



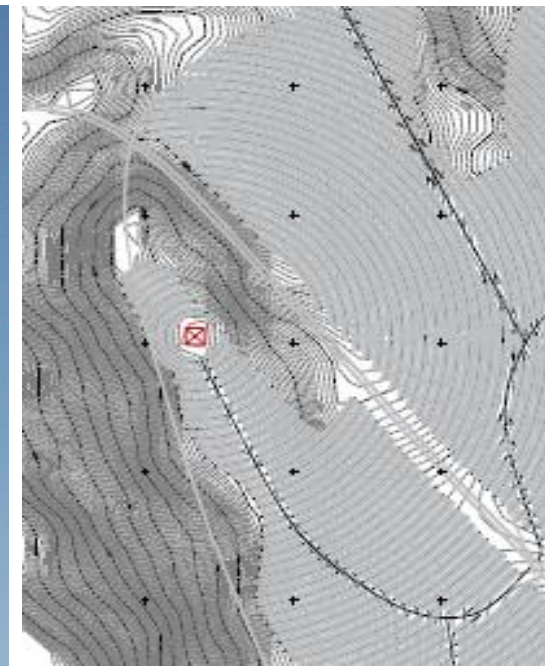
**Dii**

Renewable energy  
bridging continents

ASSOCIATED PARTNER



**Medgrid**



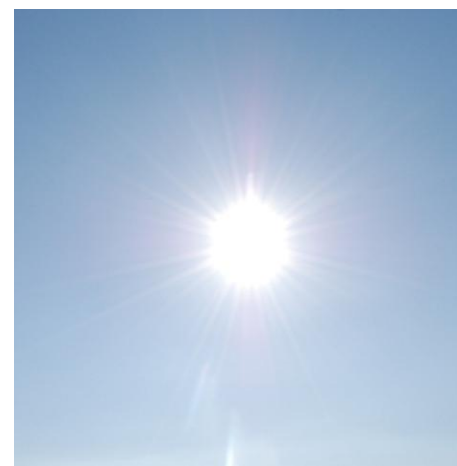
**NUR  
ENERGIE**

**Nur Energie**

**TuNur Solar Export Project - Linking Tunisia with Europe**

**May 2011**

# Nur Energie in Tunisia



**IN TUNISIA**, Nur Energie has been **active for over two years** and has already carried out extensive development and feasibility work.

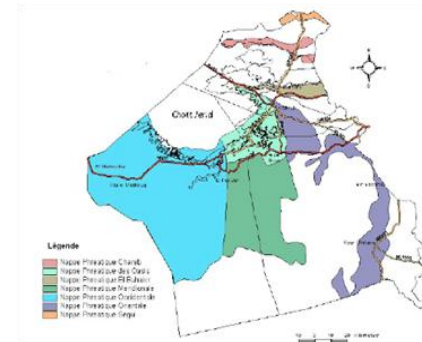
To date Nur Energie has identified a site for a 2000 MW solar power plant as well as a technically feasible HVDC cable route from Tunisia to Italy and is now conducting detailed site follow up analysis.

Nur Energie's development work on the ground has included:

- Site Evaluation together with Comete Engineering and DLR;
- Solar radiation measurement station installed since September 2010
- Site screening and evaluation together with local engineering bureau
- Specific site for utility-scale export project has been identified and geotechnical analysis completed.

## Building local Support

- Water cooling for large solar thermal plants not feasible and not desirable in deserts – focus on dry cooling technologies
- Focus on high levels of local content to maximise Tunisian value-add in the project



# Nur Energie's Export Opportunity



## Sub-marine cable interconnector between North Africa and Europe

Tunisia has an excellent opportunity to be one of the first countries to connect sub-marine electricity cables to the European grid. Nur Energie has been investigating sub-marine electricity cable routes in the Mediterranean for more than two years.

Nur Energie **has already identified a feasible cable route** through the Mediterranean. An interconnection request to the Italian electricity network has been filed in December 2010 and **an interconnection point for up to 2000MW of capacity has been offered by Terna**. Follow-up permitting work for the converter station is currently in preparation.

Nur Energie has developed an in-house proprietary techno-economic model for solar export plants from North Africa to Europe that includes:

### **Study on technical and economic feasibility of cable connection through the Mediterranean.**

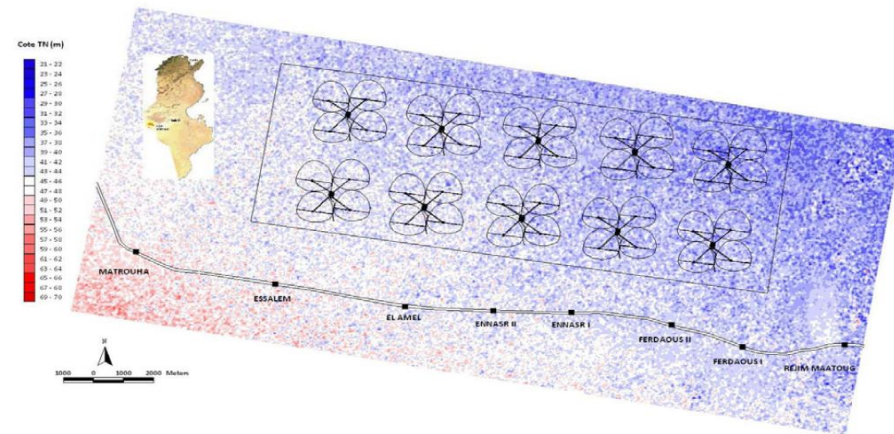
Work with Statnett Engineering, experienced sub-marine HVDC engineering consultancy, previous work included engineering for 560km/700MW sub-marine HVDC cable between Holland and Norway

### **Study on Grid integration into the Italian electricity network.**

Work with CESI, Italian electricity research bureau part-owned by Terna, the Italian grid operator, that analysed 6 possible inter-connection points for 2000MW capacity. Terna has now offered one of these interconnection points to Nur Energie, thus confirming this technical work.



# Nur Energie's Solar export project



## Overview of project characteristics

### CSP Field

- Solar Tower Technology
- Thermal storage capability with molten salt as back-up
- Unit size for each tower between 133-250MW
- Total size of the field: 2000MW

### HVDC Cable to Italy

- Landing point in central Italy with good inter-connection to the Italian and European high-voltage network
- Cable capacity: 2000MW

### Timeline

- Ready-to-Build cable aim: 2013
- First electricity delivered aim: 2015/2016
- Phasing-in of CSP to 2000MW target capacity in incremental units of 133-250MW, depending on demand

# Nur Energie timeline for Tunisia Solar Export project



2010

2011

2012

2013

Tunisia 2,000 MW CSP

Installation of Solar measurement station Tunisia

EIA complete in Tunisia

Social-Economic Impact Study

Formation of Project Co

Tunisia 2GW Land Lease Announcement

Plant Engineering and Design

EPC signed for Tunisia

Financial close Tunisia

Sub-Marine cable

Filing of Interconnection request

Formation of Cable Co

"STMG" offered by Terna

Conferenza di servizi

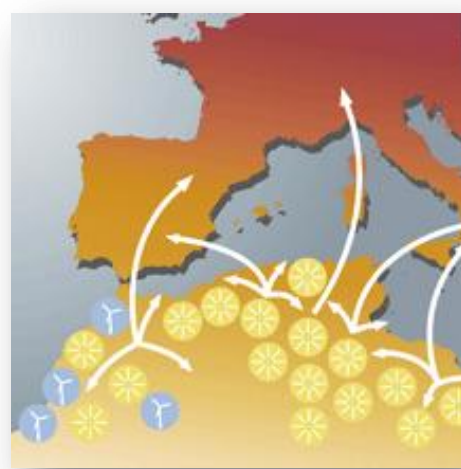
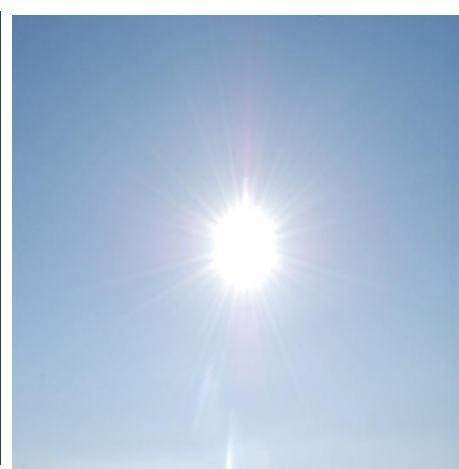
Full Engineering and EIA

Application for "STMD"

Turnkey contract for EPC signed



# Economic and Policy Drivers for TuNur



**Legislation: Policy for solar exports into Europe is already implemented, and various mechanisms in operation**

## **EU Policy/Article 9**

EU Renewable Energy Directive 2009/28/EC sets mandatory target of 20% renewable energy by 2020. It allows EU member states to meet the target by importing renewable energy from non-EU member states and extend national support programs such as feed-in tariffs to them. Article 9 of Directive 2009/28/EC allows “virtual” accounting of renewable energy imports even before the operation of export cables, if cable projects are already implemented and foreseeable to be connected within defined time frame; this disconnects the construction schedule of CSP plants from the construction schedule of new HVDC electricity cables. Italy has now implemented the EU directive into national law, opening the market for imported renewable electricity.

## **Electricity Sales**

Incremental build out of CSP units allows gradual development of solar export opportunity. PPAs can be signed based on individual plants (as in the US PPA model) and PPA offtaker can agree on contingent call option to buy into the project’s equity.

## **Value of CSP electricity**

Electricity production is predictable and firm over the course of the day based on solar storage and/or co-firing solutions; The value for an electric utility is in firm power production and stable electricity price (no fossil fuel price link); hence CSP exports from North Africa provide utility-scale hedge to fossil fuel price volatility, increasing the inherent value of the power

# Electricity Offtake – PPA terms



## Main terms proposed

<b>Target Capacity</b>	Individual units: 133-250MW
<b>Interconnection in Italy</b>	Centre-North Italy (North of Rome)
<b>Target production</b>	Ca. 15hours per day (60% capacity factor - i.e. 8AM-11PM)
<b>Production Forecasting</b>	Protocol to be established between Nur Energie and PPA offtaker; this will govern an initial commissioning period, as well as the main “steady-state” operating period
<b>Obligations</b>	Offtaker will purchase from Nur all power delivered according to the Production Forecasting Protocol, and Nur will deliver all such power produced
<b>Contingent Option</b>	At Offtaker’s request, a contingent call option on the project’s equity can be included in the PPA
<b>Conditions Precent</b>	The PPA is conditional on full financial close of the project

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