

## D2.3 3rd report on twinning and networking activities

### Reporting period:

Due date of deliverable	M36
Actual submission date	M42
Organisation name of lead beneficiary for this deliverable	TU/e
Dissemination Level	PU
Start date of project	1.10.2022
Duration	36 months

Responsible organization:	TU/e
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Version:	Version 3

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## 1. HISTORY OF CHANGES

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## 2. ABSTRACT

This deliverable reports on the twinning and networking activities carried out during the final reporting period of the DITARTIS project under Work Package 2. The activities focused on strengthening institutional research-support capacity, enhancing advanced technical expertise, promoting cross-institutional knowledge exchange, and reinforcing international research collaboration.

A comprehensive administrative training was delivered during the Twinning Event (4–5 February 2025) at TU/e. The programme provided participants with structured insight into TU/e’s Research Support Network (RSN), the institutional project-flow model, proposal development workflows, financial and legal procedures, consortium agreement preparation, research data management (RDM), FAIR principles, open science strategies, ethical compliance, and EU grant management processes.

In addition, two advanced technical courses were delivered by TU/e: FEM for Electromagnetic Devices (5LWF0) (5 February 2025 – 4 April 2025) and Electrical Components (5AT010). These courses significantly strengthened competencies in electromagnetic finite-element modelling, electric machine design, nonlinear material behaviour, electric vehicle powertrain engineering, and system-level simulation using FLUX2D and MATLAB/Simulink.

Complementary exchange forums, research visits, workshops, joint publication efforts, and conference participation further strengthened collaborative networks and enhanced the international visibility of the consortium.

### 3. ACTIVITIES CARRIED OUT DURING THE REPORTING PERIOD

#### Task 2.4 – Short-Term Visits and Training Activities

Within the twinning activities, TU/e delivered two three-month courses to DITARTIS partners in 2025, offered online to accommodate the duration and international participation.

Fem for electromagnetic devices (5LWF0)	University	Student Name	Email address	Supervisor	Email address supervisor
	Siemens Industry Software	Robert Szabo	<a href="mailto:robert-matei.szabo@siemens.com">robert-matei.szabo@siemens.com</a>	Calin Husar	<a href="mailto:calin.husar@siemens.com">calin.husar@siemens.com</a>
	Siemens Industry Software	Flavius Paduraru	<a href="mailto:flavius.paduraru@siemens.com">flavius.paduraru@siemens.com</a>	Calin Husar	<a href="mailto:calin.husar@siemens.com">calin.husar@siemens.com</a>
	Technical University of Cluj Napoca	Paula Petrescu	<a href="mailto:paula.petrescu@emd.utcluj.ro">paula.petrescu@emd.utcluj.ro</a>	Claudia Martis	<a href="mailto:Claudia.Martis@emd.utcluj.ro">Claudia.Martis@emd.utcluj.ro</a>
Electrical components (5AT010)	University/Organization	Student Name	Email address	Supervisor	Email address supervisor
	Typhoon HIL	Dusanka Sudar (MSc)	<a href="mailto:dusanka.sudar@typhoon-hil.com">dusanka.sudar@typhoon-hil.com</a>	Jelena Trickovic	<a href="mailto:jelena@typhoon-hil.com">jelena@typhoon-hil.com</a>
	Siemens Industry Software	Robert Szabo	<a href="mailto:robert-matei.szabo@siemens.com">robert-matei.szabo@siemens.com</a>	Calin Husar	<a href="mailto:calin.husar@siemens.com">calin.husar@siemens.com</a>
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#### **Technical Course: FEM for Electromagnetic Devices (5LWF0)**

**Course duration: 5 February 2025 – 4 April 2025**

**Attendees: Robert Szabo (Siemens Industry Software), Flavius Paduraru (Siemens Industry Software), and Paula Petrescu (Technical University of Cluj Napoca)**

**Trainer: Dave Krop (TU/e)**

The course introduced students to the theory and practical use of FEM for electromagnetic analysis. They learned how to set up and solve electromagnetic problems using weak formulation, discretization, boundary conditions, and material modeling. Using FLUX2D, students built 2D models of inductive components and electrical machines, created meshes, selected appropriate solvers, visualized field quantities, and extracted key results such as flux linkage and losses. They also studied saturation, eddy currents, torque production, and winding design. The course included thermal and demagnetization checks for validation. By the end, students could build accurate FEM models and analyze electromagnetic devices and machines in realistic conditions.

#### **Technical Course: Electrical components (5AT010)**

**Course duration: 12 November 2024 – 17 January 2025**

**Attendees: Dusanka Sudar (Typhoon HIL), Robert Szabo (Siemens Industry Software), Flavius Paduraru (Siemens Industry Software), and Raymond Birasa (Technical University of Cluj Napoca)**

**Trainer: Esin Ilhan Caarls (TU/e)**

The course introduced students to the key electrical technologies used in hybrid and fully electric vehicles, covering traction machines, power electronics, batteries, charging systems, and fuel cells. Students learned how these components operate individually and how they

interact within a complete HEV/EV powertrain. They explored machine torque production, inverter and converter behavior, battery characteristics such as state of charge and degradation, and the challenges of fast charging.

A strong focus was placed on system-level understanding, including electrical-mechanical-thermal interactions that influence vehicle performance. Using MATLAB/Simulink, students performed basic design estimations, simulated energy flows, and evaluated how component choices affect efficiency, range, and drivability. By the end of the course, they were able to analyze major EV subsystems, understand emerging propulsion technologies, and model powertrain behavior using industry-relevant tools.

### **Administrative training**

**Duration: 4–5 February 2025**

**Attendees from UTC: Cristina Adascalitei; C. Ianchis; S. I. Muresan**

**Trainers from TU/e: Nailia Nasibulina, Research Support Network team**

The administrative training provided DITARTIS partners with a practical introduction to TU/e's research-support system and the workflows involved in developing and managing research projects. Participants learned how the Research Support Network (RSN) operates, including the roles of first-tier support (PDOs and program managers) and second-tier specialists (finance, legal, data management, open science, communication).

The training covered each stage of the project life cycle—orientation, proposal preparation, approval, project start-up, execution, and follow-up—highlighting best practices and common pitfalls. Key topics included budgeting, consortium and grant agreements, ethics, health and safety, open science, and the creation of FAIR-compliant data-management plans. Participants also explored open-access requirements and responsible data use, including considerations for AI-related research.

The program included interactive sessions with TU/e experts, presentations from visiting partners, a campus tour, and an ERC-focused session delivered by the Personal Grant team. Overall, the training strengthened participants' administrative competencies, improved understanding of European research-support standards, and supported more effective proposal development and project execution within the DITARTIS collaboration.

### **Task 2.5. Exchange forums (if any)**

During the reporting period, multiple exchange forums, exploratory meetings, working visits, and conference participations were organized by the participating workgroups. These activities strengthened scientific collaboration, supported joint publication development, enhanced proposal preparation capacity, and increased the international visibility of the DITARTIS consortium.

**20–22 May 2024 – Vaasa, Finland**

**Networking and Training Event and Scientific Presentation (UVA organizer, TU/e, UTC, UPV, and SISW Participation)**

The 3rd DiTArtIS Training Event took place at the University of Vaasa from 20–22 May 2024 and brought together DiTArtIS ESRs, senior academics, and industry representatives for advanced training and knowledge exchange. The programme featured keynote lectures on AI applications in sustainable energy systems and grid resilience, complemented by ESR presentations and a poster session covering modelling, control, diagnostics, and cybersecurity topics. The event also included industry contributions, hands-on tutorials in Julia and machine-learning methods, and expert talks on digitalisation, electrification, and cross-sector AI challenges. A networking session further supported interaction and collaboration among participants.

Dr. Calina Ciuhu (TU/e) participated in this event in Vaasa and delivered the presentation “Bridging Industries: Common AI Challenges and Solutions.” The presentation highlighted physics-informed and hybrid AI modelling approaches, emphasizing structured problem formulation, sensor optimization, and the integration of domain knowledge with data-driven techniques. The contribution supported interdisciplinary dialogue and strengthened collaboration in AI-enabled energy systems research.

### **September–December 2024 – SISW–UPV Collaboration Joint Research and Manuscript Development Phase**

Following identification of a suitable journal for publication, partners initiated structured collaborative manuscript preparation. Each partner contributed dedicated sections, experimental descriptions, and analytical results. This phase established the foundation for joint scientific dissemination.

Moving into January 2025, the team had the valuable opportunity to reunite for a dedicated training event hosted at the Universitat Politècnica de València in Valencia. This gathering proved invaluable, facilitating the reiteration of the current status of the study and the alignment of perspectives. Furthermore, the event provided an excellent chance to visit the laboratories at UPV, offering deeper insight into their methodologies and enhancing the understanding of how to best interpret the data provided by UPV for the ongoing study. This face-to-face interaction and hands-on experience significantly strengthened collaborative efforts and refined the approach going forward.

### **January 2025 – Valencia, Spain Working Visit at Universitat Politècnica de València (SISW–UPV Collaboration)**

A dedicated working and training event was hosted by UPV in Valencia. The meeting enabled alignment of research perspectives, detailed discussion of experimental methodologies, and laboratory visits to improve interpretation of shared datasets. The face-to-face interaction significantly strengthened collaboration and refined the publication strategy.

### **February–June 2025 – Iterative Refinement Phase (SISW–UPV Collaboration)**

Bi-weekly alignment meetings were conducted to refine the joint manuscript. Additional experiments were performed where required, and methodological challenges were addressed to ensure robustness and coherence of the final results.

### **8–9 September 2025 – Vaasa, Finland** **Exchange Forum for Sustainable Power Systems (UVA Organizer)**

The University of Vaasa organized a two-day Exchange Forum focused on renewable-rich and digitalized power systems. The programme combined keynote lectures, technical presentations, laboratory visits to the FREESI Lab, and structured round-table discussions.

Key contributions included:

- A keynote lecture on controllability and stability of modern power systems (University of Maribor, Associate Prof. Boštjan Polajžer).
- Presentations on IEC 61850-based monitoring and control, micromarkets and EV integration, and bidirectional DC-DC converter control strategies.
- Faculty discussions on collaborative research directions.

The event strengthened scientific exchange and supported identification of new joint research initiatives. The participant list is provided in **Error! Reference source not found.**

### **August–September 2025 – Conference Dissemination (SISW Participation)**

A comprehensive draft of the joint research paper was finalized and prepared for journal submission. Preliminary experimental findings were presented at FES 2025, where Alexandra Baicoianu (SISW) delivered the presentation “A Practical Approach to Bearing Fault Detection using Pretrained ResNet18.” This activity enhanced early dissemination and international visibility.

### **17–18 November 2025 – Genoa, Italy** **Working Visit to University of Genoa (UVA Participation)**

Prof. Mazaher Karimi, Qudrat Ullah, and Tohid Abedi (UVA) visited the University of Genoa and met with Prof. Michela Robba and her research team. Discussions addressed resilience in digitalized electricity systems, protection and control challenges in power-electronics-dominated networks, frequency security, and EV integration themes. The meeting strengthened scientific cooperation and defined future collaboration directions.

### **29 November 2025 – Vaasa, Finland** **Workshop: Web Development with Python and Django (UVA Organizer)**

A full-day hands-on workshop on Python and Django web development was organized at UVA under the Django Girls Vaasa initiative, with DITARTIS as sponsor.

The programme included introductory sessions, team-based programming exercises, and collaborative development activities. A presentation on the DITARTIS project was delivered to highlight its role in supporting research and skills development. The workshop promoted

technical capacity building and interdisciplinary collaboration. The participant list and photographs are included in **Error! Reference source not found.**

**3–5 December 2025 – Fredrikstad, Norway**  
**Working Meeting at Østfold University College (UVA Participation)**

Prof. Mazaher Karimi (UVA) engaged in research discussions with local partners to explore future collaboration opportunities and align research directions.

**3–5 February 2026 – Dubai, UAE**  
**ICCE 2026 Conference Participation (UVA)**

Prof. Mazaher Karimi participated in ICCE 2026, where he presented the paper “Impact of Network Loading and Disturbance Types on the Performance of ROCOF-Based Islanding Detection” and served as a session chair. The participation strengthened international networking and scientific dissemination.

**March 2026 (Planned) – Edinburgh and London, United Kingdom**  
**Working Visit and Risk & Resilience Day Participation (UVA)**

Prof. Mazaher Karimi and Tohid Abedi are scheduled to participate in “Risk and Resilience Day” and to visit City St George’s, University of London. The meetings aim to strengthen collaboration and support joint proposal development in resilient and digitalized energy systems.

**Preparatory Meetings for Horizon Europe Proposals**

**HORIZON-CL5-2023-D4-01-03 (Proposal No. 101137882)**  
Partners DITARTIS: UTC, UVA

Flexible Hybrid Solutions for Interoperable Positive Energy District (PED) Energy Systems  
Preparatory meetings were held between the Technical University of Cluj-Napoca (UTC) and the University of Vaasa (UVA), coordinated by C. Martis. The discussions focused on defining consortium roles, aligning technical objectives, and preparing the scientific and implementation framework for the proposal submission under Cluster 5.

**HORIZON-CL5-2024-D3-01-07 (Proposal No. 101172714)**  
Partners DITARTIS: UTC, UVA, UPV

Technologies and Solutions for Sustainable Refurbishment and Efficiency Improvement of Run-of-River Power Plants and Energy Market Interfacing  
Preparatory meetings were organized involving UTC, Universitat Politècnica de València (UPV), and the University of Vaasa (UVA), coordinated by C. Martis. The meetings addressed proposal structuring, technical concept alignment, work package definition, and consortium coordination to strengthen competitiveness under the Horizon Europe call.

**HORIZON-MSCA-2025-DN-01 (Proposal No. 101312134)**

Partners DITARTIS: UTC, UPV, SISW, TU/e

Doctoral Network for the Development of European Virtual Interoperable Labs for Efficient and Circular Electrical Machines. Preparatory meetings were organized involving UTC, Eindhoven University of Technology (TU/e), Universitat Politècnica de València (UPV), and SIEMENS INDUSTRY SOFTWARE NV (SISW), coordinated by C. Martis. The meetings addressed proposal structuring, technical concept alignment, work package definition, and consortium coordination, as well as training methodologies for the talent development under the Horizon Europe call.

**HORIZON-WIDERA-2025-01(Proposal No. 101309971)**

Partners UTC, UPV, TU/e

EU Interconnected Virtual Lab for Electrical Machines and Drives. Preparatory meetings were organized involving UTC, Eindhoven University of Technology (TU/e), and Universitat Politècnica de València (UPV). The meetings addressed proposal structuring, technical concept alignment, work package definition, and consortium coordination, as well as development of the capabilities required, through capacity-building and institutional transformation, to set up an interconnected European centre of excellence in the field of distributed and virtually connected laboratories for electrical machines and drives under the Horizon Europe call.

**Task 2.6. Conferences and events outside consortium attendance**

During the reporting period, consortium members actively participated in several international conferences and scientific events, contributing through paper presentations, special session organization, keynote lectures, and networking activities.

**SPEEDAM 2024 – International Symposium on Power Electronics, Electrical Drives, Automation and Motion (Rome, Italy, 2024)**

Dr. Zohreh Kaheh (UVA) presented a scientific paper at SPEEDAM 2024, contributing to the dissemination of research results in the field of power electronics and electrical drives.

**SPEEDAM 2024 Conference (Ischia, Italy, 2024)**

Prof. Miadreza Shafiekhah (UVA) organized a Special Session at the conference, strengthening the international visibility of the consortium and promoting scientific exchange in sustainable energy systems.

**MED POWER 2024 Conference (Athens, Greece, 2024)**

Prof. Mazaher Karimi (UVA) participated in the conference as part of international networking and scientific exchange activities.

**IEEE PES ISGT Conference (Malta, Europe, 2024)**

Prof. Mazaher Karimi (UVA) attended the conference, supporting dissemination and collaboration in smart grid and power systems research.

**IEEE International Conference and Exposition on Electrical and Power Engineering (EPEi 2024) presenter: Cristina Adăscăliței**

Cristina Adăscăliței, Sorin I. Cosman, and Claudia S. Martis presented “Advanced Thermal Management Techniques for Electric Motors: A Comparative Analysis.”

**IEEE International Conference and Exposition on Electrical and Power Engineering (EPEi 2024) presented by Raymond Birasa**

Raymond Birasa, Jose E. R. Sarrio, Doha K. M. Idris, Jose A. A. Daviu, and Claudia S. Martis presented “Irreversible Partial Demagnetization Analysis for Different Permanent Magnet Synchronous Motor Rotor Topologies.”

**IEEE International Conference and Exposition on Electrical and Power Engineering (EPEi 2024) presented by Doha K. M. Idris**

Doha K. M. Idris, Raymond Birasa, Philippe D'Almeida, and Claudia S. Martis presented “Comparative Analysis of Classical and AI-Based MPPT Techniques in Stand-Alone PV Systems.”

**33rd IEEE International Symposium on Industrial Electronics (ISIE 2024), Ulsan, South Korea**

Jose E. Ruiz-Sarrio et al. presented “Incipient Bearing Fault Signature Identification via Vibration Envelope Analysis and MUSIC.”

**2-5 June 2024 - Jungmun, Seogwipo, Jeju, Republic of Korea**

**21st Biennial IEEE Conference on Electromagnetic Field Computation, CEFC 2024**

Ir. Bram Daniels (TU/e) participated in the IEEE CEFC conference, that focusses on the latest developments in modeling and simulation methodologies for the analysis of electromagnetic fields and wave interactions, with applications emphasis on computer-aided design of low and high frequency devices, components, and systems. Bram presented a work titled “Comparison of the Finite Element Method and High-Order Isogeometric Analysis for Modeling Magnetic Vector Hysteresis”, that was ultimately awarded with the Best Student Presentation Award.

**26th International Conference on Electrical Machines (ICEM 2024), Torino, Italy**

Jose E. Ruiz-Sarrio et al. presented “On the Utilization of Radial Vibration Transient Signals for Induction Machine Misalignment Diagnosis.”

**16th IEEE Energy Conversion Congress and Exposition (ECCE 2024), Phoenix, USA**

Jose E. Ruiz-Sarrio et al. presented “Diagnosis of Rotor Asymmetries in Wound Rotor Induction Machines via PSH Analysis of Vibration Transients.”

### **50th Annual IEEE Industrial Electronics Society Conference (IECON 2024), Chicago, USA**

Jose A. Antonino-Daviu et al. presented “Accelerometer Locus Investigation for Induction Machine Misalignment Fault Diagnosis Including Transient Behaviour.”

### **11th IEEE International Conference on E-Learning in Industrial Electronics (ICELIE 2024), Chicago, USA**

Jose A. Antonino-Daviu et al. presented “Understanding Stator Current and Frame Vibrations for Electrical Machine Maintenance: An Educational Approach Using FEA-Assisted Test Bench.”

### **Applied Superconductivity Conference 2024, Salt Lake City, USA**

In September 2024 A. Desikan had a poster presentation entitled:

Desikan, A., de Bruyn, B. J. H., Krop, D. C. J., & Lomonova, E. A., “Electromagnetic-Thermal Analysis of an HTS Linear Motor for High-Dynamic Applications”

### **3-5 December 2024 – Kanazawa, Japan - ISS Symposium 2024**

E. Gottardi presented a paper “A Hybrid Model for Studying AC Losses in HTS Tapes of a Linear Machine”, E. Gottardi, D.C.J. Krop, E.A. Lomonova. This paper received a best paper Award of ISS 2024.

### **2025 Joint MMM-Intermag Conference, INTERMAG 2025, New Orleans, USA**

In January 2025 G. Zuidema had an oral presentation entitled:

Zuidema, G., Krop, D. C. J., & Lomonova, E. A. (2025), “Data-Driven Sensitivity Framework for a MIMO Magnetic Levitation Actuator”

### **1st FES Conference (23–28 September 2025)**

Prof. Mazaher Karimi (UVA) served as a session chair, contributing to scientific dialogue and strengthening the project’s international presence.

### **Kainuu Digital Summit 2025 – “AI Empowering Business, Academia and Startups” (5–6 November 2025, Kajaani, Finland)**

Prof. Mazaher Karimi (UVA) delivered a keynote speech addressing the role of artificial intelligence in advancing research and innovation across academia and industry.

### **2025 International Conference on Artificial Intelligence, Computer, Data Sciences and Applications (ACDSA), Antalya, Türkiye presented by C. Adăscăliței**

C. Adăscăliței, C. S. Marțiș, and S. I. Cosman presented “Validation of LPTN-Based Thermal Modelling for PMSM Using Experimental Data.”

**2025 International Conference on Future Energy Solutions (FES 2025) presented by C. Adăscăliței**

C. Adăscăliței et al. presented “Thermal Modeling of a PMSM Using Exponential and Logistic Curve Fitting in MATLAB.”

**5th International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME 2025), Zanzibar, Tanzania presented by C. Adăscăliței**

C. Adăscăliței et al. presented “Experimental Thermal Analysis of PMSM: Effects of Current Variations on Temperature Stability.”

**2025 International Conference on Future Energy Solutions (FES 2025)**

J. Antonino-Daviu et al. presented “Investigation of CNN Hyperparameters and Input Data Size for Automatic Bearing Fault Diagnosis.”

**34th IEEE International Symposium on Industrial Electronics (ISIE 2025), Toronto, Canada**

Jose A. Antonino-Daviu et al. presented “Load-Related and Eccentricity Fault Diagnosis in Induction Motors Using Decision Tree and Genetic Algorithms.”

**15th IEEE International Symposium on Diagnostics for Electric Machines, Power Electronics and Drives (SDEMPED 2025), Dallas, USA**

Jose E. Ruiz-Sarrio et al. presented “High-Frequency Numerical Modelling for Impedance Frequency Response in Electrical Machine Stator Coils – A Comparative Study.”

**SDEMPED 2025, Dallas, USA**

Jose E. Ruiz-Sarrio et al. presented “Synchronous Machine Salient Pole FRA Signature Modelling via Hybrid Methodology.”

**SDEMPED 2025, Dallas, USA**

Jose E. Ruiz-Sarrio et al. presented “Impedance Sweep Frequency Response Analysis for the In-Situ Inspection of Distributed Stator Windings in Induction Motors.”

**17th IEEE Energy Conversion Congress and Exposition (ECCE 2025), Philadelphia, USA**

Jose E. Ruiz-Sarrio et al. presented “Rotor Winding Asymmetry Diagnosis Through Low-Order Vibration Transients in Wound Rotor Induction Motors.”

**ICCE 2026 Conference (3–5 February 2026, Dubai, UAE)**

Prof. Mazaher Karimi (UVA) served as a session chair and presented the paper “Impact of Network Loading and Disturbance Types on the Performance of ROCOF-Based Islanding Detection,” contributing to international dissemination in the field of power systems and resilience.

## 16th IEEE CPEEE 2026 Conference (2026)

Prof. Mazaher Karimi (UVA) presented the paper “A Seamless Mode-Switching Control Framework for Parallel Three-Phase Inverters in Grid-Interactive AC Microgrids,” further strengthening dissemination in the area of grid-interactive inverter systems.

## 4. CONCLUSIONS

During the reporting period, the activities implemented under Tasks 2.4–2.6 have significantly contributed to strengthening collaboration within the consortium and enhancing the research and innovation capacity of the participating institutions. The short-term visits and training activities enabled direct knowledge transfer and hands-on exposure to advanced research management practices, particularly through the interaction with TU/e’s research support structures and project lifecycle workflows.

The exchange forums and associated working meetings fostered intensive scientific collaboration, leading to the development of joint research outputs, iterative refinement of methodologies, and the submission of four Horizon Europe proposals. These interactions also facilitated the consolidation of partnerships and the identification of new research directions, ensuring continuity beyond the project’s duration.

Furthermore, during this reporting period, consortium members actively participated in more than 20 international conferences and scientific events, contributing to the dissemination of research results, increasing the visibility of the consortium, and strengthening links with the broader scientific and industrial communities.

Overall, the activities carried out during this reporting period have met their objectives, demonstrated a strong integration of capacity building, collaboration, and dissemination, while laying a solid foundation for future joint research initiatives and sustained institutional cooperation.