Foreword

Croatian Nuclear Society continues with its successful series of international conferences for professionals working in the field of nuclear energy and associated areas. This International Conference of the Croatian Nuclear Society (HND2026), subtitled "Nuclear Option for Reliable Electricity Generation", is already a 15th event in the successful series of international conferences, formerly known as "Nuclear Option in Countries with Small and Medium Electricity Grids", biennially organized by the Croatian Nuclear Society.

The purpose of conference series is to present and discuss the most relevant topics concerning the role and position of nuclear option in the current energy balance, with special attention paid to the countries with small and medium electricity grids. Main concerns with which modern society is faced include availability of energy resources, greenhouse gas emissions and potential climate changes with evidence of apparent global warming. In such a context the issue of ensuring reliable and sustainable energy becomes ever more challenging.

Expansion of nuclear energy can provide a robust, low‑carbon foundation for reliable electricity generation, but the benefits depend on careful technology selection, grid adaptation, outage management, supply‑chain assurance and regulatory preparedness. Small modular reactors (SMRs) are well matched to smaller electrical systems by reducing single‑unit risks and enabling phased investment. Successful deployment requires integrated technical, economic and institutional planning, and, where appropriate, regional cooperation on fuel services and waste management to maintain continuous, secure electricity supply.

Nuclear option thus offers a proven technical path to reliable, low‑carbon electricity, recognized with high-capacity factors, predictable output, and long operational lifetime. It can make an effective backbone for modern, decarbonized power systems. When appropriately sized and integrated, nuclear option reduces exposure to fuel‑price

volatility, supports system adequacy, and complements variable renewables and storage by providing firm, dispatchable capacity. Successful deployment requires coordinated planning across technical, regulatory, and financial domains and, where appropriate, regional cooperation to manage backend services and grid reliability. In sum, nuclear option can be a dependable cornerstone of a resilient, decarbonized electricity system if technical, institutional and financial frameworks are established up front to manage construction, operation, safety, and the back‑end lifecycle.

Following the success of the previous conferences in the series, the 15th International Conference in Zadar serves the same general purpose, concentrating on the topics which attracted the most of interest previously.

At the Conference, the nuclear option is considered and discussed from the point of view of national energy strategies, resources, costs, and technological, organizational, and educational requirements, as well as environmental advantages. The focus is on matters related to nuclear power plants operation and design safety, fuel cycle, waste management, decommissioning and achievement of Long-Term Operation (LTO). As in the previous cases, the important goal of the Conference is to promote regional co-operation and exchange of experience in use of nuclear power and fuel cycle facilities among the countries with an interest in the nuclear option.

Authors' and presenters' contributions are provided in 11 invited lectures and almost 100 papers have been contributed in total. The contributed papers are grouped into eight thematic sessions:

S1: Nuclear Safety Analyses (NSA)
S2: Operation, Maintenance and Lifetime Expansion Experience (OMLEE)
S3: Nuclear Option in the Context of Energy, Economics, Finance and Resilience (NEEFR)

S4: Regulatory Practice, Licensing, Emergency Preparedness, Safety Culture and Public Relations (RPLEPSC)
S5: Reactor Physics and Nuclear Fuel Cycle (RPNFC)
S6: Severe Accident Analyses and Risk Assessment (SAARA)
S7: Radioactive Waste Management and Decommissioning, Radiation Hazard and Protection (RWMDRHP)
S8: Small Modular Reactors (SMRs)

A special topic to this HND2026 conference is implementation (design, licensing and operation) of small modular reactors (SMRs) which is a subject of several invited presentations. This topic is additionally addressed under the round table discussion, which is one of the focal points of the conference. SMRs with typical electric power output up to 300 MWe are designed for factory fabrication and modular on-site assembly. They offer lower single-unit risk for small electrical grids, shorter construction times, and staged capacity additions. Key benefits can be seen in enhanced siting flexibility, potential cost reductions via standardization, and suitability for pairing with renewables. However, their successful development path is facing several challenges that need to be resolved, like licensing maturity, supply-chain scale-up, financing models, and spent-fuel management.

This "Conference Proceedings" provides contributed full papers, invited presentations and summarized outlines and topics for the round table discussion.

We would like to express our gratitude to nearly 200 authors and co-authors that put a large effort into completing their full camera-ready papers. We would also like to thank the sessions' coordinators and chairs, reviewers, and all those who gave a hand in organizing the HND2026 Conference.

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Finally, we are particularly grateful to all the sponsors and donors whose help has been essential for the success of this International Conference. We express our thanks to all those who, through their efforts and participation, have contributed to the Conference's success.

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Editors