# TECHNICAL SPECIFICATION

**Replacement of servomotors and oil pumps for Units AN4, AN6, AN9 and AN10 of Pļaviņas HPP**

Technical specification on 11 pages

Annex: Technical Design "Replacement of servomotors and oil pumps for Units AN4, AN6, AN9 and AN10 of Pļaviņas HPP"

1. **Brief description of the object and its technical condition**

Servomotors of similar type have been installed for the hydro-units AN4, AN6, AN9 and AN10. They were manufactured in 1991 for the reconstruction of these particular Units. The diameter of servomotor pistons is 500 mm and the stroke is 625 mm.

Servomotors are operated by 39.2 bar oil pressure in accordance with hydro-mechanical diagram. Great volume of oil is required for the operation of servomotors and for providing pressure in the system. The volume of four servomotors’ oil is 0.51 m³. The required oil pressure and amount is provided by two oil pumps, the productivity of each pump is 8.9 l/s and the capacity of electric motor is 55 kW. For each Unit four servomotors (with piston diameter 500 mm) with the help of levers are connected to the regulating ring which controls the opening of wicket gates. Schematic diagram of operation is in Figure 1.



On the servomotor pistons and on the surface of cylinders there are cavities and scratches (grooves) found. Cavities and scratches on the cylinder surface that have appeared during the operation increase oil leaks between the piston sides. Considering the fact that oil is constantly under pressure on one side or on the other side of servomotor piston therefore due to leaks the pressure decreases and oil pumps start operation for increasing the pressure up to the nominal.

Figure No.1

As through the servomotors the pressure of oil in the system decreases fast, oil pumps of Units AN4, AN6, AN9 and AN10 are operated more often than the pumps of the other units. Units AN4, AN6, AN9 and AN10 being in stand-by the pumps are started every 17 to 23 minutes, while the frequency of Unit 5 pumps starts in stand-by is about 2 hours.

Frequent starting of OPE (oil pressure equipment) pumps due to oil leaks through servomotor piston rings causes intensive wearing and faster deterioration of oil pump componenets. Oil pumps were manufactured in 1960 and new spare parts are not manufactured for them and not available any more.

Technical design was developed in 2021 for the replacement of servomotors and oil pumps of Pļaviņas HPP Units AN4, AN6, AN9 and AN10.

*Technical design is in the Annex and it is available only in the Latvian language.*

Within the scope of the Technical design calculations were made, and based on these calculations the diameter of servomotor has been reduced from 500mm to 400mm, as a result of that the capacity of OPE pumps is reduced by 27%, but the required capacity of pumps electric motor is 37kW that is by 32.7% less than that of the existing pumps.

1. **Objective of Work**

To ensure the starting of OPE pumps for the Unit being in reserve not more often than every 90 minutes. To improve energy efficiency of OPE pumps.

1. **Scope of Work**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| No. | Work to be performed | | Unit of measure | Amount | | Performed by | Essential technical parameters, conditions |
| For one Unit | Total |
|  | Development of the Work Performance Programme (hereinafter – WPP) and coordination with the Employer | | set |  | 1 | Contractor | Detailed WPP in accordance with “Latvenergo” AS procedure K233 “The procedure of performance of work carried out by the contractors at the generation facilities” |
|  | | Preparatory works | object | 1 | x4 | Contractor | In accordance with the technical design "Replacement of servomotors and oil pumps for Pļaviņas HPP Units AN4, AN6, AN9 and AN10" and the requirements stated in Technical specification |
|  | | **Dismantling work** |  |  |  |  |
|  | | dismantling of feeback linear sensor of servomotors | set | 1 | x4 | Contractor |
|  | | dismantling of high pressure pipes of servomotors | set | 1 | x4 | Contractor |
|  | | dismantling of servomotors | set | 1 | x4 | Contractor,  Employer |
|  | | dismantling of supports of servomotors | set | 1 | x4 | Contractor |
|  | | dismantling of regulating ring | set | 1 | x4 | Contractor |
|  | | Inspection of wicket gates (WG) levers. Inspection of WG ties liners, assessment of wear and play by dismantling the element. Preparing the form of liners and pins | set | 1  (24 levers,  48 pins,  48 nylon liners) | x4 | Contractor |
|  | | replacement of liners in case of defect | set | 1  (48 liners) | x4 | Contractor |
|  | | replacement of pins in case of defect | set | 1  (48 pins) | x4 | Contractor |
|  | | dismantling of pump stations | set | 1 | x4 | Contractor |
|  | | **Assembly works** |  |  |  |  |
|  | | Assembly of pump stations | set | 1 | x4 | Contractor |
|  | | Assembly of regulating ring and wicket gates, including renovation/replacement of regulating ring and adjustment of wicket gates | set | 1 | x4 | Contractor |
|  | | assembly of supports of servomotors | set | 1 | x4 | Contractor |
|  | | assembly of servomotors | set | 1 | x4 | Contractor |
|  | | assembly of high pressure pipes of servomotors | set | 1 | x4 | Contractor |
|  | | assembly of feeback linear sensor of servomotor | set | 1 | x4 | Contractor |
|  | | **Testing, adjustment and inspections** |  |  |  |  |
|  | | Inspection of assembled pipelines | set | 1 | x4 | Contractor |
|  | | Adjustment of WG drive of the unit in accordance with the design of the unit manufacturer and parameters given in the operation instructions | set | 1 | x4 | Contractor |
|  | | **Handing over – acceptance of works** |  |  |  |  |
|  | | visual inspections | object | 1 | x4 | Contractor, Employer |
|  | | functional tests | object | 1 | x4 | Contractor, Employer |
|  | | Re-assembly of constructions (fencing, covers) dismantled for the performance of work | object | 1 | x4 | Contractor |
|  | |  |  |  |  |  |  |
|  | | Preparing and processing of as-built documentation of repair works and inspections | set | 1 | x4 | Contractor | See part 8 of technical specification |
|  | | Trial run of the unit | object | 1 | x4 | Contractor,  Employer | See part 9 of technical specification |
|  | | Commissioning of the unit | object | 1 | x4 | Contractor, Employer |
|  | | Handing over – acceptance of contract works (signing of Taking Over certificate) | set | 1 | 1 | Contractor,  Employer |

Items of the scope of work also include all the works that are technologically directly connected with particular work to be performed or technology of work performance in order to ensure good quality of work performance and/or safe operation of separate part or construction.

The Contractor shall eliminate the defects caused to the constructions and mechanisms/equipment during the performance of work. Construction defects shall be eliminated according to the surrounding constructions (material, colour etc.), but the damaged mechanisms/equipment shall be repaired or replaced by equivalent ones previously agreed by the Employer.

1. **Requirements for designing -**
2. **Technical requirements for the performance of works** 
   1. Organization of Work
      1. The Work Performance Programme shall be developed in accordance with Latvenergo AS Generation procedure K233 “The procedure of performance of work carried out by the contractors at the generation facilities”.
      2. The Work Performance Programme shall be submitted to the Employer for approval not later than 3 weeks before the commencement of work at the facility.
      3. For commencing work, at least 5 working days in advance, the Contractor shall submit a complete list of employees for issuing the pass cards and admitting the teams to the work sites in accordance with Latvenergo AS Generation procedure K233 “The procedure of performance of work carried out by the contractors at the generation facilities” and Latvenergo AS regulations of pass regime. Before the commencement of work at site the Contractor’s personnel shall be instructed by the Employer.
      4. Organizational measures and admitting to work shall be performed in accordance with Latvenergo AS procedure K233 “The procedure of performance of work carried out by the contractors at the generation facilities” and Latvenergo AS regulations of pass regime NOP 020. These regulations are binding for the Contractor during the performance of work.
      5. The documents binding for the Contractor (procedures, regulations etc.) are available at <https://latvenergo.lv/lv/par-mums/saistosie-dokumenti-darbuznemejiem>.
      6. The Contractor shall observe all the laws in force in the Republic of Latvia, Cabinet regulations , standards (ISO, IEC, LVS, LEK), instructions and other regulations and requirements related to the performance of work, including LEK025 “Safety requirements working on electric facilities”, LEK037 “Safety requirements working on hydro technical structures and facilities of hydro power plants”, Cabinet regulation No.1041 “Regulations on mandatory applicable energy standard regulating the requirements for organizational and technical safety of operation of power supply objects”, Cabinet regulation No.238 “Fire safety regulations”, Cabinet regulation No.359“Labour protection requirements at workplaces”, Cabinet regulation No. 372 “Labour protection requirements when using personal protective equipment”, “Law on technical supervision of dangerous equipment”, “Law on Pollution”, “Waste Management Law”, Cabinet regulation No.526 “Labour protection requirements when using work equipment”, Cabinet regulations No.143 “Labour protection requirements when working at height”. All the regulations and requirements are binding for the Contractor during the performance of work.
      7. The Contractor shall provide for the Employer’s technical supervisors and leading technical personnel to have a safe access to the object under repair for its visual inspection and quality control.
      8. The Employer is entitled to suspend the performance of work in the case of gross offence of safety or establishment regulations endangering health of the employees, safety of equipment in operation or could cause material damage, as well as in the case of the accident occurred. In the case of offence the Employer reserves the rights to take away the pass cards from the guilty persons and expel them from the work place ineligible for coming back there. If the guilty persons are allowed to continue work these persons shall have a repeated instructions for Contractors at Latvenergo AS.
      9. The Employer shall provide the Contractor with the possibility of getting acquainted with the documentation of the object under repair that is available at the HPP technical archive in accordance with Latvenergo AS procedure K162 “The procedure of processing and filing the documents and access to the technical archives of HPP Technical management” and that is necessary for the performance of work.
      10. For connecting the Contractor’s mechanisms, electrical equipment or using other resources the Contractor shall submit a letter (according to the Employer’s procedure K233) stating technical parameters (electric power (kW) supply of compressed air (m3) etc.) and the persons responsible for the technical condition of the equipment to be connected. The letter shall be submitted to the head of the HPP who decides on the availability and use of the required resources.
      11. The Employer shall indicate the connection point of electricity supply for the installation equipment. It is unacceptable to make unwarranted connection to the Employer’s electrical facilities in the points not coordinated before. The switchgear and cables necessary for the connection shall be provided by the Contractor. The Contractor is responsible for the repair switchgear, connection of using equipment, connected cables and technical condition of using equipment by appointing person in charge of electrical equipment. The Employer reserves the right to disconnect this switchgear from voltage if the technical condition of outgoing lines and using equipment does not comply with the provisions or if the connection is unwarranted.
      12. If a temporary electrical facility is arranged for performing work and it is connected to Latvenergo AS electrical facilities, the Contractor shall submit the following information (according to procedure K233) about the person in charge of electrical facility (name, surname, electrical safety group (at least Cz group, but foreign contractors shall give relevant electro-technical qualification that is the responsibility of the Contractor, mobile phone number), as well as technical information: required load (kW), rated current of input protective device (A), voltage (V), number of phases.
      13. For the performance of work the Contractor may use the cranes of Pļaviņas HPP machine hall. The Contractor shall have the Employer’s approval for using the cranes and shall use the cranes in such a way that the Employer could be able to perform regular maintenance of the cranes by duly informing the Contractor about it. For the performance of works the Contractor shall provide all the required auxiliary equipment such as slings, pulleys, chains, wire ropes. To get permission for the Contractor’s crane operator to operate the cranes of Generation facility the Contractor shall submit a letter (see Annex 2 to K233) and a copy of certificate of gantry (bridge) crane operator, if such is not submitted in the Contractor’s offer. The required documents shall be submitted by the Contractor with the letter to the project manager. The decision on permission to operate the generation facility cranes is made by Technical Director of HPP.
      14. For the supervision and analysis of contract work the Employer shall call project meetings where the time schedule is checked, separate changes in the schedule and technical solutions are coordinated. A day before the planned project meeting the Contractor shall submit to the Employer’s project manager a project progress report stating performed works, work that is being performed and the work that is going to be started/performed by the Contactor in the nearest two weeks and other current information. The progress report shall be developed in such a way that the Employer could evaluate the compliance of the progress to the time schedule of the contract and to the planned progress. In case of lagging behind the schedule the Employer is entitled to require explanations from the Contractor and the performance of measures for compensation of delay and keeping to the final term of performance. The implementation of these requirements is mandatory for the Contractor.
      15. If necessary, the Contractor may plan the execution of work also in the evening hours and the days off, but the acceptance of work stages and quality control as well as solving other matters with the involvement of the Employer’s personnel shall be planned and performed in working hours on workdays.
      16. When performing work the Contractor shall consider the following physical and mechanical risk factors of labour environment – electricity hazard, noise, vibrations, electromagnetic field, lighting, lifting mechanisms, moving mechanisms, risk factors of traumatism (falling down from the height of 1.5m or higher; dropping of tools and devices on people or electric facility in operation); physical overwork; chemical risk factors of labour environment – hydrocarbons and their compounds (oils, solvents, paints).
      17. In the object there is a possibility of risks that at the work place the Contractor’s personnel may have contact with asbestos, asbestos fibres, asbestos dust or asbestos containing material (risks presented by asbestos). If during the performance of work the Contractor establishes that work is going to be performed having contact with asbestos, asbestos fibres, asbestos dust or dust of asbestos containing material, he shall provide for the inspection of work places in order to approve or deny possible contact with asbestos, that is, the Contractor shall ensure the assessment of risks presented by asbestos and primary measurements of asbestos fibre exposition in the air at the work place (amount of asbestos fibres in a definite volume unit of air (fibres/ cm3)) at the work place. The Contractor shall observe the labour protection requirements in regards to work with asbestos in order to protect the safety and health of employees against the risks which arise or may arise when coming into contact with dust from asbestos or asbestos-containing material at the workplace in accordance with the requirements of the normative acts of the Republic of Latvia (incl. Labour protection requirements in work with asbestos, Cabinet Regulation No.852, Riga, 12.10.2004; Labour protection requirements when coming in contact with chemical substances at workplaces, Cabinet Regulation No.325, Riga, 15.05.2007; Labour protection requirements when coming in contact with carcinogenic substances at workplaces, Cabinet Regulation No.803, Riga, 29.09.2008) and Regulations and Directives of European Parliament and Council of Europe.
      18. After dismantling the waste metal (scrap metal) from the working places shall be delivered by the Contractor to HPP site specified by the Employer and handed over to the technical supervisor by statement in accordance with K248 “Procedure for getting and selling of ferrous and non-ferrous scrap metals and waste at Latvenergo AS. Scrap metal shall be sorted (ferrous metal, aluminium, copper). Construction waste and other dismantled waste shall be taken for utilization.
      19. The Contractor shall ensure:

sufficient number of tools, measuring instruments, equipment, materials and mechanisms, scaffolds and auxiliary equipment necessary for the performance of work in good quality, and shall bear full responsibility for technical condition of these devices;

all the necessary preparatory work, including materials for covering and cleaning the equipment located in the object;

tanks necessary for the storage of oil that has been drained;

application of materials according to the description of technical requirements and their use. The coordination of applied materials shall be during the development of the Work Performance Program;

transportation of all materials, constructions, including the collection of dismantled materials and construction waste from the object to the utilization area;

all safety fencing, repair platforms, bridges, scaffolds, warning signs, safety and protective means required for work in the allocated work area (equipment shall be put up and inspected by the Contractor);

Cleaning and keeping the work place/area in order during the performance of works

Marking of supplied and reconstructed quipment according to RDS-PP standard and the existing operative labels. All marks shall be coordinated with the Employer.

Observing the requirements of LEK002 and LEK 035 during the performance of works.

* 1. **Preparing of the object**
     1. The Contractor bears full responsibility, including the liability for all its involved sub-contractors, for safe performance of work in the allocated work area under the contract, the requirements stated in the normative acts of the Republic of Latvia and other regulations and instructions regarding safety engineering, labour protection, sanitary, fire security and nature protection.
     2. The Contractor shall provide the allocated work area/place with information boards containing the following information: name of the general contractor, name of the subcontractor, work to be performed, name, surname, mobile phone number of the responsible work manager (in accordance with procedure K233 “The procedure of performance of work carried out by the contractors at the generation facilities”).
     3. Before commencing work the Contractor shall take all measures in order to protect and not damage the nearby objects and equipment. In case of damage the Contractor shall renew the damaged objects/places on his own account.
  2. **Environmental requirements**
     1. Not to do harm to environment or to minimize it as much as possible the Contractor shall ensure a considerate and environmentally friendly choice of methods of work and performance of work in the object taking into account the environmental risk factors
        1. Chemical substances and mixtures:
* Respective safety data sheets (SDS) shall be available at the object for all chemical substances and chemical mixtures used in the object in accordance with regulation REACH EK 1907/2006;
* During the performance of work the requirements stated in the SDS regarding the action of chemical substances, safety, storage, environmental protection and waste management shall be observed;
* Registration of chemical substances and mixtures shall be organized in the object by stating the name, the amount, classification and marking of the chemical substance or mixture.
* The amount of chemical substances and mixtures being stored at the object at the same time shall be assessed and the means shall be provided for localization (defects of tanks, faults of machinery and equipment) and collection (absorbers, containment booms and other means) of possible leaks, as well as preventive measures for the storage of chemical substances and mixtures.
* At establishing the leak of chemical substance and/or mixture the Contractor shall immediately organize the elimination of the cause of the leak, localize further spreading of pollution and reduce negative impact on the environment.
* The Contractor shall include in the WPP the information on the planned types and scopes of localization and collection materials.
  + - 1. Waste:
* Every day the Contractor shall provide for collecting of construction waste, household waste, hazardous waste separately into marked containers, the location of which shall be coordinated with the Employer.
* The Contractor shall provide for separate collecting of hazardous waste according as to the type (oil, packing of the used chemical substances and mixtures, absorbers, solvents, degreasers etc.) according to Safety Data Sheets and classes given in the classifier of waste.
* Waste containers shall be marked, stating the name of waste and symbols of hazard (for hazardous waste).
* The Contractor shall organize periodically the utilization of construction waste and hazardous waste by delivering it to a certified hazardous waste management company having a respective licence.
  + 1. The Contractor periodically submits to the Employer and adds to the as-built documentation the Registration Card-Bills of Lading of Hazardous Waste and Registration Card-Bills of Lading of Construction Waste. If during the performance of work there was no hazardous waste the Contractor shall add to the as-built documentation a statement on the absence of hazardous waste (1 copy).
    2. Waste management shall be performed in accordance with the requirements Cabinet Regulation No.113 of 1 July 2021 “Procedures for record-keeping of transportation of waste”.
    3. The tanks where fire hazardous compounds are stored (including 1m3 containers for oil), shall be marked and equipped with additional liquid catching baths under the tanks for catching liquid in case of leakage.
    4. When performing the work in the course of which dust or welding fumes are released the Contractor shall provide for the local exhausting of dust and gas in order to avert the pollution of ambient air and nearby equipment. If necessary, the nearby equipment shall be covered. The same refers to washing with different liquids.

1. **Quality control**
   1. The Work Performance Programme (WPP) shall include the description of measures required for ensuring the quality that will let the Employer’s representatives supervising the works to evaluate consecutively and objectively the quality of each stage of work. The quality control of works includes: initial control of work performance documentation, supplied goods and mechanisms, devices and machinery; technological control of separate work operations or work processes; final control of completed (to be handed over) work (construction element).
   2. The quality control of all performed works will be done and ensured singly and constantly by the Contractor. The Contractor shall appoint the persons responsible for the performance of work in sufficient number. There shall be a person always present at the object who knows the work to be performed.
   3. The scope of works and the quality of their execution will be also evaluated by the Employer’s responsible technical supervisor.
   4. Quality control is performed in the follwing areas:

* accurate observance of work performance technologies all in all and separately for each type of work;
* compliance of mechanical qualities and and strength parameters of applied materials with what is stated in technical specification;
* conformity of technical characteristics of applied mechanisms and equipment with the stated by the manufacturer;
* during the work the Contractor shall specify the actual scope of work;
* when handing over the works the Contractor shall prepare statements on hidden works or assembly of constructions, as-built diagrams and as-built drawings of performed works and enclose conformity documents of the used materials.

1. **Assessment of energy efficiency**

As a result of work performance the energy efficiency of OPE pumps will increase compared to the existing pumps – the capacity of electrical motors of pumps is going to be reduced by 32.7%.

1. **As-built documentation**
   1. The Contractor shall submit as-built documentation on performed works processed in accordance with the normative acts valid in the Republic of Latvia and the Employer’s requirements stated in procedure K162 “Procedure of processing and filing the technical documentation and access to it the technical archives of HPP Technical management”.
   2. As-built documentation is all kind of documentation, in paper and in electronic form, worked out by the Contractor and submitted to the Employer connected with the execution of contract works, including: Work Performance Programme, drawings, forms, statements etc.
   3. As-built documentation submitted by the Contractor shall be in the Latvian language unless agreed otherwise with the Employer. Specifications of applied materials and data sheets, manufacturer’s instructions of equipment may be submitted in English.
   4. Before the trial of the unit the Contractor shall submit the following processed and coordinated with the Employer as-built documentation on the performed works:

* work performance statements, acceptance statements of important constructions, statements of hidden work, statements of assembly works, measurement and test forms and reports;
* statements on the quality control of anti-corrosion protection work;
* as-built diagrams and as-built drawings with presented RDS-PP and existing operative labels;
* quality certificates of applied materials (declarations of conformity, certificates etc.);
* Registration Card-Bills of Lading of Waste (hazardous, construction) regarding the registration and utilization of waste;
* statements on the handing over of dismantled scrap metal to the Employer;
* specifications of installed equipment, operation and maintenance instructions including safety and health protection measures, as well as operational limitations;
* other documents certifying the performance of work in good quality, and characterizing the supplied equipment and materials and the compliance with the requirements of technical specification.
  1. As-built documentation shall be submitted by the Contractor in 2 (two) copies, one of these copies shall be in paper form and one – in electronic form (PDF searchable format) in the file exchange resource (https://ftpprod.latvenergo.lv), processed in accordance with the Employer’s requirements stated in procedure K162 “Procedure of processing and filing the technical documentation and access to it the technical archives of HPP Technical management”.

1. **Acceptance of Work**
   1. After the completion of repair of separate components and parts of the unit, prior to their closing or covering, the Contractor shall organize the acceptance of these components and parts by asking the Employer’s representative and drawing up the statement on performed work.
   2. The Contractor shall notify the Employer in writing on the completion of works for each object (AN4, AN6, AN9 and AN10) and the readiness for starting the operation tests.
   3. The operation test of the Unit shall be performed according to the test programme drawn up by the Contractor and coordinated with the Employer according to LEK002 “Technical maintenance of energy facilities” and the requirements of the normative documents in force.
   4. The Employer’s acceptance commission decides on the readiness to start trial tests and prepares statement on the readiness for starting the trial run. Before starting the trial run as-built documentation shall be submitted, equipment shall be marked with operative labels, work place and equipment shall be completely ready for continuous operation.
   5. The acceptance commission assigned by the Employer shall get acquainted with the scope and quality of performed work, results of performed tests and documentation submitted by the Contractor.
   6. The trial run of the hydro-unit shall be started, only when all the tests or trials to be performed before the trial run according to the test programme are completed, and acceptance commission called by the Employer’s project manager has signed the statement on the readiness of the hydro-unit for the trial run.
   7. The trial run of the hydro-unit shall last for 2 (two) calendar weeks. During the trial run the Employer shall operate the Unit not less than 72 hours performing at least 3 (three) automatic starts and stops in all operation modes, as well as changing of the modes.
   8. If during the trial run any defect is found the elimination of which requires disconnection of equipment, after the defect elimination operation time is started anew.
   9. The trial run of the Unit is considered to be successfully completed if the Unit has operated without any defects and the following requirements of successful test have been met:
      1. the hydro-unit has operated for no less than 72 summary hours and at least 3 (three) automatic starts and stops in all operation modes have been performed, as well as changing of the modes;
      2. the hydro-unit being in stand-by the OPE pumps start not more often than in 90 minutes;
      3. at the visual inspection of the Unit at the end of the trial run no visual defects are found for the Contractor’s performed works and installed equipment including oil leaks (oil leak is considered to have 1 drop in 24 hours).
   10. If any defect is found during the trial run and from the moment of defect elimination till the end of trial run term any of the above mentioned requirements for successful trial run is not met, the trial run of the Unit is extended till the moment when all the requirements have been met.
   11. During the trial run of the Unit the Contractor will be allowed to eliminate the defects that do not require stoppage of the hydro-unit or putting it in reserve. On weekdays a short (up to 2 hours) putting of the unit in reserve is admissible between the load peaks. On the days off the putting of the unit in reserve is admissible for the period up to 8 hours. If the mentioned time periods are exceeded after the defect elimination the trial run summary time recording shall be continued or started anew by the resolution of acceptance commission.
   12. After a successful completion of the trial run of the Unit the statement on the completion of operation tests and commissioning of the object (one hydro-unit) is signed.
   13. When the statements of commissioning of the objects (AN4, AN6, AN9 and AN10) are signed the Employer’s project manager prepares Taking over certificate of the contract works, and it is signed by both parties.
   14. The Contract Works are considered to be accepted when the Taking Over certificate is signed by the Employer.
2. **Warranty**

The warranty period for all the Contractor’s performed work, delivered equipment and materials shall be 36 months from the moment of signing of the statement of formal acceptance of the object..

1. **The planned time schedule for the execution of work**

The planned time for the execution of Contract Work shall be 2023-2025 Year.

The replacement of servomotors and oil pumps is planned to be performed for each unit in succession.

The shutdown for one Unit is planned for 2 months *not taking into account the trial run of the Unit.*

**The time schedule for the execution of work for each unit will be specified according to the annual schedules of the shutdown of main equipment of the particular year.**

Tentative time for the execution of work (the succession of the hydro-units may be changed)

AN4 – will be updated;

AN6 - will be updated;

AN10 - will be updated;

AN9 - 20.05.2024 - 19.07.2024