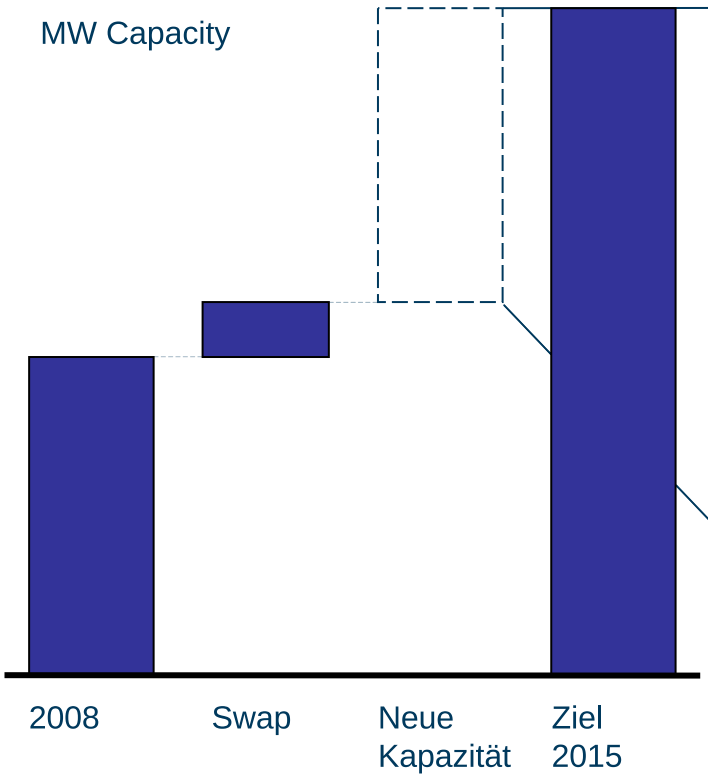
ERNEUERBARE ENERGIEN: WACHSTUM TROTZ FINANZKRISE

Dr. Torsten Amelung, Statkraft Markets GmbH
Tagung Grünewald Consulting & Energieagentur NRW, Düsseldorf, 03.09.2009

Statkraft
PURE ENERGY

“Als Europas führender Anbieter von erneuerbaren Energien, werden wir den weltweiten Bedarf nach reiner Energie decken.”



Wachstumsziele

	Wasser	Gas	Wind	Sonstige*
Nordische Länder	✓		✓	✓
Europa	✓	✓	✓	✓
International	✓			

Statkraft

1.

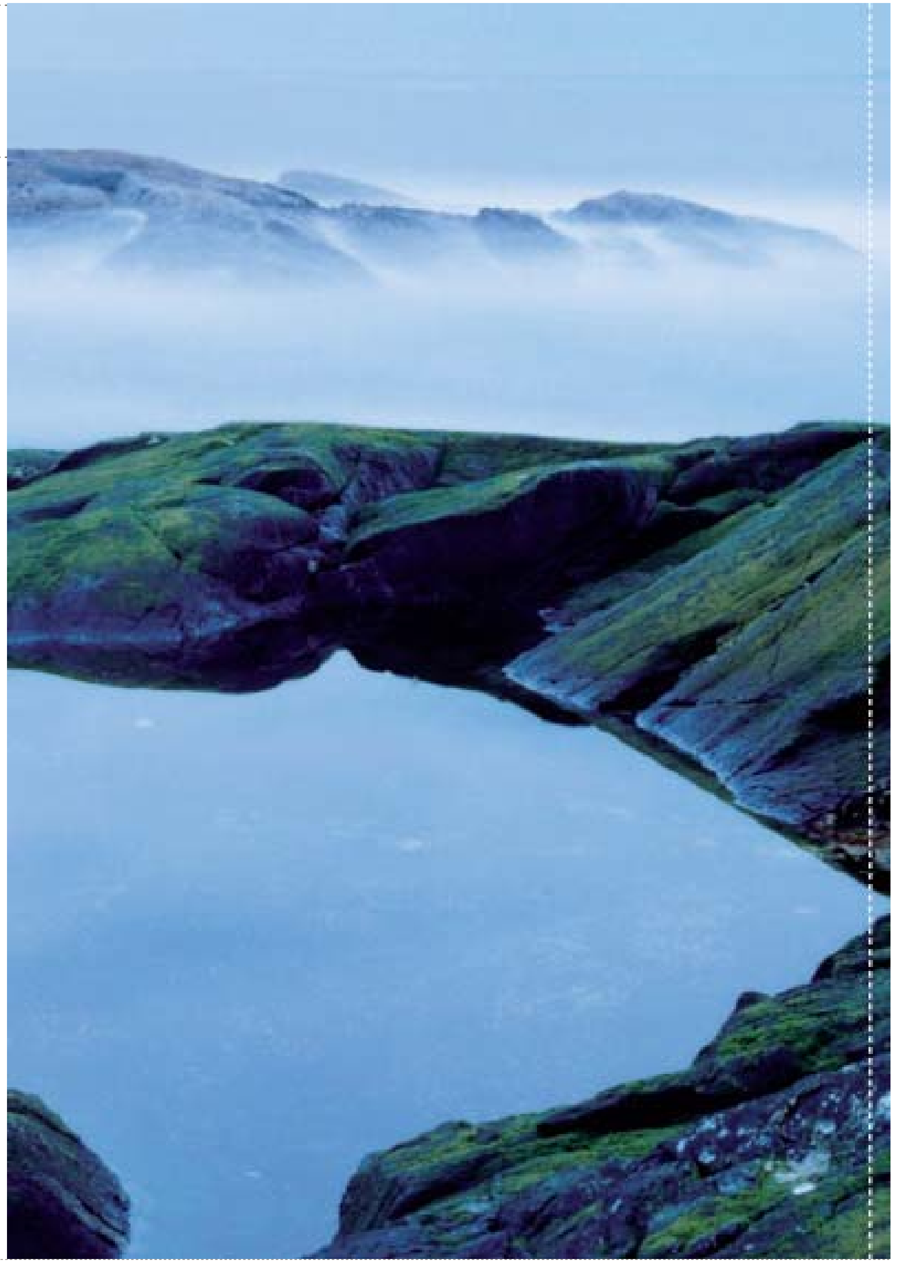
WACHSTUMSPOTENTIAL

2.

STRUKTURELLE ÄNDERUNGEN AM BEISPIEL SOLAR

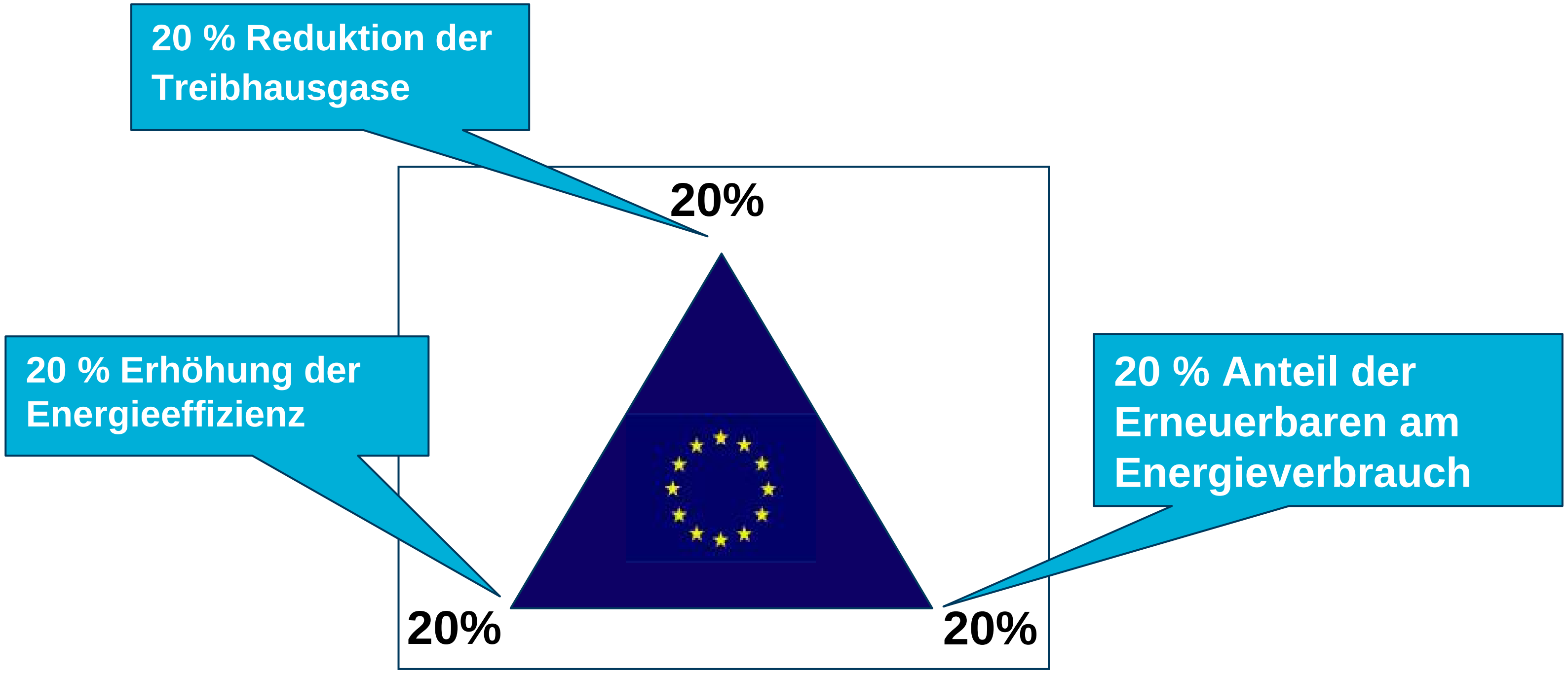
3.

WERTSCHÖPFUNGSKETTE UND PERSONALBEDARF



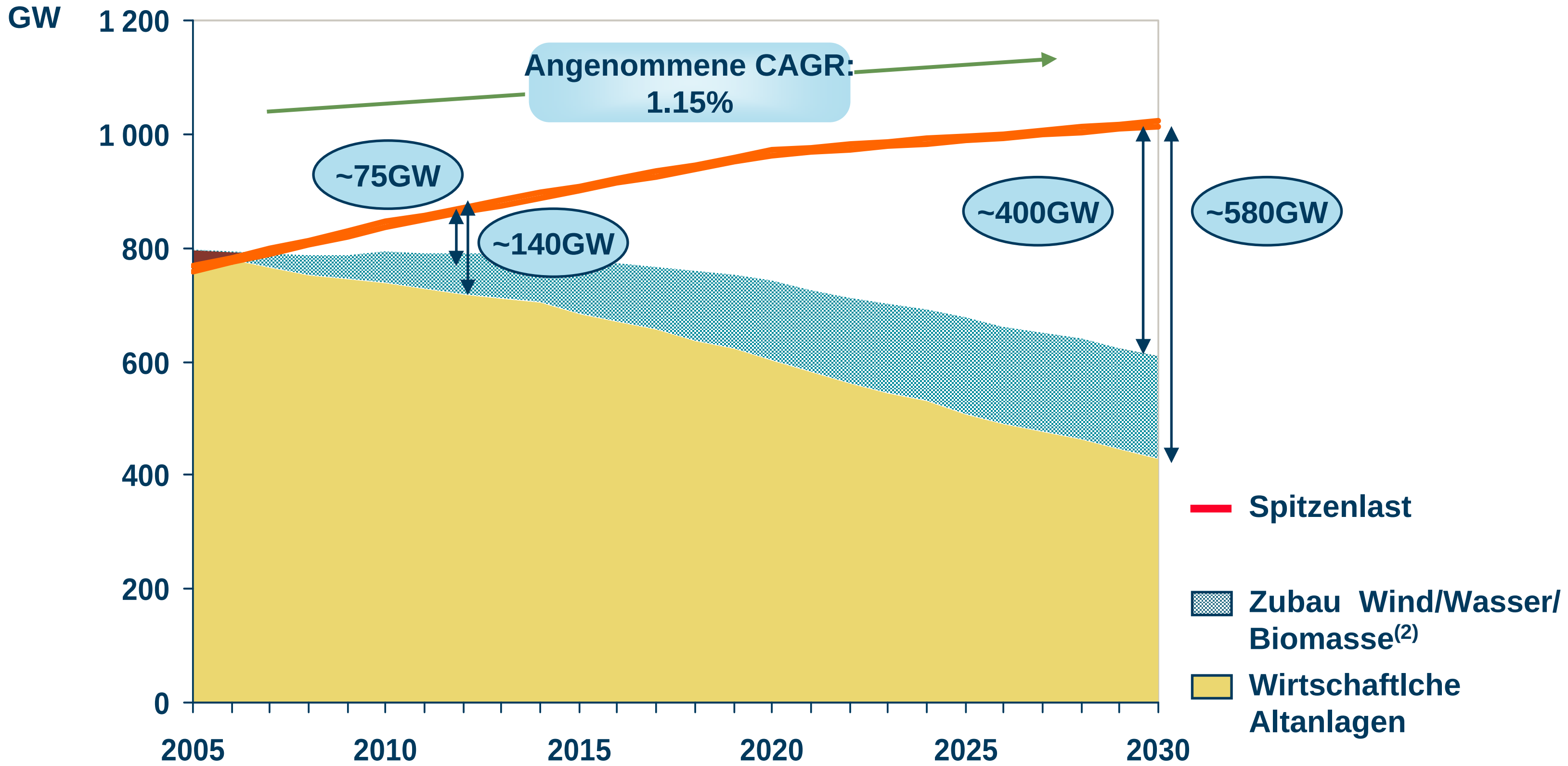
FÜHRUNGSROLLE DER EU IN DER KLIMAPOLITIK

Ziele der EU-Energiepolitik für 2020…



…um den globalen Temperaturanstieg auf 2° C zu begrenzen

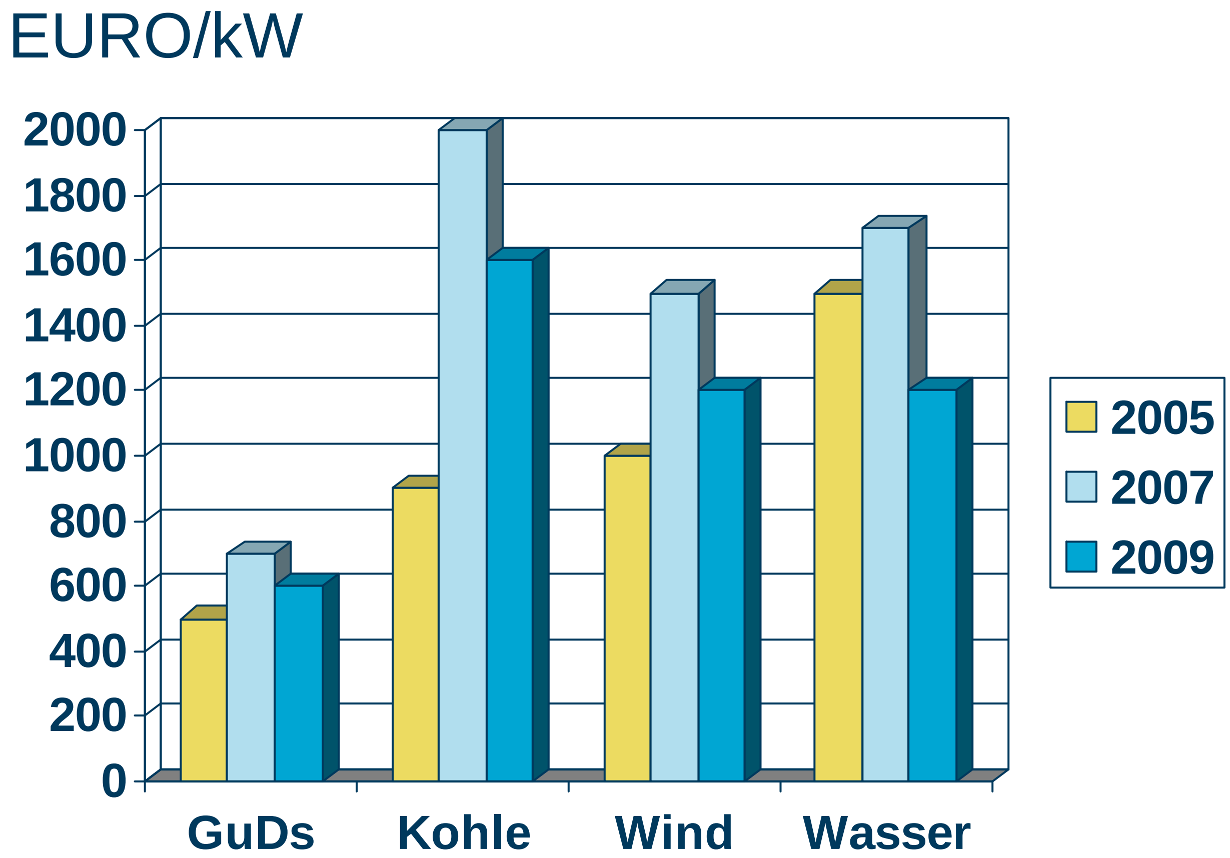
ERNEUERUNG DES KRAFTWERKSPARKS IN EUROPA



Statkraft

Note(s): EU 25 plus Norway, Switzerland, Bulgaria, Romania, Balkan, excluding Baltic, Ireland, Malta
Note(s): According to Eurprog forecast in EMM
Source(s): UCTE; Eurprog; BCG analysis

TRENDS BEI NEUBAUPROJEKTEN (eigene Schätzung)



Statkraft

1.

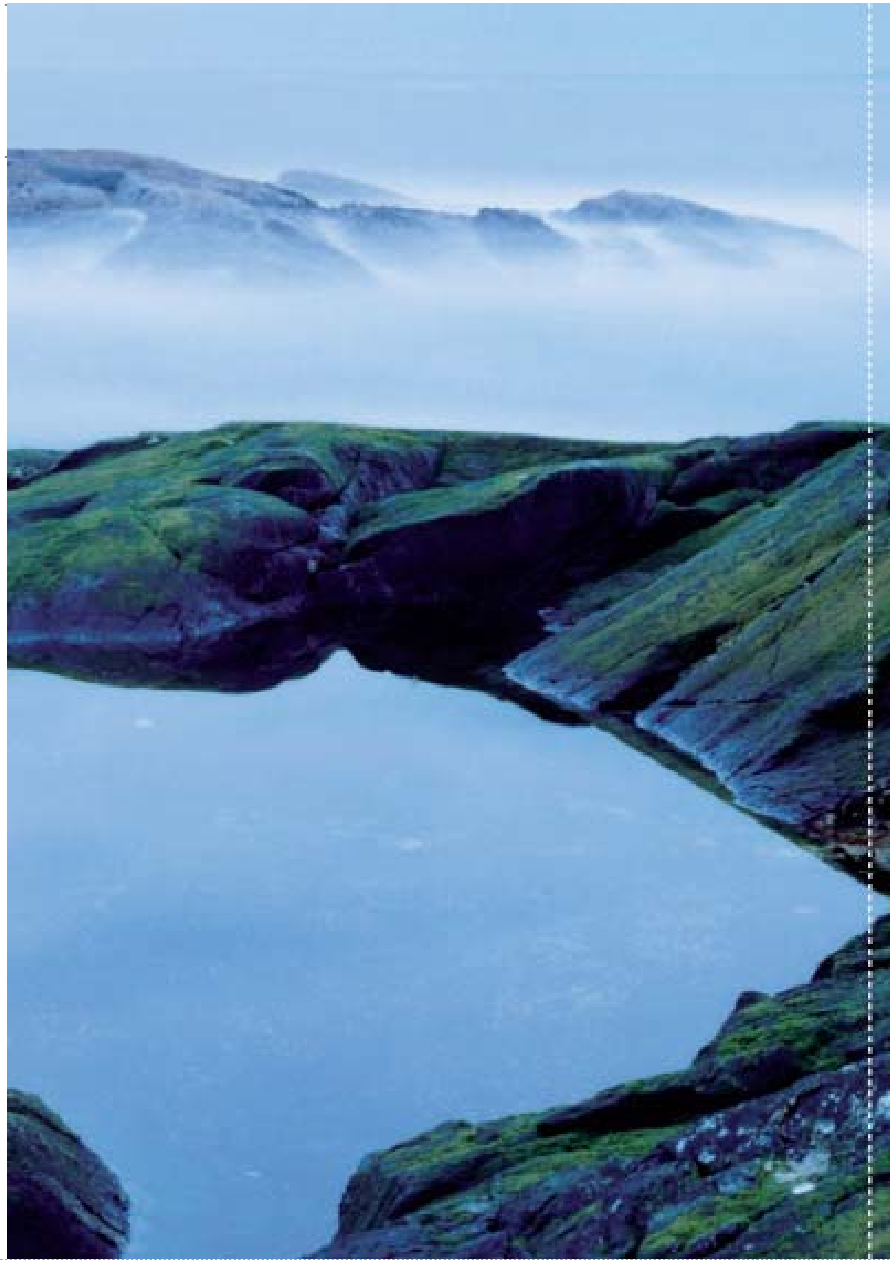
WACHSTUMSPOTENTIAL

2.

STRUKTURELLE ÄNDERUNGEN AM BEISPIEL SOLAR

3.

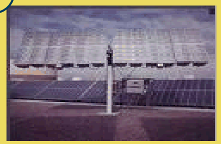
WERTSCHÖPFUNGSKETTE UND PERSONALBEDARF



Statkraft

TECHNOLOGISCHE VIELFALT

Commercial technologies short-mid term

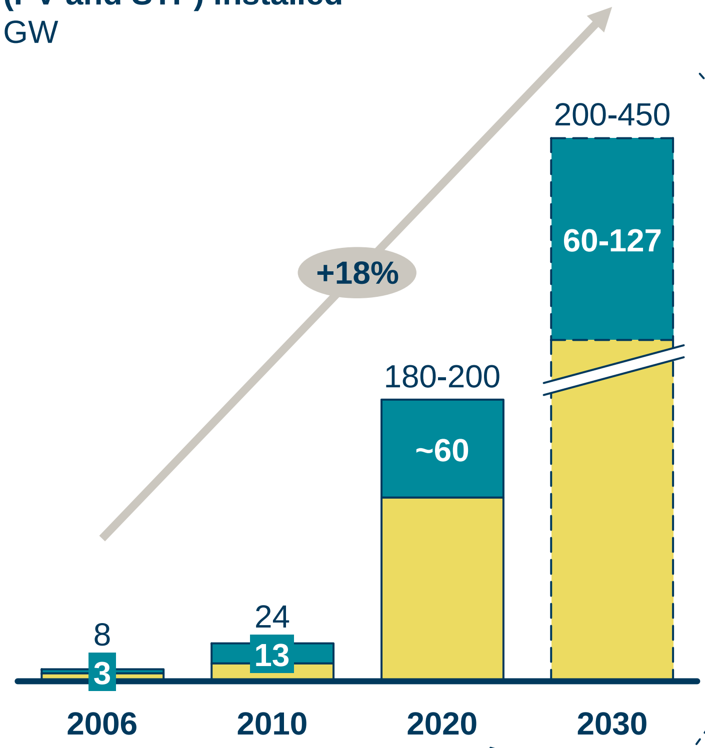
	Key technologies		Sub technologies	Description	Development
Photo Voltaic (PV)	1	 **Wafer-based PV**	- Mono-crystalline - Poly-crystalline	- Uses solar cells combined to modules to generate electricity	Commercial
	2	 **Thin film**	- Amorphus silicon (a -Si) - Cadmium telluride (CdTe) - Copper indium gallium selenide (CIGS)	- Thin layer of glass, steel, and semiconductor material used to convert light directly into electricity	Commercial
			- Nano - Organic dye	- Mixture of flexible polymer substrates with nano materials - Flexible PV using plastic as substrate	Laboratory phase
	3	 **Con-cen-trating PV**	- N/A	- Mirrors used to concentrate light onto cells to increase effectiveness	Pilot
Solar thermal	4	 **Para-bolic trough**	- Without storage or hybrid fossil - With storage - With storage and hybrid fossil	- Parabolic mirrors concentrate sunlight on a tube filled with heat transfer fluid - Heated fluid powers steam turbine	Commercial
	5	 **Dish-stirling**	- N/A	- Solar energy converted to heat in a dish collector drives stirling engine, a heat engine that does not require water supply	Pilot
	6	 **Power tower**	- N/A	- Sun-tracking mirrors focus sunlight on a receiver at the top of a tower which heats water to produce electricity	Pilot

Source: Research reports; press search; team analysis

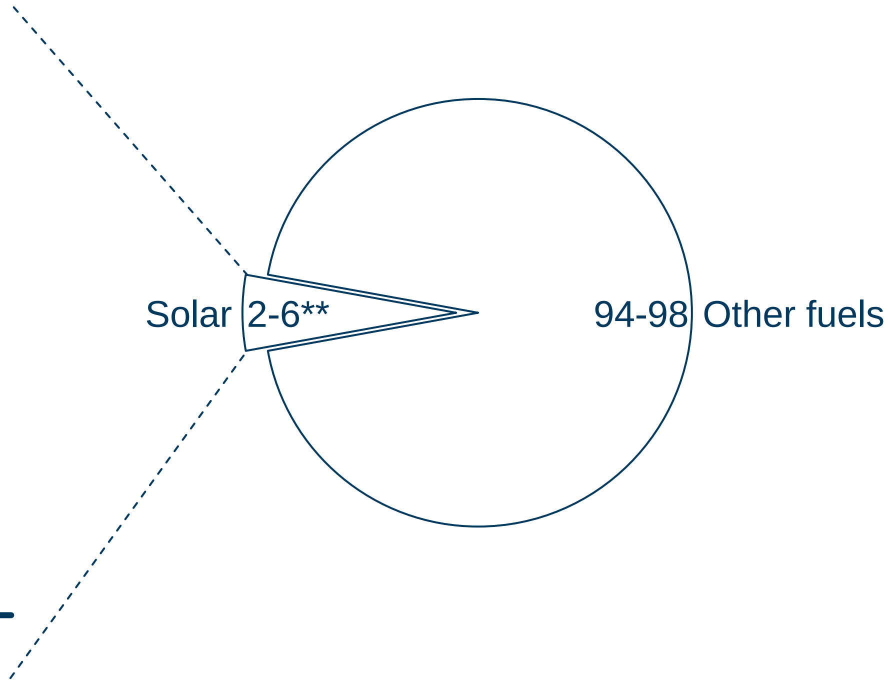
EXTREMES WACHSTUM DER WELTWEITEN NACHFRAGE UND DER ERZEUGUNGSKAPAZITÄTEN

Europe
Rest of world

Global cumulated solar generation capacity (PV and STP) installed
GW



Power generation mix 2030
Percent of total 7.9* TW (cumulative)



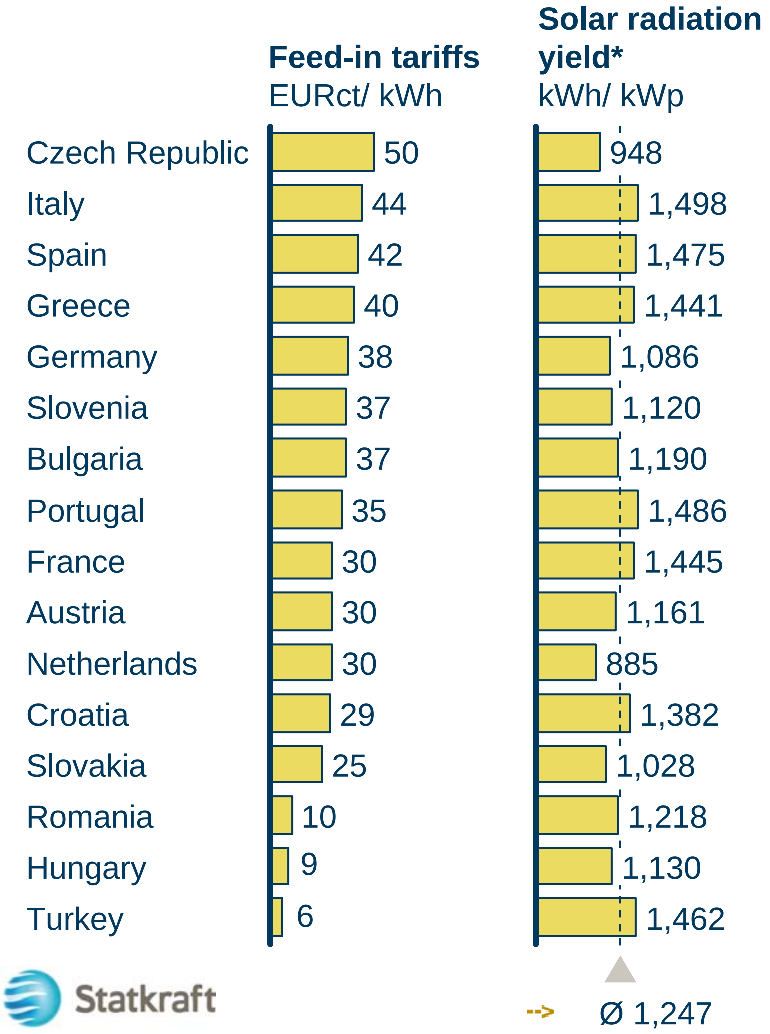
Of which centralized segment ~15%, residential ~50%, commercial ~30%, and off-grid ~5%

* IEA 2030 reference scenario

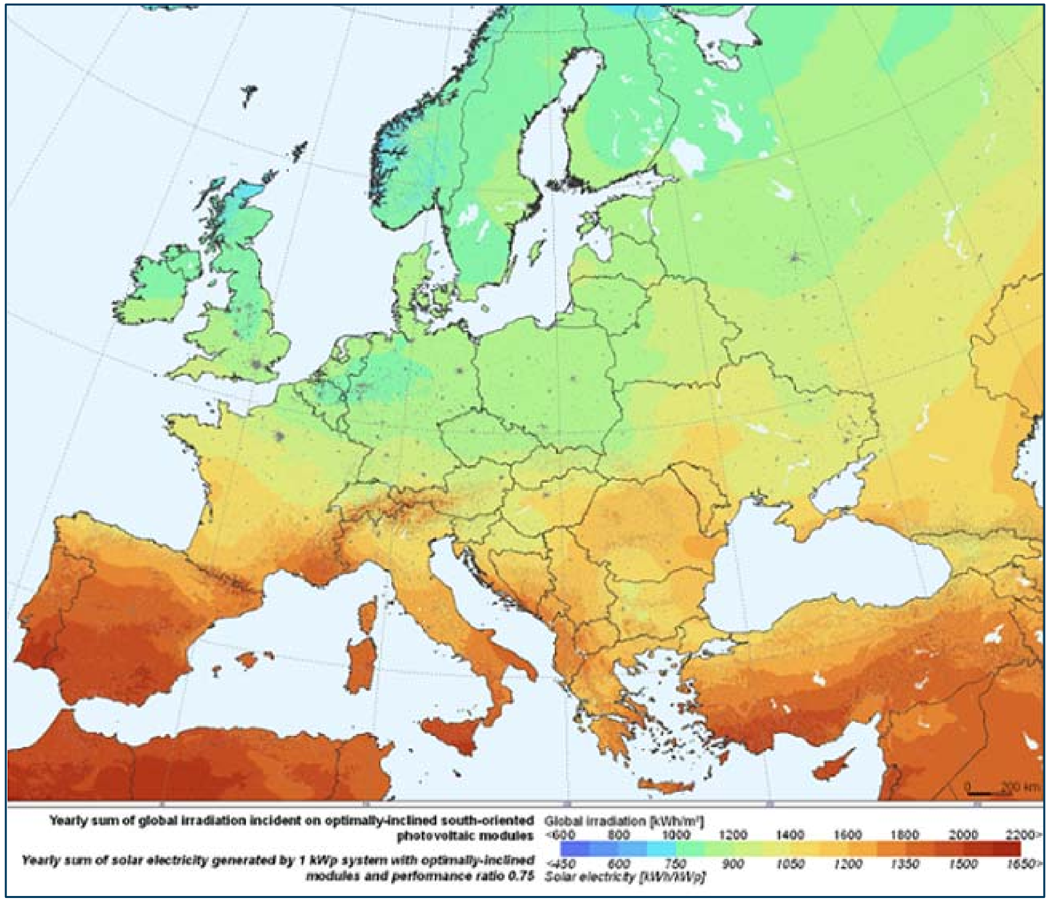
** Various analysis of the solar generation share of total power generation mix ranges from 20% in 2040 (Jäger-Waldau, 2003) to 0.008%. World Energy Outlook 2006, Alternative scenario, estimates PV generation to 237 TWh/year by 2030 which equals ~1% of total generation

Source: McKinsey PV demand model; IEA; team analysis; IPCC Fourth Assessment

DEZENTRALE ERZEUGUNGSSTRUKTUR DURCH SUBVENTIONEN UND NATURGEGEBENE STANDORTBEDINGUNGEN



European radiation map



Statkraft

* Assuming best location and optimal inclination
Source: National legislation; McKinsey legislation database; European Commission; team analysis

ERWARTETE KOSTENREDUZIERUNG FÜR EINZELNE TECHNOLOGIEN

EURct/kWh

ESTIMATES

Commercial technologies short-mid term

		Projected generation cost	Strengths	Issues
PV	Wafer based*	2006: 32; 2010: 26; 2020: 15	Proven technology High modularity (1kW-50MW) Use direct and indirect sunlight	Limited silicon availability High manufacturing cost High weight Not aesthetic
PV	Thin film a-Si		Use direct and indirect sunlight	Low technical efficiency limit
PV	Thin film CdTe**	2006: 26; 2010: 22; 2020: 13	Most proven thin film tech. Low manufacturing cost Use direct and indirect sunlight	No turnkey manufacturing equipment Cadmium toxicity (manufacturing, marketing and end life) Not suitable for flexible cell
PV	Thin film CIGS		High efficiency Low manufacturing cost Use direct and indirect sunlight No known degradation	No turnkey manufacturing equipment Possible Indium shortage may increase price
PV	CPV		High efficiency Use direct and indirect sunlight	Unproven technology Minimum system size – 1 MW
Solar thermal	Parabolic through***	2006: 27; 2010: 23; 2020: 16	Low generation cost	Low modularity (Min. size ~20 MW) Limited installed base Lower subsidies Not able to utilize indirect sunlight
Solar thermal	Power tower		Low generation cost	Low reliability Low efficiency in overcast conditions
Solar thermal	Dish-sterling		Relatively modular (minimum size – 25 KW)	Pilot stage only Low efficiency in overcast conditions

* Assumes full installation cost of 4.78 EUR/Wp in 2006 going down to 1.94 EUR/Wp in 2020; Annual O&M costs of 1% of full inst.cost; 20 year lifetime; Solar yield of 1500 kWh/kWp; 6% Discount rate; 0.35% Annual degradation

** Assumes full installation cost of 3.90 EUR/Wp in 2006 going down to 1.73 EUR/Wp in 2020; Annual O&M costs of 1% of full inst.cost; 20 year lifetime; Solar yield of 1500 kWh/kWp; 6% Discount rate; 0.50% Annual degradation

*** Assumes full installation cost of 3.59 EUR/Wp in 2006 going down to 1.72 EUR/Wp in 2020; Annual O&M costs of 2.2% of full inst.cost; 20 year lifetime; Solar yield of 1500 kWh/kWp; 6% Discount rate; 0.50% Annual degradation

Source: NREL; DLR; Fraunhofer Institute; DOE; Sargent & Lundy; McKinsey analysis

1.

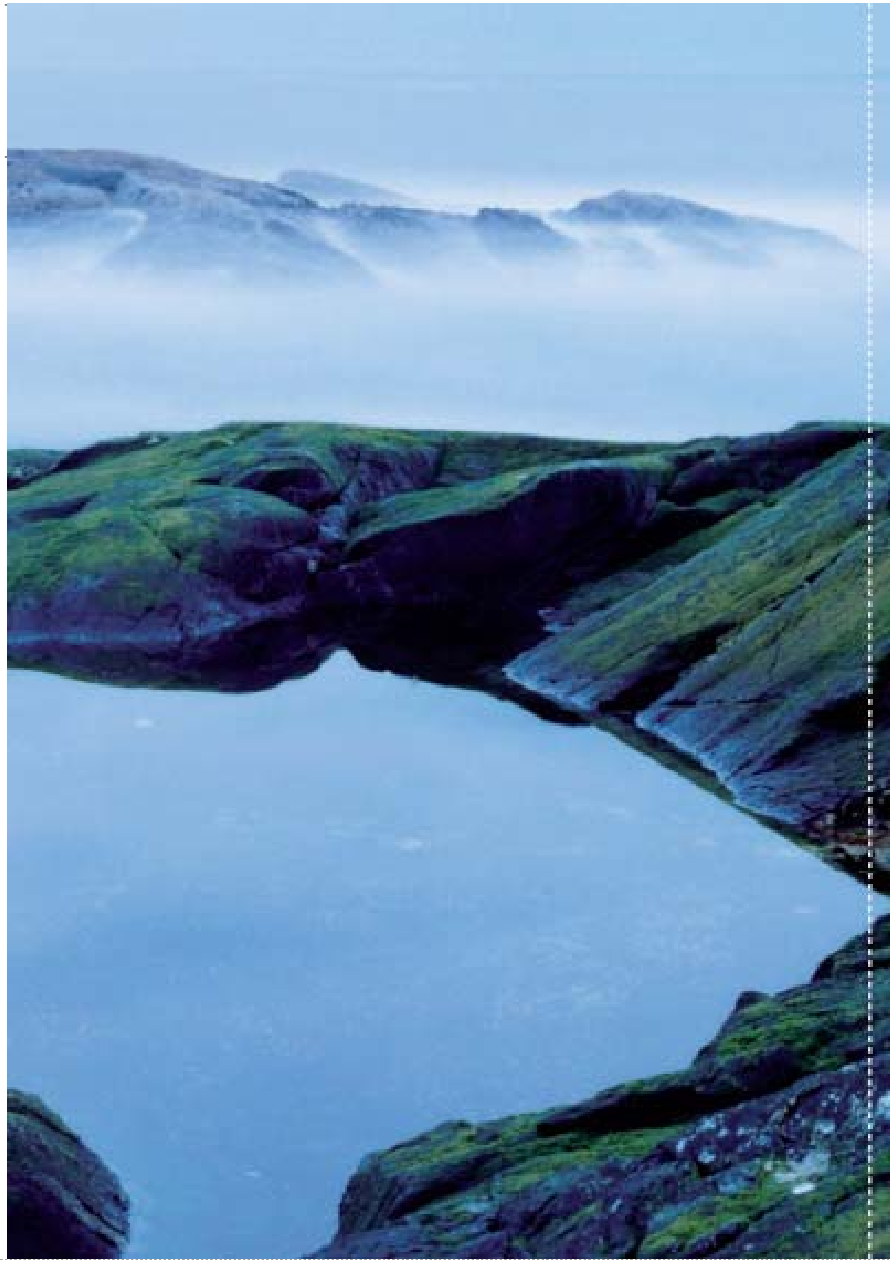
WACHSTUMSPOTENTIAL

2.

STRUKTURELLE ÄNDERUNGEN AM BEISPIEL SOLAR

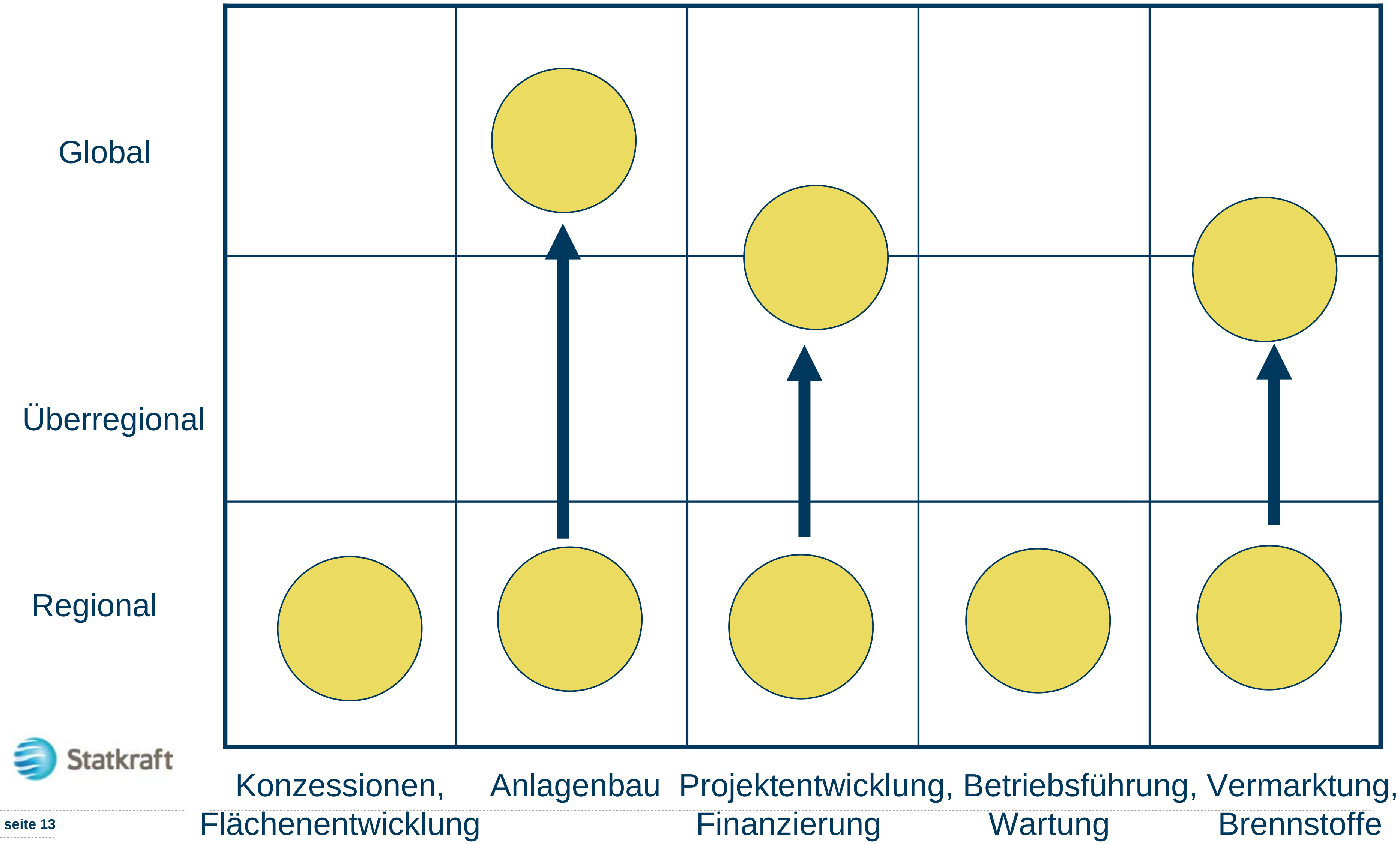
3.

WERTSCHÖPFUNGSKETTE UND PERSONALBEDARF



Statkraft

INTERNATIONALISIERUNG DER WERTSCHÖPFUNGSKETTE



Statkraft

AUSWIRKUNGEN AUF DEN PERSONALMARKT

HARTE FAKTOREN:

--> Ausbildung: „Neue“ Berufsbilder z.B. Meteorlogen, Projektentwickler; wirtschaftswissenschaftliches und ingenieurwissenschaftliches Profil

--> Berufserfahrung: Mitarbeit bei Projekten und Auslandseinsatz

--> Sprachkenntnisse: 2 Fremdsprachen

WEICHE FAKTOREN:

--> Flexibilität, pragmatische Vorgehensweise, weniger „Konzernmenschen“

--> Weniger Taylorismus, mehr Selbständigkeit in den operativen Einheiten

--> Stärkerer Ergebnis- und Kostenfokus des einzelnen („Unternehmer im Unternehmen“)

Statkraft