



DEMOKRIT • Distributed E-Mobility on Kriti

Short Description of concept and feasibility study for the implementation of a solar-powered public and private e-mobility system for citizens and visitors of the Mediterranean island of Crete (Kriti) | **Version 2.0**

Background

Crete is only the 5th largest island in the Mediterranean, but its significance as the birthplace of the **Mycenaean Civilization** and **unique reservations of unspoiled Nature** makes it indeed **the most important one**. Crete has a wonderful climate, is home to a **proud and creative population**, it is a tourist magnet of the first order, (25% of tourism in Greece), and a prominent farmer location for fruits, **fine wines** and **world famous honey & olive oil**.

But the island has severe problems: The power generation is inadequate; it is based solely on the combustion of diesel and marine oil. The power supply is poor and deficient. Constant blackouts are common. The traffic situation is the same: there is no attractive rail-based transport network, the roads are out-dated, the traffic in particular the transport of goods is dangerous, and the costs of fuels run away exceptionally quickly. High **unemployment, declining incomes** and **rising prices** characterize the economic situation. Finally, **tourism** - the backbone of the Cretan economy - **is also in trouble** and that for years. Due to lack of investment Crete has lost contact to its competitors in many places.

Crete needs new ideas and investments, significantly **better infrastructure**, more **ecologic protection**, more **cultural support** and a **pioneering tourism**. Crete needs a **courageous "Minoan" leap** over the past at the top of the 21 Century. Yes, Crete can do it...

Our goals

in this situation we want to help to change the positive development on the island **with our project proposal**. But after many years of project experience with Crete and the Cretans, we know any new development on the island should be carefully examined, discussed and debated with those concerned if it is to be successful. Therefore we are convinced that the very **innovative concepts**, we propose, must be evaluated and investigated in a investigated for **possible unintended side effects** and. Our proposal is also that the results have to be **implemented in a discourse of civil society in Crete** and translated into a sort of master plan.

Our proposal is a brand new **intelligent energy & transport** and business concept Crete. We want to demonstrate that it is a feasible task to

- establish the missing, public rail transport as a **modern, fast and environmentally friendly system** for citizens and tourists, and connect this system with an equally modern, fast and **environmentally friendly private transport** system;
- take the **power** for this system not from the already weak Cretan supply system but from a **autonomous self-supply system with energy** (zero-energy concept) - and even export electricity;
- establish a **real tourist attraction** on the island, not only because it is reasonable and eco-friendly, but because it is an **architectural masterpiece** that fits into the island in form and material in a way that you will not find elsewhere;
- have a **low-cost and mass-accepted tariff system** and **customer/owner system**, which leads to a genuine acceptance, and perhaps even reach cult status;
- **create jobs** and **stimulate the economy**, because the system itself is a Job Machine, the tourism will be boosted so that the entire economy of the island will be strengthened
- built, maintained and developed the main technical components of the system (trains, cars, bikes) on the island;
- use brilliant new composite materials and design principles that have unlike conventional materials a minimal CO2 footprint in the innovative, energy-saving design, construction or assembling of those vehicles;

- finally define a **model for similar environments, economic zones and cultures** and will help Crete **to have a real export hit** that fits the island! What succeeds in Crete can be reached everywhere in the Mediterranean.

The Concept

These objectives will be implemented with the following concept study modules:

1. The airports of Chania, Heraklion and Sitia as described in Figure 1 shall be connected with a mono-rail train similar to that one that is currently constructed in Brazil for the Olympic Games. On these lines, all other towns on the northern coast of Crete to be tied, which lie between the airport and the main focus of tourist attractions in Crete. The track serves both passenger transport such as road transport.
2. The routing system with its approximate length of 300 km will be used on the entire length to integrate the greatest number of photovoltaic modules in the rail construction, the station buildings and other buildings. As shown in Figure 2 PV power plant build of about 150 MV line and to generate the power for the train.

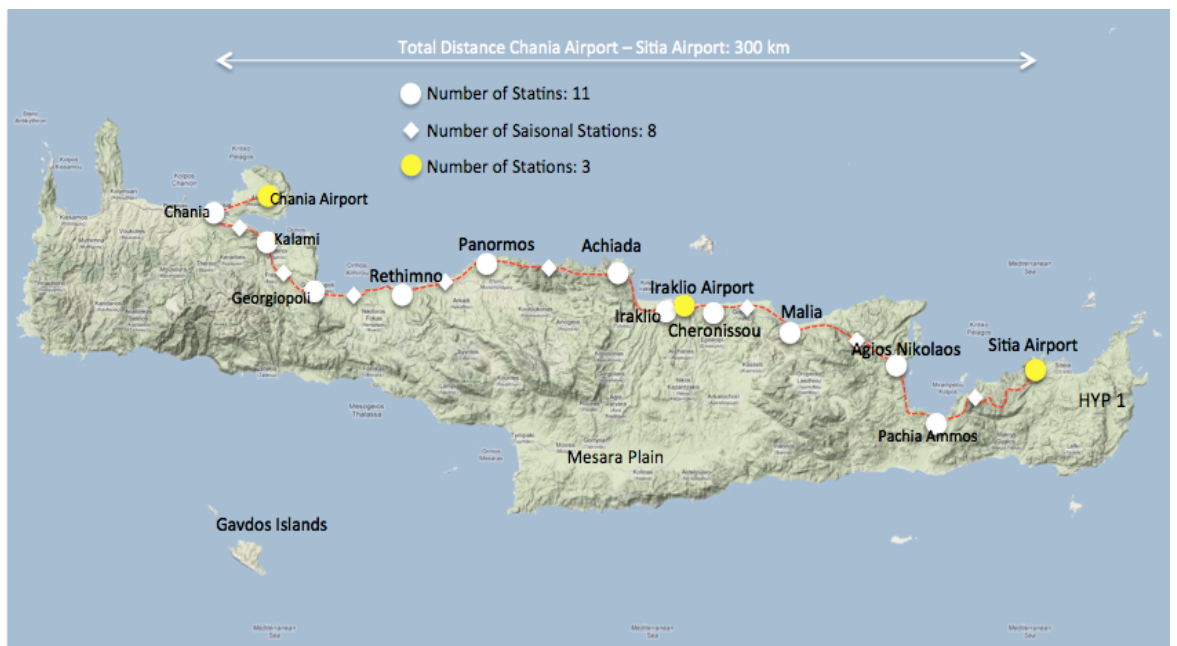


Figure 1: Mono-Rail Routing

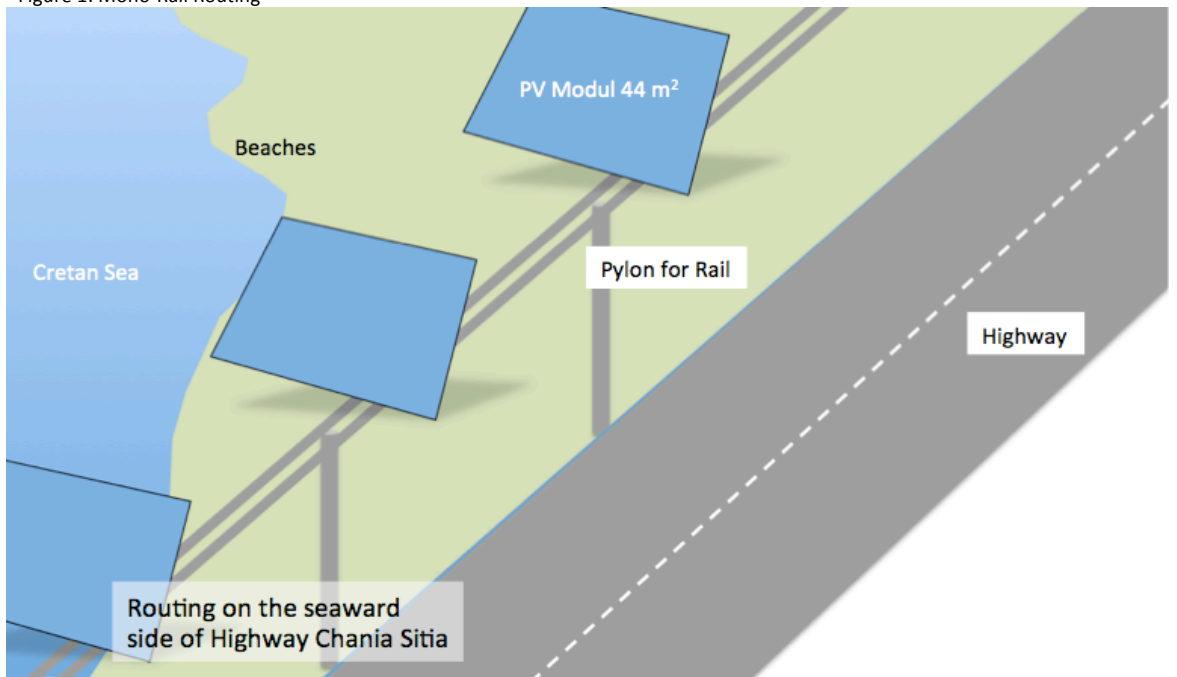


Figure 2: Integrated PV Power Plant

3. The stations shall also be distribution and service centres for electric cars and electric bicycles, so individual and public transport form a conceptual unit. Anyone traveling by train, acquires (optional) the right to use the other electric vehicle and share it. If you want to "share" an e-car or an electric bike you may also take the train conversely. The stations are therefore at the same time technical and logistical venues for the private transportation sector. This model explicitly allows room for other stakeholders (eg private car rental companies).
4. The electrical supply to the private e-transport is handled via the railway stations. The cars and bikes are cared for there by fast charging or battery replacement after the model of Better Place with the solar power of the web.
5. Since in particular the e-cars but also e-bikes are very expensive at the moment, on Crete is a manufacturing or final assembly of vehicles of both types to be built that are particularly competitive. Priority is given to new production techniques and the model at the centre of policy targets.
6. Particular attention will be paid to the materials used and their CO2 footprint. Therefore primarily to natural composites are used (less than 10% of the CO2 balance of steel, aluminium, etc.). The raw materials for this should come from the local Cretan agriculture, specifically for economic and ecological reasons.
7. The system requires a uniform tariff and usage system. A model for the user tariff for visitors and citizens to develop. This tariff system should also include cultural and tourist activities. With the train fare is a broad concept of "Car-sharing" are connected, which is separate from the conventional car hire or replace them.

Tasks

We consider the completion of the investigation tasks of the study, divided into 10 sections, as follows. The topics will be covered by and with the partners (which have partially not been included in the planning yet, but are listed here as the experts, see »Disclaimer«) discussed and then implemented by them. And very important to us, whatever may become of the project, an insightful study and a magnificent book is it in any case.

The investigative tasks of the study are as follows:

- I. **Construction of the railway, routing, environmental influences:** Bombardier, Forster + Partner GmbH and investigate in cooperation with ZETA Constructions SA and the Technical University of Crete, the rail concept, the features, the design of the features and design of the stations and the construction of the railway line. Bombardier to investigate the combination of passenger and cargo traffic.
- II. **Integration of the PV power plant:** investigate SolarWorld, Mechatron and Foster + Partners, the PV power plant concept, the design of the equipment, building integration, etc.
- III. **Overall architectural solution:** Foster + Partners to develop a total architectural design of the track and the trains.
- IV. **Operation and maintenance of the trains:** Bombardier developed the concept of operations and the O & M plan for the "Monorail" Trains
- V. **E-Mobility Integration into the stations:** Bombardier, NAMCO, IFM, SolarWorld and Foster + Partners examine how the private electric vehicles can be integrated at the stations in the entire system, power is to be examined under alternative approaches
- VI. **Design and manufacturing concept of private electric vehicles:** NAMCO, IFM, Oxyx Composite and TU Crete develop cost models for e-vehicles, both people moving and transport should also be matched. Oxyx Composite to develop a concept for the use of natural compounds for frame & bodywork. Amongst others, the concept is being developed as the Cretan agriculture may be involved in the delivery of raw materials.
- VII. **Car-Sharing & tariff system:** Dt. Carsharing Association developed a functioning tourist fare system based on different models of renting and sharing. The cultural and tourist service model is the Dt. Car sharing association studied.
- VIII. **Modes of funding:** Solar Development Consulting developed a comprehensive financing strategy for planning, construction and operation of the entire system including the power generation and marketing.
- IX. **Acceptance Studies, Economic Impact:** Solar Development Consulting conducts extensive social science research acceptance over the whole range of methodological

- X. **Discourse in civil society:** Solar Development Consulting organized with representatives of the European Parliament the social discourse on the concept of civil society in Crete.

What's so innovative?

In our opinion »innovative« in the strict sense is the following:

- *The combination of **rail-transport** with an **autonomous power supply from renewable sources**, which also can feed a fleet of vehicles with other E-powering technologies*
- *The **design of the entire system** with a comprehensive design that covers all system components by an architecture with a sensitive link back to the environment and culture. **Never before an architect has designed an entire public transport system with track, stations and squares and other buildings.***
- *The combination of a transport system for citizens and tourists with a **simple and harmonized tariff and sharing model** for trains and private transport in an e-mobility concept for the whole island!*
- *The concept of developing well-functioning and **low-cost electric cars** with a thoughtful charging concept and to use **natural composite materials** that have a minimal CO₂ footprint whose raw materials come from agriculture on site – on a traditionally agriculturally dominated islands in the Mediterranean.*
- *A **major project of this kind joined in social discourse in advance** - in the sense of a learning process for citizens and decision-makers to develop the concept and to have accepted by the public, so that the project itself can be considered a contribution to the growing energy-consciousness of the island.*

What is the European added value?

DEMOKRIT promotes international cooperation for future partners in the creation of the internal energy market. As unquestionably the project does this through the rational use of energy resources and the access to renewable energy sources for sustainable development. The intended effects of the economic approach are equally positively as they affect the entire European financial and economic situation positively!

DEMOKRIT is to develop a **modern, environmentally friendly and socially defensible solution** to the energy shortages and massive traffic problems on the island. Crete should not be the "battery of Europe", it is to benefit from its resources of the island through a cost-effective, energy-self-sufficient and sustainable transport system of public and private e-mobility for tourists and Cretan population as well so it can offer a working way out of the **cost and supply gap** on the island.

The **main added value** of DEMOKRIT, however, is: the concept is a **solution for the Mediterranean region**. When this model can be implemented in Crete, it is also applicable to all other islands or regions with similar conditions in the Mediterranean. It has therefore a **dedicated European added value** for the EU Member States of the Mediterranean region mainly affected by the euro and state crisis in particular.

What fits to »STEER«

DEMOKRIT is a **proposal for an application** to the EU STEER program because our proposal it is precisely in the focus of the STEER program. STEER has two dedicated targets to be especially encouraged:

Energy-efficient transport: *measures to reduce the circulation of private vehicles and road transport and to shift to more efficient modes and traffic systems.*

Clean and energy efficient vehicles: *Measures that help to transform the market towards more energy-efficient vehicles and to support and supplement the recent legislation in this area.*

Our concept makes it fairly clear that DEMOKRIT is exactly an optimal implementation of the described goals of the STEER program in the framework of the offered EU added values:

1. The proposed concept of a **solar-powered monorail** that transports both persons and for goods; for Crete it is in particular a very efficient mode of transport, which contributes in an outstanding way to **significant reduction of the circulation of private vehicles and road freight**; and by the way, it is itself an **exceptionally clean and energy-efficient vehicle**.

2. The proposed concept for the explicit production of efficient and cost-effective electric vehicles contributes in a marvellous way to **transform the market towards more energy-efficient vehicles**; our proposal, however, focuses the energy-efficiency not only on the **traction-technology**, but also on the **manufacturing of the vehicles and the related materials**.



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