After the RISEnergy Transnational Access, Users are required to submit a User Report. This should be done within 4 weeks after the Access is completed unless otherwise agreed. The User Report will be given to the User(s) by the WP2 leader. The report contains sections related to the work performed, the main results and observations that were achieved.

This document should be completed, signed, and sent by e-mail to risenergy@for.kit.edu.

Summary questionnaire for Users who have been granted Transnational Access (TA) under the RISEnergy project Horizon Europe TA scheme. More information on RISEnergy TA can be found in "General Rules" and in "Access Policy" which can be found on the RISEnergy webpage.

Please complete, sign, and send this form, together with the Cost claim by e-mail to risenergy@for.kit.edu *with title: RISEnergy APPXXX - reports.*

General information about the project	
Project title (as used in Application)	Evaluation of Cr_2O_3–Y_2O_3–ZrO_2 composed coatings on corrosion resistance to Hydrogen and thermal exposure
Project number (APPXXX) and acronym (max 15 characters)	APP186 - CrOYOZO
RISEnergy RI(s) accessed	TA63 – CNRS-PROMES-MSSF
Keywords (up to five, free text)	Ceramic coating, corrosion resistance, thermal shock
Arrival date (in town where RI is located)	18.01.2026
Departure date (from town where RI is located)	24.01.2026
Starting date of Access (first day at RI)	19.01.2026
Finishing date of Access (last day at RI)	23.01.2026
Number of days not using the RI (during the above period)	3
Reason for not using RI those days (describe)	Wheater (clouds+snow)
Number of days using the RI	2
Number of Users granted Access (group size)	3
Comments	1 new user
User	
User group leader or sole applicant (user group member 1)	
First name	

Last name	
Affiliation / Employer	
Country of Employer	
E-mail	
User travelling to RI?	
Comments	
User group member 2	
First name	
Last name	
Affiliation / Employer	
Country of Employer	
E-mail	
User travelling to RI?	
Comments	
User group member 3	
First name	
Last name	
Affiliation / Employer	
Country of Employer	
E-mail	
User travelling to RI?	
Comments	
User group member 4	
First name	
Last name	
Affiliation / Employer	
Country of Employer	
E-mail	
User travelling to RI?	
Comments	
Please insert more fields if your groups had more than four members.	

Access Summary Report - work performed and initial results
Brief description of the objectives of your project (up to 200 words)
[Please describe short the main objectives of your project]

The aim of the project is to evaluate the protective role of ceramic coatings consisting from Metco 6156 (Cr_2O_3 powders) mixed with Metco 207 powders (yttria-stabilised zirconium oxide material with a **high** yttria content) deposited on a stainless steel substrate in order to find a thermal barrier that can extend the blade life. Thermal shock behaviour of the ceramic layers in the solar furnace facility using a concentrator to heat the samples to a temperature range of 600-1000°C at a high rate and cooling. Thermal shocks of complex ceramic layers (anchor layer: FeCrNi plus ceramic coating Metco 207 (high Y in YSZ)) on SS 316L substrate (5-6 layers) in the range of 1000-1200 ˚C. Persons involved: Cimpoesu Nicanor, Daniela Lucia Chicet and Bogdan Istrate. (2 persons at a time).

Activities performed (up to 600 words)

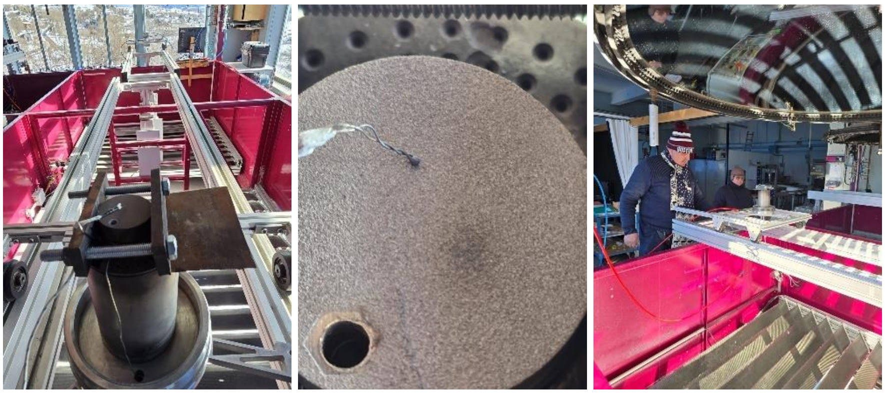
[Please summarise the work carried you (steps taken, instrumentation used, techniques employed, data sources consulted etc.)]

After the experimental tests (on the 316L stainless steel substrate, complex ceramic coatings made of YSZ powder mixtures (38%Y2O3)+Cr2O3 (10%, 30% and 50%) were deposited with an APS (Aerospace Plasma Deposition) and a robotic arm) at the Gheorghe Asachi Technical University of Iasi within the Thermal Coatings Laboratory belonging to the Faculty of Mechanics using a bonding layer made of NiCrFe powders.

Figure Stages from APS of complex ceramic powders

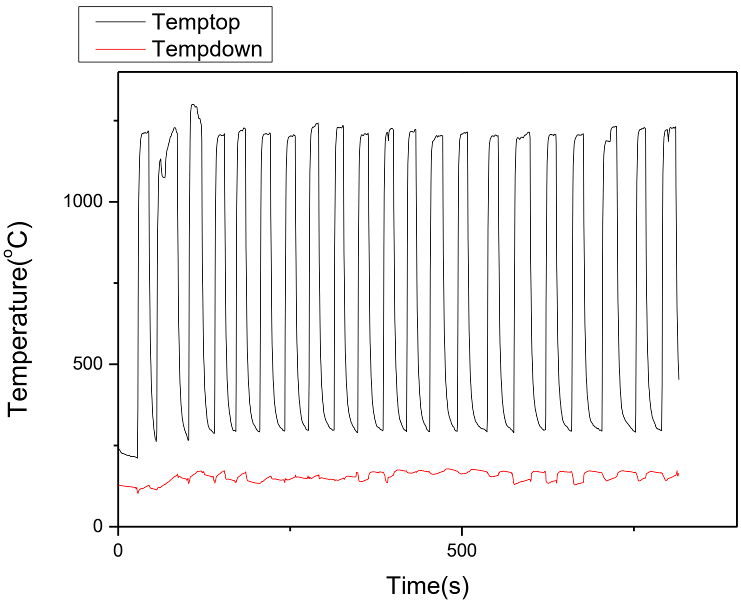
During the trip to PROMES from January 19-23, 2026, although we did not have sun all the time, in the first days we initiated Prof. Romeu Chelariu into the experimental part of the solar concentrator by presenting him with the working installation, the translation system, the GraphTech equipment and the main operating principles (how a solar concentrator works by using reflective or refractive surfaces—such as mirrors or lenses—to collect sunlight from a large area and focus it onto a much smaller receiver, where the solar energy becomes highly concentrated, how concentrated sunlight produces high temperatures, which can be used directly for heating or to generate steam that drives a turbine for electricity production, how the system from PROMES follows well-established optical principles: by carefully shaping and orienting the reflective surfaces toward the sun, it maximizes energy capture while minimizing losses, making it an efficient and time-tested method for harnessing solar power.), subsequently, in the last two days, carrying out the proposed experiments (we managed to complete all the experiments thanks to the team of 3 people involved in this trip and thanks to our support by the Promes team).

The experimental set-up was made from the sample on which the thermal shocks were performed and the K-thermocouples were mounted, one on the ceramic surface in the area where we will concentrate the solar beam and one under the experimental sample, in contact with the sample to analyse the temperature difference between the surface and the material.



We performed the following experimental tests:

1. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 800 °C - cooling in air to below 300 °C.
2. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 900 °C - cooling in air to below 300 °C.
3. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 1000 °C - cooling in air to below 300 °C.
4. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 1200 °C - cooling in air to below 300 °C.
5. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr_2O_3) at a temperature of 1200 °C - cooling with compressed air (forced cooling) to below 300 °C.
6. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr_2O_3) at a temperature of 800 °C - cooling in air to below 300 °C.
7. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr_2O_3) at a temperature of 900 °C - cooling in air to below 300 °C.
8. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr_2O_3) at a temperature of 1000 °C - cooling in air to below 300 °C.

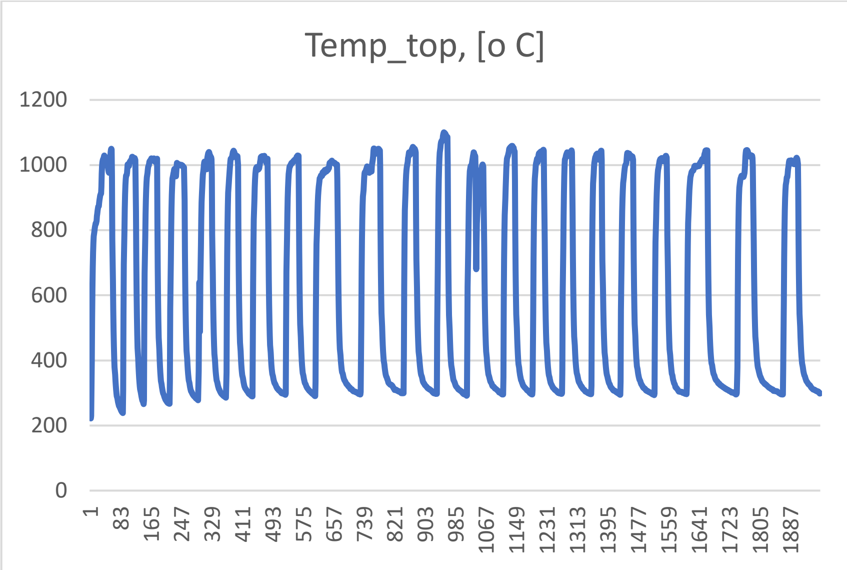


…
10. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr_2O_3) at a temperature of 1200 C - cooling with compressed air (forced cooling) to below 300 °C.
Experiments in same conditions were done on sample P3 as well, the surface of the samples was photographed after each thermal shock and images analysis will be performed in order to see the surface colour modifications (by naked eye only in few cases modifications were observed).

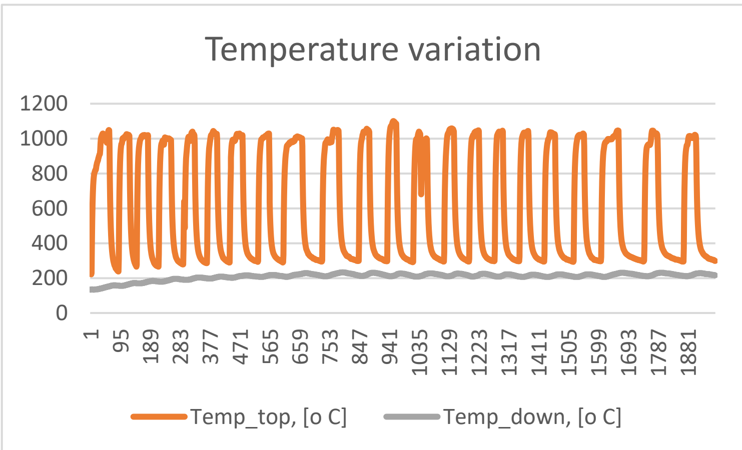
S.M. Hashemi, N. Parvin, Z. Valefi, M. Alishahi, Comparative study on tribological and corrosion protection properties of plasma sprayed Cr2O3-YSZ-SiC ceramic coatings, Ceramics International, Volume 45, Issue 17, Part A, 2019, 21108-21119, ISSN 0272-8842, https://doi.org/10.1016/j.ceramint.2019.07.087.
Reddy, G. M. S., Prasad, C. D., Patil, P., Shetty, G., Kakur, N., & Ramesh, M. R. (2023). High temperature erosion performance of NiCrAlY/Cr2O3/YSZ plasma spray coatings. Transactions of the IMF, 101(5), 245–251. https://doi.org/10.1080/00202967.2023.2208899
Luțcanu, M.; Cimpoeșu, R.; Abrudeanu, M.; Munteanu, C.; Moga, S.G.; Coteata, M.; Zegan, G.; Benchea, M.; Cimpoeșu, N.; Murariu, A.M. Mechanical Properties and Thermal Shock Behavior of Al2O3-YSZ Ceramic Layers Obtained by Atmospheric Plasma Spraying. Crystals 2023, 13, 614. https://doi.org/10.3390/cryst13040614

Scientific results (up to 800 words)

[Summarise the (initial) outcomes of your study at the RI(s).]
We performed the following experimental tests:
1. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 800 °C - cooling in air to below 300 °C. – no colour change of the ceramic layer was observed
2. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 900 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed
3. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr_2O_3) at a temperature of 1000 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed



4. A set of 20 thermal shocks on sample P1 (YSZ+10%Cr2O3) at a temperature of 1200 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed
5. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1200 °C - cooling with compressed air (forced cooling) to below 300 °C.
6. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 800 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed
7. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 900 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed
8. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1000 °C - cooling in air to below 300 °C - no colour change of the ceramic layer was observed
9. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1200 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed
10. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1200 °C - cooling with compressed air (forced cooling) to below 300 °C.
11. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 800 °C - cooling in air to below 300 °C. - no colour change of the ceramic layer was observed
12. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 900 °C - cooling in air to below 300 C. - no colour change of the ceramic layer was observed
13. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1000 °C - cooling in air to below 300 C - no colour change of the ceramic layer was observed



14. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1200 °C - cooling in air to below 300 °C. a colour change of the ceramic coating was observed

15. A set of 20 thermal shocks on sample P2 (YSZ+30%Cr2O3) at a temperature of 1200 °C - cooling with compressed air (forced cooling) to below 300 °C. - Partial exfoliation of the ceramic layer was observed at the 12th thermal shock, we continued the thermal shock cycles until the 20th, it did not completely detach from the surface, the colour on the surface changed but it did not completely exfoliate and was not destroyed.
It should be noted that thermal shock tests were also performed on experimental samples without a bonding layer deposited between the stainless steel and ceramic substrates. These performed well at temperatures of 800 and 900 C but showed cracks, pitting and finally exfoliation at temperatures of 1000 and 1200 C, respectively, especially in the case of forced cooling with compressed air. For all samples, the two temperatures of the ceramic layer in the solar beam concentration area and below the metal sample were recorded using Graphtec equipment on channels 1 and 2.

Interpretation of the results (up to 400 words)

[Discuss the data obtained and describe the major scientific conclusions drawn.]
The experimental results indicate a clear influence of both ceramic composition and cooling regime on the thermal shock resistance of the deposited coatings under concentrated solar flux. For sample P1 (YSZ + 10% Cr_2O_3), the ceramic coating demonstrated excellent thermal stability, withstanding repeated thermal shock cycles up to 1200 °C followed by air cooling without any visible colour change or surface degradation, which suggests good phase stability and strong adhesion promoted by the NiCrFe bonding layer. Sample P2 (YSZ + 30% Cr_2O_3) also showed stable behaviour under air cooling up to 1000 °C, with no observable colour changes, indicating that moderate chromium oxide content can still provide adequate resistance to cyclic thermal loading. However, at 1200 °C, the behaviour of P2 became more sensitive to both temperature and cooling rate: air-cooled tests led to visible colour changes in the ceramic layer, suggesting microstructural or compositional transformations, while forced cooling with compressed air induced partial exfoliation beginning at the 12th thermal shock. Despite this damage, the coating did not fully detach and maintained partial integrity through 20 cycles, highlighting a degree of residual adhesion and toughness. The comparison with samples lacking a bonding layer further underlines the critical role of the NiCrFe interlayer, as unbonded coatings failed at significantly lower temperatures (1000–1200 °C) through cracking, pitting, and exfoliation, especially under forced cooling conditions. Overall, the data confirm that APS-deposited YSZ–Cr_2O_3 coatings with an appropriate bonding layer can tolerate severe thermal gradients generated by solar concentrators, while higher Cr_2O_3 contents and rapid cooling increase the risk of damage at extreme temperatures. The thermocouple measurements recorded with the Graphtec system also provide valuable insight into the temperature gradients across the coating–substrate system, supporting the conclusion that coating composition and interface engineering are decisive factors for reliable operation in high-temperature solar applications.

Main achievements during the TA related work (up to 250 words)

[Describe the main achievements during your stay at the site(s), Outputs (results, publications, models, etc.), conclusions, next steps, potential impact]

During the stay at the host site, the main achievements included the successful completion of all planned experimental campaigns under real concentrated solar flux conditions, the validation of the experimental setup using K-type thermocouples and Graphtec data acquisition, and the systematic evaluation of APS-deposited YSZ–Cr_2O_3

ceramic coatings with a NiCrFe bonding layer under severe thermal shock regimes. The experiments generated a consistent set of high-quality thermal and visual data that clearly highlighted the influence of coating composition, bonding layer presence, and cooling rate on thermal shock resistance, providing a solid experimental basis for future scientific publications and comparative modelling studies. The results allowed well-supported conclusions to be drawn regarding the superior stability of low Cr_2O_3 content coatings and the critical protective role of the metallic bond coat at high temperatures. As next steps, detailed microstructural, phase, and adhesion analyses (SEM, EDS, XRD) are envisaged, followed by numerical modelling of thermal gradients and stress evolution under solar loading. The potential impact of this work lies in advancing the reliability of ceramic thermal barrier coatings for solar concentrator and high-temperature energy systems, contributing to longer component lifetimes, improved operational safety, and more efficient use of renewable solar energy in demanding industrial environments.

Data Management

[Describe the further usage and storage of project data. State where the data will be kept and name a person responsible for the data. Define data]

All project data generated during the experimental campaigns—including raw and processed temperature measurements from the Graphtec system, experimental logs, visual inspection records, and subsequent analysis files—will be stored in both digital and physical formats to ensure long-term preservation and traceability. The primary digital dataset will be kept on secured institutional servers at Gheorghe Asachi Technical University of Iași, with regular backups on encrypted external storage media, while physical documentation will be archived within the Thermal Coatings Laboratory of the Faculty of Mechanics. Access to the data will be restricted to authorized project members, in accordance with institutional data management and research integrity policies. The person responsible for data management, storage, and controlled access is Prof. Romeu Chelariu, who will oversee data curation, ensure compliance with data protection requirements, and coordinate data sharing for publications or collaborative research. In this project, "data" is defined as all recorded experimental measurements, calibration files, images, observational notes, metadata, analysis outputs, and derived results produced throughout the lifecycle of the research. Temperature vs time variations are also send to Ms. Anita Haeussler from PROMES facility.

Difficulties during the TA related work (up to 250 words)

[List problems and issues, you had, completing out your research project: Did you get access to all the necessary equipment, facilities, databases, etc.?
If not, please specify the problems that occurred and list equipment the was not working or accessible.]

We encountered no difficulties in carrying out the experiments that Anita Haeussler, the Promes representative who helped us with the set-up, could not help us with so that the experiments could be carried out in conditions of safety and technical correctness.

Intended publications

[Explain where and how you expect to publish the outcomes of your project work. Include also anything already published (What and where?)]

We will present the preliminary results at Bramat 2026 International Conference, 14th International Conference on Materials Science & Engineering, March 04–06, 2026, Brașov, Romania (https://www.bramat.ro/), with an oral or poster presentation with title: Evaluation of Cr_2O_3–Y_2O_3–ZrO_2 composed coatings on corrosion resistance and thermal exposure.

---------- Forwarded message ---------
From: <bramat_s4@unitbv.ro>
Date: Thu, Jan 29, 2026 at 9:07 AM
Subject: Re: BRAMAT 2026 Section IV. Engineering applications (new entry)
To: <ramona.cimpoesu@academic.tuiasi.ro>

Dear dr. Ramona Cimpoeșu,

Thank you for submitting the abstract to BRAMAT 2026. We are pleased to inform you that your paper titled: ***Evaluation of Cr2O3–Y2O3–ZrO2 composed coatings on corrosion resistance and thermal exposure*** has been accepted by the scient committee for poster presentation at the 14th International Conference on Materials Science & Engineering, March 04–06, 2026, Brașov, Romania.

Detailed guidelines for presentation and additional conference details will be provided in due course on the conference website. If you require any further specific information, please respond to this email.

Best regards from Brașov,
Mihai Alin POP

On Wednesday 28/01/2026 at 15:07, BoomForm wrote:

The results obtained after the corrosion resistance evaluation of the coatings after thermal shocks will be presented after evaluation at ACME 2026 conference (https://mec.tuiasi.ro/acme2026/).

The results will be included in two papers (one paper will present preliminary results from the coating process and thermal shock behaviour and the other one will evaluate the influence of Cr_2O_3 addition to YSZ (high Yttria content) on corrosion properties) proposed for specialized journals like Ceramics International, Materials and Corrosion or more generalized like Materials, Applied Sciences .

Expected impact

[The impact the expected results will have on current and future research or practice, public safety, European standardization, competitiveness, integration and cohesion and on sustainable growth. any follow on proposals, projects, collaborations, commercialisation]

The expected results of this research are anticipated to have a significant impact on both current and future research and industrial practice by providing validated experimental data on the behaviour of advanced ceramic coatings under extreme thermal gradients generated by solar concentrators. These findings support the development of safer and more reliable high-temperature components, thereby contributing directly to public safety and operational reliability in solar-thermal and energy-intensive applications. At a European level, the results can inform future standardization efforts related to thermal barrier coatings and testing methodologies under concentrated solar flux, strengthening harmonized practices across research infrastructures. By improving coating durability and lifetime, the project enhances industrial competitiveness and supports technological integration between academic research and applied engineering. The work also contributes to sustainable growth by enabling more efficient and resilient renewable energy systems with reduced material degradation and maintenance needs. Building on these outcomes, follow-on activities may include joint European research proposals, expanded collaborations with solar research centers and coating manufacturers, and the potential commercialization of optimized coating systems for high-temperature solar and energy applications.

We intend, with prof Corneliu Munteanu coordinator, to propose a research grant on Exploratory Research Projects (ERPs) 2026 competition (https://uefiscdi.gov.ro/proiecte-de-cercetare-exploratorie-pce).

Conclusions / additional comments

[Provide any other comments you might have on your work]

The entire team thanks the organizers of the Promes Facility and the RiseEnergy project for this opportunity to characterize the thermal shock resistance of ceramic coatings made in our university's laboratories.
The work carried out during this project provided valuable experimental insight into the real behaviour of advanced ceramic thermal barrier coatings exposed to concentrated solar radiation and severe thermal shock conditions, confirming both the robustness of the experimental methodology and the relevance of the selected material systems for high-temperature renewable energy applications. The collaboration between the involved research teams proved highly effective, enabling efficient knowledge transfer, optimal use of specialized infrastructure, and the successful completion of all planned tests despite variable weather conditions. The results obtained form a solid foundation for detailed microstructural investigations, numerical modelling, and future joint scientific publications, while also opening perspectives for extended European cooperation in the field of solar-thermal materials and protective coatings. Overall, the project represents a meaningful step toward improving the durability, safety, and efficiency of components operating in extreme thermal environments, fully aligned with long-term sustainable energy objectives.

Did you complete the European Commission User questionnaire https://ec.europa.eu/eusurvey/runner/RIsurveyUSERS?

X *Yes* ☐ *No*

Feedback – HSE, Ethics and Satisfaction

Please rate on a scale from 1 (excellent) to 5 (poor). Feel free to provide additional comments

Practical information on how to apply for Transnational Access and the overall application process	1 (excellent)	2	3 (neutral)	4	5 (poor)
	☐	X	☐	☐	☐

Comment

Information provided, once your project was accepted, on how to proceed	1 (excellent)	2	3 (neutral)	4	5 (poor)
	X	☐	☐	☐	☐

Comment

Support received at the site(s) regarding technical/scientific matters and logistics	Have you got sufficient support from the RI staff during the project? If not, please, specify the problems. X ***Yes*** ☐ *No*

Please specify any problems

RI extension / upgrades required	In your opinion, is the RI needed to be upgraded? If yes, please give an explanation. ☐ *Yes* X *No*

Please specify

<table>
<tr><td colspan="2"></td></tr>
<tr><td>Problems with local regulations</td><td>Have you had any problems with regulations of the visited RI owner (HSE, lab working hours, etc.)? If yes, please, specify
☐ Yes X No</td></tr>
<tr><td colspan="2">Please specify</td></tr>
<tr><td>Health and safety issues</td><td>Did you encounter any health or safety issue during your research? Please provide details.
☐ Yes X No</td></tr>
<tr><td colspan="2">Please provide details</td></tr>
<tr><td>Environment & Ethics</td><td>Did your research involve the use of elements that may cause harm to the environment, to animals or plants? Please provide details.
☐ Yes X No</td></tr>
<tr><td colspan="2">Please provide details</td></tr>
<tr><td>Environment & Ethics</td><td>Did your research deal with endangered fauna and/or flora and/or protected areas? Please provide details.
☐ Yes X No</td></tr>
<tr><td colspan="2">Please provide details</td></tr>
<tr><td>Environment & Ethics</td><td>Did your research involve the use of elements that may cause harm to humans, including research staff? Please provide details.
☐ Yes X No</td></tr>
<tr><td colspan="2">Please provide details</td></tr>
<tr><td>Environment & Ethics - Dual use</td><td>Does your research have the potential for military applications? Please provide details.
X Yes ☐ No</td></tr>
<tr><td colspan="2">Please provide details
The research conducted has a predominantly civil and energy-related orientation, focusing on improving the thermal stability, durability, and reliability of advanced ceramic coatings for high-temperature applications such as solar concentrators and renewable energy systems. While the fundamental knowledge generated—particularly regarding thermal barrier coatings, resistance to extreme thermal gradients, and adhesion under cyclic loading—could be considered dual-use in a broad materials science context, any potential military relevance would be indirect and limited to general high-temperature protection technologies used in aerospace or propulsion environments. The present study does not target, develop, or test materials for weapons, defense systems, or classified applications, and all methodologies, materials, and results remain within the open scientific domain intended for peaceful industrial, energy, and sustainability purposes. Therefore, the primary impact of the research is clearly civilian, supporting</td></tr>
</table>

renewable energy efficiency, infrastructure safety, and long-term sustainable technological development.	
Environment & Ethics – Misuse	Does your research have the potential for malevolent /criminal/terrorist abuse? Please provide details. ☐ *Yes* X*No*
Please provide details	
Environmental issues	Were any potentially dangerous substances (materials / gases etc.) released into the environment (atmosphere, water, or land)? Please provide details. ☐ *Yes* X *No*
Please provide details	
Ethics issues	Are there any other ethics issues that should be taken into consideration? Please specify ☐ *Yes* X *No*
Please provide details	
Overall impression of communication and interaction after finishing your TA and related work	see rating below

1 (excellent)	2	3 (neutral)	4	5 (poor)
X	☐	☐	☐	☐

Comment

Suggestions for facilities not included in RISEnergy which you would use for your research

[Please provide suggestions for specific type of facilities missing (RI gaps) or measurement / experiments you would like to perform which can not be done on current RISEnergy facilities.]

RI gaps and specific measurements/experiments that would significantly strengthen this coating–solar-thermal research, but are typically not fully covered by the current RISEnergy concentrated-solar test offer (or are only partially accessible depending on the site and scheduling):

- In-situ high-temperature stress/strain measurement under solar flux: full-field strain mapping (high-T Digital Image Correlation), curvature/warpage monitoring, or in-situ residual stress evolution during heating/cooling. This is essential to link exfoliation to thermo-mechanical mismatch, not just surface temperature.
- High-heat-flux + controlled atmosphere testing: the ability to run solar-flux thermal shocks in controlled environments (low oxygen, inert gas, humid air, SOx/Cl-containing atmospheres) to simulate real corrosion/oxidation conditions found in industrial receivers and hot-gas paths.
- Combined thermo-mechanical loading under concentrated flux: solar heating while applying mechanical loads (biaxial bending, tensile/compressive, vibration) to reproduce service conditions where stresses are not purely thermal.
- Standardized high-cycle thermal shock / thermal fatigue rigs at very high ramp rates: facilities that can deliver hundreds to thousands of cycles, with precisely controlled heating/cooling rates (including forced cooling), to reach statistically meaningful lifetime trends and enable qualification-type datasets.

- In-situ degradation diagnostics: real-time monitoring tools such as acoustic emission (crack initiation), infrared thermography (hot spots/delamination signatures), optical/laser profilometry (spallation onset), or reflectometry/emissivity tracking to correlate "colour change" with optical-property evolution.
- Post-exposure advanced characterization at high throughput: an integrated pipeline for SEM/EDS, EBSD, XRD (including high-T XRD), Raman spectroscopy, micro-CT, and FIB cross-sections dedicated to coated systems after solar testing–especially important to identify phase changes, sintering, porosity closure, and interfacial damage mechanisms.
- Adhesion/fracture toughness methods tailored to TBCs after solar shock: scratch testing is useful but often insufficient; missing are facilities for 4-point bend delamination, indentation spallation, wedge tests, and mode I/II interfacial fracture evaluation at elevated temperature.
- Optical and thermophysical property measurements before/after solar exposure: dedicated capability to measure spectral absorptance/reflectance, emissivity (high-T), thermal diffusivity/ conductivity (e.g., laser flash), and heat capacity, to quantify performance drift for receiver applications.
- Validated multiphysics modeling support linked to facility metrology: a structured service to couple measured solar flux maps + temperature histories with thermo-mechanical FE models (including temperature-dependent properties, creep, oxidation, and interface damage), producing predictive lifetime/critical-stress outputs.

Suggestions how RISEnergy can improve future TA programme, how to make the TA more impactful and how to enable the achievement of high TRL levels

[Your suggestions]

Integrated testing–characterization–modeling workflows(provide coordinated access not only to solar testing facilities but also to advanced post-exposure characterization and multiphysics modeling support and linking experimental data directly to predictive lifetime or performance models is essential for moving from fundamental research toward applied validation).

Longer or staged TA access for high-TRL validation (to enable multi-phase access schemes (e.g., proof-of-concept to durability testing to pre-industrial validation) so that promising technologies can evolve within the same infrastructure ecosystem rather than stopping at low TRL experimental demonstrations).

Industrial engagement and co-development: to encourage participation of industrial partners in TA projects through dedicated calls, matchmaking events, and confidentiality frameworks. Direct industry involvement accelerates technology transfer, standardization relevance, and commercialization pathways.

Standardized testing protocols and benchmarking datasets (develop common experimental methodologies, shared reference materials, and open benchmark datasets across RISEnergy facilities. This would improve reproducibility, comparability of results, and acceptance by certification bodies and industry).

Enhanced data management and sharing platforms (implement secure but interoperable repositories for experimental data, metadata, and models generated during TA. Structured data availability increases scientific impact, enables reuse, and supports future collaborative proposals).

Follow-up funding and continuity mechanisms (provide small continuation grants or fast-track access for the most promising TA outcomes to bridge the gap between academic validation and pilot-scale demonstration, a critical step for achieving high TRLs).

Feedback – Pro-active Innovation Support

Awareness	Did you know about the pro-active innovation support of RISEnergy? ☐ Yes ☒ No
[Please specify how you learned about the pro-active innovation support]	
Personal experience	Have you taken advantage of or benefited from the pro-active innovation support? ☐ Yes ☒ No
[*Please provide details]*	
Information/service provided by the pro-active innovation support?	1 (excellent) ☐ | 2 ☐ | 3 (neutral) ☐ | 4 ☐ | 5 (poor) ☐
[*Please provide details]*	

1 (excellent)	2	3 (neutral)	4	5 (poor)
☐	☐	☐	☐	☐

I declare that the above provided information and especially that information on the number of days visited the RI is correct.

☒ *I have read the [RISEnergy privacy policy](#) for participation in the RISEnergy TA and consent to participation and the associated data processing.*

Your full name:

Your signature: