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Kozloduy NPP Plc.

Attention to:
Executive Director
Georgi Kirkov

3321 Kozloduy Bulgaria

Framatome GmbH

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Your letter of	MARKET RESEARCH No. 51147
Our reference	FRAM-KNPP-2022-03-29-RFM-v3
Date	17/04/2023

Subject:

ПОКАНА ЗА ПАЗАРНА КОНСУЛТАЦИЯ № 51147
Доставка на нови абсорбционни охладителни машини

INVITATION TO MARKET CONSULTATION NO 51147
Supply of new absorption chillers

Dear Mr. Kirkov,

further to information provided during the market research 2022 Framatome wants to provide the following information for your attention.

The size of the proposed chillers (see details below) is largely comparable to the equipment currently installed at Kozloduy NPP.
However, the dimensions of the proposed chillers are too large to be moved into the building as one single piece of equipment. Hence, a common practice for such replacement projects is to deliver the replacement chillers in e.g. three major component pieces. Each of these pieces can be moved into the building individually. Final assembly takes place at the location of final installation. In order to confirm suitability and drastically increase the smooth performance of the project for all Parties, based on our significant experience in such challenges we recommend, a preliminary transport study before implementation of the replacement project itself. During the preliminary transport study a detailed evaluation of the transport pathway will be performed and a corresponding equipment delivery plan will be compiled. As non-binding budgetary price estimation, Framatome estimates the price of such preliminary transport study to amount to 14.000,- €. Framatome would be pleased to perform the respective feasibility study and provide a corresponding binding offer.

An alternative chiller design will not result in significantly different equipment dimensions. The dimensions are predominately determined by the required cooling power. Hence, alternative chiller designs do not provide a more beneficial alternative in our view.

The technical proposal for new absorption chillers below is based on refrigeration technology provided by a leading European supplier of efficient refrigeration systems and services. Together with this partner, Framatome may realize the project to provide such efficient chiller technology and the expected long-term services to Kozloduy NPP. Through such a project Kozloduy NPP will take full benefit of

Framatome's expertise to provide integration of HVAC equipment and services for nuclear power plants and our partner's proven capacity to design and manufacture state-of-the-art refrigeration equipment. Our partner as well as Framatome are major companies in our respective businesses. Hence Kozloduy NPP can rely on such partnership for long-term maintenance services and engineering support.

As an indicative information the estimated time for delivery of the below described refrigeration machines can be considered to be about 6 to 8 months after contract conclusion.

The technical information below and the rough order of magnitude price estimation are for information of Kozloduy NPP and the sole purpose of this market research only.

– Yours truly,

Framatome GmbH

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Technical description:

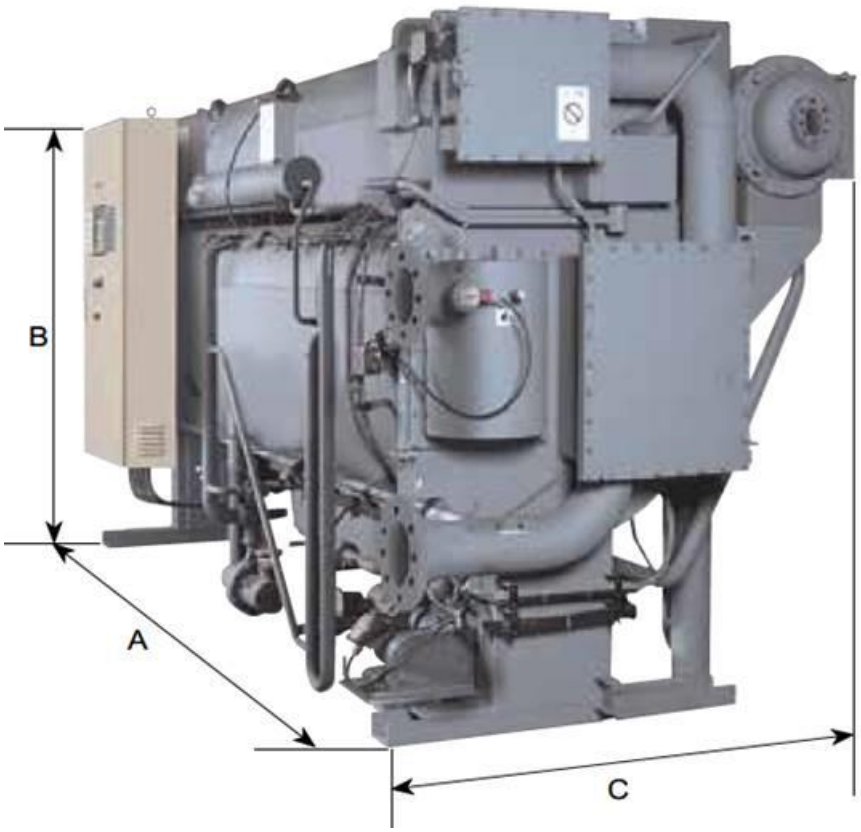
The following table presents a comparison of the preliminary data of the existing refrigeration machines (Customer Requirements) and the proposal by Framatome (Framatome Solution). The specified data are to be considerd preliminary technical information and may be subject to commonly agreed adaptations following further discussions between Kozloduy NPP and Framatome.

Rough technical comparision:

Technical criteria	Customer Requirements		Framatome Solution*	
Current chiller design / concept	Double-acting steam-fired absorption chiller - Absorbent: LiBr (Lithium bBromide). - Refrigerant: deionized (distilled) water. - Inhibitor: Octyl alcohol		Double effect steam-fired absorption chiller - Absorbent: LiBr (Lithium Bromide) - Refrigerant: Water - Inhibitor: Lithium Molybdate	
Machine type	RCW60	RAW090	equiv. RCW60	equiv. RAW090
Cooling Power (kW)	2110	3165	2170	3101
Cold Water temperature IN / OUT (°C)	12 / 7	12 / 7	12.2 / 6.7	12.2 / 6.7
Cold Water temperature flow rate (l/min)	5732	8600	5634	8016
Cooling Water temperature IN / OUT (°C)	32 / 37.6	32 / 37.7	29.4 / 35.4	29.4 / 35.4
Cooling Water temperature flow rate (l/min)	9257	13656	9336	13350
Working steam pressure (MPa)	0.8	0.784	0.785	0.785
Consumption of working steam (kg/h)	2510	3840	2470	3530
Length A (mm)	5880	6940	6370	6710
Height B (mm)	2750	3185	2900	3330
Width C (mm)	2305	2490	2800	3000
Approx. weight (t)	21	32	25	32

*Preliminary technical values

Preliminary layout:



Generic system description:

The proposed absorption chiller consists of the following main components:

- Lower shell consisting of evaporator, absorber, eliminator, base frame
- Upper shell consisting of generator, condenser, low temperature (LT) generator, eliminators, rupture disk mounting flange
- High temperature (HT) generator
- Heat exchangers HT and LT
- Pumps (absorbent pumps, refrigerant pump, purge pump)
- Purge unit including storage tank and further accessories
- Steam trap
- Control panel including controller with data display and further accessories
- Sensors and switches (e.g. pressure or chilled water flow)
- Interconnecting piping and wiring

Technical consultation:

To prepare a more detailed technical proposal, Framatome kindly asks KNPP to consider the following techical questions:

- What are the requirements concerning project-specic documentation (e.g. pre-approval documentation, manufacturing documentation, …)?
- Are there nuclear-specific requirements for the refrigeration machines such as:
  - saftey class (operational chiller or safety chiller),
  - quality class (resulting requirements on quality management system),
  - qualification requirements (e.g. seismic requirements, ambient conditions, …),
  - requirements on electrical and I&C equipment (e.g. for cabinet, sensors, software,…),
  - requirements on mechanical equipment (e.g. for valves, heat exchangers,…)?
- Installation and commissioning:
  - Which level of enginering works is expected?
  - Complete installation and commissing services or only supervision?

Rough order of magnitude price estimation:

Framtome estimates a rough order of magnitude (ROM) price for the two above described refrigeration machines of about 2’500’000 €.

This estimation includes a basic engineering effort and documentation (industrial standard) for non-classified chillers at a nucelar power plant.

This ROM shall be discussed and price adjustments can be commonly agreed, according to further clarification of requirements and sharing of scope (e.g. installation support by Kozloduy NPP).

– In case Kozloduy NPP specifies further safety, quality and qualification requirements e.g. on elecrtical and I&C and mechanical equipment this ROM shall be subject to escalation.