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Water Resources

- An integrated GIS-based system that provides real-time water balance/accounting for modeling and monitoring Non-Revenue Water (NRW). The system should be able to identify data gaps and advise when and where additional monitoring is needed, and should alert when a-typical pressure and water consumptions occur.
- An advanced machine learning enabled dash board and GIS based decision support system for sub-basin level water abstraction management. The system should be able to analyze current and past data to compare permitted abstraction with actual withdrawals and provide projections and recommendations for system operation. Types of data to be managed includes (but is not limited to) GIS data, production permits, production data.
- A decision support system for managing (multi-) annual water budgets and a matching energy budget.

Groundwater Hydrology

- An integrated GIS-based system that can overlay hydrological, GIS and water quality data for improved management of national scale hydrological data (including soil profiles), including storing and using historic data for DSS and predicted operation.
- Proven tools (TRL 6-8) that will be integrated into an alternative approach to protect drilling from anthropogenic contamination rather than the borehole protection zone approach.
- Proven tools for mapping subsoil geological layers.
- Proven tools for scanning drill drawings and data extracting for database construction.

Groundwater Wells

- Technologies for monitoring continuous water level.
- Technologies for monitoring mineral oil levels in deep water wells.
- Technologies for monitoring the boreholes condition in deep water wells.
- Environmentally friendly technologies to prevent clogging and clean filters at the bottom of a water wells.
- Technologies for the accurate mapping of boreholes geometries with typical diameters of 12"-18", at a depth of up to 1000 m.
- Technologies and models for predicting drilling behavior during earthquakes.
- Casing Patch for big diameter casings (9" 5/8 up to 24").
- Drilling with water-based polymer drilling (complete drilling without the use of bentonite).
- Scrubbers for H₂S gas neutralization/removal during well development based on chemical reaction.

Surface Water

- Auto remote technologies for controlling, sampling and transporting water samples of watershed streams and reservoirs.

Water Treatment

- Innovative technologies (at least TRL 6-7) that can be implemented for potable water and that removes the following contaminants: nitrates, volatile organic contaminants (VOC such as vinyl chloride, trichloroethylene, tetrachloroethylene), sulfides, explosive residues, fuel residues, PFAS, chrome and other new and emerging contaminants.
- Innovative technologies (at least TRL 6-7) that can be implemented to remove or to reduce the establishment or removal of disinfectant by-products (such as THM).
- Methods for treatment and separation of lubricant oils from groundwater drilling.
- Efficient technologies and materials for the dissolving/release of sulfur and iron sediment from water systems (pumps, boosters, filters, pipes).
- Innovative on-site water chlorination technologies using chemicals with long shelf life (more than 1 year).
- Low maintenance fully automated UV disinfection systems that either do not require off line CIP or that require minimum down time for system maintenance.
- New and innovative UV disinfection technologies that offer improved performance (lower cost, easier maintenance, etc.) compared to current standards.
- Technologies to reduce environmental pollution and to reduce quantities of chemicals and energy used in treating filtration plants backwash and during pipe cleaning.

Desalination and Membrane Systems

a) Pre-treatment

- Integrating membrane processes with technologies for the removal of dissolved organic material from effluents.
- Innovative filtration media as pretreatment to desalination plants.
- Innovative technologies for silica removal as pretreatment before RO membranes.

b) Improving the efficiency of the desalination process

- Innovative and groundbreaking methods and technologies for the desalination of brackish water, seawater and effluents that increase the process's efficiency – higher fluxes, energy savings and improved salt rejection.
- Innovative and groundbreaking technologies that reduce chemical usage and increase the recovery ratio.

- Innovative technologies for the prevention and minimization of biofouling on membranes and improvement of the membrane's resistance to biofouling.
- Technologies for the continuous monitoring of boron content in raw and desalinated water.
- Innovative methods for the removal of boron with greater efficiency and lower cost than existing technologies (resins, membranes).
- Technologies that enable desalination with a higher recovery ratio for raw water with high silica concentrations.
- Innovative and effective anti-scalants to prevent silica scaling as well as phosphorus-free or phosphorus-reduced anti-scalants.
- Innovative technologies for the stabilizing of desalinated water at reduced costs.
- Innovative cleaning materials for RO membranes cleaning (i.e., CIP: Cleaning-In-Place).
- AI/ML capabilities to optimize the operation of desalination plants.

c) Treating brine and backwash streams

- Methods for the treatment, removal, extraction and reduction of brine in different applications (brackish water and effluent desalination).
- Treatment of effluents (after treatment in a UF-RO facility), and the removal of all components of organic matter.
- Innovative techno-economic technologies for the treatment of nitrates in brackish water brine.
- Innovative methods and technologies for treating and reducing the volume of brine.

Water Quality Monitoring and Water Security

- Methods for rapid identification of chemical pollutants, pathogenic and indicator bacteria in the field, the laboratory and continuously in water supply systems.
- Reliable equipment for the continuous inline monitoring of water quality parameters including: chlorine, turbidity, biofilm, sulfide, disinfection by products (e.g., THM) and more.
- Methods and technologies for cleaning, rehabilitation and disinfection of contaminated water supply systems particularly for fuel, pesticides and bacterial contamination.
- Innovative water quality event detection systems (EDS) for drinking water contamination.
- Smart systems for analyzing and asserting of water quality anomalies.
- Fast and cheap methods for monitoring biological toxicity factors (Cyanobacteria, fish toxins, etc.) in reservoirs or supply lines.

Pumping Equipment

- Methods for reducing energy consumption in pumping systems.
- Pumping equipment (pumps, piping, hydraulic accessories) from advanced materials designed for use in corrosive water and in cavitation's at pressures of up to 70 atmospheres.
- Water-based lubricated bearings capable of operating for periods of up to 10 minutes until the arrival of the water (for water lubrication drillings)
- Advanced tools for the efficient hydraulic design of pumping stations (models, CFD, etc.).
- Technologies for the early and reliable prediction of specific faults in electromechanical equipment.
- Technologies for reducing vibrations following the reverse rotation of vertical pumps in deep drilling.
- Technology for the rapid assembly of drilling equipment (using automation).
- Technologies for monitoring and analyzing vibration of the pump in deep water wells.
- Environmentally friendly lubricants permitted for use in potable water systems (for use in deep drillings where water lubrication cannot be used).
- Multi-stage centrifugal pumps for deep drilling of over 400 meters.
- Ceramic coatings to improve the efficiency of pumping equipment.
- Technology of using trust bearings for installation and operation in pump head instead of installation in the motor.
- Lineshaft type pumping equipment, oil and water lubricated for installation in wells. The equipment includes pressure pipes, oil tubes, shafts and spiders.
- API/Flanged pressure pipes for installation in wells with submersible pumping equipment.
- Dismantling and assembly of pumping equipment in wells (Lineshaft + Submersible).
- Solutions for online monitoring drilling levels.

Electricity

- Methods and means for grounding electrical facilities in desert regions.

Energy

- Small, sabotage resistant electrical supply systems to supply electricity to measuring systems and facilitate data transmission from facilities that are not connected to the electricity grid.
- Innovative technologies to reduce energy consumption in water and pumping systems.
- Generation of renewable energy in water facilities while exploiting Mekorot's relative advantages and the dual use of facilities and sites.

- Independent energy systems for monitoring and transmission systems.
- Innovative energy storage technologies for internal consumption or supplier to the grid.

Piping Systems

- Systems for the remote detection of leaks in underground pressure pipelines.
- Systems for monitoring illegal connections and damage to underground pipelines caused by infrastructure works.
- Technologies for measuring and/or monitoring (without excavation) the wall thickness of an underground metal pipe with a cement internal coating.
- Technologies and decision support systems for monitoring the condition of tensioning wires in 108", 66", 48", 36" diameter prestressed concrete pipes.
- Advanced tools for removing the external coating from the pipe end, prior to welding.
- Advanced technologies for assessing the condition of the external coating of different diameter underground pipes.
- Advanced technologies for checking the condition of internal coating in metal piping of different diameters.
- Advanced technologies (such as robots) for repairs of underground steel pipes of different diameters (interior and exterior walls), without excavation.
- Technologies for the measurement and mapping of deformations in underground pipes after installation and soil compacting.
- Technologies for examining the quality of the soil side support (compaction levels and cavities).
- Technologies for the restoration and renewal of pipes (insertion, demolition, etc.).
- Advanced methods with improved accuracy for locating underground pipes.
- Advanced methods for efficient pipeline flushing before operation.
- Technology for assessing biofouling in pipelines.
- Non-invasive method for checking the quality of welds that produces a digital output.

Pipe Accessories

- "Smart" air valves which enable the monitoring and transmission of essential measured parameters to control centers.
- Technologies for detection malfunction and leakage in valves.

Hydraulics and Pressure Transients

- Technologies for transient pressures monitoring and management (incorporated with the existing SCADA) based on burst acquisition mechanism or similar.

Materials and Corrosion

- Innovative Technologies for monitoring the condition assessment (wall thickness) of pipelines and fittings (T-connections, elbows) and other infrastructures (like steel and concrete tanks).
- Advanced technologies for monitoring the condition assessment of the external coating of underground pipes of various diameters (like ECDA).
- Advanced technologies for monitoring the condition assessment of the internal coating of pipelines systems of various diameters (like ILI).
- Steel Piping/construction systems and technologies for leakage repairs with Quick Return to Service and without water shutdown necessary, approved for contact with drinking water and with the repair ability in non-straight figures (T-joints and elbows).
- Nanomaterials (like CNT), Nanotechnology and Nano-sensors for corrosion protection and improving other technical properties (like mechanical, durability, LCC, etc.) of infrastructure materials, external coatings and internal linings) and predictive maintenance (diagnostics).
- Assessment of Long-term behavior and service life/durability/ageing of Mortar Cement Lining with Acrylic Additives for Big Diameter Water Transmission Pipelines.
- Materials and technologies for passive corrosion protection (technologies for effective surface preparation before coating, coating and paint types).

Cathodic Protection

- Innovative technologies for devices of impressed current cathodic protection (ICCP) system such as ICCP rectifiers, isolation joints, shallow or deep impressed anodes beds (different types of materials), remote control devices, test points, etc.
- Innovative Technologies for monitoring protection level of protected pipelines by ICCP systems.

Reservoirs

- Auto remote technologies for controlling, sampling and transporting water samples of watershed streams and reservoirs.
- Technologies for autonomous sampling and monitoring water in reservoirs at varying depths and on the water's surface.
- Innovative technologies for monitoring, inhibiting, and treating the growth of toxic cyanobacteria in open reservoirs.
- Technologies for excluding birds and rodents from reservoirs and facilities.
- Innovative technologies and models for forecasting the development of seasonal biological growth in reservoirs storing raw drinking water or agricultural irrigation water.
- Rapid technologies for monitoring sedimentation in reservoirs –depth and composition.

- Technologies for polishing irrigation water stored in reservoirs to prevent clogging of irrigation systems.
- Technologies to simulate contaminant loads, removal, and process efficiency in advanced effluent treatment processes
- Innovative technologies to improve the safety of soil reservoirs and technologies for assessing the quantity of water leaks through the reservoir's sealing and their location.
- Technologies for continuous monitoring and Dam Safety assessment
- Innovative technologies to improve the safety of earth fill Dam.
- Technologies for assessing the quantity of water leaks through the reservoir's sealing and their location.
- Improving the life span of plastic sheets used cover reservoirs.
- Technologies for the detection voids and cavities in earth dikes.
- Technologies for the disposal of runoff from floating reservoir covers.
- An advanced process for sediment digestion in reclaimed water reservoirs.

Water Tanks

- Technologies for sealing leaks from steel and concrete tanks and rehabilitation.
- Technologies for the non-destructive testing reinforced concrete walls and floors (concrete and steel corrosion conditions, corrosion rate, leaks, cracks in concrete, hidden segregations).
- Systems for the continuous monitoring of reinforced concrete condition.
- Technologies for improving existing steel tanks durability using advanced coatings.
- Materials and methods for water tanks construction with a techno-economic priority throughout the facility's life cycle.
- More efficient and cheaper methods for testing the durability of existing structures and systems during earthquakes.
- Water tanks cleaning technologies while working without emptying the water tank.

Wastewater Treatment and Effluent Reclamation

- Technologies that turn wastewater treatment plant into smart plants where wastewater treatment is pre-planned and effluent quality is predicted and actively managed using AI and ML based tools.
- Tools for the continuous detection and monitoring of changes in wastewater load composition at the entrance to pretreatment facilities and in reactors to streamline process control efficiency and reduce operational costs.
- Real time process monitoring to prevent the accumulation of filamentous micro-organisms, that

interfere with sedimentation processes in wastewater treatment plants and other biological processes.

- Predictive models to optimize the decomposition of organic materials, for the removal and recycling of nutrients (P, N) in activated sludge processes.
- Energy efficient, temperature resistant technologies for the anaerobic treatment of sewage including anaerobic membrane (AnMBR) treatment.
- Innovative technologies for the complete removal of dissolved organic materials from treated wastewater (with an emphasis on organic micro contaminants, hormones and drugs) to IPR (Indirect Potable Reuse) quality level.
- Innovative technologies for the removal of dissolved organic materials from wastewater sludge (with an emphasis on organic micro contaminants, hormones and drugs).
- Environmentally-friendly technologies for prediction, prevention and elimination of zooplankton in reservoirs.
- Technologies to predict and prevent the development of chemical materials harmful to fish in treated waste water reservoirs (such as: ammonia, nitrate and sulfide).
- Resource recovery towards zero waste wastewater treatment (liquid and sludge) and circular economy: recycling and use of by-products generated in wastewater treatment processes. For example: phosphorus, nitrogen, sand, wipes, acids, anaerobic centrate.
- Solution to ongoing problems in the anaerobic digestion process. For example: struvite precipitation, sand accumulation, foam formation.
- Performance monitoring systems for maintenance operations.
- Improving existing control systems by smart planning, and writing a P&ID that becomes an integral part of the control system at wastewater treatment plants.

Effluent Reclamation Hydrology

- Innovative technologies for improved efficiency of the SAT (Soil Aquifer Treatment) using boreholes and infiltration ponds.
- Innovative methods for studying and understanding factors that influence the infiltration of effluents.
- Remote sensing for improved infiltration management
- Proven tools and technologies (TRL 6-8) to optimize the operating regime of effluent infiltration (operation and infiltration regimes, soil cultivation regimes, etc.), with the aim of maximizing infiltrated quantities and maintaining (or improving) the quality of the treated water.
- Advanced methods for determining soil wetness and temporal permeability for improved management of the infiltration process at the SAT (Soil Aquifer Treatment) infiltration fields

Command & Control

- Encryption and Cyber immunity for PLCs, remote-control systems, and wireless data communication.
- Technology of Remote Terminals Units (RTU) and programmable logic controller (PLC) using dnp3 and other SCADA protocols.
- IoT (Internet of Things) systems for data transfer, managing IoT components and providing a situation picture.
- Narrowband, satellite communication systems in the KU and KA sectors.
- Network operations center (NOC) systems for operational technology (OT) technology network.
- Machine Learning and Artificial Intelligence for operational technology (OT).
- Small, energy-efficient, and secure communication systems (secured communications), for the transmission of data from measuring and monitoring devices to command centers.

Digital transformation and information technology

- Modernization and optimization of computing infrastructures both cloud and on Prem.
- Implementation of Big Data infrastructure to enable data driven organization.
- Improving visualization, analytics capabilities and proactive decision-making based on data.
- Application of AI / ML for business process optimization.
- Access to information and business processes anywhere, anytime via Mobile.
- Automate and optimize business processes using BPM and RPA tools.
- Collaboration of information, knowledge, and learning within the organization.
- Implementing agile approach to achieve quick value to the organization.
- Tools to achieve internal / external service excellence.
- Create an advanced customer experience using UI / UX.
- Software and methods for establishing Digital Twins.

Cyber

- Advanced tools and methods for the prevention of information leakage- DLP.

Physical Security

- Invisible systems for detecting short and medium-range intrusion of facilities.
- Mobile (outdoor) detection and documentation systems for covert installation on suspicious sites.
- Systems for protecting water lines (above and belowground) and water accessories installed along pipelines outside of Mekorot facilities.
- Simple and durable "smart" video recording and transmission analytical systems.

Unmanned & Autonomous Vehicles

Promoting solutions for different needs based on different platforms, most of which are:

- An unmanned aerial vehicle (UAV) / unmanned aircraft system (UAS).
- An unmanned vehicle in the maritime industry such as ROV's and AUV's and US.
- An autonomous vehicle for aerial or maritime solutions.

Operational missions

- Water quality: Spraying reservoirs of different volumes to treat biological materials in the water body.
- Water samples.
- Monitoring physical parameters in water.
- Security: Responding to security challenges (public safety, strategic facilities) using autonomous drones.
- Pipes:
 - Visual inspection and monitoring of internal surface.
 - Performing operations inside the pipes (such as welding, cleaning obstacles).

Advanced analysis missions

- Spectral analysis of soil moisture.
- Spectral analysis of technical status of the facilities for detecting cracks (such as water ponds).
- Image recognition of photos and videos for objects detection (such as men, vehicle, obstacles, ladders, etc.).
- Mapping and measurements of aerial photos.
- Tracking changes in the field.
- Planning and execution comparison.

Asset Management

- Commercial software tool for Asset Management, including, at least, data management, health indexing and SAP connection features.

Decision Support Systems (DSS)

- Water loss - models for real-time leakage detection in regional water transmission systems, identifying the precise location of leakage and/or water theft.
- Maintenance - Models for the early detection of system failures (from pumping equipment to complex systems) of supply, distribution and water treatment systems.

- Water supply–
 - Using the water network's topology to solve upstream or downstream flow faults.
 - Tools to improve operations.
 - Decision support systems (DSS).
- Wastewater treatment - models for optimizing wastewater treatment systems, with an emphasis on optimization at all stages of the process.
- Water quality - modeling the movement of dissolved substances in the water supply system, forecasting water quality values (especially values that are not chemically preserved) within a water network composed of several different water sources with varying mixing ratios.