TESSe2b
the smart energy storage

Thermal Energy Storage Systems

for energy efficient building an integrated solution for residential building energy storage by solar and geothermal resources

TESSe2b Project

Project Presentation

First Workshop & B2B Meeting

Luís Coelho – Instituto Politécnico de Setúbal (IPS)

Objectives

- To present the European Project TESSe2b.
- Give an overview of the project structure.

Project Title

Thermal Energy Storage Systems for Energy Efficient Buildings. An integrated solution for residential building energy storage by solar and geothermal resources

- TESSe2b Project –

Project number: 680555

Call identifier: H2020-EeB-2015 **Call for EeB – Energy-efficient Buildings**

EeB 6 – 2015: Integrated solutions of thermal energy storage for building applications

Context of the project

TESSe2b Project

Type of action: **RIA** - Research & Innovation Actions (defined in the call)

Activities expected to focus on Technology Readiness **Levels 4-6**.

- Budget: 4.311.700 euros;
- Number of participants: 10
- Number of countries: 8
- Starting date of the project: 01/10/2015;
- Duration: 48 months

G. Technology readiness levels (TRL)

Where a topic description refers to a TRL, the following definitions apply, unless otherwise specified:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

General Objectives

- Increasing **energy efficiency** in buildings, enhance **green technologies** and promote advance **thermal energy storage** solutions.

- The target of TESSe2b is to **design**, **develop**, **validate** and **demonstrate** a **modular** and **low cost thermal storage** technology based on **solar collectors** and highly efficient **heat pumps** for **heating**, **cooling** and domestic hot water (**DHW**) production.

General Objectives

Latent Thermal Energy Storage

Heating and Cooling Tanks (NEPCM)

Enhanced PCM BHEs

Renewable Energy Sources

Solar (Thermal Panels)
Heating and DHW

Geothermal - GSHP
Cooling, Heating and DHW

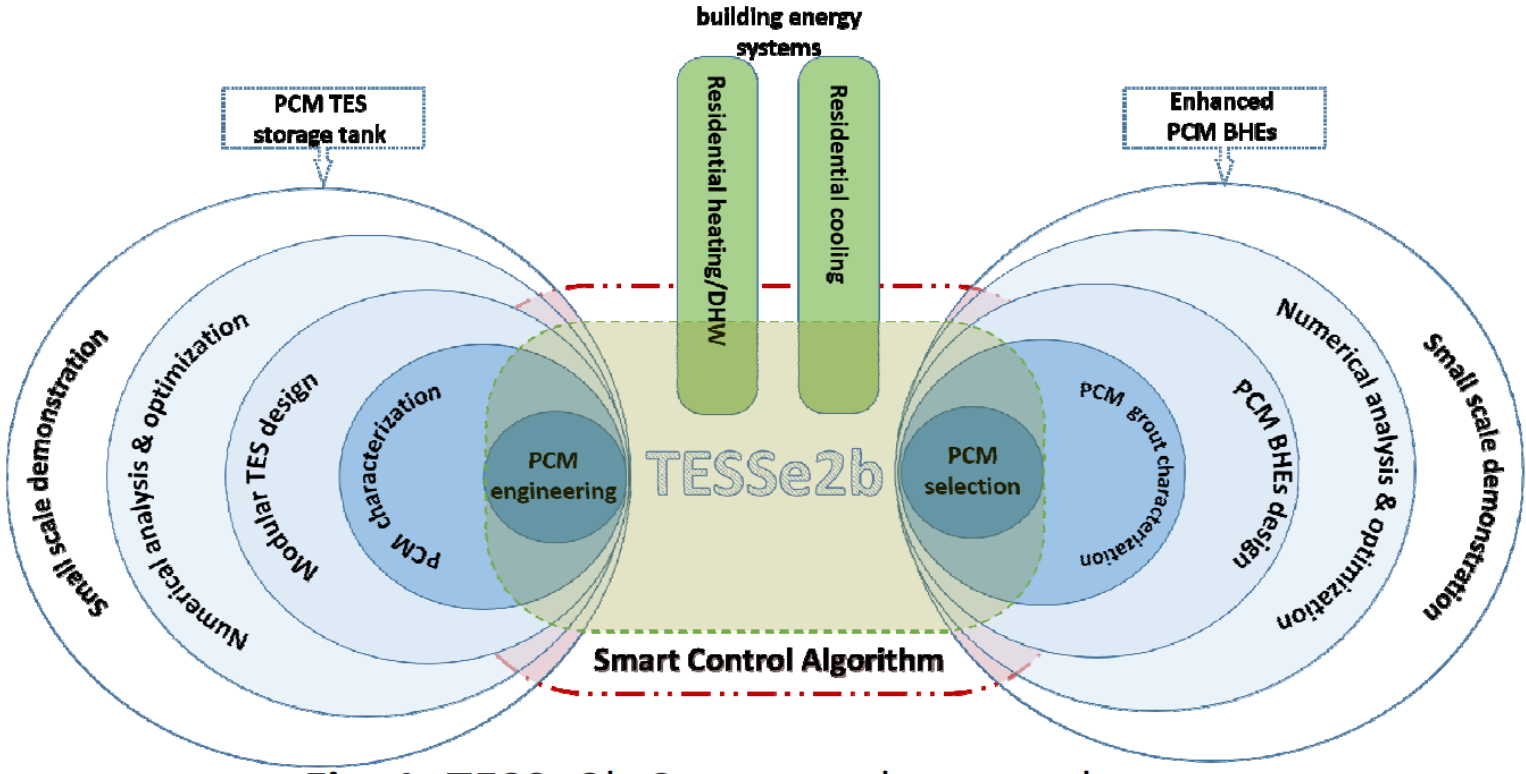


Fig. 1: TESSe2b Conceptual approach.

Specific Objectives

- OBJ1 - Selection and characterization of candidate **PCM** to ensure optimum design and performance for **high efficiency PCM TES tank** and **enhanced PCM borehole** heat exchangers.

- OBJ2 - Exploit **nanotechnology** to develop a new nano-composite **enhanced** paraffin PCM (**NEPCM**).

- OBJ3 - Development of a **protective thin film** coating against the corrosivity of **salt-hydrates** to the heat exchanger (HE).

Specific Objectives

- OBJ4 - Design optimization and development of **compact modular TES tanks** including a **high performance HE**.

- OBJ5 - Development of a **smart model-based control system** for efficient TESSe2b operation and integration into a robust working prototype.

- OBJ6 - **Demonstration**, on-site monitoring and technology validation of prototypes of a single building in **three pilot sites**.

Specific Objectives

- OBJ7 - **Cost-effectiveness analysis** of TESSe2b solution to evaluate the **return-on-investment period**.

- OBJ8 - To design an **effective exploitation strategy and business plan** to demonstrate the **overall benefits** in the several levels of the TESSe2b solution adoption.

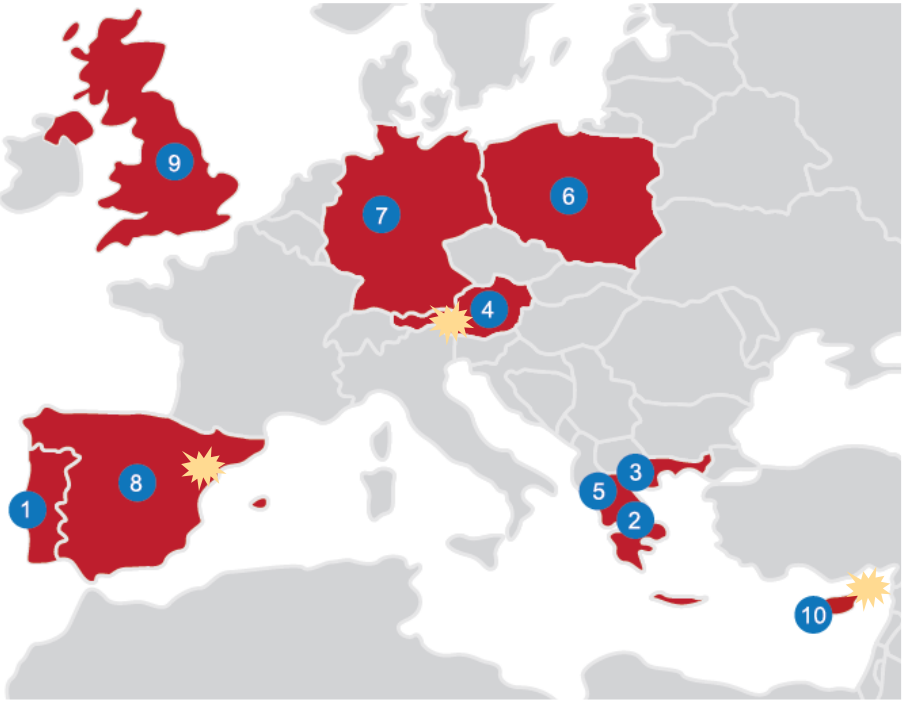
Expected results

- The TESSe2b solution will **reduce the building energy consumption at least 15%,** but it might be possible to reach **25-30%,** with a corresponding reduction in operating costs.

- The estimated **payback** period is expected to reach **8-9 years**.

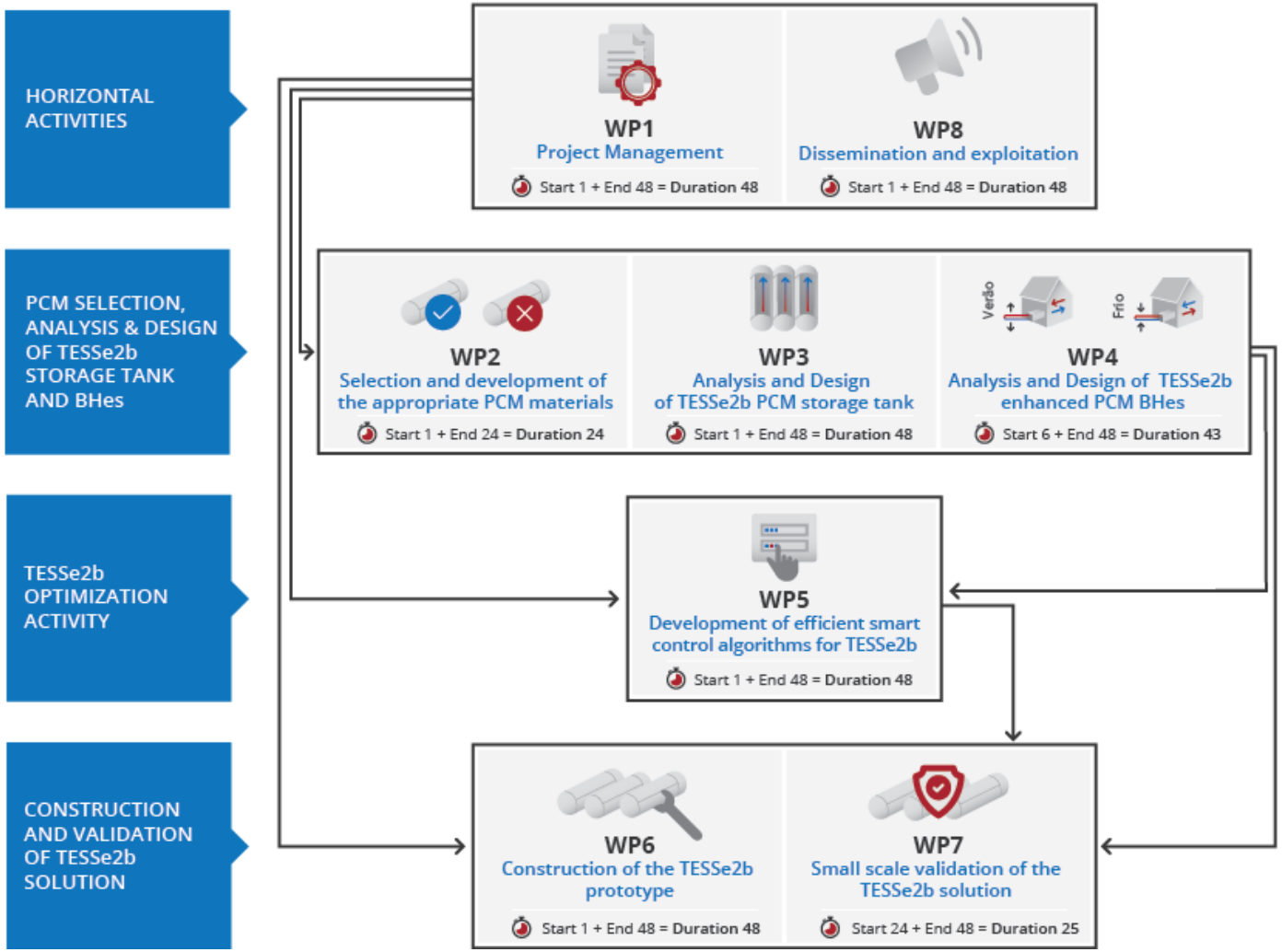
- TESSe2b project and its exploitable products have the **potential** not only to be included as a **market opportunity** but also to **enhance the development of TES systems** in the EU market.

Consortium overview and organisation



Name	R&D legal statuses	Country
Instituto Politécnico de Setúbal - IPS	Higher education	Portugal
Centre For Renewable Energy Sources and Saving Fondation - CRES	Research organisation	Greece
Technologiko Ekpedeftiko Idrima Stereas Elladas - TEISTE	Higher education	Greece
Geoteam Technisches Buro Fur Hydrogeologie, Geothermie Und Umwelt Gmbh - GEOTEAM	SME	Austria
Panepistimio Ioanninon - UOI	Higher education	Greece
Szkola Glowna Gospodarstwa Wiejskiego - SGGW	Higher education	Poland
Ruhr-Universitat Bochum - RUB	Higher education	Germany
Asociacion Ecoserveis - ECOSERVEIS	Non-profit org.	Spain
Phase Change Material Products Ltd – PCM Produc	SME	U.K.
Z & X Mechanical Installations Limited – Z&X	SME	Cyprus

Work Plan



Total: 8 Workpackages

Management: One

Dissemination and exploitation: One

Technical: Seven

Workpackage WP1 - Project Management [Months: 1-48]

WP leader: IPS

TASK 1.1: Management Meetings

Task Leader: IPS; Contributors: all partners

TASK 1.2: Consortium Agreement

Task Leader: IPS; Contributors: all partners

TASK 1.3: Coordination of R&D activities

Task Leader: IPS; Contributors: all partners

TASK 1.4: Financial and Administrative management

Task Leader: IPS; Contributors: all partners

TASK 1.5: Knowledge Management

Task Leader: IPS; Contributors: all partners

TASK 1.6: Ethical and Societal Issues

Task Leader: IPS; Contributors: all partners

TASK 1.7: Acquiring Audit Certificates

Task Leader: IPS; Contributors: all partners

Communication inside the consortium

- A **easy and efficient communication** inside the consortium is a **key point for a successful project**.
- So far **there has been good communication** between all partners and we must **continue** to ensure this communication.
- **Face-to face progress meetings** in every six months.
- **Remote technical** (each WP) **and coordination meetings** (WP1); One per month (responsible: WP leader).
- **Bilateral specific meetings** (responsible: Partners)

Communication inside the consortium

- **Monthly Internal Report** (responsible: WP leader).
- **Interim Report**, one in every six months (responsible: Project Coordinator).
- **EMDESK** (specialised management software for European research projects) has been an **essential tool** for maintaining a good communication inside the consortium and for a good project management.

EMDESK

Workpackage WP2 - Selection and development of the appropriate PCM materials for TESSe2b [Months: 1-24]

WP leader: PCM Products

TASK 2.1: Development of a **nano-enhanced paraffin PCM** for TESSe2b hot/cold thermal storage tank

Task Leader: UOI; Contributors: PCM Products, IPS, TEISTE, RUB

TASK 2.2: Selection of the appropriate **salt-hydrate PCM** for TESSe2b hot/cold thermal storage tank

Task Leader: PCM Products; Contributors: IPS, TEISTE, SGGW

TASK 2.3: Selection of appropriate **encapsulated organic PCM for the BHEs**

Task Leader: PCM Products; Contributors: IPS, GEOTEAM, CRES

TASK 2.4: **Thermal characterisation** and benchmarking of the candidate TESSe2b PCMs

Task Leader: PCM Products; Contributors: UOI

Workpackage WP3 - Analysis and Design of TESSe2b PCM storage tank [Months: 1-42]

WP leader: TEISTE

TASK 3.1: Modular **design of thermal storage containe**r for candidate PCMs

Task leader: TEISTE; Contributors: IPS, SGGW

TASK 3.2: **Design and optimization of integrated HEs** for PCM storage tanks.

Task leader: TEISTE; Contributors: IPS, SGGW, CRES

TASK 3.3: Development of **HE's thin film protective coating**.

Task leader: UOI; Contributors: PCM PRODUCTS

TASK 3.4: **Report the technical characteristics** of TESSe2b PCM storage tank.

Task leader: TEISTE; Contributors: IPS, CRES, UOI, SGGW, RUB, PCM PRODUCTS

Workpackage WP4 - Analysis and Design of TESSe2b enhanced PCM BHEs [Months: 6-48]

WP leader: GEOTEAM

TASK 4.1: Analysis and Design of the **BHE's grout backfilling**

Task leader: GEOTEAM; Contributors: IPS, TEISTE, RUB, ECOSERVEIS, PCM PRODUCTS, Z & X

TASK 4.2: **Optimization of the BHE** - Design by macro-scale numerical simulation

Task leader: GEOTEAM; Contributors: IPS, CRES, TEISTE, UOI, SGGW, PCM PRODUCTS

TASK 4.3: **Report the technical characteristics** of enhanced PCM BHEs

Task leader: GEOTEAM; Contributors: IPS, CRES, TEISTE

Workpackage WP5 - Development of efficient smart control algorithms for TESSe2b [Months: 1-48]

WP leader: RUB

Task 5.1: Analysis for the **appropriate sensors, logical units and actuators**

Task leader: SGGW; Contributors: RUB

Task 5.2: Development of a **database** with **usage profiles** and **technical data** for TESSe2b components

Task leader: SGGW; Contributors: RUB, IPS, PCM PRODUCTS

Task 5.3: Development of a **control algorithm** implemented in **Building Energy Management** (BME) system

Task leader: RUB; Contributors: SGGW

Workpackage WP6 - Construction of experimental TESSe2b prototype [Months: 18-36]

Task leader: TEISTE

Task 6.1: Development of the **TESSe2b laboratory pre-prototypes**

Task leader: TEISTE; Contributors: IPS , CRES, UOI, SGGW, RUB, PCMPRODUCTS, Z&X

Task 6.2: Development of three **TESSe2b prototypes**

Task leader: Z&X; Contributors: IPS , CRES, TEISTE,UOI, SGGW, RUB, PCM PRODUCTS, Z&X, ECOSERVEIS

Workpackage WP7 - Small scale validation of the TESSe2b solution [Months: 24-48]

Task leader: CRES

TASK 7.1: Small scale validation of TESSe2b solution in **Austria**

Task leader: GEOTEAM; Contributors: IPS, CRES, TEISTE, SGGW, RUB, ECOSERVEIS, Z&X, PCM PRODUC

TASK 7.2: Small scale validation of TESSe2b solution in **Cyprus**

Task leader: Z&X; Contributors: IPS, CRES, TEISTE, SGGW, RUB, ECOSERVEIS, Z&X, PCM PRODUC

TASK 7.3: Small scale validation of TESSe2b solution in **Spain**

Task leader: ECOSERVEIS; Contributors: IPS, CRES, TEISTE, SGGW, RUB, ECOSERVEIS, Z&X, PCM PRODUC

Workpackage WP8 - Dissemination and Exploitation [Months: 1-48]

Task leader: CRES

TASK 8.1: **European market study**

Task leader: CRES; Contributors: all partners

TASK 8.2: **Business and financial case**

Task leader: CRES; Contributors: all partners

TASK 8.3: **Exploitation plan**

Task leader: ECOSERVEIS; Contributors: all partners

TASK 8.4: **Dissemination**

Task leader: CRES; Contributors: all partners

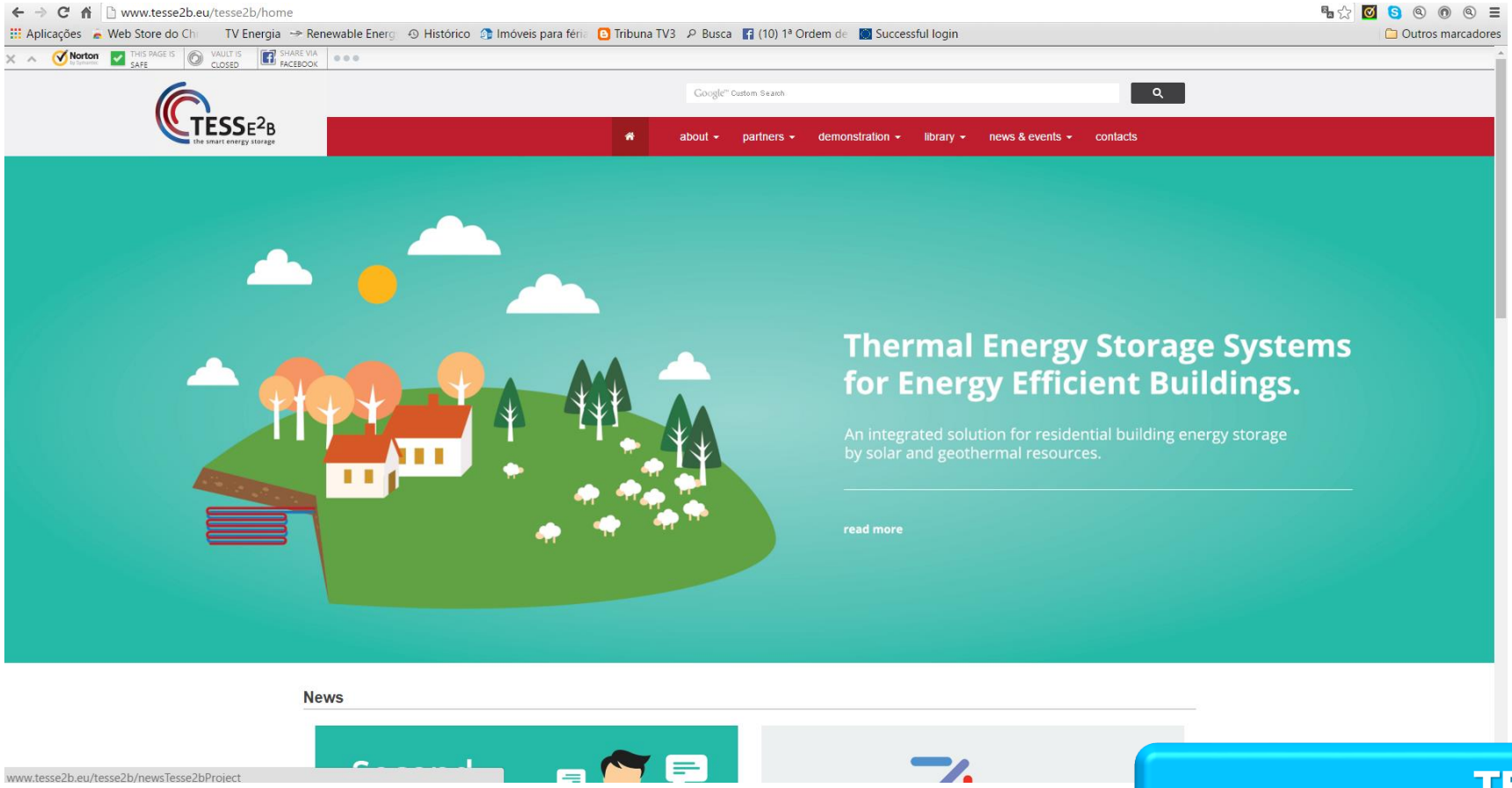
TASK 8.5: **Communication**

Task leader: IPS; Contributors: all partners

TASK 8.6: **Conference** on TESSe2b on teaching/training activities

Task leader: TEISTE; Contributors: all partners

Website and Project Video



www.tesse2b.eu

[TEESe2b Video (www.youtube.com/watch?v=Otyn0PntoGg)](https://www.youtube.com/watch?v=Otyn0PntoGg)

Conclusions

- The progress of the project is currently at month 21.
- The development of the project is going well and is still in line with the objectives previously proposed.
- They were achieving important results so far.
- Some project results will be shown in the next presentations.

TESSe2b
the smart energy storage

Thank for your attention

Thermal Energy Storage Systems

for energy efficient building an integrated solution for residential building energy storage by solar and geothermal resources

European Commission