FONDAZIONE BRUNO KESSLER

FBK REET ENERGY CAPACITIES a full programme on renewable sources and sustainable solutions

Future potential lays down on system integration and whole chain collaboration

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Fondazione Bruno Kessler
Centro Materiali e Microsistemi
Renewable Energies and Environmental Technologies

FBK REET vision, mission and value proposition

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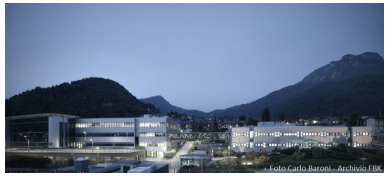

VISION

*REET unit has the objective to **exploit** the overall **innovation cycle**, from **research** to **development** of **technologies**, to **innovation of new integrated energy solutions** for the benefit of local economy, of **enterprises**, of the society as a whole.*

MISSION

*REET unit has the mission to **apply its VISION** on the specific sectors of **Renewable Energies** and **Environmental Technologies**, providing **support to research**, **innovation** and **technology transfer**, both at the local level for the benefit of the territory and local enterprises and at the international level for wide impact themes on energy and environment.*

VALUE PROPOSITION

FBK – REET ***value proposition*** is targeted to customized technologies, to a service oriented support, to the assessment of a whole value chain, to advanced system integration with real expertise in energy and technology domain. REET can offer a customized environment of innovation oriented to the end-user needs based on its wide range expertise and a full team of scientists and engineers.

REET expertise and services

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WHAT WE DO

We can offer a broad framework of services, from innovation support to full technological development, yielding a **truly comprehensive** and **global approach**

R&D projects and innovation

Numerical simulation and multiphysic analysis

Development of new industrial solutions

Consulting on ENERGY & ENVIRONMENT

Feasibility studies

Prototyping design and pre-engineering

Sustainable systems from renewable sources

Renewable resource assessment

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FIELD OF EXPERTISE AND RTD INTEREST

- CONCENTRATED SOLAR POWER
- HYDROGEN AND THERMAL STORAGES
- BIOMASS CONVERSION PROCESSES

SMART BUILDINGS
PHOTO CATALYTIC PROCESSES
INTEGRATED AND HYBRID ENERGY SYSTEMS

EU FP7 - DiGeSPo project

Novel m-CHP generation from small scale concentrated solar power

Luigi Crema , Senior Researcher @ FBK - REET

Project Coordinator

Modular 1-3 kW_e, 3-9 kW_{th} micro Combined Heat and Power (m-CHP) system based on innovative Concentrated Solar Power (CSP) and Stirling engine technology

This CSP m-CHP will provide electrical power, heating and cooling for single and multiple domestic dwellings and other small commercial, industrial and public buildings. This technology is part of a energy program developed in FBK

Overview of the technology

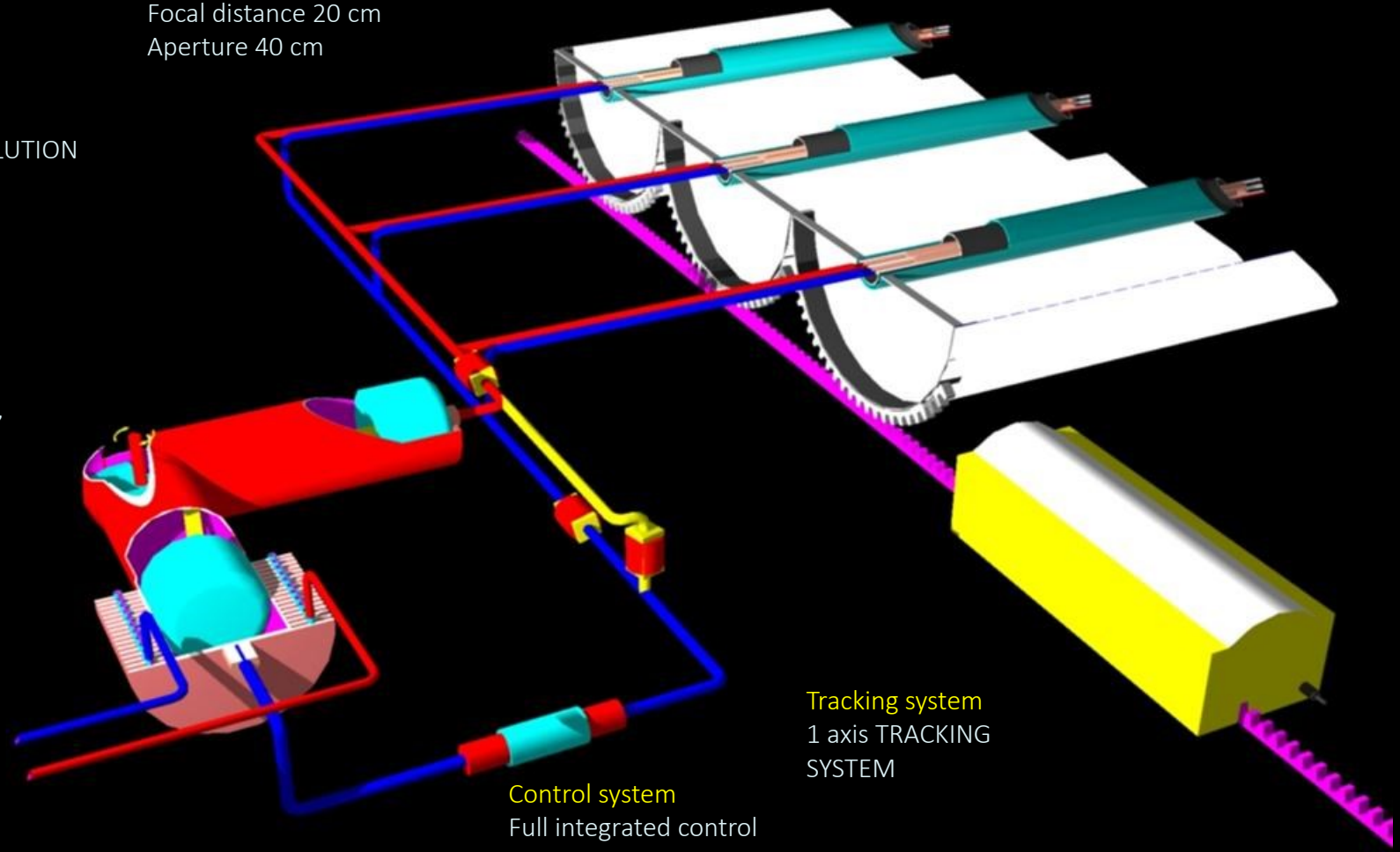
The system integrates:

Reflection optics
COLD TEMPERED GLASS
THICKNESS 0,75mm.
Focal distance 20 cm
Aperture 40 cm

Evacuated tube
NEW RECEIVER DESIGN and
NEW CER.MET. COATING

Thermal Fluids
COLLECTOR: OPERATING TEMPERATURE 300°C,
INVESTIGATION on NEW SOLUTION WITH NANOPARTICLES
STIRLING: SC NITROGEN

Cogeneration engine
HIGH ENERGY DENSITY STIRLING ENGINE. 2-3 kWel , 6 – 10 kWth



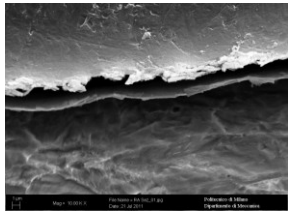
Power Generation
VARIABLE SPEED POWER GENERATION

Control system
Full integrated control system

Tracking system
1 axis TRACKING SYSTEM

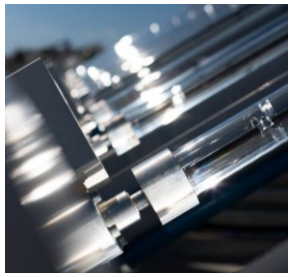
Main results

more at www.digespo.eu



Best candidate Absorbing material realized in FBK

Absorptance 0,96, emittance 0,09 @ 350°C, in a low cost solution

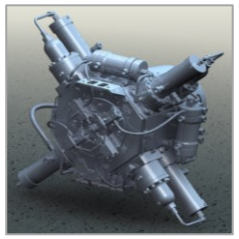


Design of new solar absorber highly performing at medium temperatures

Overall demosntrated efficiency 50%, target efficiency by end of the project 60 – 65%

Fully integrated solar collectors

Thermal fluid as carrier and demosntrated management of CSP system in Malta

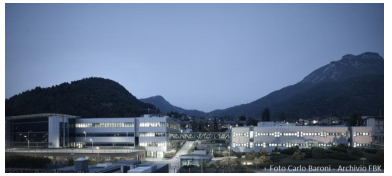


New High Density Stirling engine, fully design in FBK

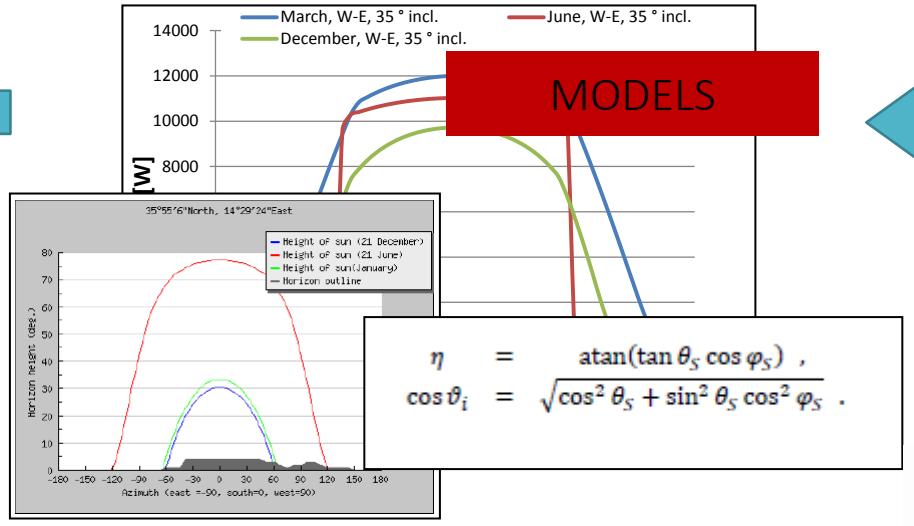
Double acting engine for medium temperature applications, expected efficiency 16% @ 300°C

DiGeSPo project

a model for innovation during research



INNOVATION



MODELS

$$\eta = \operatorname{atan}(\tan\theta_S \cos\varphi_S) \,,$$
$$\cos\vartheta_i = \sqrt{\cos^2\theta_S + \sin^2\theta_S \cos^2\varphi_S} \,.$$

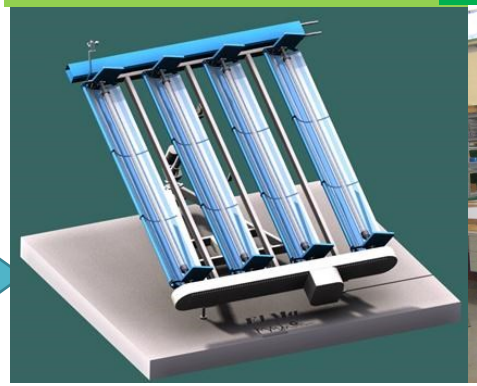
RTD

El.Ma. Electronic Machining

RENEWABLE ENERGIES & ENVIRONMENTAL TECHNOLOGIES

PRE-ENGINEERING

PROTOTYPATION



DEVELOPMENT

REQUEST FOR NEW RTD

PLUG and PLAY TECHNOLOGY

SOLAR ABSORBER
FBK CER.MET. COATING

REET MAIN ENERGY INFRASTRUCTURES

CSP Solar plant in Malta

Tests on m-CHP, steam generation, validation of solar components like mirrors, receivers, tracking systems, engines

Sustainable Connected Home

Smart building facility as a full scale living laboratory. Test of innovative Energy and ICT technologies

m-CHP Lab

This laboratory is equipped for the management of electrical and thermal power generation. It is distributed in two different locations of FBK, one dedicated to electrical generation and combustion and the second dedicated to thermal energy generation and storage.

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Bruxelles

European Commmission
FP7 projects, collaboration activities within SET PLAN

Graz
Bruxelles

eseia
european sustainable energy innovation alliance

FBK Founding member
Alliance to implement sustainable energy systems within EU society

Bruxelles

N.ERGHY

JTI – Fuel Cell and Hydrogen
FBK Member of N.Herghy
FP7 projects and programmes, on H2 and Fuel Cells

Bruxelles

EERA
European Energy Research Alliance

Members of the JP CSP

Roma

ENEA
Ente per le Nuove tecnologie, l'Energia e l'Ambiente

New collaborations
programmes in construction

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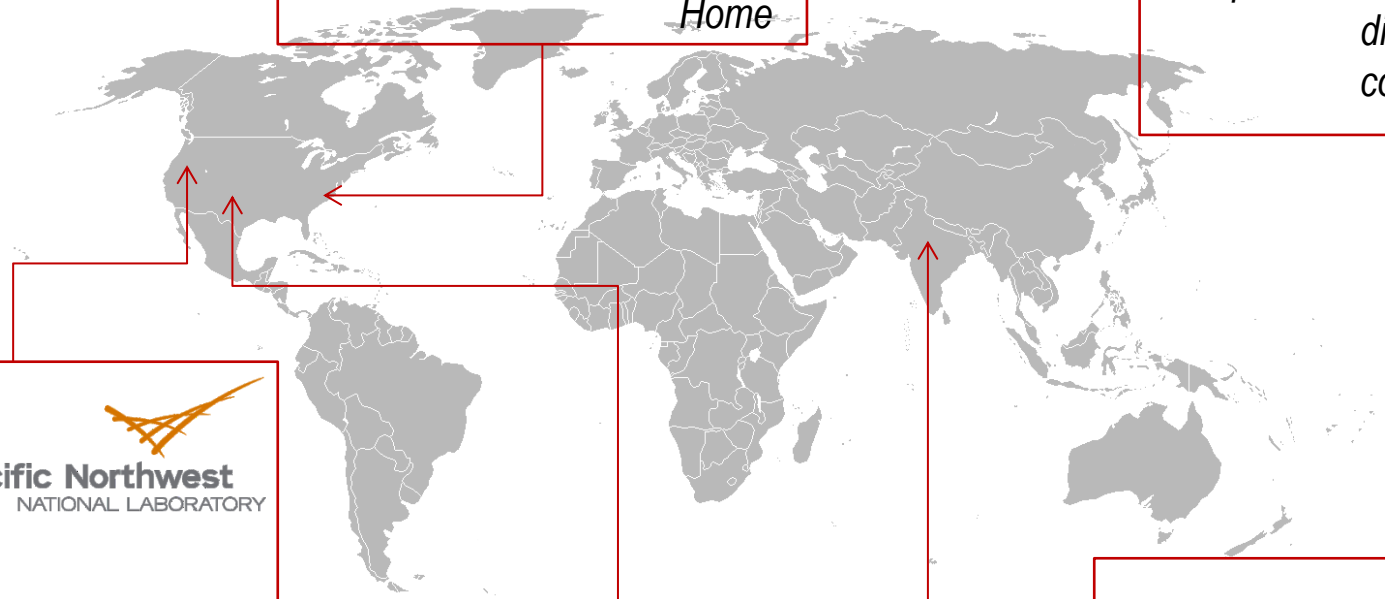
Massachusetts Institute of Technology

Green Alliance MIT – FBK for Connected Sustainable Home

… più altri esistenti, in fase di avviamento o consolidamento



Pacific Northwest NATIONAL LABORATORY

US Doe PNNL Memorandum of Understanding

Colorado University of Colorado at Boulder

Collaborations with local enterprises

India, IIT Delhi

ITPAR III Programme, Renewable ENERGIES and Sustainable SYSTEMS for Rural Communities of India