TRANSOLAR: FROM PV IN TRANSPORTATION TO GRID CONNECTION

(Phit-To-Grid)

Transolar Project **objective** is the reduction of CO_2 emissions by means of photovoltaic technology in heavy truck road transportation. Mitigation of fuel consumption is obtained by fuel substitution and significant improvement in the overall system efficiency.

Project **target** sets around appliance of electric distributed generation on road transport, thus main challenges and guarantees for success at European level are:

- Improvement on ***energy efficiency*** when designing and building refrigerated boxes and related logistic operations, inbound, outbound and transportation
- ***New materials*** development and appliance as the way to assure vehicle targeted weight reduction
- Redesign of electro mechanic system and batteries both of the vehicle and the frigo equipment for efficient energy usage
- Design and installation of ***truck plug–in systems for energy sale to Smart Grids*** during stationary non driving periods of time
- Equipment for ***telemetric and remote invoicing*** when operating within intelligent European electrical grid environment

Project viability is focused on the *catalytic effect for the integration of RES in the transportation sector* and the contribution to *Greening* by effective CO_2 reduction. Transversally it links to the industrial sectors directly involved: PV assemblers, truck box manufacturers, transport sector and frigo manufacturers. Also technology centres and universities, and local industrial clusters in all three geographic areas are required.

EUROPEAN SCOPE

NORTHERN EU	SOUTH EAST EU	EASTERN EU
LOGISTICS	LOGISTICS	LOGISTICS
PV ASSEMBLER(1)	PV ASSEMBLER(3)	PV ASSEMBLER(2)
TRUCK BODYBUILDER	TRUCK BODYBUILDER	TRUCK BODYBUILDER
FRIGO MNFG	FRIGO MNFG	FRIGO MNFG
TECHNICAL CENTER (Smart grids)	ELECTRIC DISTRIBUTOR	UNIVERSITY
UNIVERSITY	TECHNICAL CENTER (Logistics)	TECHNICAL CENTER (Energy and PV)
	UNIVERSITY	

Modelling process for every part of the project, former to prototype construction comprehends:

1. Modelling of vehicle loading and unloading operations
2. Modelling of Frigo system working conditions in different loading scenarios, empty, partial and full truck load
3. Simulation of vehicle driving conditions
4. Modelling of radiation during transit in the European scenario
5. Three different constructive models for PV solution, metallic-based, plastic-based and architectural integration
6. Generic model for PV electric generation and specific model for each PV technology to be industrialized: monocristaline, polycristaline, and thin film
7. Energy efficiency model for the system and for every scenario to be investigated and deployed: Frigo & truck box system, Frigo & truck box + battery system, and full vehicle system
8. Fiscal model in a European environment to guarantee Business viability: sustained, sustainable and renewable

MODELS & Work Packages			
1.1.	Mechanical design	9.0	Smart Grid connection
2.0	Electrical design	10.0	Risk Assessment
3.0.	Photovoltaic Tec	11.0	Standards quality and regulation
4.0.	Thermodynamics	12.0	Market development
5.0.	Electromagnetic	13.0	Life Cycle
6.0.	System operation	14.0	Dissemination
7.0.	Frigo and PV	15.0	Hydrogen avenue (APU's)
8.0	Industrialization		

Geographic scope for the Project covers North of Africa and Europe where driving conditions are to be intensively tested. Solar radiation (*European dynamic radiation map*-EDRM) and business start up, for pan-European logistic fleets will run simultaneously.

Critical technical parameters identified for every model and the building of prototypes are: power, surface, weight, temperature, electromagnetic fields, mechanical stress, aerodynamics, operation and maintenance. However, main barriers to be tackled will be related to European transportation legal standards and policies, and dis-alignment in smart grids among countries, where inappropriate harmonization in the R&D stages might threaten final business viability.

Latest the business model to operate in the European market proposes three main alternatives dealing with: Vehicle ownership (fleet, renting or individual owner), the logistic operator, and the final energy service company. It is recognized pre-paid modality in those cases when there is no contractual relationship between the energy service company and the electric grid operator, or those others in areas lacking of proper communication connection. The rest of business interests depend on the participation of the photovoltaic assembler, other parties involved during the product design and manufacturing and the key role of electricity distribution companies.