

The PV Markets and Industrial Activity In Greece and Bulgaria

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Introduction

- Climate conditions in SE Europe are favourable for exploiting renewable energy sources, particularly wind and solar.
- Solar energy can be directly converted into heat (solar thermal collectors) or electricity (photovoltaic modules).
- Daily electricity consumption peak coincides with maximum insolation

The PV Effect

The photovoltaic effect was observed in 1839, but the first applications were made possible after semiconductors were discovered in 1954.

Today there is large scale PV industry developed in Germany, Japan, China and the US. The technology is becoming mature.

However, the manufacturing process is still costly and support is required for market development and competition with conventional energy sources.

Potential for PV Development in Greece

Feed-in Law introduced since July 2006:

System power [kWp]	Mainland Grid	Non-interconnected Islands
$\leq 100\text{kW}$	€45c	€50c
$> 100\text{kW}$	€40c	€45c

- 10+10 years electricity sales contract
- 40% investment subsidy
- Complicated licensing procedure – long delays in installation/connection
- Potential for large, centralised production plants

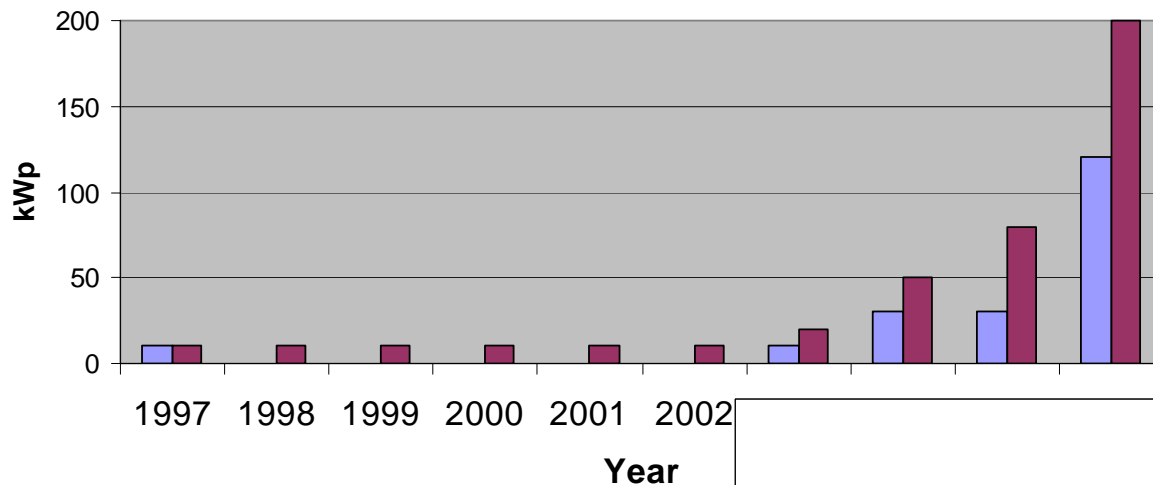
Potential for PV Development in Bulgaria

Feed-in Law introduced 1st January 2007:

System Power [kWp]	Mainland Grid
≤ 5	0.40 €/kWh
> 5	0.385 €/kWh

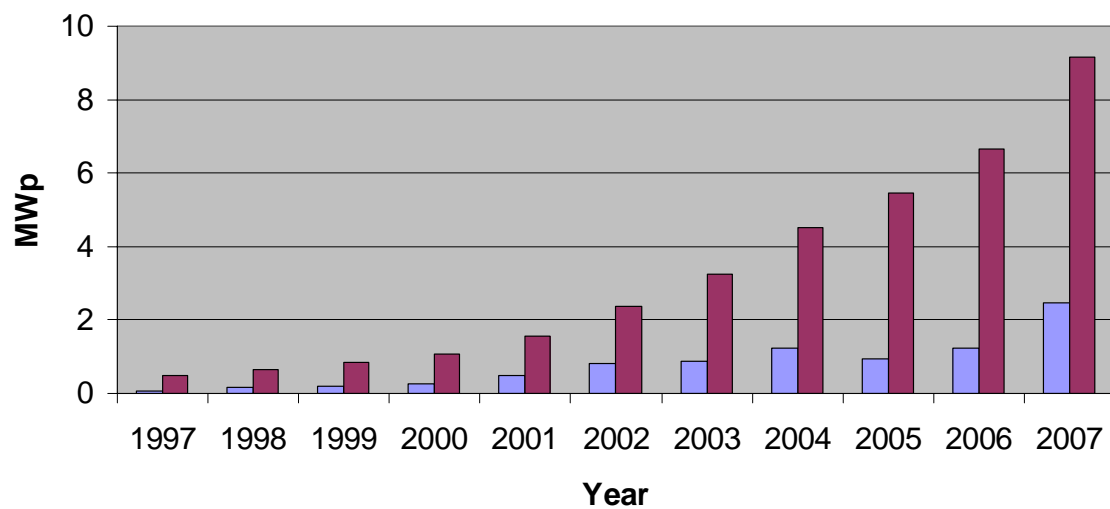
- No clear subsidy scheme currently – under preparation with EU co-funding
- 12 year tariff guarantee
- Simple connection, retroactive tariff payments (not all utilities)
- Revision in 2009 according to PV market development

Bulgarian PV Market



■ Annual Installed Capacity ■ Accumulated Installed Capacity

Greek PV Market



■ Annual Installed Capacity ■ Accumulated Installed Capacity

Investment Opportunities

- [1] **Centralised** PV power production (order of MWp)
- [2] **Commercial** applications (tens of kWp)
- [3] **Domestic** applications (few kWp)
- [4] Development of local **industry**



Market Prospects

Centralised Production

- In Greece, more than 7000 applications have been submitted to the Regulatory Authority of Energy (RAE) for PV installation licenses
- Minimum national target for ~800MWp by 2020
- 10s of MWp mature projects (2008-2009) in Bulgaria
- Potential for large projects (25-50MWp) in both countries
- Grid parity 2010-2015
- Sustainable market with large number of building integrated systems (BIPV)

Advantages of BIPV

Commercial/Domestic

- Replacement of expensive building materials
- Auxiliary role in building, architectural integration
- Use of existing infrastructure, proximity to grid
- Decentralised production at point of consumption, saving of transport losses
- Grid reinforcement
- Production matching peak consumption – peak shaving

Industrial activity (BG/GR)

PV Production facilities in operation/preparation:

- **Energy Solutions S.A.** – Module assembly line (in operation, 10MWp) (BG/GR)
- **Solar Cells Hellas** – Wafer and Cell line (commissioning phase, 60MWp) (GR)
- **ICM** – Monocrystalline ingot production (in operation, 25 Tons/2.5MWp cells) (BG)

Wafer/cell/module assembly line (GR) cells (BG)



Solar Cells Hellas S.A.

- Founded in 2005
- Building completed in industrial area of Patras
- Cell and wafer production to start in May. Module production end of 2008.
- Initial capacity 30MWp/yr
- Full capacity: 60MWp/yr to be reached by end of 2008.



- Building: 14.000m²
- Available land (privately owned): 37.000m².
- Working places: 230
- www.schellas.gr



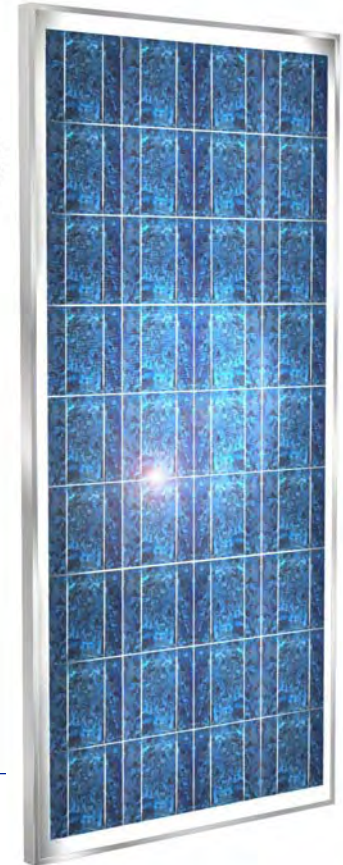
Energy Solutions S.A.



- Company founded in December 2003
- Investment by VIOHALCO - Greek industrial group of companies
- 10MW_p capacity at end of 2006
- Located in industrial complex of STOMANA INDUSTRY, Pernik (30km SW of Sofia)
- Production equipment by German and US equipment manufacturers
- Raw materials by major suppliers world-wide
- Focused on high quality certified production

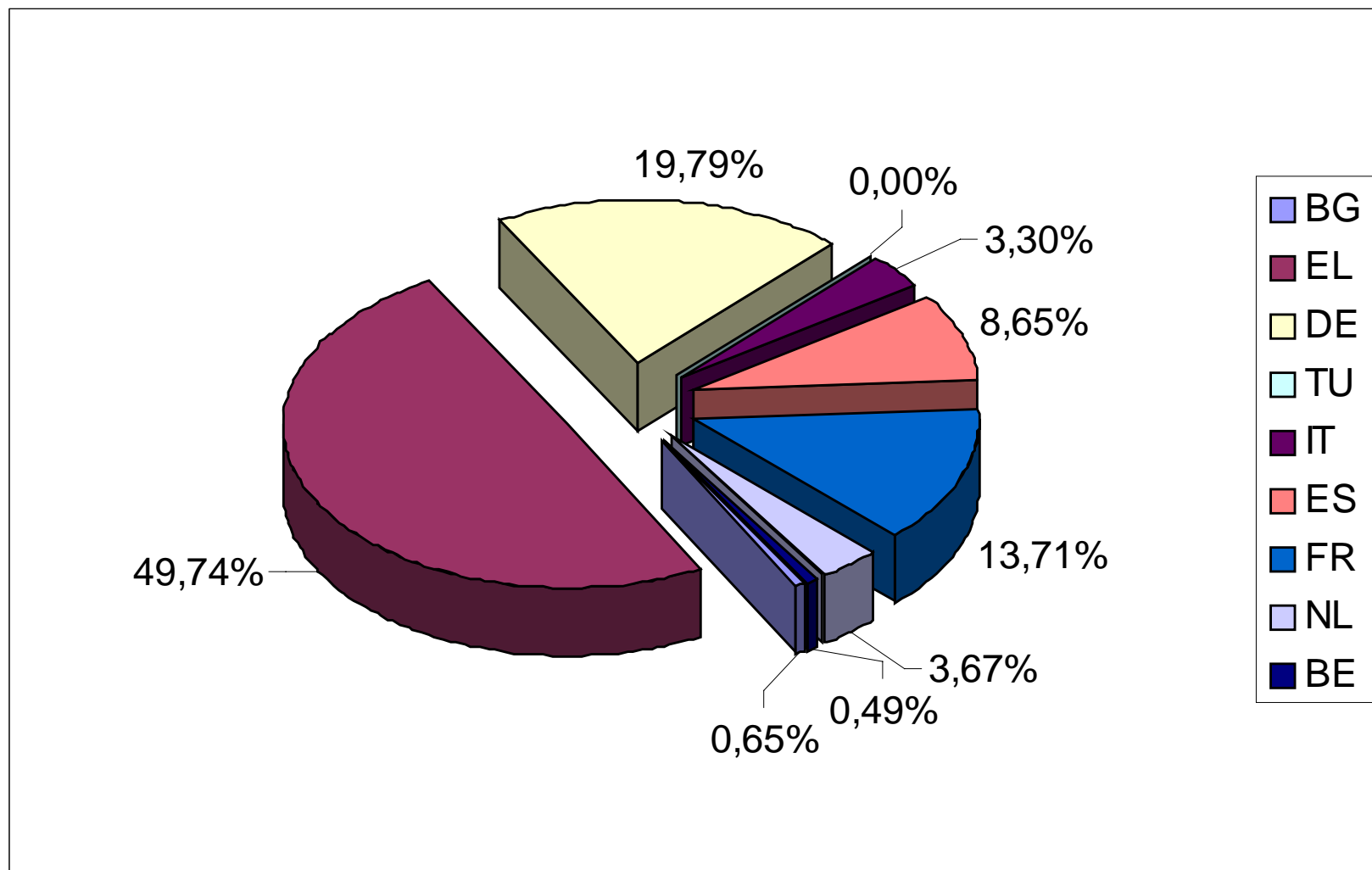
Products

- ES660/QP
190-220W_p polycrystalline module
(in production, IEC61215, SCII & IEC61730 by TÜV)
- ES636/QP
120-135W_p polycrystalline module
(in production, IEC61215, SCII & IEC61730 by TÜV)
- ES536/QM
85-95W_p monocrystalline module (5" cells)
(in production – limited quantity)



ISO9001:2000 certification since Nov. 2007

Sales 2008





ENERGY SOLUTIONS

(modules production)

Pernik, Bulgaria

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SOLAR CELLS HELLAS

(wafers, cells and modules production)

Patras, Greece

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