plants, by the IEC (m ³)
2013	6,471,656,527
2014	5,867,958,700
2015	5,588,037,522
2016	5,464,694,022
2017	5,522,770,404
2018	5,896,219,446
2019	5,835,648,997
2020	5,865,870,606
2021	5,850,274,128
2022	5,723,629,472
2023	5,670,595,020

Table 36: Summary of treated industrial waste water effluents discharged to the sea from IEC's Sites, according to authorities permits, for the years 2013-2023 (m³)

Year	Summary of treated industrial waste water effluents discharged to the sea from IEC's Sites, according to authorities permits, for the years 2013-2023 (m3)
2013	485,595
2014	411,035
2015	400,092
2016	370,722
2017	389,054
2018	357,940
2019	375,419
2020	413,015
2021	341,275
2022	315,802
2023	439,327

Table 37: Summary of the amounts of treated wastewater effluents used or discharged, while separating effluents from industrial sources from effluents from sanitary sources, during the period 2017-2023:

Part A – Sanitary Wastewater and effluents

Year	2017 (m3)	2018 (m3)	2019 (m3)	2020 (m3)	2021 (m3)	2022 (m3)	2023 (m3)
Total self-origin sanitary wastewater	357,060	344,280	342,540	344,490	333,090	321,480	323,820
Total external-origin sanitary effluents used in cooling towers	4,443,348	5,172,668	4,144,109	2,159,270	3,065,293	3,320,533	3,420,311
Total self-origin sanitary effluents reused for gardening areas irrigation	101,774	103,140	87,241	102,881	71,566	83,392	85,399
Total self-origin sanitary wastewater transferred to authorized sewage treatment plants	255,286	241,140	255,299	241,609	261,524	238,089	238,421

Table 38: Summary of the amounts of treated wastewater effluents used or discharged, while separating effluents from industrial sources from effluents from sanitary sources, during the period 2017-2023:

Part B – Treated Industrial Effluents, Boron Enriched Water, Concentrate water from demineralized water production facilities

Year	2017 (m3)	2018 (m3)	2019 (m3)	2020 (m3)	2021 (m3)	2022 (m3)	2023 (m3)
Total amount of self - treated industrial effluents and self - concentrate water	943,416	1,044,101	1,039,214	956,008	1,040,969	880,722	869,615
Total amounts of reused treated industrial effluents and self - concentrate water	554,362	686,161	663,795	542,993	699,694	564,920	430,288
Total treated industrial effluents discharged to the sea according to authorities permits	389,054	357,940	375,419	413,015	341,275	315,802	439,327
Boron enriched water from external sources	410,946	637,867	768,715	587,051	565,276	751,930	609,311

Table 39: Total withdrawal Intensity of all water types, in relation to sales turnover 2013-2023

Freshwater Withdrawal Intensity (m3/USD million sales)

Poor quality water Withdrawal Intensity (m3/USD million sales)

Total water Withdrawal Intensity (m3/USD million sales)

Year	Total consumption of freshwater by IEC's power plants sites (m3)	Total consumption of poor quality water by IEC's power plants sites (m3)	Total consumption of water from all sources (fresh + poor quality) by IEC's power plants sites (m3)	Freshwater withdrawal intensity (m3/USD million in sales turnover)	Poor quality withdrawal intensity (m3/USD million in sales turnover)	Total water withdrawal intensity (m3/USD million in sales turnover)
2013	5,096,584	5,096,641	10,193,225	640.9	640.9	1,281.9
2014	4,285,882	4,850,895	9,136,777	661.1	748.3	1,409.4
2015	4,866,935	4,608,788	9,475,723	823.9	780.2	1,604.2
2016	4,565,698	4,820,337	9,386,035	773.7	816.8	1,590.5
2017	4,797,440	5,510,430	10,307,870	711.7	817.5	1,529.2
2018	4,851,136	6,599,836	11,450,972	771.0	1,048.9	1,819.8
2019	5,341,845	5,663,860	11,005,705	749.5	794.7	1,544.2
2020	4,910,415	3,392,194	8,302,609	663.9	458.7	1,122.6
2021	5,503,905	4,401,829	9,905,733	772.8	618.0	1,390.8
2022	5,485,340	4,720,775	10,206,115	835.3	718.8	1,554.1
2023	4,985,746	4,545,309	9,531,055	732.5	667.8	1,400.4

Table 40: Total withdrawal Intensity of all water types, in relation to the electricity generation 2013-2023

Freshwater Withdrawal Intensity (m3/ gross MWh*1000)

Poor quality water Withdrawal Intensity (m3/ Gross MWh*1000)

Total water Withdrawal Intensity (m3/ Gross MWh*1000)

Year	Total consumption of freshwater by IEC's power plants sites (m3)	Total consumption of poor quality water by IEC's power plants sites (m3)	Total consumption of water from all sources (fresh + poor quality) by IEC's power plants sites (m3)	Freshwater withdrawal intensity (m3/Gross MWh*1000)	Poor quality withdrawal intensity (m3/Gross MWh*1000)	Total water withdrawal intensity (m3/Gross MWh*1000)
2013	5,096,584	5,096,641	10,193,225	89.2	89.2	178.4
2014	4,285,882	4,850,895	9,136,777	82.9	93.8	176.6
2015	4,866,935	4,608,788	9,475,723	96.1	91.0	187.1
2016	4,565,698	4,820,337	9,386,035	93.7	98.9	192.7
2017	4,797,440	5,510,430	10,307,870	98.3	112.9	211.3
2018	4,851,136	6,599,836	11,450,972	101.3	137.8	239.0
2019	5,341,845	5,663,860	11,005,705	111.8	118.5	230.3
2020	4,910,415	3,392,194	8,302,609	110.7	76.5	187.2
2021	5,503,905	4,401,829	9,905,733	143.9	115.1	258.9
2022	5,485,340	4,720,775	10,206,115	139.6	120.2	259.8
2023	4,985,746	4,545,309	9,531,055	139.6	127.3	266.9



צילום: יוסי וייס

Chapter 4 Recycling waste and by-products

Byproducts

The coal-fired power generation process is characterized by the formation of two by-products: Coal ash and FGD gypsum.

Coal ash is formed from the mineral fraction in the coal that remains after burning it.

Gypsum in the flue gas desulfurization (FGD) facilities is created because of a reaction between the sulfur dioxide in the emission gases and the limestone.

The reuse of byproducts, as part of the principles of a circular economy and sustainable development, has environmental benefits and provides an alternative to the use of natural resources in mining raw materials. This practice also prevents waste landfilling, reduces greenhouse-gas emissions, and reduces harm to nature and to biodiversity.



Production and Uses of Coal Ash from the Orot Rabin and Rutenberg Power Plant Sites

Coal ash is a byproduct of coal combustion at the Orot Rabin and Rutenberg power plant sites.

In 2023, the Israel Electric Corporation generated approx. 414,400 tons of coal ash.

The quantity of coal ash has decreased in recent years, due to the increased use of natural gas to generate electricity, reduced operating hours of coal-fired units, and operation of the units at partial capacity.

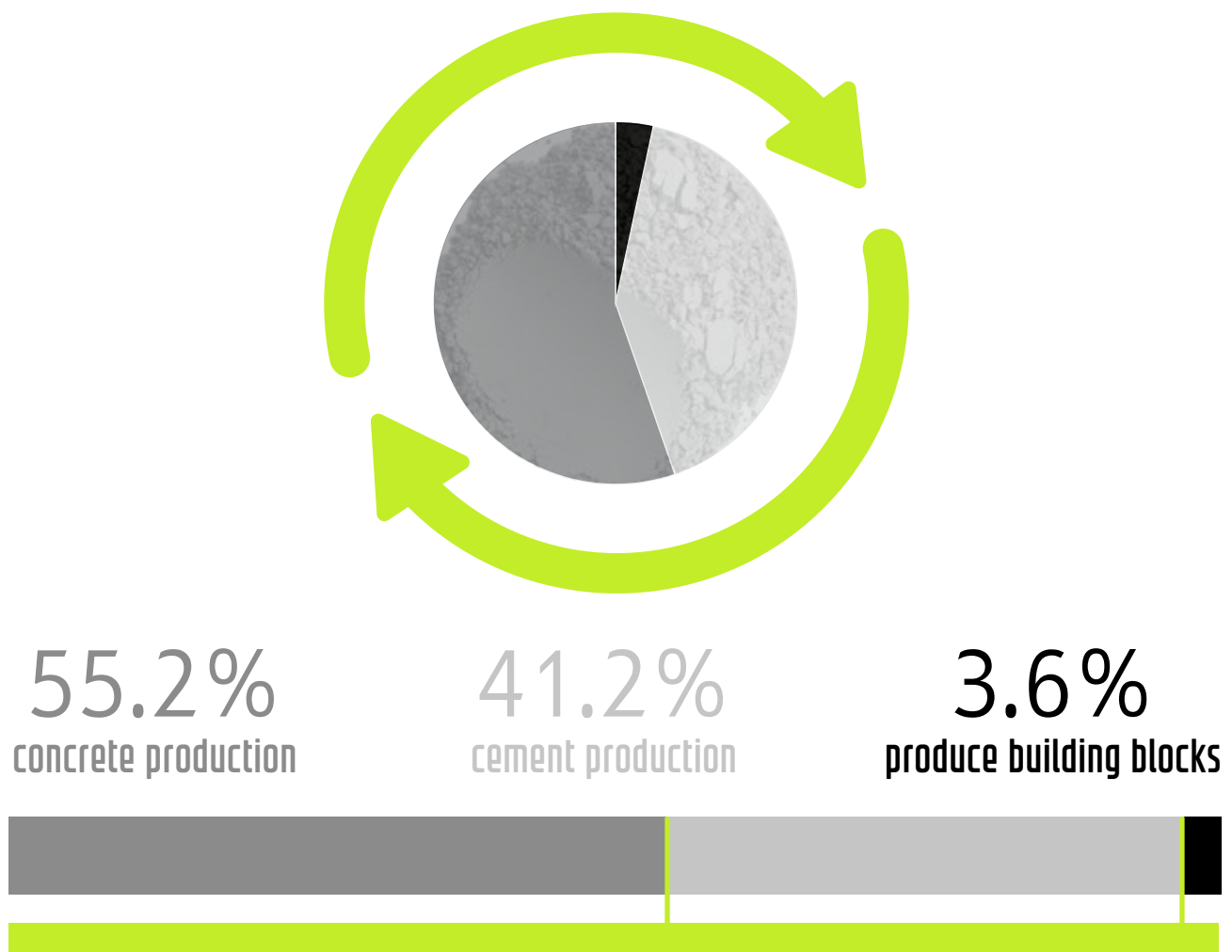
Approx. 90% of the coal ash is fly ash, gathered at the reduction facility installed at the coal-fired units (electrostatic precipitators - ESP), and approx. 10% of the coal is bottom ash, sinking to the bottom of the boiler.

Since 1999, the whole amount of ash produced by the Israel Electric Corporation generated was transferred for industrial use, for use in the infrastructures sector and in agriculture, the main uses being to produce cement and concrete (like the common uses in most developed countries). Since 2018, the coal ash is no longer used in the infrastructures sector, and since 2021, use of coal ash outside the construction sector has been terminated.

In 2023, 41.2% of the coal ash was used to generate cement; 55.2% were used to generate concrete; and 3.6% were used to produce building blocks.

Adding fly ash to the construction products utilizes the ash's bonding properties (fly ash is a "pozzolanic material"), and enhances the concrete's properties: higher strengths, lower specific weight, higher workability, and higher corrosion resistance. In terms of the environment, using coal ash as a raw material to produce concrete and cement mitigates damage to the environment and natural areas from mining the raw materials the ash replaces, such as limestone, clay and sand (which is growing increasingly scarce in Israel).

Coal ash uses are made on the basis of permits issued by the authorities, including the Ministry of Environmental Protection. The Israel Electric Corporation monitors the coal ash environmental quality (the concentration of trace elements and radioactive elements) on a semiannual basis. The results consistently comply with the criteria for using fly ash safely from an environmental point of view.



The groundwater near the coal ash storage sites at the Orot Rabin and Rutenberg power plants has been monitored for a long time, and according to the monitoring results, storage has no effect on water sources quality.

The same conclusion was drawn from the monitoring near the first road embankment built using coal ash under the access road to Jasser- a-Zarqa.

Coal, like all other geological materials, contains low concentrations of natural radioactive elements. Use of coal ash is monitored for radiation because construction products containing coal ash must comply with Israeli Standard 5098, that limits the radioactive element content in all construction products marketed in Israel. Note also that according to the international standard set by the International Atomic Energy Agency in 2014 (International Basis Safety Standards, GSR Part 3), coal ash with the known concentration of radioactive elements in Israel is “cleared” from the need of administrative control in terms of radiation hazard.

Table 41: Production and Use of Coal ash for the years 2013-2023 (thousand metric tons)

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total production of coal ash	1,200	1,083	1,055	848	804	719	758	657	605	564	414
Total use of coal ash	1,258	1,056	1,054	848	805	719	741	634	584	560	414
Use for cement production	645	548	603	519	480	382	344	268	243	226	171
Used for concrete and other concrete products production	497	452	385	280	273	331	389	361	341	334	244
Use for infrastructures	57	0	30	14	17	0	0	0	0	0	0
Agriculture and other uses	59	56	36	35	35	6	8	5	0	0	0

Production and Use of Gypsum from the Sulfur Dioxide Emission Reduction Facilities (flue gas desulfurization-FGD) at the Orot Rabin and Rutenberg Power Plant Sites

The emission gases from Generation Units 1 through 4 at the Rutenberg Power Plants (while coal-fired) and Generation Units 5 and 6 at the Orot Rabin Power Plants are treated at the sulfur oxides emissions reduction facilities (flue gas desulfurization, or FGD). The emission gases that go through the FGD System are washed in a limestone suspension. In these facilities, the sulfur dioxide (SO₂) reacts with the calcium carbonate (CaCO₃) and gypsum (CaSO₄, 2 H₂O) is created as the final product of this process. The gypsum created like this is no lower in quality than naturally occurring gypsum.

In 2023, the Israel Electric Corporation produced 86,320 tons of FGD gypsum. Of which, 45,270 tons were produced at the Rutenberg Power Plant and 41,050 tons were produced at the Orot Rabin Power Plant.

The entire quantity of gypsum produced by the Israel Electric Corporation was supplied for use in the cement industry at the Nesher and Shafir plants (gypsum is an essential component of ground cement, to delay the concrete hardening) and production of gypsum products at the Orbond plant.

Table 42: The Consumption of Limestone and the Production of Gypsum by FGD scrubbers at Coal-Fired Power Plants during the years 2012-2023 (metric tons)

Year	Limestone consumption	FGD gypsum production
2012	46,800	86,500
2013	37,800	74,200
2014	39,400	72,100
2015	40,600	72,557
2016	33,290	61,771
2017	44,345	73,690
2018	65,585	118,660
2019	77,805	142,160
2020	72,689	134,330
2021	58,834	103,570
2022	67,530	120,560
2023	50,359	86,320

Hazardous Materials and Hazardous Waste

The Company holds, uses and stores hazardous materials at some of its sites.

At sites where hazardous materials are held in quantities exceeding the threshold according to requirements, a toxic substances license regulates the activity of the site in accordance with the law.

The Company is working, on an ongoing basis, to mitigate the potential risk from using hazardous materials in the electricity generation process, including through reduction of the consumption of hazardous materials at source in the production processes; replacing materials with lower-risk materials; finding environmentally friendly alternatives and training employees.

As part of its obligation according to any law, the IEC removes hazardous waste to authorized sites, according to any law.



Green Purchasing

Green Purchasing is a means of reducing the organization's environmental impacts. Prioritizing of green products is expected to promote a circular economy and reduce waste and emissions over the products' lifetime, among other effects. Examining the environmental aspects of our procurement procedures also allows us to find the products and materials the organization procures and inculcates sustainability aspects into the procurement processes.

In recent years, the Israel Electric Corporation has been seeking to promote green Purchasing through a variety of measures, such as:

- Transitioning to digital tenders
- Using recycled paper as the primary source of paper for the Company's needs
- Examining the qualities of environmentally acceptable oils to substitute the oils that have been used for years
- Transitioning to using green cleaning agents
- Using water-based silicon
- Using environmentally acceptable paints
- Energy efficient air conditioners and light bulbs
- Using green materials to absorb oils
- Promoting use of reusable packages in the warehouses
- Tracking green products and suppliers.

Several actions were taken in the area of green Purchasing in 2023, including promotion of the acquisition of dishwashers and reusable cups to replace the use of disposable tableware at the Company's administrative sites.

From time to time, the IEC examines proposals for various green products and services submitted by green Purchasing suppliers, within its sustainable development targets.

Solid Waste

The IEC treats waste generated as a result of its day-to-day operations by adopting the Total Waste Management approach. Under this approach, various actions along the entire waste formation chain (prevention, reduction, collection and treatment), in order to reduce the level of environmental impact of the waste. Among others, actions are taken to reduce consumption and prevent the formation of waste, reduce the volume of waste disposed for landfill by separating various types of waste at source and transferring them for reuse and recycling, subject to the development of the recycling market in Israel.

Actions are also being taken to minimize office waste, including:

- **Move to printing centers** - The new printing centers combines three separate functions into a single multifunction printer: a printer, a copy machine, and a scanner. The printing centers offer savings and protect the environment by combining all these functions into a single appliance, thus offering lower consumption of many resources, including paper, or area, energy savings, and various types of perishable materials. The default option is double-sided printing.
- **Repurposing of wood drums for the community** – Wood drums, originally designed to wind cables, are remade into outdoor and garden furniture, playground equipment, and leisure facilities, for the benefit of the community.
- **Waste plastic collected at the Company's sites is gathered and sent** to the visitor center at the Hiriya Recycling Park, for community activities and reuse
- **Possibilities for the reuse of plastic products are continually examined**





Waste management targets

Waste targets in relation to base year 2020



-10%

Reduction of solid waste transferred to landfills



-15%

Reduction of hazardous material waste



+10%

Increase of solid waste transferred to recycling



+5%

Increase of reused solid waste

Table 43: Total Hazardous Waste and Non-Hazardous Waste Transfers from the Israel Electric Corporation Power Plant Sites for 2023

* Data reported as part of the Pollutant Release and Transfer Registry (PRTR)

Site	Total transfer of hazardous waste for 2023 (metric tons)	Total transfer of non-hazardous waste for 2023 (metric tons)	Total Waste for 2023 (metric tons)
Orot Rabin	3,322	313,396	316,718
Rutenberg	487	196,224	196,711
Haifa	285	503	787
Nativ Ha'or	0	2,951	2,951
Eshkol	1,609	264	1,873
Hagit	486	244	730
Gezer	898	4,575	5,473
Zafit	463	2,778	3,242
Eilat	7	87	94
Atarot	82	0	82
Kinarot	35	0	35
Caesarea	103	128	231
Hartuv	12	0	12
Eitan	18	0	18
Total IEC	7,806	521,150	528,957



Table 44: Distribution of the amounts of Hazardous Waste according to treatment methods, for the period 2019-2023 (metric ton)

Data	2019	2020	2021	2022	2023
Total hazardous waste	4,573	6,105	4,800	5,631	9,224
Total hazardous waste transferred to landfills	151	1,191	690	638	1,371
Total hazardous waste transferred to recycling	1,500	690	3,913	4,827	7,639
Total hazardous waste transferred to disposal	2,922	4,224	197	166	214



Table 45: Distribution of the amounts of non-hazardous waste according to treatment methods, for the period 2019-2023 (metric ton)

Data	2019	2020	2021	2022	2023
Total solid waste excluding byproducts, as detailed below	20,726	19,993	25,294	22,699	23,368
Total solid waste transferred to landfills	7,217	8,512	8,086	7,003	7,224
Total solid waste transferred to waste to energy facilities	3,605	2,704	4,360	4,537	2,935
Total solid waste transferred to recycling	9,904	8,777	12,848	11,159	13,210
Total byproduct – gypsum transferred to reuse	142,160	134,330	103,570	120,560	86,320
Total byproduct – coal ash (dry basis) transferred for reuse (*including coal ash from field excavation operations intended for the construction of combined cycles)	745,716	646,670	583,700	560,200	414,400



Table 46: Total Waste Transfer Intensity from the IEC Power Plant sites in relation to sales turnover, 2019-2023, Based on PRTR Data

Non-hazardous Waste Intensity (metric tons/ USD million sales)

Hazardous Waste Intensity (metric tons/ USD million sales)

Total Waste Intensity (metric tons/ USD million sales)

Year	Total non-hazardous waste transfers	Total hazardous waste transfers	Total waste transfers	Non-hazardous Waste Intensity	Hazardous Waste Intensity	Total Waste Intensity
2019	906,895	63,412	970,307	127	9	136
2020	801,110	33,255	834,365	108	4	113
2021	719,382	4,687	724,070	101	1	102
2022	708,385	5,586	713,971	108	1	109
2023	521,150	7,806	528,957	77	1	78



Reducing the Use of Disposable Tableware

In 2020, the IEC decided to reduce the use of environmentally harmful disposable tableware and dishes by switching to reusable dishes and disposable tableware made of environment-friendly materials, raising employee awareness, and creating change in consumption habits at all of its sites.

As part of this decision, actions were taken to reduce the use of disposable dishes and tableware. In the first stage, the project focused on cups for cold and hot beverages, as the cups accounted for approx. 80% of the disposable tableware used at the IEC.

All of the canteens at IEC sites have switched to reusable cups. Melamine cups were purchased and put to use and glasses were distributed for the Company's conference rooms. The process was accompanied by a company-wide campaign to raise awareness of the use of reusable dishes.

In 2023, the IEC installed dishwashers in its kitchenettes, with the aim of discontinuing the supply of disposable cups for kitchenettes and conference rooms.



Chapter 5

Noise and Magnetic Fields

Treatment of Noise Nuisances

The process of generating, transmitting, and delivering electricity might be a source of environmental noise. Noise is mostly generated by the equipment used to generate the electricity in the power plants, and to a lesser extent, from the substation transformers or the transmission line insulators. Most of this equipment is far away from populated areas.

Other components of the electricity transmission, transformation, and distribution systems, closer to populated places (including power lines, distribution transformers, fuse boxes, switches) are not normally a substantial source of noise; yet, these sources are inspected as well, and when it is necessary, they receive acoustic treatment at the source or using protective measures.

The Israel Electric Corporation seeks to comply with the noise levels stipulated in the Noise Regulations and to comply with the other requirements and obligations stated in the licensing processes to construct and operate its facilities. Environmental noise levels are controlled throughout the equipment's lifespan; from planning and procurement to the initial operation and throughout its useful life, to enable the equipment's continuous operation without creating noise nuisances.

When designing new electricity facilities, the noise levels expected in highly populated areas near the installation site are predicted. The noise level prediction findings are submitted to the environmental authorities in environmental impact surveys, in environmental statements of opinion, or within the process of obtaining construction permits, and environmental monitoring requirements and other measures are taken, as necessary, based on these findings.

At the procurement stage, the technical specifications for the equipment include the acoustic requirements that will guarantee compliance with the permitted noise levels around the facilities. Furthermore, at the new facility initial operation stage, noise is measured around the site and in nearby highly populated areas, to verify compliance with the requirements and to make sure there are no deviations from the set threshold levels.

During routine operation, no deviation from noise thresholds is expected; specific noise checks and measurements are performed according to requests received or localized

Environmental Aspects of Electric and Magnetic Fields

Electric and Magnetic Fields – What Are They

When energy is transferred through electric facilities, it creates an electric field and a magnetic field around them. The electric and magnetic fields' levels are mostly determined according to the voltage level and the current level (respectively) applied to the facility, and the distance from the facility.

These fields change direction at a 50 Hz frequency, which is considered extremely low. The energy related to this frequency is very low, and effectively negligible.

Effects of the Electric and Magnetic Fields

In the past four decades, there have been many studies worldwide investigating the link between prolonged exposure to magnetic fields from electrical grid facilities or from home appliances and the possibility of a higher prevalence of some diseases. In November 2010, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) published guidelines on the maximum exposure value, for exposure to a magnetic field from the electrical grid, setting it at 2,000 milligauss for short-term effects for the general population, based on the known health effects of inducing an electric field in the body.

The commission's position is that the epidemiological research published thus far on this subject does not present sufficient evidence of the existence of long-term health effects in humans, and/or sufficient information to allow health-related threshold values to be established.

To address the formation of long-term health effects of prolonged exposure to magnetic fields, the World Health Organization (WHO) and other global entities support applying the precautionary principle, according to which, even if the very existence of a risk and the risk's limited scope are uncertain, and even if they might not exist at all, taking some limited measures to address exposure to magnetic fields is appropriate.

A breakdown of the risks is available in the report by the [World Health Organization \(WHO\), published in June 2007](#).

And in the report by the [ICNIRP dated November 2010](#).

The International Agency for Research on Cancer (IARC), part of the World Health Organization, classified magnetic fields under the third group, a "possibly carcinogenic to humans," considered the lowest classification. This category also includes emissions from gasoline engines or hot beverages, and certain types of pickled vegetables. Additional information is available in the: [IARC summarizing report](#).

Legislation and Policy in Israel

In March 2005, the report by the Expert Committee on Magnetic Fields from the Electrical Grid (hereinafter - the "**Expert Committee**") was published. The Expert Committee accepted the threshold value for maximum exposure to magnetic fields from the electrical grid set by the ICNIRP, which was 1,000 milligauss at the time; and at the same time, it anchored the demand to follow the precautionary principle when designing new facilities and operating the current facilities. The Company is gradually implementing the precautionary principle in the current facilities, according to the Expert Committee report recommendations. Also, according to Company estimates and according to its investigations, the electric facilities it owns comply with the ICNIRP guidelines.

The Non-Ionizing Radiation Law was enacted in 2006. According to the Non-Ionizing Radiation Law, the maximum permitted levels of exposure to radiation from a radiation source for humans should have been anchored in regulations that were scheduled to be promulgated by January 1, 2007. The law stipulates that as long as no such regulations are promulgated on matters concerning the electricity sector, the Ministry of Environmental Protection Radiation Commissioner decisions on, inter alia, construction permit terms and operation permit terms on matters pertaining to the electricity sector, must comply with the Expert Committee report recommendations.

[The Expert Committee report](#)

The law further stipulates that the Commissioner's decision for the purpose of the law, on matters affecting the costs for the electricity sector, on which the Commissioner has been notified in writing by the Minister of Environmental Protection or the Minister of Energy, requires permission from the Minister of Environmental Protection, the Minister of Finance, and the Minister of Energy. The draft regulations under the Unionizing Radiation Law were published for public comment in January 2019.

The Israel Electric Corporation's Operations

To construct and operate radiation sources, as defined in the Non-Ionizing Radiation Law, the Company must maintain appropriate permits lawfully issued by the Ministry of Environmental Protection.

The Company has the necessary permits to build and operate radiation sources, and where the Company does not have such permits, it is working to obtain them. The Company builds and operates new and existing electricity facilities according to the terms appearing in the construction permits and operation permits, on all that concerns implementing measures to limit exposure levels, restrict access, display warning signs, duties to report, and more.



Chapter 6

Biodiversity

Managing and Improving Implications for Biodiversity

By virtue of being infrastructure facilities that are located in or close to open and natural (undisturbed) areas the Company's plants sometimes have impact on the biodiversity. Such impact stems from their actual presence in the open field and from the accompanying environmental impacts caused by the on-going operation of the facilities.

The IEC owns tens of thousands of kilometers of power lines, of varying voltage, spread across the country. Among the many facilities of the Company are facilities and lines located in or near open areas and nature reserves, which affect terrestrial biodiversity. Accordingly, as part of the environmental documents issued with regard to projects, the impact of the projects on nature and biodiversity is also examined. In addition, actions are taken during the project's planning and construction stages to minimize environmental impacts and to rehabilitate the surrounding environment and ecology when construction is completed.

In recent years, parallel to the global development and awareness of the importance of preserving biodiversity, the issues reviewed on this topic have been expanded.

When examining alternative locations for new facilities and power lines, the need to reduce traversing areas of rich biodiversity is taken into account, in order to minimize the impact on these areas.

The facilities located near declared nature reserves as per Outline Plan 8 - the National Outline Plan for National Parks and Nature Reserves (up to 500 meters from the facility) are:

- Hagit Power Plant, located near the Nahal Tut nature reserve
- Yavne Power Plant, located near the Shita Malbina nature reserve
- Hula Substation, located near the Ein Te'o and Nahal Kadesh nature reserves
- Nazareth Substation, located near the Nazareth Iris nature reserve
- Safed Substation, located near the Meiron Mountain nature reserve
- Tefen Substation, located near the Har Sne nature reserve
- Mifalei Plada Substation, located near the Holot Hamifratz nature reserve

The facilities located near declared national parks according to National Outline Plan 8 (up to 500 meters) are:

- The Sha'ar Ha'guy substation, which is located near the Harei Yehuda national park
- The Ein Harod Substation, which is located near the Ma'ayan Harod national park
- The Yokne'am Substation and the Daliyat al-Karmel substation, which are located near the Carmel national park
- Kinarot Substation, which is located near the Kfar Nahum national park

For ultra-high (400 kV) and high voltage (161 kV) lines being planned and built across areas with high environmental value (including nature reserves and open spaces), measures are taken to reduce the environmental footprint, including environmental restoration of the work areas and access roads, shielding of high-voltage lines in sensitive areas against electrocution of birds, treatment of invasive species, etc., to protect valuable areas and unique natural habitats.



The main impacts on biodiversity can be divided into terrestrial aspects and marine aspects:

Biodiversity – terrestrial aspects

- **The Company takes into consideration the need to reduce traffic through biodiversity-rich areas in order to minimize impacts on these areas**, and examines alternative locations for new facilities, utility poles, and power lines. In addition, lines in ecologically sensitive areas (such as nature reserves or open spaces) are constructed in collaboration with the Nature and Parks Authority, in compliance with environmental requirements, with diligent reduction of the ecological footprint to the extent possible; this is achieved by minimizing access routes and setup surfaces; using substrates made of local materials that can blend into the natural environment; avoiding work in certain areas during periods of high environmental sensitivity (e.g. in winter time near winter pools or nesting sites during nesting seasons); avoiding work near the shores of streams; relocating or fencing trees to reduce damage to them; and rigorously rehabilitating the environment and landscape at the conclusion of the construction work.
- **Performing ecological reports for projects** – In relevant power line and substation construction projects, an ecologist's report is prepared, including a survey of the fauna and flora species in the vicinity of the planned project, with reference to the Red List of Vertebrates in Israel, which defines and classifies endangered species and what action should be taken to prevent their extinction (the definitions in the Israeli Red List are consistent with the definitions in the Red List of Threatened Animals of the International Union for Conservation of Nature (IUCN)). Based on the findings of the ecological opinion, guidelines and actions are derived to reduce the projects' ecological footprint.
- **Increasing Intra-organizational awareness of the importance of preserving biodiversity** - by providing access to information and the use of geographical platforms such as GIS to embed environmental aspects in power line planning.
- **Collaborating with the Society for the Protection of Nature in Israel**, the Nature and Parks Authority and the Ministry of Environmental Protection, through "public appeal" to assimilate biodiversity conservation considerations in companies.
- **Proactive measures taken to reduce harm to birds**, including building geographical models of sensitive areas potentially harmful to birds; formulating guidelines for planning and constructing power lines; and assisting in the creation of pilot projects, groundbreaking projects, and work plans in this field.

Policies and goals for the improvement of terrestrial biodiversity

As part of the Company's strategic goals, the IEC has set a target of mapping all of the Company's sites, based on protected areas (nature reserves, etc.) and areas with high biodiversity value which are not declared protected, by 2023, and accordingly providing relevant environmental planning guidelines.

IEC has completed the mapping of all of the Company's sites in 2023, based on protected areas (nature reserves, etc.). The mapping helps IEC planners create a prudent plan for minimizing environmental impacts when planning a new line or maintenance work plans on existing lines. Additionally the mapping is available and accessible to Company's staff on the mapping site.

During 2021-2022, a national geographical model was built presenting sensitive areas for electrocution of birds. In 2023, the model will be integrated with the Company's geographical information systems, so that it can be used as a tool for deriving the planning and operational impacts of planned overhead or underground power lines.

Light pollution

As part of the IEC's efforts to minimize the impact of infrastructure facilities on biodiversity, it was decided that starting 2022 all new substation sites will be built in compliance with the "Ecological code for environmental friendly planning of lighting at infrastructure facilities," issued by the Society for the Protection of Nature in Israel in that year. The ecological code primarily focuses on darkening of infrastructure facilities located in areas with ecological value. As noted, the IEC has decided to adopt these values; today, all new substations are set up in a way that they are routinely dark (except when a malfunction is being handled or maintenance work is being performed), preventing light pollution that disturbs flora and fauna from leaking into open areas and nature reserves.

Spreading Wings project

The Spreading Wings project, launched in 1996 as a result of collaboration between the IEC, the Nature and Parks Authority, and the Society for the Protection of Nature in Israel, is aimed at protecting the population of birds of prey in Israel, as part of the Company's corporate sustainability policy.

The key goals of the project are to reduce harm caused by IEC facilities to birds of prey as a result of electrocution and collisions with power lines, and to preserve this population through active interface activities, such as the operation of feeding stations and acclimation cages, GPS tagging of birds of prey, research, monitoring, and imports of vultures when necessary.

In the early years of the project, the focus was solely on the vulture population, as during that period there were dozens of vulture electrocution incidents every year in sensitive areas. However, as a direct result of the project, as high-voltage lines were shielded against electrocution, these incidents were gradually reduced over the years, until they became a negligible cause of death for the vulture population. **In fact, there have been no vulture electrocution incidents since 2019.**

In light of the success of the project focused on the vulture population, it was decided to expand this effort to help save other species of birds of prey that are at risk of electrocution, such as eagles, including the Bonelli's eagle, golden eagle, eastern imperial eagle, white-tailed eagle, and more.

The project is currently based on applied research conducted to develop protective means for utility poles, which are the main cause of electrocution of large birds, due to their tendency to use these poles as a convenient place to stand, sleep, observe, or even nest. The project currently operates on three main axes: safeguarding poles to prevent electrocution, safeguarding lines against bird collisions, and preserving the population of birds of prey.



The preservation interface takes proactive measures to expand breeding stocks, monitor at-risk species of birds of prey, and fight poisoning by supplying high-quality food for vultures and maintaining feeding stations, purchasing GPS transmitters and monitoring telemetry data, importing vultures from other countries, and conducting activities to educate the public and raise awareness.

In recent years, there has been an increase in efforts to track endangered species of birds of prey, and as a result, the tracking capabilities of avian telemetry (flight) data have greatly improved. The data helps to actively preserve the birds of prey populations, contributes to knowledge and research on the subject and enables preparation of more accurate work plans for safeguarding pylons.

Preventing electrocution of birds:

Approximately 3,000 poles have been safeguarded within the Spreading Wings project, over a period of more than 25 years, at a rate of approx. 100 poles each year. The project has reduced the number of vulture electrocution incidents from dozens every year in the 1990s to an average of one incident every three years.



In 2021, a geographical sensitivity model was prepared to predict electrocution of hawk eagles, which are currently severely endangered in Israel, and other eagles in Israel (the imperial eagle, tawny eagle, booted eagle, and others). The model mapped the 6,000 high-voltage poles with the highest probability of causing electrocution, and was embedded in the Company's work plans for safeguarding the utility poles. Following the development of the model and the identified need to increase the pace of the safeguarding process, in 2021 the IEC decided to double the pace to 200 poles

per year; concurrently, the IEC joined a request made by the Nature and Parks Authority and the Society for the Protection of Nature in Israel to the Israel Electricity Authority to recognize the need for broader protection.

In 2021, the Israel Electricity Authority agreed in principle to the acceleration of the safeguarding process and recognition of the costs according to actual execution, to save the Bonelli's eagle; a decision was made to increase the pace of the pole safeguarding process to approx. 1,000-1,200 poles per year. Therefore, the Company began preparations to accelerate safeguarding, including training of professional teams to execute the work, acquisition of the appropriate equipment, creation of multi-year work plans, logistical preparations, and setup of an IT module for project management.

When preparations were complete, in the second half of 2022, the Company began the safeguarding work in practice, such that approx. 712 high-voltage poles were safeguarded during the second half of 2022.

During 2023, intensive activities within this project led to the safeguarding of 1,008 high-voltage poles in sensitive areas for electrocution of Bonelli's eagles and other endangered birds of prey. The program focused on the Shfela, Arava Tichona, Jezreel Valley, and Beit She'an Valley regions. Despite the temporary halt of the safeguarding operations due to the Iron Swords War, the IEC was able to execute its ambitious plan in this area



IEC employees safeguarding a high-voltage pole to prevent the electrocution of birds of prey; Tal Shachar region.

Pilot of protecting poles using drones:

Completing a pilot project for the installation of protective sleeves to prevent electrocution of birds, using drones, with the aim of attaining a more efficient pace of work and reducing environmental damage by eliminating the need to use an elevation platform and clear access roads to the poles. 12 high-voltage poles in the most sensitive areas were successfully safeguarded using drones, as part of this project, in the Ramat Hagolan region and the Jordan Rift Valley, with close guidance from professionals both in the environmental and ecological aspects and in the engineering and electrical aspects of the work. The research and development process to create and implement the installation device borne by the drones took approximately three years. This is an innovative, groundbreaking, pioneering pilot project on a global level.

Continued R&D of protective devices:

A thorough and deep learning on the process of upgrading the various protective devices was done, and protective devices were adapted and added to optimally serve the needs of the grid workers and improve effectiveness in preventing electrocution.

Dismantling of a high-voltage line near a vulture feeding station:

The Company, in partnership with the Nature and Parks Authority, led a voluntary effort to dismantle a non-operational high-voltage line in an open space near Dimona. This work was carried out due to the uniqueness of the line, which crossed valuable pristine territory and passed close to one of the Negev region's largest and most important vulture feeding stations, visited daily by many birds of prey, mainly griffon vultures and Egyptian vultures. The project included dismantling of approx. 10 km of the line, or a total of 60 poles, and ecological and landscape restoration of the worksite after completion. Environmental guidelines were written specifically for this project and implemented in the field during the work.



Dismantling of the power line in the Dimona region, before and after; as shown, full ecological and landscape restoration of the area of the poles and the worksite were performed.

Supply of high-voltage poles for vulture “training”:

The IEC voluntarily led an effort to provide dismantled wood poles (and the accompanying equipment) to the Nature and Parks Authority, to be rebuilt as simulated poles close to vulture feeding stations and acclimation cages. The goal of this effort is to create negative reinforcement for vultures to land on the poles by connecting the pole arms and insulators to low-voltage wires, thus conditioning the vultures to avoid landing on high-voltage poles, in order to reduce the probability of electrocution and collision incidents.



IEC workers loading wooden poles onto Nature and Parks Authority vehicles.

Preventing bird collisions:

As of 2013, the IEC collaborates with the Society for the Protection of Nature in Israel, the Nature and Parks Authority and the Ministry of Environmental Protection, as part of the public appeal to assimilate biodiversity considerations in companies. Subsequent to the projects performed in previous years aimed to reduce harm to biodiversity, as a result of birds' collisions with power lines and the national mapping of areas with significant potential for harm to birds due to collisions with power lines, a study began in 2022 involving the installation of devices to prevent bird collisions in the Jezreel Valley and Beit She'an Valley regions. Approx. 2,600 devices were installed in the pilot project, across about 8 km of ultra-high voltage power lines and 8 km of high voltage power lines in open spaces sensitive to bird collisions. In addition, unmarked segments were designated as controls.

When installation was completed, in 2023, these areas began to be monitored for field findings, such as feathers, bones, etc., by a researcher and a dog handler.

During the year, the steering committee of the project held status meetings to examine the various markers installed in the experiment and discuss scientific, operational, and practical questions regarding the large-scale implementation of the markers.

The research phase is scheduled to be completed during 2024, and will be followed by consideration of further measures, such as how to implement the project on a large scale.



Ecological Surveys

Within the ecological surveys carried out to study how planned projects will affect biodiversity (included in the environmental documents), the flora and fauna species in the project's area are surveyed. To obtain the most comprehensive information possible, botanical and zoological field surveys are carried out, as well as literature review from different sources, while referring to the "red book" of vertebrae species in Israel that defines and classifies endangered species, whose extinction must be prevented with designated action. The "red book" definitions conform to the International Union for Conservation of Nature definitions – the IUCN Red List of Threatened Animals.

Actions undertaken by the IEC as outcome to the findings of the ecological surveys:

- Environmental and ecological reports for planning, building and operating new Company sites/facilities (transmission lines, distribution and private substations) are prepared when necessary - where it is required to do so as part of the outline plans process (falls under the responsibility of NOGA (the independent system operator), which is authorized to conduct the surveys), and where the areas in question are ecologically and environmentally sensitive, as a condition for obtaining permits.
- The aspects being assessed in the process of writing ecological reports for the different projects are extensive, and the findings are used to issue detailed guidance regarding the planning, building and operation stages.
- On the basis of the ecological reports, the Company's power lines and various sites (primarily substations) are set up in the field. Examples for action taken in view of the findings of the ecological surveys:
- High voltage - local burial of lines and pole protection against birds' electrocution and collision near water reservoirs.
- Dismantling of existing power line segments in areas with bird and landscape sensitivity.
- Addressing the issue of invasive species during the course of the work and after work is completed and teams leave the area.
- Environmental and ecological restoration of worksites. As part of the work of building power lines and substation facilities, plans are written for the environmental and ecological restoration of the worksite. Restoration is performed in areas where projects have been carried out, such as access roads, platforms for setting up poles, organizational areas, tool storage areas, etc. Restoration activities include returning the work site to its previous condition, obscuring access roads, working with local substrates, returning the land to its natural slope, and more.

Following are some examples derived from an ecological survey carried out to analyze alternatives to a future 400 kV ultrahigh line, made to connect a planned manufacturing site in the Beit Shean area to the national transmission grid. Based on the ecological survey, the environmental optimal option was recommended.

The examined alternatives consisted of two geographical areas:

1. **Ramat Tzvaim** – the northern alternative.
2. **Emek Harod** – the southern alternative.

Based on the overall environmental considerations (not limited to the ecological considerations), an option that combines the northern and southern alternatives was chosen. The tables hereafter detail animal observations in the southern alternative area, including a breakdown of risk levels according to the index in the red book of vertebrae in Israel. Dolev, Perevolotsky 2002:

	Extinct	EX
	Regionally Extinct	RE
	Critically Endangered	CR
	Endangered	EN
	Vulnerable	VU
	Near Threatened	NT
	Least Concern	LC
	Data Deficient	DD

Table 47: Mammal, Reptile, and Bird Species Near the Southern Alternative Route.
(Reference: Biogis Website, 2018 Field Survey, Nature and Parks Authority Data)

Mammal species			Reptile species		
	Species	Status		Species	Status
	Jackal	LC		Black whipsnake	LC
	European badger	LC		Palatine Viper	LC
	Jungle cat	VU		Pond turtle	LC
	Otter	CR		Bridled mabuya	LC
	Indian crested porcupine	LC		Sand lizard	LC
	Nutria	LC		Turkish gecko	LC
	European hare	LC		Snake-eyed lacertid	LC
	Wild boar	LC		False coral snake	VU
	Gunther's vole	LC		Common chameleon	LC
	Common red fox	LC		Starred lizard	LC
	Mountain gazelle	VU		Edible frog	LC
				Green toad	EN
				Lemon-yellow tree frog	VU

Table 47: Mammal, Reptile, and Bird Species Near the Southern Alternative Route.
(Reference: Biogis Website, 2018 Field Survey, Nature and Parks Authority Data)

Birds species			Birds species			Birds species		
Species		Status	Species		Status	Species		Status
	Coot	NT		Marsh-harrier	RE		Swallow	LC
	Eagle owl	NT		Montagu's harrier			Booted eagle	
	Oriental honey buzzard			Pallid harrier	NT		Lesser spotted eagle	
	Honey buzzard			Hen-harrier			Tawny eagle	
	Grey heron	RE		Skylark			Spotted eagle	RE
	Bulbul	LC		Bluethroat			Imperial eagle	
	Lesser kestrel	EN		Spoonbill			Willow warbler	
	Eleonora's falcon			Great egret			Crested lark	NT
	Kestrel	LC		Little egret	LC		Buzzard	NT
	Peregrine falcon	RE		Brown ibis	LC			
	Hobby	NT		White wagtail	NT			
	Red-footed falcon			Sparrow hawk	LC			
	Common redshank			Levant sparrow hawk				
	Green sandpiper			Griffon vulture	VU			
	Mallard	NT		Moorhen	LC			
	Black kite			Alpine swift	LC			
				Swift	LC			

Table 48: Mammal, Reptile, and Bird Species Near the Northern Alternative Routs.
(Sources: Biogis Website, 2018 Field Survey, Nature and Parks Authority Data)

Mammal species			Reptile specis		
	Species	Status		Species	Status
	Jackal	LC		Black whipsnake	LC
	European badger	LC		Palatine Viper	LC
	Jungle cat	VU		Pond turtle	LC
	Indian crested porcupine	LC		Bridled mabuya	LC
	European hare	LC		Sand lizard	LC
	Wild boar	LC		Turkish gecko	LC
	Gunther's vole	LC		Snake-eyed lacertid	LC
	Common red fox	LC		False coral snake	VU
	Mountain gazelle	VU		Common chameleon	LC
	Striped hyena	VU		Starred lizard	LC
				Edible frog	LC
				Green toad	EN
				Lemon-yellow tree frog	VU

Table 48: Mammal, Reptile, and Bird Species Near the Northern Alternative Routs.
(Sources: Biogis Website, 2018 Field Survey, Nature and Parks Authority Data)

Birds species			Birds species			Birds species		
Species	Status		Species	Status		Species	Status	
Coot	NT		White stork	NT		Marsh sandpiper		
Eagle owl	NT		Black stork			Hoopoe	NT	
Kestrel	LC		Snipe	NT		Long-legged buzzard	NT	
Mallard	NT		Little grebe	VU		Black partridge	VU	
Rock partridge	NT		Domestic pigeon			Graceful warbler	LC	
Goldfinch	NT		Long-eared owl	LC		Cormorant		
Snake eagle	LC		Great tit	LC		Egyptian vulture	VU	
Stone curlew	NT		Armenian gull			Black-headed gull		
Great egret			Teal			White-throated kingfisher	NT	
Shoveler	LC		Black kite			Osprey		
Hooded crow	LC		Palestine sunbird	LC		White pelican		
Jay	LC		Isabelline wheatear	LC		European bee-eater	VU	
Black partridge	VU		White pelican			Barn owl	NT	
Rock partridge	NT		Rose-ringed parakeet					
Snake eagle	LC		Collared turtle dove	LC				
Red-backed shrike	NT		Wood sandpiper					
Lesser grey shrike								

Biodiversity – Marine Aspects

Marine fauna biodiversity in the area of the hot-water outlets of the Orot Rabin power plant

– Monitoring the invertebrate population at the bottom of the sea (benthos).

As part of the marine environmental monitoring programs performed according to the Ministry of Environmental Protection requirements, the composition of the faunal population at the bottom of the sea near the hot water outlets (from cooling the power plants' generation units) and the saltwater outlets (from returning the brine from the desalination facilities to the sea through the power plants' water outlets) is monitored once every two years at the coastal power plants Rutenberg and Orot Rabin and every five years at the Reading power plant.

The monitoring compares spots far away from the outlets (to the north and to the south, up to two kilometers away) the control points, and nearby points, distributed around the outlets at different depths (Figure 2). To check the extent of the hot water and salt water streams' effect on the marine environment, the compositions of the fauna in the sand between the sampling points are compared. Because this fauna is affected by the environmental conditions in its habitat, it can indicate long-term changes in the habitat conditions.

The organisms are classified according to the chief taxonomical classifications (Polychaeta, Crustacea, Mollusca, and Nematoda; Image 1), and as possible, according to the lowest taxonomical level, i.e., species level. As shown in Figures 3 and 4, the effect of the hot water flows is primarily evident at points OR2, OR3, and OR4, which are close to the outlets (at a distance of up to 500 m), in both seasons. A high abundance of polychaeta in the spring and of crustacea and mollusca in the fall is also apparent. The reason for the high abundance of mollusks may be the spawning season of bivalves, which appear in large numbers, though few of the individuals reach maturity by the following spring monitoring. In addition, the point's depth has a greater effect on the abundance of crustaceans and mollusks than the proximity of the points to the outlets. This can lead to the conclusion that the effect of the hot and salty water discharge is limited to the area closest to the outlets, whereas at the other points natural factors (depth, sand grain particle size, sediment stability, etc.) have a greater effect on the composition of the fauna population in the sand.

Figure 2: Sampling point distribution map.

The points at which fauna is sampled in the sandy bottom are marked in blue.

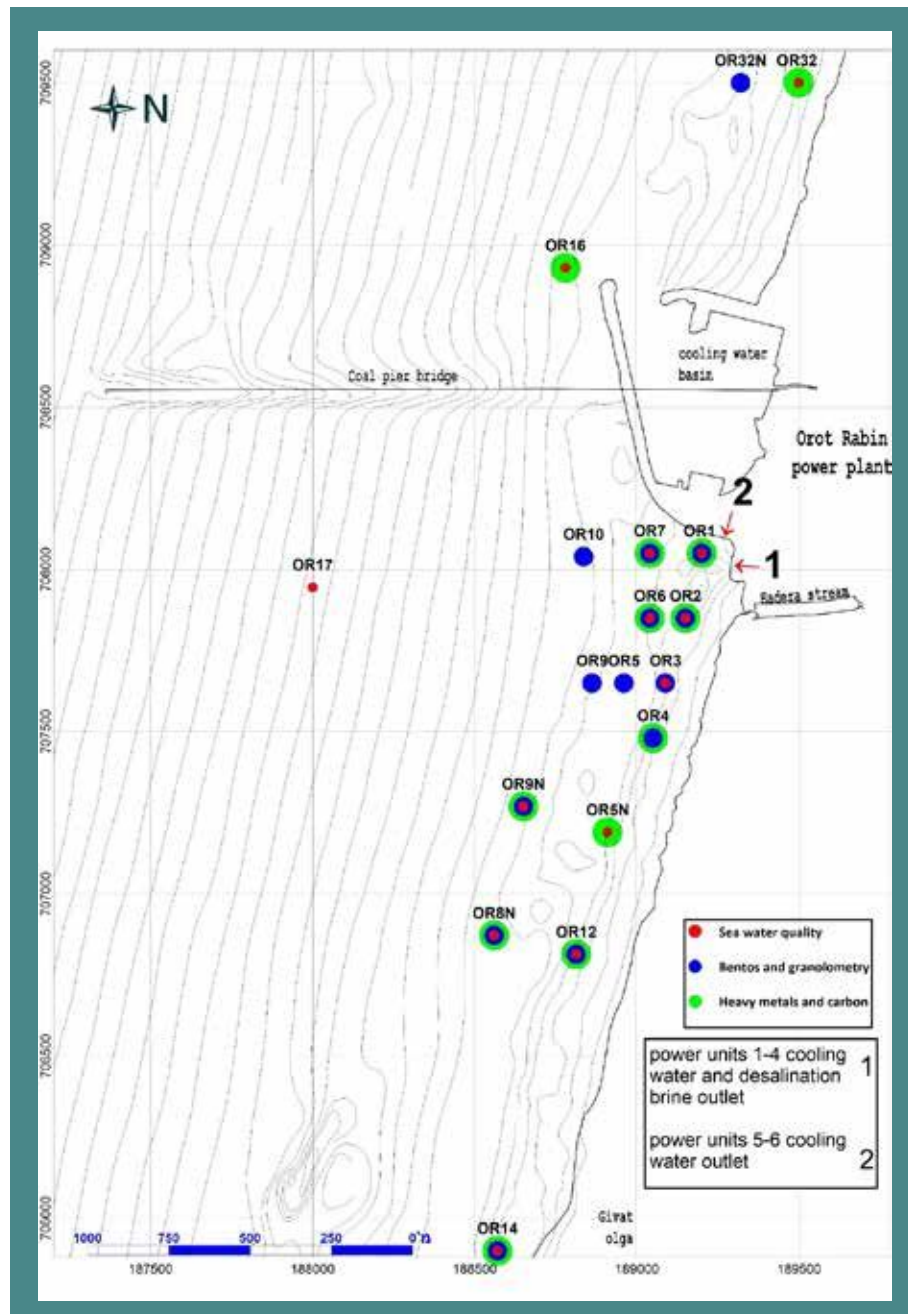


Figure 3: Abundance (3-repetition mean) of individuals of the primary categories in the Orot Rabin outlet area, depth, and distance of the sampling point from the outlet, spring 2023.

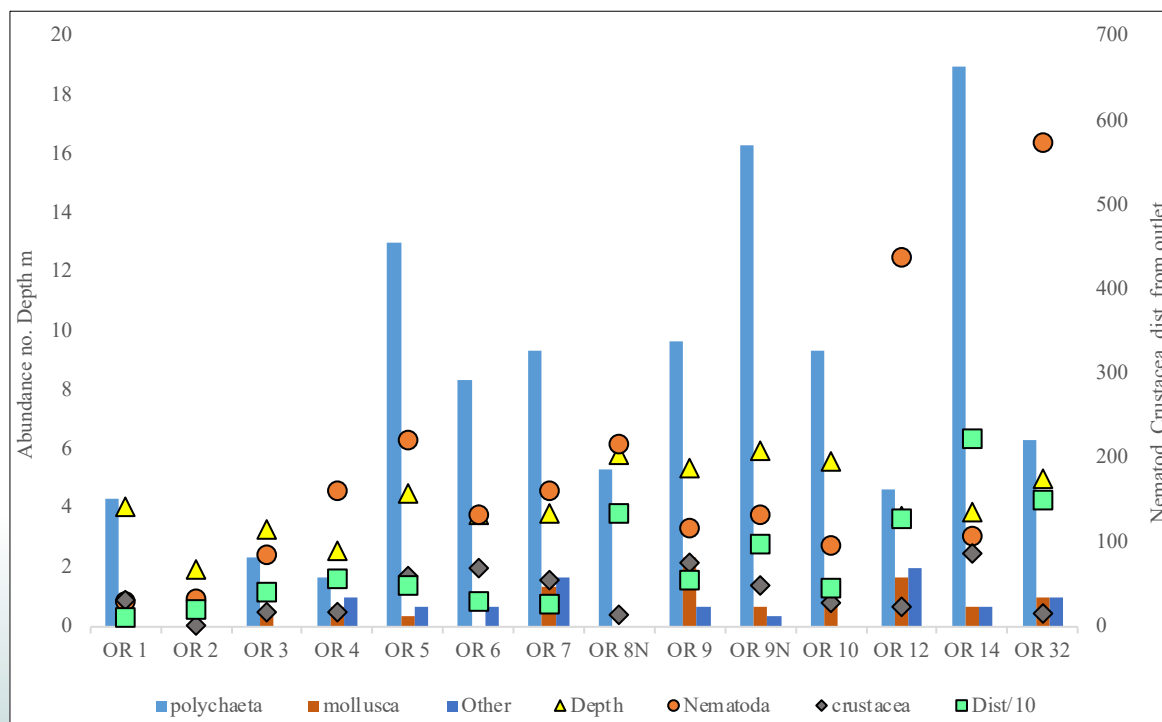


Figure 4: Abundance (3-repetition mean) of individuals of the primary categories in the Orot Rabin outlet area, depth, and distance of the sampling point from the outlet, fall 2023.

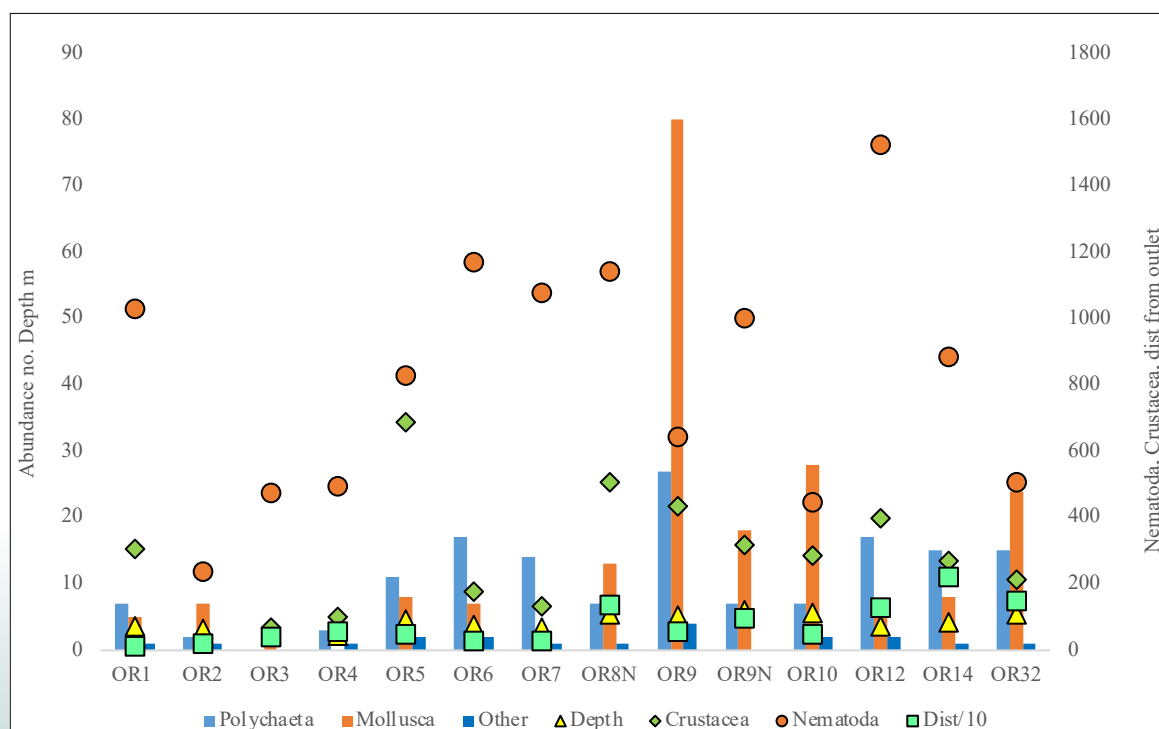
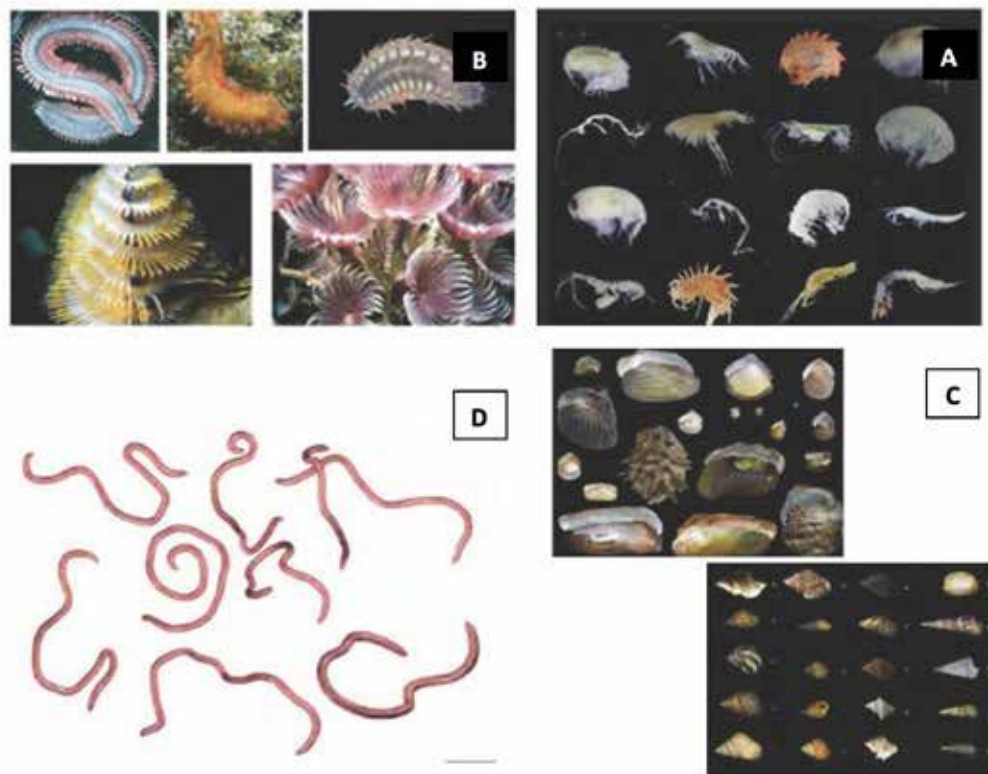


Image 1: A) Crustacea; B) Polychaeta; C) Mollusca, Bivalvia at the top and Gastropoda at the bottom D) Nematoda.



Marine micro-phytoplankton biodiversity in the hot water and salt water outlet area at the Rutenberg power plant

Within the marine environmental monitoring plans carried out according to the Ministry of Environmental Protection requirements, the prevalence of algae (concentration of cells per liter) near the Rutenberg Power Plant water outlets is monitored annually. These outlets include hot water from the Rutenberg and Dorad Power Plants, brine from the VAD desalination facility, and the desalination brine from the Mekorot drillings (enriched with nitrates).

Changes in temperature, salinity, and nitrate concentrations can affect the abundance of different classes of algae in the sea. Because some algae can create toxins that might harm filtering fauna such as oysters, fish, as well as birds in high concentrations, it is very important to monitor the concentrations of algae, to make sure they do not deviate from the norm.

Three sampling spots are located perpendicularly to the shore: RUT3, 250 meters away from the cooling water outlets from the Rutenberg Power Plant Unit No. 1 and Unit No. 4; RUT9, 800 meters away from the outlets, and RUT17, 1,160 meters west of the outlets.

The algae were classified into five classes of size and taxonomical category:

- (1) cells smaller than 2 μm , a class containing mostly the Cyanobacteria
- (2) algae smaller than 5 μm meters, mostly the small eukaryote algae
- (3) algae larger than 5 μm , mostly Dinoflagellates
- (4) Diatoms larger than 5 μm
- (5) Chlorophyceae; (Image 2).

In 2023, the monitoring was only performed in the spring, due to the Iron Swords War, which prevented monitoring in the vicinity of the station in the fall. The species richness of the Cyanobacteria and Chlorophyceae was smaller by an order of magnitude than that of the Diatoms and the Dinoflagellates. The species richness of the Dinoflagellates was lowest at point RUT3, and identical at both western points. In the Diatom category, species richness was highest at point RUT3, similar to most past monitoring findings, where species richness of this category was highest at point RUT3 in both seasons. The species richness of Cyanobacteria was higher at point RUT3 and identical at the western points. The Chlorophyceae category was not represented in this monitoring (Figure 5). The concentration of microalgae cells was higher at point RUT3, mainly due to an increase in Cyanobacteria. Cyanobacteria were dominant at all three sampling points, accounting for $89.8\% \pm 1.0\%$ of total algae. The most common species of Cyanobacteria was *Synechococcus* sp., the most abundant species during the monitored years also in other regions along the coastline of Israel (Figure 6). Species diversity was highest at point RUT3.

In 2023, no unusual concentrations of algae species were detected, and algae species with a toxic potential, such as *Pseudonitzschia*, were detected at very low concentrations, far from the threshold concentrations that might have adverse effects. The species *Prorocentrum* minimum, that creates a number of toxins, was detected at concentrations lower than the potentially harmful threshold by three orders of magnitude.

In summary, no substantial differences can be found between the sampling points in terms of the concentration of cells per liter. Species richness and species diversity were higher at point RUT3, which is close to the outlets.

The prevalence of species with the potential for toxicity was lower than the concentrations that might present a threat by at least three orders of magnitude. Hence, it could be stated that the water discharge from the Rutenberg Power Plant outlets do not have a negative effect on the regional population of algae.

Figure 5: Species richness of different algae categories, spring 2023.

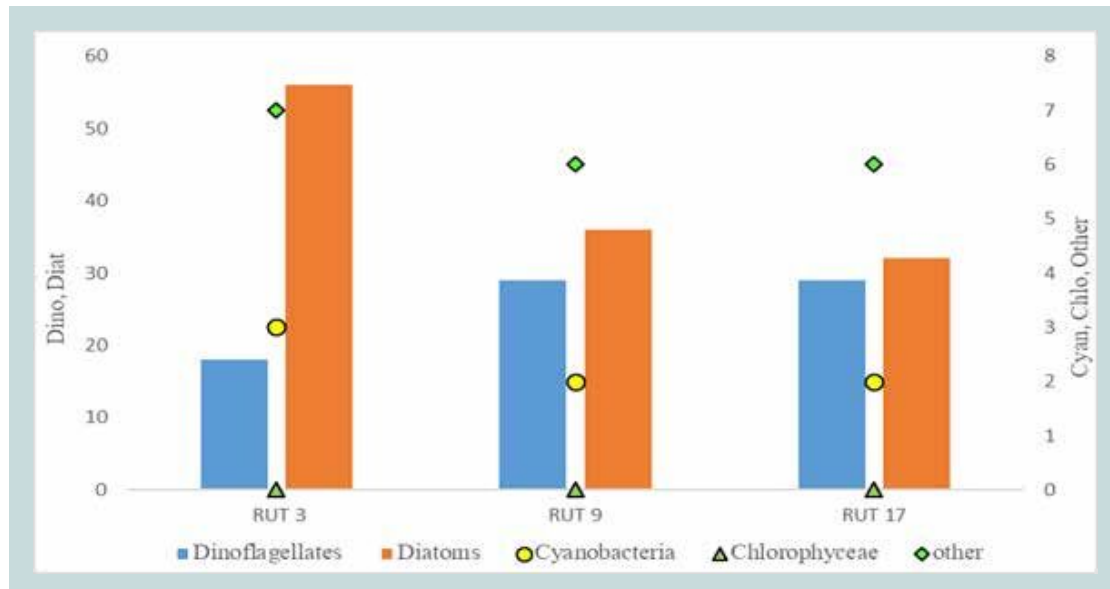


Figure 6: Concentration of cells per liter of the different microalgae categories and species diversity, spring 2023.

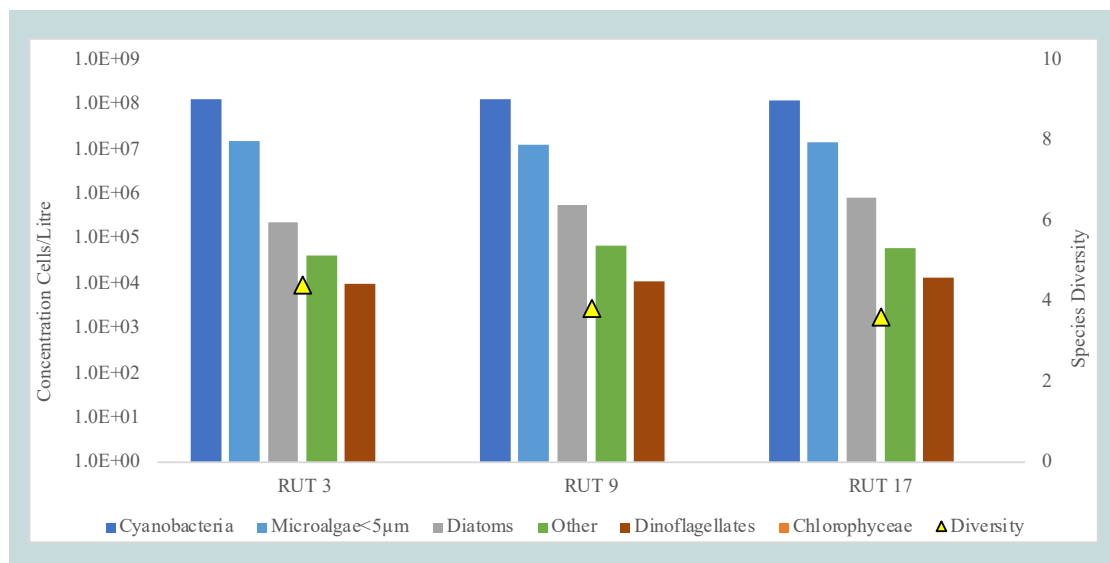
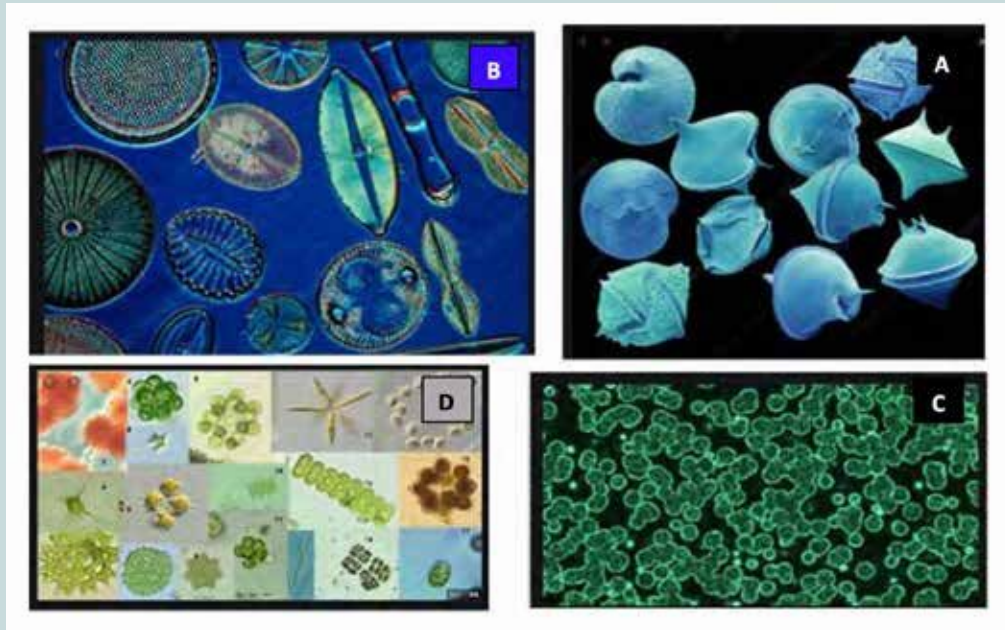


Image 2: Main groups of micro-algae - A) Dinoflagellates (over 5 μm); B) Diatoms; C) Cyanobacteria (smaller than 2 μm); D) Chlorophyceae.



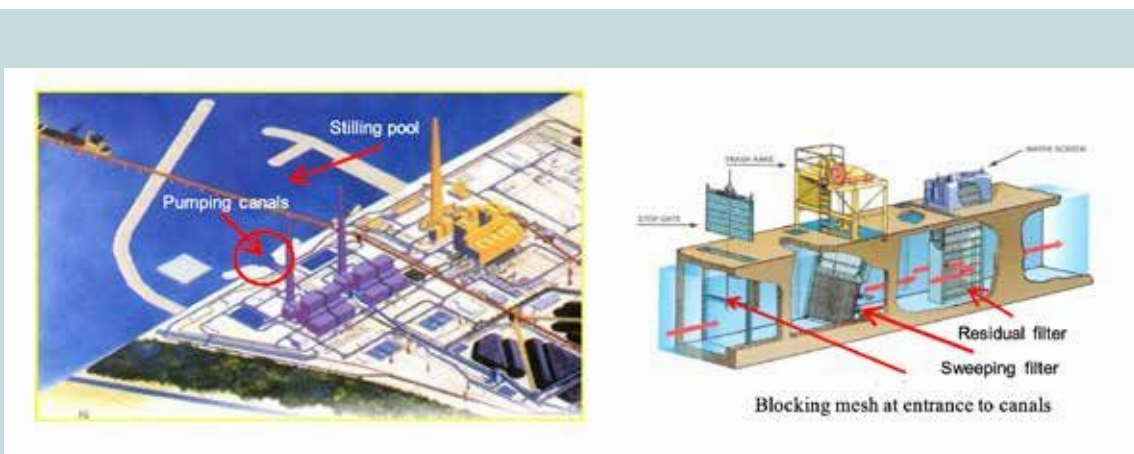
Pilot project to detect turtles in the stilling pool

This project continues in memory of Adam Bismut, founder of the startup, who was killed in combat in Gaza

As part of the activity of the Innovation team of IEC Environmental Regulation Department in the Engineering Projects Division, a pilot project is underway to detect turtles in the stilling pool and pumping canals of the Haifa power plant.

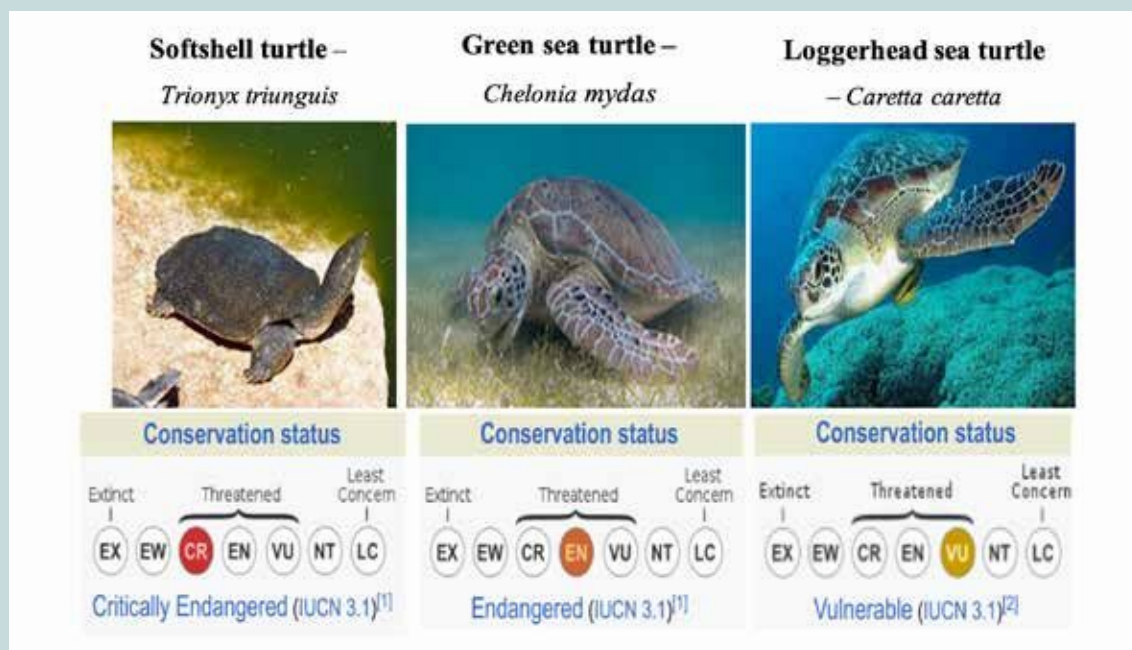
Background: The coastal power plants use seawater to cool turbines and accessory systems in the electricity production process. Large quantities of seawater are pumped for that purpose from a stilling pool, protected from the open sea by breakwaters, through channels protected by a system of filters to preserve the plant's cooling system (Figure 7).

Figure 7: a) diagram of the stilling pool of a coastal power plant; b) filter system



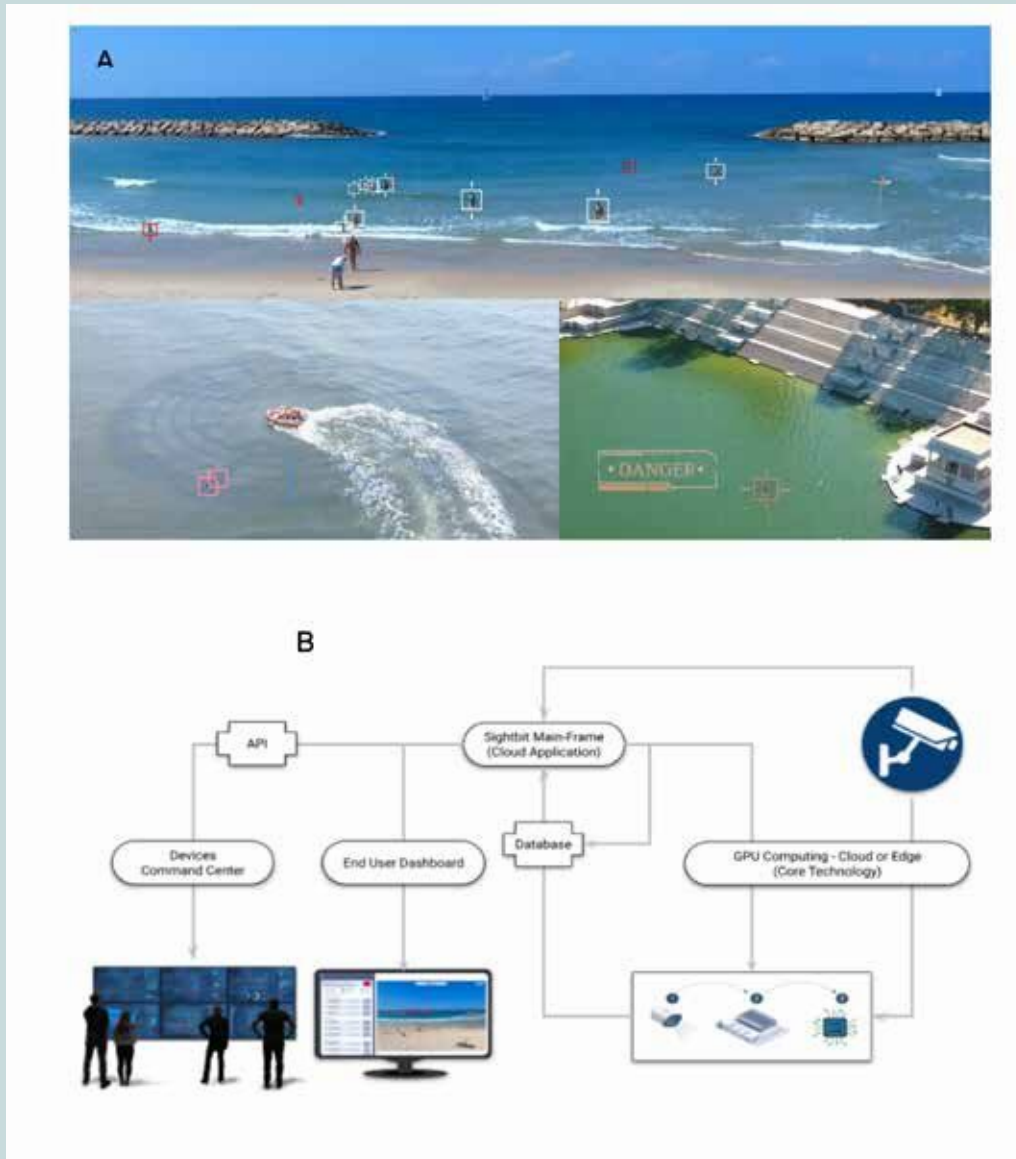
On rare occasions, sea turtles or softshell turtles (Figure 8) visit the coastal plants' stilling pools, where they are at risk of entering the cooling water pumping channels and becoming trapped in the filters. According to the Red List of Threatened Species of the IUCN (International Union for Conservation of Nature), the three species of turtles are endangered to varying degrees. The loggerhead sea turtle is categorized as a vulnerable species, the green sea turtle is endangered, and the softshell turtle is critically endangered (in the Middle East).

Figure 8: Sea turtles and softshell turtle.
Species of turtles that may encounter the pumping channels.



To find the turtles in time, extract them, and transfer them to the Turtle Rescue Center in Mikhmoret to recuperate, the IEC initiated a pilot program with Sightbit, a startup which has developed software that receives direct transmissions from cameras and uses artificial intelligence to learn to identify objects specified by the user (such as turtles), and send real-time alerts to the end user (Figure 9).

Figure 9: a) identification of selected objects from a camera; b) flow chart of the operation of the software

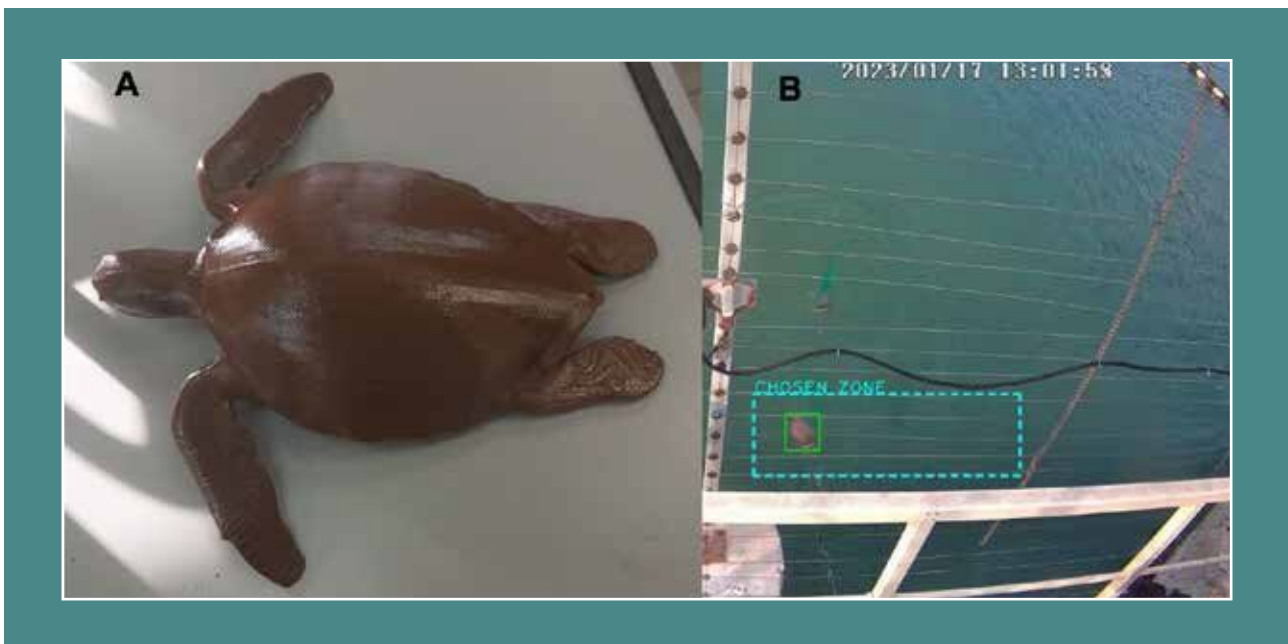


Phases of the pilot program:

- Planning of the system infrastructure with all relevant functions at the IEC.
- Finding the preferred locations for the cameras (after a tour of the site).
- Installation of the cameras and connection to the internet infrastructure (taking cyber and security considerations into account).
- Teaching the software to identify the selected objects.
- Receiving alerts whenever the software identifies the designated object.

In the process of teaching the software to identify sea turtles, a tour of the Turtle Rescue Center in Mikhmoret was held and turtles were photographed at the center's pool. A 3D printed model of a loggerhead sea turtle was also used (Figure 10A).

Figure 10: a) printed turtle; b) alert as received on a phone



As of 2023, the pilot project was in its final stages; real-time alerts are received when a turtle passes through the designated area (Figure 10B), and there have been no false-positive alerts for passing birds or other objects.

