SUstainable PolyEnergy generation and HaRvesting
Conference and Exhibition
Savona (Italy), 6th - 8th September 2023

SUPEHR23

Updated 22nd August 2023

	Wednesday 6th September 2023	Thursday 7th September 2023	Friday 8th September 2023
	Electrochemical And Alternative Energy Storage	**Thermal And Electrical Hybrid Systems – Sustainable Power Plants**	**Energy Micropolygeneration And Harvesting**
	Track Chair: Dr. Maria Paola Carpanese	*Track Chair: Dr. David Tucker*	*Track Chair: Dr. Daria Bellotti*
8.00-8:30	Registration		
8.30-9.00	Opening session	Registration	Registration
9.00-11:00	Plenary session	Plenary session	Plenary session
11.00-11.20	Coffee break & Exhibition time	Coffee break & Exhibition time	Coffee break & Exhibition time
11.20-12.40	Conference sessions	Conference sessions	Conference sessions
12.45-14.00	Lunch	Lunch	Lunch
14.00-16.00	Keynote Sessions	Keynote Sessions	Keynote Sessions
16.00-16.20	Coffee break & Exhibition time	Coffee break & Exhibition time	Coffee break & Exhibition time
16.20-17.40	Conference sessions	Conference sessions	Conference sessions
	Tirreno Power combined cycle & Reception Cocktail – 18.00-20.00		
		20.00 – Gala dinner	

6th September 2023

OPENING SESSION: Welcome and introduction – Federico Delfino (Rector of the University of Genoa); Paolo Silvestri (Conference Chair)

PLENARY SESSION

	Vision for Future Green Power Generation (LEAP)
	"Auditorium Tirreno Power" – Room AN1
	Moderators: Alberto Traverso, Silvia Marelli, University of Genoa
9:00-11:00	**Speakers:** Toshinori Watanabe, Gas Turbine Society of Japan – Japan David Tucker, National Energy Technology Laboratory (NETL) – US Andrea Galliani, Italian Regulatory Authority for Energy – Italy Michael Caravaggio, Epri – US Alessandro Gaglione, Tirreno Power SpA – Italy

CONFERENCE SESSION – Morning

	Development of storage systems: hardware	Thermal and electrical hybrid systems – sustainable power plants	Electrochemical and alternative energy storage
	"Auditorium Tirreno Power" Room AN1	Room MA116	Room MA117
	Chair: Luis Vaccaro	Chair: Carlo Alberto Niccolini	Chair: Diego Donati
11:20	**SUPEHR23-61** **Double input DC-DC converter for highly flexible and reliable Battery Storage Systems** Alessandro Benevieri, Lorenzo Carbone, Simone Cosso, Mario Marchesoni, Massimiliano Passalacqua and Luis Vaccaro	**SUPEHR23-23** **Improving combustion efficiency of gas turbine by oxygen enrichment– CFD study** Antonio Alcaide Moreno, Roberto Arévalo, Julio Guillén-Ángel and Gonçalo Calado	**SUPEHR23-18** **Thermodynamic analysis of an industrial process integration of a reversed Brayton high-temperature heat pump: A case study of an industrial food process** Enrico Jende, Nancy Kabat, Panagiotis Stathopoulos and Eberhard Nicke
11:40	**SUPEHR23-65** **Behaviour assessment of a renewable energy storage system based on hydrogen technologies for residential utility electricity supply** Fabiana Romano, Simona Di Micco, Davide Lanni, Alessandra Perna, Viviana Cigolotti, Mariateresa Russo, Claudio Miranda and Mariagiovanna Minutillo	**SUPEHR23-28** **An investigation of modelling parameters for surge phenomenon in axial compressors** Sreenath Purushothaman, Alberto Traverso, Luca Mantelli and Aristide Massardo	**SUPEHR23-32** **Ammonia as fuel for Gas Turbine** Daria Bellotti, Egidio Pucci, Christian Romano and Roberto Meloni
12:00	**SUPEHR23-44** **DEMO Nuclear Fusion cycle performance analysis, an exergetic assessment** Daniela Marino, Andrea Burlando, Alberto Traverso, Alessio D'Alessandro and Luciana Barucca	**SUPEHR23-34** **Early surge detection on a turbocharger used to pressurize a SOFC plant emulator** Carlo Alberto Niccolini Marmont Du Haut Champ, Paolo Silvestri, Federico Reggio, Mario Luigi Ferrari and Aristide Fausto Massardo	**SUPEHR23-36** **Modeling and simulation of a thermal storage system based on phase change materials integrated in a tertiary building** Milen Pérez, Manuel Andrés, Luis A. Bujedo, Ismael Lozano, Jesús Samaniego and Juan Carlos del Castillo

KEYNOTE SESSION

	Battery Energy Storage Systems (Part 1)
	"Auditorium Tirreno Power" – Room AN1
	Moderators: Fabrice Fourgeot, Sunergy; Paola Carpanese, University of Genoa
14:00-16:00	**Speakers**: Fabrice Fourgeot, SUNERGY – France **SUPEHR23-37 – Modelling Gas Evolution in Aqueous Nickel-Zinc Battery Cells;** Britta Doppl, Niklas Herrmann, Felix Konrad Schwab and Birger Horstmann **SUPEHR23-70 – Current state of Na-Zn battery research;** Norbert Weber Alba Saenz, BCARE – Spain Grégory Sacré, EverZync Group SA - Belgium

CONFERENCE SESSION– Afternoon

	Battery Energy Storage Systems – Keynote Session Part 2	Thermal and electrical hybrid systems – Sustainable power plants	Electrochemical and alternative energy storage
	"Auditorium Tirreno Power" Room AN1	Room MA116	Room MA117
	Moderators: Nora Ganzinelli, Shadi Mirhashemi	Chair: Luca Mantelli	Chair: Francesco Roncallo
16:20	**"Graphite Resilience For lithium-Ion baTtery anodes through a sustainable European End-to-End supply Chain"** Nora Ganzinelli (RINA, GR4FITE3 coordinator)	**SUPEHR23-41** **A virtual reality learning platform for industrial scale steam generators** Luca Mantelli, Alberto Traverso, Katia Lupinetti, Franca Giannini, Luigi Monica and Sara Anastasi	**SUPEHR23-48** **Testing and Analysis of a Novel Energy Management System** Jonas Tombrink, Maike Johnson, Konstantinos Theologou, Felipe Trebilcock, José Luis Corrales Ciganda and Steven Lecompte
16:40	**SUPEHR23-72** **Development of new polymer coatings for Nickel-Zinc battery separators** David Vidal, Odile Fichet, Linda Chikh and Séverine Alfonsi	**SUPEHR23-49** **A Comparison of Strategies to Extend the Operating Range of Radial Compressors for Turbocharging** Carlo Cravero and Davide Marsano	**SUPEHR23-33** **Techno-Economic Analysis of Innovative Solutions for Island Grids with High Renewable Solar Share** Abhishek Dubey, Alessandro Sorce, Massimo Rivarolo, Alberto Traverso and Silvio Sala
17:00	**SUPEHR23-71** **Electrochemical properties and performance optimization of the Na-Zn All-Liquid Cell** William Nash, Tom Weier, Martins Sarma and Norbert Weber	**SUPEHR23-50** **Integrated SOFC-ICE systems for the maritime sector: the case study of a tourist vessel** Marta Gandiglio and Paolo Marocco	**SUPEHR23-52** **Battery energy storage systems for ancillary services in renewable energy communities** Tommaso Ferrucci, Francesco Roncallo, Davide Poli, Davide Fioriti, Stefano Barberis, Alberto Vannoni, Carlo Tacconelli and Valeria Gambino
17:20	**"High-energy density graphene-based electrochemical double layer capacitors"** Sebastiano Bellani (BeDimensional) **"Integrating electrical storage and generation in industrial environments through Advanced Grid Interfaces (AGISTIN project)"** Gianluca Lipari (EPRI)		

7th September 2023

PLENARY SESSION

	Which hydrogen technology for sustainable energy
	"Auditorium Tirreno Power" – Room AN1
	Moderators: Martina Hohloch, German Aerospace Center Stefano Barberis, University of Genoa;
9:00-11:00	**Speakers:** Giacomo Schiaffino, Fincantieri – Italy Luca Rofi, Ansaldo Green Tech – Italy Thomas Lamberti, Bluenergy Revolution (BER) – Italy Jean Francois Tissot, Accelleron – Switzerland Natalia Pierozzi, Rina Consulting – Italy

CONFERENCE SESSION– Morning

	Thermal and electrical hybrid systems – sustainable power plants	Thermal and electrical hybrid systems – sustainable power plants	
	"Auditorium Tirreno Power" Room AN1	Room MA116	
	Chair: Federico Silvestro	Chair: Daria Bellotti	
11:20	**SUPEHR23-6** **Contribution to Electrical System Inertia of Dual Fuel two-stroke Engines in Isolated Grid: a Case Study** Federico Silvestro, Fabio D'Agostino, Bruno Gabriele, Alberto Traverso and Silvio Sala	**SUPEHR23-51** **Dynamics and control implementation of a supercritical CO2 simple recuperated cycle** Simone Maccarini, Swatara Tucker, Luca Mantelli and Alberto Traverso	
11:40	**SUPEHR23-7** **Thermodynamic analysis for SOFC/ICE integration in hybrid systems for maritime application** Ahmed Elkafas, Stefano Barberis and Massimo Rivarolo	**SUPEHR23-54** **Study on an adaptive multi-model predictive controller for the thermal management of a SOFC-GT hybrid system** Jinwei Chen, Zhenchao Hu and Huisheng Zhang	
12:00	**SUPEHR23-12** **A multi-criteria design tool for performance comparison of innovative energy systems for maritime sector** Giaime Niccolò Montagna, Simone Piccardo, Thomas Lamberti, Massimo Rivarolo and Loredana Magistri	**SUPEHR23-55** **Future of the production of green hydorgen in Paraguay** Gustavo Riveros-Godoy, Enrique Buzarquis, Massimo Rivarolo and Peter Lindstrom	

KEYNOTE SESSION

	Low Emission Advanced Power systems (SUPEHR-LEAP) **Round Table (recorded 2h)**
	"Auditorium Tirreno Power" – Room AN1
	Moderators: David Tucker, National Energy Technology Laboratory (NETL); Loredana Magistri, University of Genoa
14:00-16:00	**Speakers**: David Tucker, National Energy Technology Laboratory (NETL) – US Mario Ferrari, University of Genoa – Italy Gustavo Riveiros, Central Hidroeléctrica ITAIPU Paraguay Ward De Paepe, University of Mons – Belgium Daniele Fiaschi, University of Florence – Italy

CONFERENCE SESSION – Afternoon

	Thermal and electrical hybrid systems – sustainable power plants	**Development of storage systems: modelling**	
	"Auditorium Tirreno Power" Room AN1	Room MA116	
	Chair: Massimo Rivarolo	Chair: Simone Cosso	
16:20	**SUPEHR23-22** **Ammonia as hydrogen carrier for transport application** Massimo Rivarolo, Davide Clematis, Daria Bellotti and Antonio Barbucci	**SUPEHR23-47** **Cross-cutting CFD support for efficient design of a molten salt electric heater for flexible Concentrated Solar Power plants** Panagiotis Drosatos, Grigorios Itskos and Nikolaos Nikolopoulos	
16:40	**SUPEHR23-63** **Power to gas plant for the production of bio-methane: techno-economic optimization** Davide Lanni, Alessandra Perna, Mariagiovanna Minutillo, Simona Di Micco and Elio Jannelli	**SUPEHR23-8** **Energy Management System for Smart Grids: Tests in Cyber-Physical Mode** Mario Luigi Ferrari, Lorenzo Gini and Matteo Pascenti	
17:00	**SUPEHR23-25** **Decentralised Hybridised Energy Management Systems (DHEMS) in power grids** David Baraja, Antonio Riesco, Alberto Alonso, Darja Skrt, Andraz Andolsek, Christoph Gutschi, Roberto Arnanz and M. Angeles Gallego	**SUPEHR23-68** **Fabrication and modeling of gradual porosity structure for solid oxide electrolysis cells** Davide Cademartori, Angela Gondolini, Elisa Mercadelli, Alessandra Sanson and M.Paola Carpanese	
17:20			

8th September 2023

PLENARY SESSION

	From digital twinning to cyber-physical modeling (LEAP)
	"Auditorium Tirreno Power" – Room AN1
	Moderators: Federico Silvestro, University of Genoa, Katia Lupinetti, National Research Council
9:00-11:00	**Speakers:** Katia Lupinetti, National Research Council – Italy Mark Bryden, AMES lab, US Federico Silvestro, University of Genoa – Italy Luca Mantelli, University of Genoa – Italy

CONFERENCE SESSION– Morning

	Energy micropolygeneration and harvesting	Integration of storage systems	Tesla Expanders
	"Auditorium Tirreno Power" Room AN1	Room MA116	Room MA117
	Chair: Mario Poldi	Chair: Fabrice Fourgeot	Chair: Daniele Fiaschi
11:20	**SUPEHR23-16** **IANOS: Innovative energy storage solutions for the decarbonisation of geographical islands** Ana Gonçalves de Carvalho, Carlos José Martins, Johan Boekema, Erwin de Boer, Jacob Dijkstra, Napoleon Bezas, Charalampos Papadopoulos, Niki Skopetou, Petros Iliadis, Mohammed Al-Saadi and Samuele Da Ronch	**SUPEHR23-43** **Impact of management strategy on green methane production from wind energy** Valeria Pignataro, Angelica Liponi, Eleonora Bargiacchi and Lorenzo Ferrari	**SUPEHR23-11** **Performance assessment of a reversible tesla machine** Ravi Nath Tiwari, Alberto Traverso and Federico Reggio
11:40	**SUPEHR23-62** **Technical feasibility study of a renewable fuel cell/electrolyzer poly-generative system** Giuseppe De Lorenzo, Orlando Corigliano, Francesco Piraino, Matteo Genovese and Petronilla Fragiacomo	**SUPEHR23-39** **Optimal Dispatch of Battery Energy Storage Considering Cycling and Calendar Ageing** Andriy Vasylyev, Alberto Vannoni and Alessandro Sorce	**SUPEHR23-14** **An Updated Design Procedure for Tesla Turbines** Avinash Renuke, Alberto Traverso and Anestis Kalfas
12:00	**SUPEHR23-64** **Technical analysis of a renewable woody biomass generator/electrolyzer poly-generative system** Giuseppe De Lorenzo, Piero Bevilacqua, Pietropaolo Morrone, Roberto Bruno, Natale Arcuri and Petronilla Fragiacomo	**SUPEHR23-60** **Development of a modular Metal-Hydrides (MH) hydrogen storage systems** Davide Violi, Thomas Lamberti, Carlo Luetto, Marcello Baricco, Paola Rizzi and Jussara Barale	**SUPEHR23-15** **Highly Efficient Bladeless Expander Concept** Avinash Renuke, Federico Reggio, Alberto Traverso, Matteo Pascenti and Paolo Silvestri
12:20			**SUPEHR23-69** **Mechanical design and manufacture of a boundary layer pump** Lapo Bufalari, Eduardo Anselmi, Mirko Rinchi, Kevin Howart, Lorenzo Talluri and Daniele Fiaschi

KEYNOTE SESSION

	Smart Electrical and Thermal Grids, technological and management challenges
	"Auditorium Tirreno Power" – Room AN1
	Moderators: Daria Bellotti, University of Genoa; Nicolò Cairo, ETN
14:00-16:00	**Speakers**: Vishnu Sishtla, Carrier Corporation Mehmet Saydam, Hypen (Business models for Smart Grids) Stefano Bianchi, AlgoWatt Antonio Marco Pantaleo, European Innovation Council

CONFERENCE SESSION– Afternoon

	Energy micropolygeneration and harvesting	Development of storage systems: materials	Thermal and electrical hybrid systems – sustainable power plants
	"Auditorium Tirreno Power" Room AN1	Room MA116	Room MA117
	Chair: Ward De Paepe	Chair: Maria Paola Carpanese	Chair: Silvia Marelli
16:20	**SUPEHR23-40** **Humidification Towards Flashback Prevention in a Classical Micro Gas Turbine: Thermodynamic Performance Assessment** Alessio Pappa and Ward De Paepe	**SUPEHR23-5** **Effect of addition of different oxides to enhance Mg-ion conductivity in Mg(BH4)2(NH3BH3)2** Asya Mazzucco, Marcello Baricco, Erika Michela Dematteis and Mauro Francesco	**SUPEHR23-13** **Turbocharged SOFC System: Emulation and Control in Cyber-Physical Model** Mario Luigi Ferrari, Luca Mantelli and Matteo Pascenti
16:40	**SUPEHR23-59** **Performance of the main technologies demonstrated in the ENVISION project** Diego Rattazzi, Paolo Finocchi, Fabrizio Tavaroli and Giorgia Spigliantini	**SUPEHR23-19** **A novel method for Ion Exchange Capacity characterization applied to Anion Exchange Membranes for Water Electrolysers** Alessio D'Alessandro, Arianna Moranda, Manuele Campione, Andrea Riva and Ombretta Paladino	**SUPEHR23-66** **Experimental investigation on the vibro-acoustic and fluid dynamics behaviour of a turbocharger compressor in the transition conditions from stable to surge** Paolo Silvestri, Silvia Marelli and Vittorio Usai
17:00	**SUPEHR23-57** **Analysis of a heat pump-based energy system exploiting a low GWP refrigerant in different European climates** Omais Abdur Rehman, Valeria Palomba, Andrea Frazzica and Luisa F. Cabeza	**SUPEHR23-20** **Design of the experiments for the selection of potential electrocatalysts for both AEM Electrolyzers and Redox Flow Batteries** Ataollah Niyati, Arianna Moranda, Federico Navarra, Andrea Riva, Manuele Campione, Giorgio Schiappelli and Ombretta Paladino	**SUPEHR23-35** **Early surge detection in a mGT plant coupled with large volumes** Carlo Alberto Niccolini Marmont Du Haut Champ, Paolo Silvestri, Federico Reggio, Mario Luigi Ferrari and Aristide Fausto Massardo

WORKSHOP SCHEDULE

6th September 2023 Room MA218

International Cooperation Workshop (Sustainable energy and international cooperation)	Thermal storage workshop (THUMBS UP)
Chair: Massimo Rivarolo	Chair: Stefano Barberis; Sara Attanà
11.20-12.40	15.15-17.15
Involved EU research projects: ONEPlanET, JUST GREEN AFRH2ICA, CIRAWA HYDRO4U **Contributions** Speakers from each project	**Involved EU research projects:** BEST STORAGE THUMBS UP ECHO HYSTORE **Contributions** Speakers from each project

7th September 2023 Room MA218

LOLABAT WORKSHOP	Innovative CSP and sCO2 power cycles Workshop
Chair: Shadi Mirhashemi, Fabrice Fourgeot	Chair: Silvia Trevisan
11.20-12.40	16.20-17.40
Involved EU research projects: LOLABAT **Contributions** **SUPEHR23-58 – Game-changing breakthroughs in Ni-Zn battery development: RNZB in LOLABAT project for a next-generation stationary energy storage battery** Fabrice Fourgeot, Shadi Mirhashemi and Alice Boudet **SUPEHR23-30 – Energy management and load profile optimization of 10 kWh BESS integrated into a Smart polygeneration grid subnetwork** Martina Raggio, Carlo Alberto Niccolini Marmont Du Haut Champ, Tommaso Reboli, Paolo Silvestri and Mario Luigi Ferrari **NiZn Battery: Environmental Impacts and Cost Analysis** Ashwani Kumar Malviya – AITEC-Parque Tecnológico-Valencia-Spain **Energy storage integration in an electro-intensive industry applications** Samuele Da Ronch (RINA Consulting) Visit of the NiZn batteries laboratory in Savona Campus	**Involved EU research projects:** SHARP-sCO2 SOLARSCO2OL CO2OLHEAT HybridPLUSS **Contributions** Speakers from each project

8th September 2023 Room MA218

Clean Maritime Technologies	Islands Workshop
Chair: Stefano Barberis, Simone Piccardo	Chair: Mario Ferrari, Avraam Kartalidis
11.20-12.40	16.20-17.40
Involved EU research projects: ENGIMMONIA ZHENIT SEANERGY NH3CRAFT RAISE **Contributions** Speakers from each project	**Involved EU research projects:** INSULAE, ROBINSON **Contributions** Insulae planning Tool (IPT) software presentation General presentation of the ROBINSON Project

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