

## Integrating National Research Agendas on Solar Heat for Industrial Processes

### Project Deliverable 6.3: Mid-term report on exchange of staff personnel within the Researchers Mobility Scheme

#### D 6.3 – MID-TERM REPORT ON EXCHANGE OF STAFF PERSONNEL WITHIN THE RESEARCHERS MOBILITY SCHEME

WP	WP6: Integrated SHIP research infrastructures
Due date:	M24
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Partner responsible	CIEMAT
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Reviewed/supervised by:	Peter Nitz, Josephine Stemmer
GA Number	731287
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#### DISSEMINATION LEVEL

PU Public

#### NATURE OF THE DELIVERABLE

R

#### HISTORY

Author	Date	Comments
Isabel Oller	25.02.2019	Version 1
Félix Téllez	25.06.2019	Version 2
Josephine Stemmer	25.06.2019	Version 3

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## 1. Description of work

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This mid-term report on exchange of staff personnel within the Researchers Mobility Scheme (RMScheme), contains the main results and future actions related to the mobility actions that happened in the first two years of the project, i.e. reflects and reports the status at the end of month M24 (December 2018). It gives an overview of the T6.2 progress.

The main objective of the exchange of personnel in the framework of INSHIP's RMScheme is to address the better execution of the Research Work Plan described in the Work Packages 2 to 5, all of them focused on RTD Activities.

Some of the laboratories have already on-going collaborations. During the building of INSHIP proposal, exchanges of personnel have already been planned to achieve the objectives of the INSHIP research work plan. Those tentative exchange plans were agreed to be adjusted once the Research Activities within WPs 2-5 were defined properly and the actual research work was further progressed. The adjustment of tentative mobility actions was aimed at supporting newly evolving collaborations between INSHIP partners. To optimize the results of the exchange of personnel, the following procedure needs to be adhered to:

- Prior to respective assignments of personnel: Specifying of activities of the respective staff / Purpose of the mission / Duration of the mission (a minimum of one working week or 4-5 working days).
- After completion of the mission, the assigned person shall write a report on her/his activities during the mission.
- The hosting participant will be responsible for enabling implementation of the assigned person's tasks, including the granting of necessary access to facilities and shall also be responsible for the respective working and safety conditions.
- The hosting partner will support the personnel in the logistic formalities, including accommodation in a working room and the necessary technical support during the period of mission.
- The visiting partner will assume the necessary costs for the mobility of the research staff (travel, accommodation and living expenses), using their own defined budget.

## 2. Report on the completed activities within Task 6.2 (Month 24)

Exchange of personnel templates for registration of the activity as well as the individual activity report that should be filled in after the stay, have been implemented in the partners' only part of the INSHIP website. In addition, those templates have been also uploaded in pdf format in EMDESK.

The screenshot displays two web forms from the INSHIP website. The left form is titled 'Exchange of staff personnel' and includes a header with logos for inship, EERA (European Energy Research Alliance), and PUBLIC AREA. It contains a navigation menu and a list of procedures for personnel exchange. Below this is a 'Personal data' form with fields for name, email, institution, dates, and a description of activities. The right form is titled 'INDIVIDUAL ACTIVITY REPORT' and includes logos for inship, INSHIP (Integrating National Research Agendas on Solar Heat for Industrial Processes), and the European Union. It contains five sections (I-V) for reporting on the exchange, each with a text area and a 'Please do not exceed' limit. Both forms include footnotes and a 'Submit' button.

Figure 1. Tab with form enabled on the INSHIP website

An update on the estimation of the different exchanges and mobilities of research staff has been included in the Grant Agreement amendment (entering into force in M14) according to the objectives of the INSHIP research work plan (table included in section 3.1.4 of the new DoA<sup>1</sup> and reproduced below):

Partner name	Partner to be visited	Number of weeks	Activities to be performed	Specific Task
FISE	CIEMAT	2	Development of cost-effective concepts for solar steam	Task

<sup>1</sup> Amendment to Annex 1(Description of the Action) Part B to the Grant Agreement 731287 dated 25/01/2018 D 3.6

Partner name	Partner to be visited	Number of weeks	Activities to be performed	Specific Task
			integration layout: definition of implementation and experimental demonstration	3.1
	AEE	2	Development of process integration method linking simulation software on EE measures and heat storages with solar simulation software	Tasks 5.3 / 5.5
	CIEMAT	1	Definition of suitable ageing tests for industrial environment conditions	Task 3.3
	CEA	1	Heat storage integration and simulation	Task 5.1
CIEMAT	FBK	2	Tracking system based on SMA definition of possible application	Task 3.4
	ETHZ	1	Solar fuels / Solar thermochemical production of syngas assessment (WP4)	Task 4.3
	CEA	2	Heat storage integration and simulation (WP5)	Task 5.1
	INTEC	1	Development of methodologies for the calculation of inter-dependencies between the different RES technologies (WP5)	Task 5.3
AEE-INTEC	FISE	2	Development of concepts for industrial parks (WP5)	Task 5.4
	ETHZ	1	Solar Fuels / Solar thermochemical production of syngas assessment (WP4)	Task 4.3
	ETHZ	1	Solar Metallurgy (WP4)	Task 4.1
	CMT	1	Solar driven steam generation (WP3)	Task 3.1
	FISE	1	Balance of plant concepts (WP3)	Task 3.2
FBK	CIEMAT	24	Testing and validation of innovative concepts of volumetric solar receivers for process heat in metallurgy (WP4)	Task 4.4
FBK	UEVORA	1	Application of SMA for quasi-static solar collector (WP2)	Task 2.3
FBK, CRES	METU	1	Design of a new receiver direct flow (WP2)	Task 2.1
EVORA UNIV.	FISE	1	Solar driven steam generation (WP3)	Task 3.1
	CIEMAT	1	Thermal Energy Storage systems and storage management (WP5)	Task 5.1
CYPRUS INSTITUTE	CEA	3	Heat storage integration and simulation	Task 5.1
	CIEMAT	3	High-concentration optics for high-temperature solar reactors	Task 4.4
CRES	CIEMAT	2	Direct steam generation for industrial applications using Parabolic trough and Fresnel type collectors (WP3)	Tasks 3.1 /

Partner name	Partner to be visited	Number of weeks	Activities to be performed	Specific Task
				3.3
	AEE-INTEC	1	Study on methodologies and modeling on solar cooling with low temperature collectors (WP2)	Task 2.1
	AEE-INTEC	1	Study on methodologies and modeling on solar cooling with medium temperature collectors (WP3)	Task 3.1
	CYI	2	Development of methodologies for solar desalination for Mediterranean regions (WP5)	Tasks 5.3 / 5.5
ETHZ	CIEMAT	1	Assessment of solar fuels / solar thermochemical production of syngas (WP4)	Task 4.3
	UEVORA	1	Assessment of solar fuels / solar thermochemical production of syngas (WP4)	Task 4.3
CEA	FISE	1	Collaboration in durability and reliability tests	Task 3.3
	AEE INTEC	1	Process integration and storage management activities	Task 5.1
METU	ETHZ	2	Solar Metallurgy (WP4)	Task 4.1
	ETHZ	2	Solar Lime (WP4)	Task 4.2
	FISE	1	Industry parks and heat distribution networks (WP5)	Task 5.4
	CIEMAT	1	Activity based on drying processes	Task 2.2

**Table** in Section 3.1.4 of the amended DoA: Summary of the initially scheduled program of staff scientist exchange between the different research institutions, associated with the RTD activities of the project (WPs 2 to 5). Along the development of the Research activities, mobilities will be adjusted according to actual research requirements.

Adjustments of exchanges of personnel, or possible modifications on the ones already planned, could be defined during the project development and execution, by agreement among participating partners. This information must be transmitted to the coordinator of the relevant task and then communicated to the WP6 leader so that it can be included in updates of the aforementioned summary table (3.1.4).

Only two mobility actions have taken place in the first 24 months within the RMScheme of INSHIP.

In month 9 of INSHIP project one exchange of personnel was carried out: from CRES to CYI during a working period of two weeks and three remote working weeks, related to WP3 and with the title of: "Operation and measurements of Linear Fresnel Collector facility". The activity of this exchange supposed a variation with regard to the initially planned in the summary table (3.1.4 from the DoA), which was initially scheduled for doing activities related to WP5 instead of WP3. The mobility was carried out from 11<sup>th</sup> to 22<sup>nd</sup> of September 2017 by Mr. Panagiotis Tsekouras (from CRES in Greece to CYI in Cyprus).

The individual activity report was submitted online as procedure demands via the INSHIP website by the visiting partner (CRES). The remote working time was justified with the following items:

- Elaboration of solar collect field characteristics.
- Definition of measurements procedure.
- Elaboration of indicative set of measurement.
- Preparation of optical, thermal and energy analysis tool.

In month 24 an exchange of personnel took place from CIEMAT to CRES with a working period of three weeks (two of them of remote working time). This exchange was related to WP3 and the activity was the collaboration in tool refinement and preparation of corresponding sections of INSHIP deliverable 3.7 "Solar Field driven BOP<sup>2</sup> dimensioning" linked to task 3.2. The remote working time was justified by the necessity to review literature and collect experimental data to validate the tool prepared for deliverable 3.7 after the stay. In addition, at least two days more were required to finalize the deliverable 3.7. Mobility was carried out from the 3<sup>rd</sup> to the 7<sup>th</sup> of December, 2018 by Ms. Loreto Valenzuela, PhD (from CIEMAT, Spain to CRES, in Greece).

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<sup>2</sup> BOP Balance of Plant  
D 3.6

### 3. Annex

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#### 3.1. Individual Activity Report of CRES to CYI mobility (Month 9)

Title of the exchange: **Operation and measurements of Linear Fresnel Collector facility**

Participant's first name and family name: **Panagiotis Tsekouras**

Name of the participant's institution: **CRES**

Name of the host institution: **CYI**

WP and Task directly related to the exchange: **WP3 / Task 3.4**

Onsite working period: **11 / 09 / 2017 to 22/ 09 / 2017**

Onsite working time (in Person week(s))\*:**2**

Remote working time (in Person week(s)\*\*): **12**

#### I. Objectives of the exchange (10-15 lines max)

Please do not exceed 10 to 15 lines

1. Operation of the Linear Fresnel Collector under real environment conditions
2. Performance evaluation of the LFC and thermal performance characterization
3. Comparison of optical models
4. Proof check of theoretical models by comparing results towards measurements



II. **Main achievements and difficulties encountered** (10-15 lines max)

Please do not exceed 10 to 15 lines

**Main achievements**

1. Consistency check of onsite monitoring sensors and equipment // Development of evaluation tool for measurements analysis
2. Development of portable equipment for monitoring of concentrating solar collectors/ systems // Comparison of portable and on site measurements
3. Tests performed : Full day operation at sunny and cloudy days for various scenarios // Steady state operation at defined temperature
4. Tests under various LFC geometries (enabling different combinations of primary reflectors for tracking)
5. Comparison of optical models of the LFC // Proof check of theoretical models // Exchange of know-how on modelling and design issues of the LFC
6. Performance evaluation of the LFC // Elaboration of the coefficients of the LFC energy performance

**Main difficulties**

1. Application of the ISO 9806 standard methodology
2. Maintain steady state conditions for various temperature levels at the visit timeframe
3. Calculation of the tracking error by means of measurements

III. **Impact/advance achieved within the corresponding INSHIP activity (WP/Task)**

Please do not exceed 10 to 15 lines

**Corresponding WP / Task** : WP3 - Technology and applications to medium temperature SHIP (150°C to 400°C) / T3.4 - Compact and building envelope-integrated solar field concepts

The technology of the Concentrating Solar Collector lies in the operational range of 150-400oC and the investigated solar collector is installed in a building roof.The activities of the exchange aimed at the validation of theoretical models, the performance evaluation of the installed collector and the exchange of know-how between CRES and CyI personnel.

As a result, the use of the exchange results and experience gained can contribute to the tasks objectives and on potential improvements of the facility.

(10-15)

**IV. Joint publications foreseen** (10-15 lines max)

Please do not exceed 10 to 15 lines

A joint publication is foreseen to be published preferably to a journal presenting the core findings of the activity.

**V. Comments, if any** (10-15 lines max)

Please do not exceed 10 to 15 lines

To this point, I would like to express my thanks to the colleagues from the Cyprus Institute Mr. George Kirkos and Dr. Alaric Montenon and Mr Harris Chrysanthou for their memorable hospitality, organization and professionalism.

The very good collaboration with the CyI personnel along with the well maintained and supported Fresnel facility made the visit a pleasure leading to a fruitful collaboration.

Finally, I would like to express my appreciation to the INSHIP framework, CRES and CyI that gave me the opportunity to implement the before mentioned activities.

\*One person week equals to 5 labour days. One person week should be justified when a minimum of 3 days of onsite labour days at the host institution have been realized, considering that one day before and one day after the mobility are also part of the mobility, even if not hosted at the institution. In this sense, please consider one person week for all onsite working periods from 3 to 5 labour days.

\*\*The remote working period deals with all the preparatory work to be realized way before and after the exchange: joint work to prepare, mapping of the transfer of knowledge between both partners, preparation of experiments to do during the mobility, analysis of the experiments after the exchange, joint publications, ... This will count for your mobility person month to declare and should be counted in the Remote working period.

### 3.2. Individual Activity Report of CIEMAT to CRES mobility (Month 24)

## INDIVIDUAL ACTIVITY REPORT

Title of the exchange: Solar steam for industry (SSI)

Participant's first name and family name: Loreto Valenzuela Gutiérrez

Name of the participant's institution: CIEMAT

Name of the host institution: CRES

WP and Task directly related to the exchange: WP3, Task 3.2

Onsite working period: 03 / 12 / 2018 to 07 / 12 / 2018

Onsite working time (in Person week(s))\*: 1

Remote working time (in Person week(s)\*\*: 2

#### I. Objectives of the exchange

The objective of the exchange was to review, complete and validate a software tool to dimension systems for the supply of solar thermal energy in industrial processes within the temperature range 90°C to 300°C. CRES is in charge of the main activity as responsible of Task 3.2 (to be completed in Month 24) and CIEMAT is one of the partners involved in this task, which is supporting CRES in the preparation of this software tool.

#### II. Main achievements and difficulties encountered

CRES and CIEMAT met before the mobility exchange several times through web-conferences to agree in the flowchart and characteristics of the software tool, which has been prepared in Excel format. The final user interface defined allows the user to define main characteristics of the main process of the industry (thermal energy demand, process steam inlet/outlet temperature), site location (country, city, average DNI), and desired design conditions for the solar field (solar collector type, heat transfer fluid, incidence angle, temperature increase about process inlet temperature). The tool delivers a summary sheet with information of e.g. solar field collectors, hydraulics data of the system, and a simplified scheme of the system layout. During the stay of CIEMAT at CRES, some scenario cases were run to verify the reliability of results. For that purpose, information of real systems available in the SHIP plants webpage was used. Up to 6 case studies were executed with deviations in the results being lower than 20%. According to CIEMAT and CRES, this deviation is considered as acceptable and indicates a good agreement between the tool and the case studies, taking into consideration the limited information available.

### III. Impact/advance achieved within the corresponding INSHIP activity (WP/Task)

The completion of the tool is one of the activities committed in the WP3/Task 3.2 of the project. The tool will be useful for the pre-dimensioning of solar systems for industrial process heat applications in the medium temperature range, considering actual and reliable data of parabolic troughs available in the market and available heat transfer fluids to be used in the solar field.

### IV. Joint publications foreseen

Apart from the preparation of a report linked to Deliverable 3.7 of the INSHIP project, CRES and CIEMAT will prepare a joint publication for a journal describing the methodology and main characteristics of the tool prepared and including as results the output of representative case studies that prove the validity of the tool.

### V. Comments, if any

The collaboration of the CRES staff during the mobility exchange was excellent since the researchers involved were completely devoted to this activity during the onsite working time at CRES. Both institutions plan to strengthen collaboration on joint activities in this project or other SHIP-related project opportunities that may arise.

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\*\*The remote working period deals with all the preparatory work to be realized way before and after the exchange: joint work to prepare, mapping of the transfer of knowledge between both partners, preparation of experiments to do during the mobility, analysis of the experiments after the exchange, joint publications, ... This will count for your mobility person month to declare and should be counted in the Remote working period.