



# PV Solar

Market and Industry perspectives

EEVF 2007

September 2007

Christian Dethloff

Orkla Business Development



# Agenda

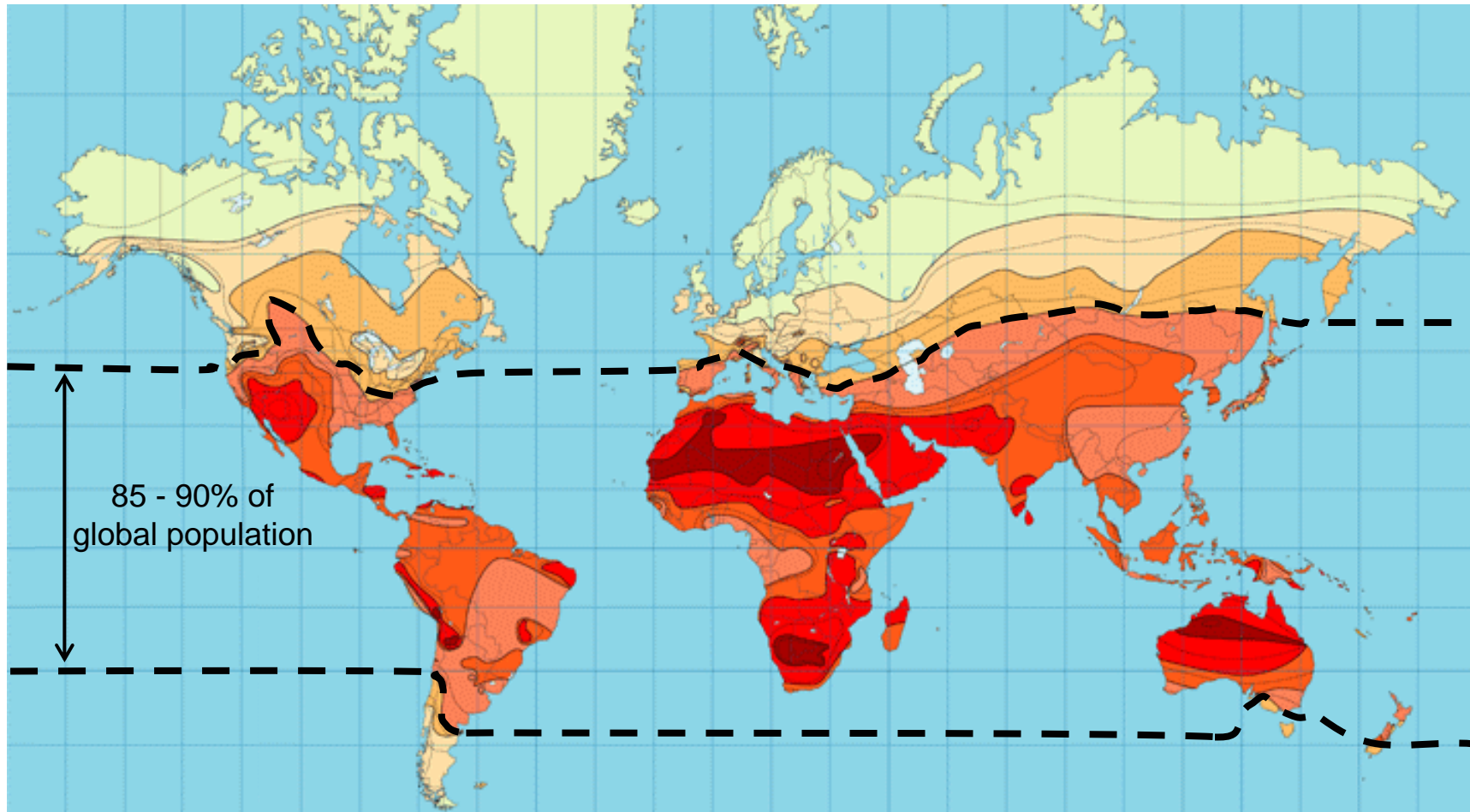
**1. The pv solar market**

**2. Industry perspective – silicon feedstock**

**3. Orkla's positions in solar energy**

# Abundant supply of solar energy where people are living

## World Insolation

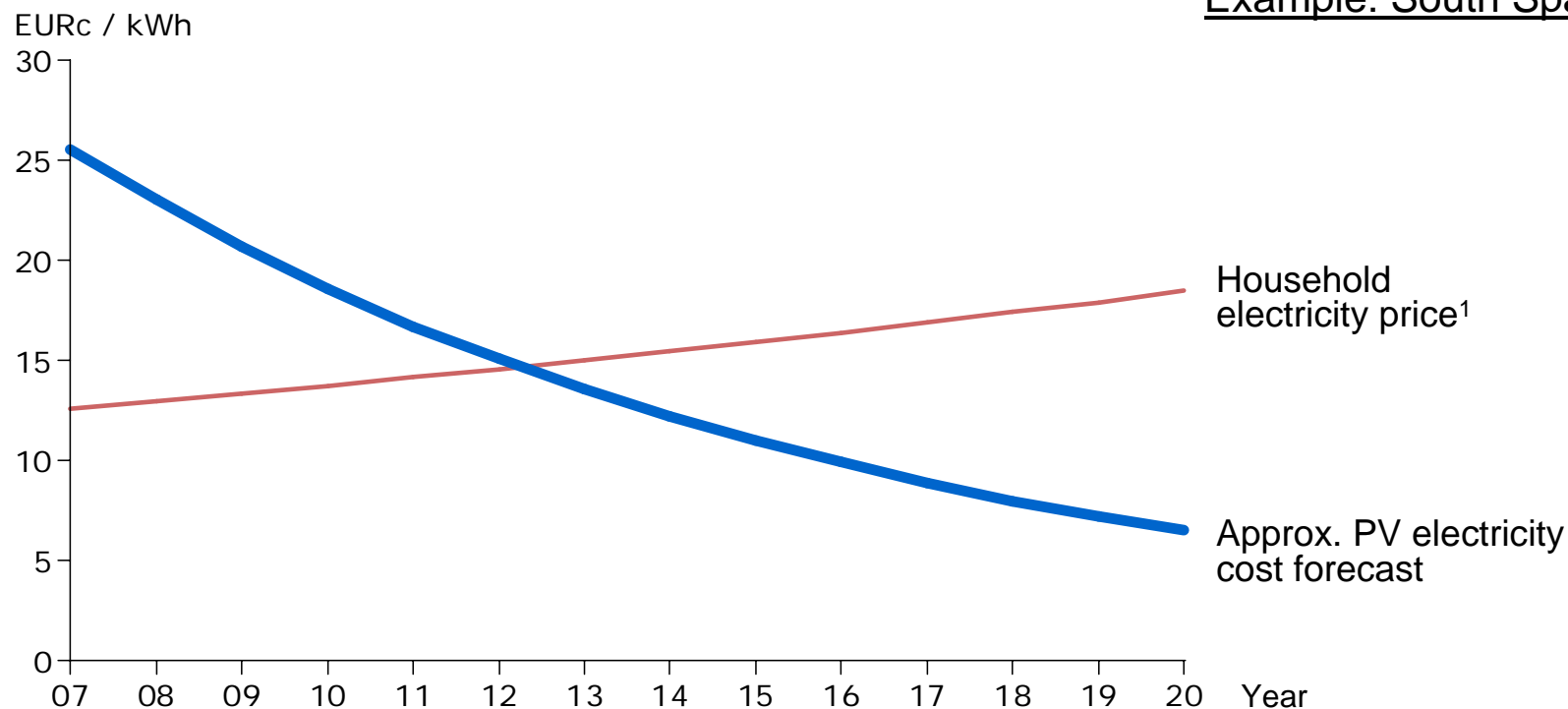


Source: SunWize Technologies

Average sun hours during the worst month of the year. Darkest red = 6 - 6,9; orange = 3 - 3,9 (most of Iberian peninsula) ; yellow = 1 - 1,9

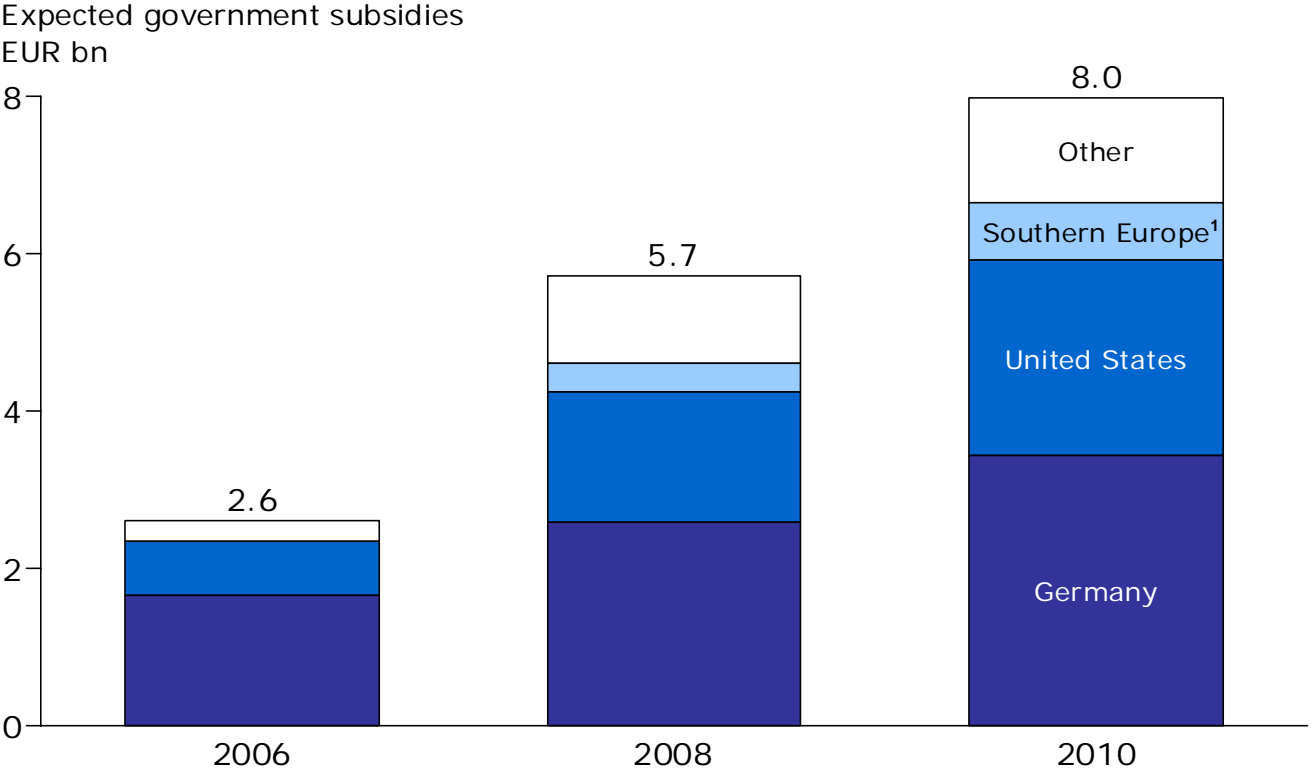
# Solar power cost is closing in on retail electricity prices, and is expected to continue to decline rapidly

Example: South Spain



<sup>1</sup> Assumes 3% annual inflation from 2006 levels  
Source: Internal analysis

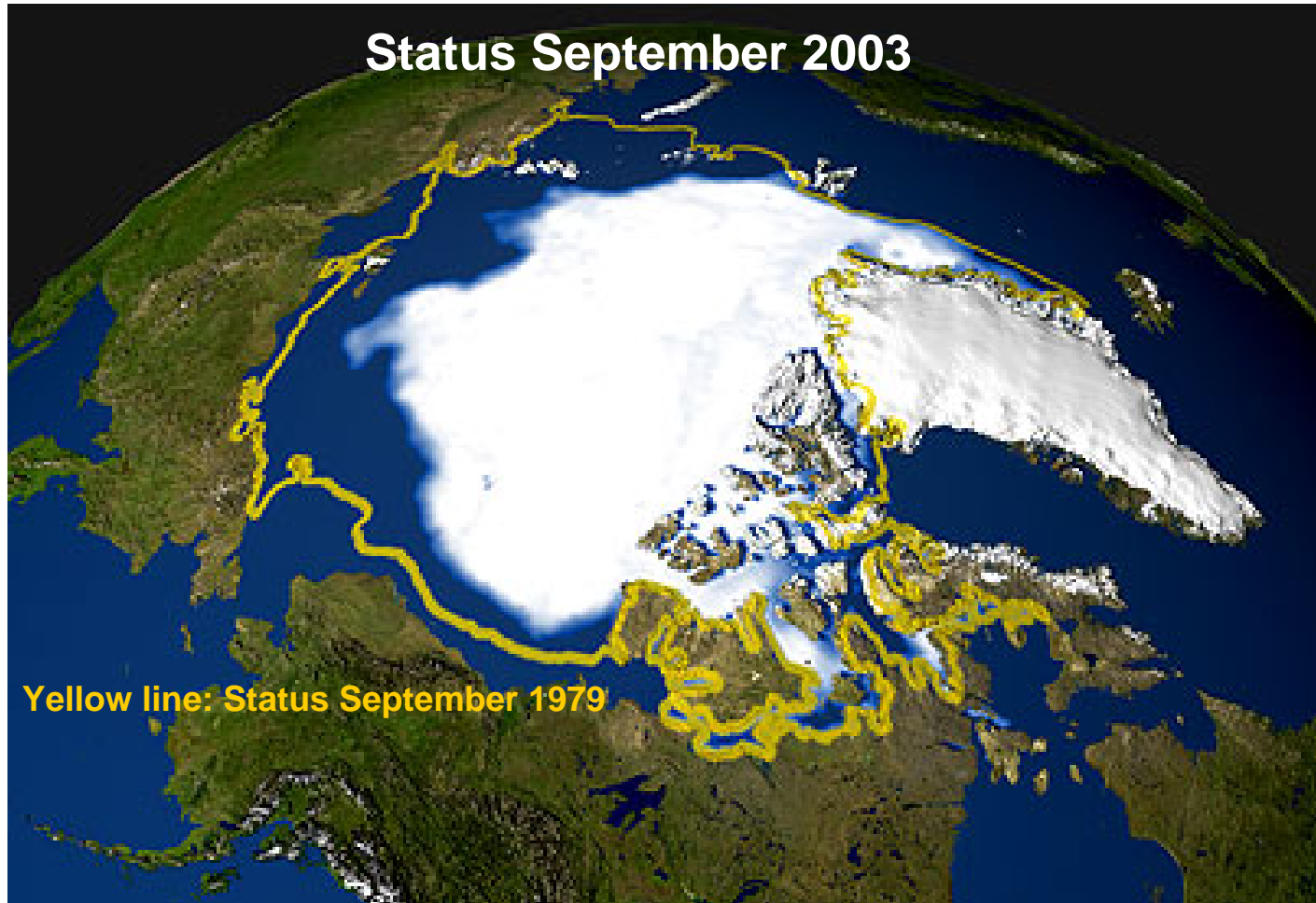
# Current gap to retail power price is closed by government incentives



<sup>1</sup> Southern Europe only includes Italy, Spain, France and Portugal.  
Source: Internal estimates

# Dramatic climate change is now accepted as a fact

Visual observations support scientific analysis



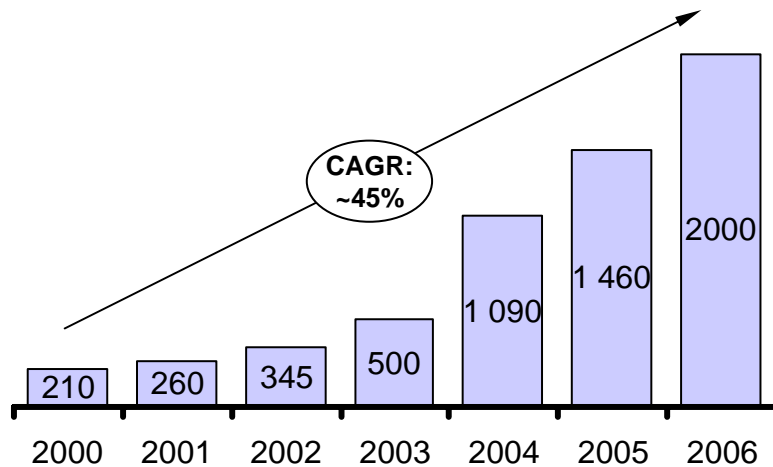
The picture shows the ice cap on the North Pole in September 2003, the yellow line outlines the circumference of the equivalent ice cap in September 1979  
Source: Getty Images

# Historic 30 - 40% (cagr) historic growth is expected to continue

## Annually installed capacity grew to 2 GW in 2006

- Industry turnover in the range of 15 BUSD
- Analysts project 10 - 15 GW in 2010

PV Market in GW per year

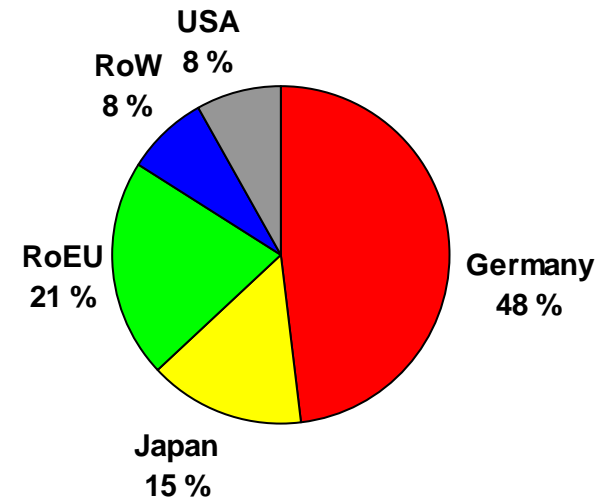


Sources: Solarbuzz, own estimates

## Southern Europe shows significant growth

- Germany and Japan remain leading single markets
- Southern EU countries emerging

PV Solar Installations 2006  
100%= ~ 2000 MW



Source: Solar Buzz and internal analysis

# Solar energy supports the grid at the point of use



Source: Smith Electric Company

# Solar panels are increasingly being used for their aesthetic qualities



# Solar power plants will compete with traditional energy in large grid connected systems



# 2 billion people are not grid connected, solar energy is an ideal alternative



70 % grid connected



30 % not connected to grid  
(2 billion people)

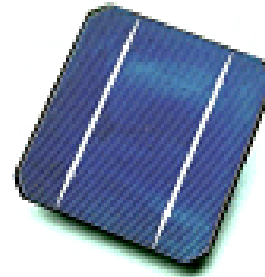
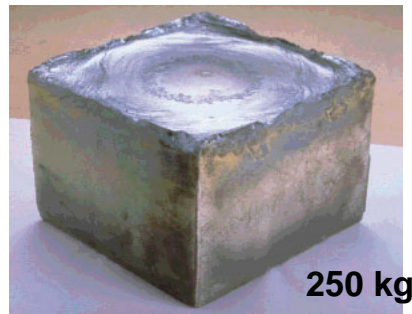
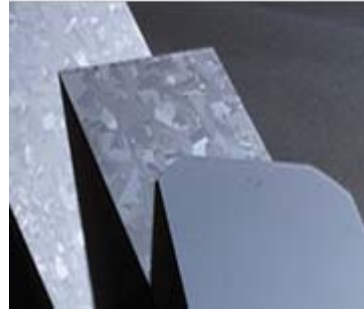
# Agenda

**1. The pv solar market**

**2. Industry perspective – silicon feedstock**

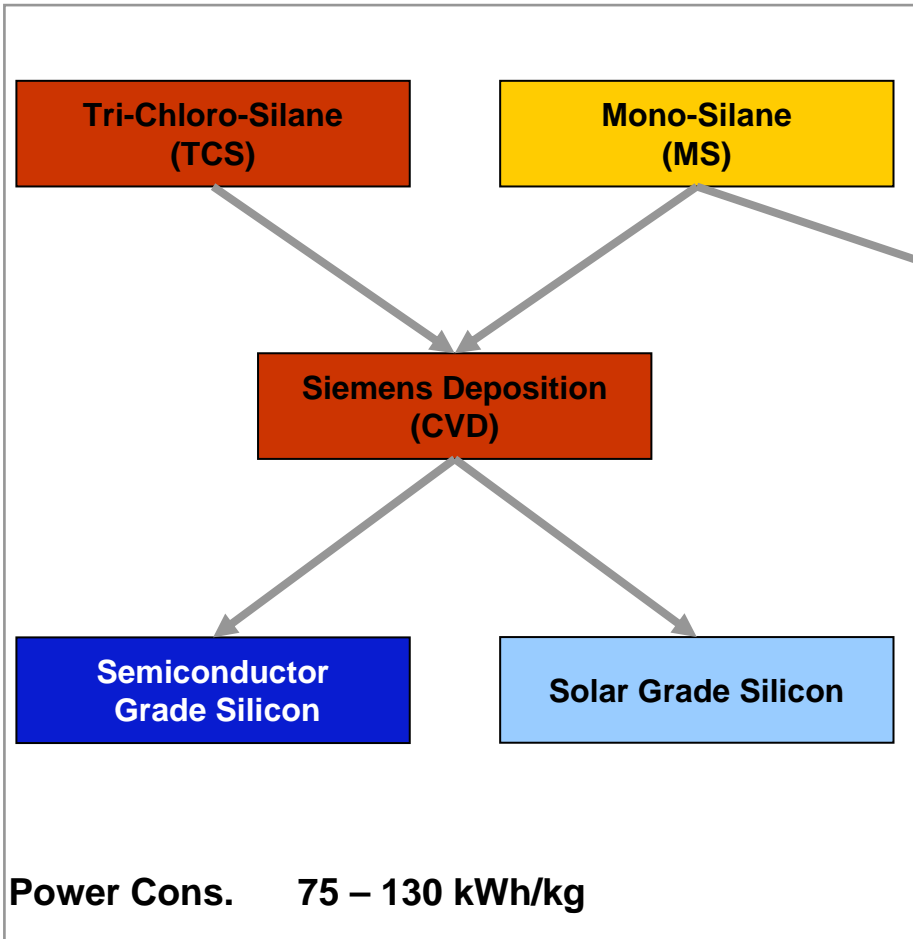
**3. Orkla's positions in solar energy**

# Silicon feedstock is key component in the solar industry value chain

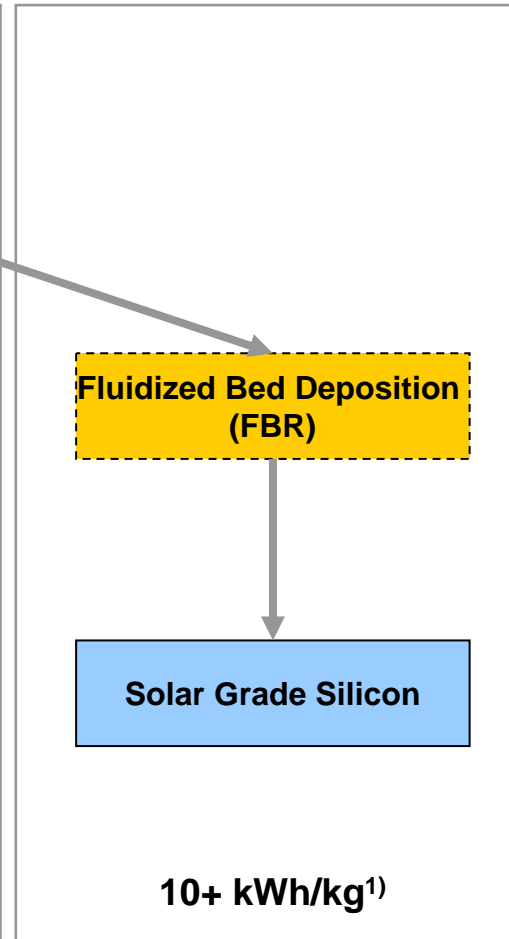


# Technologies in overview

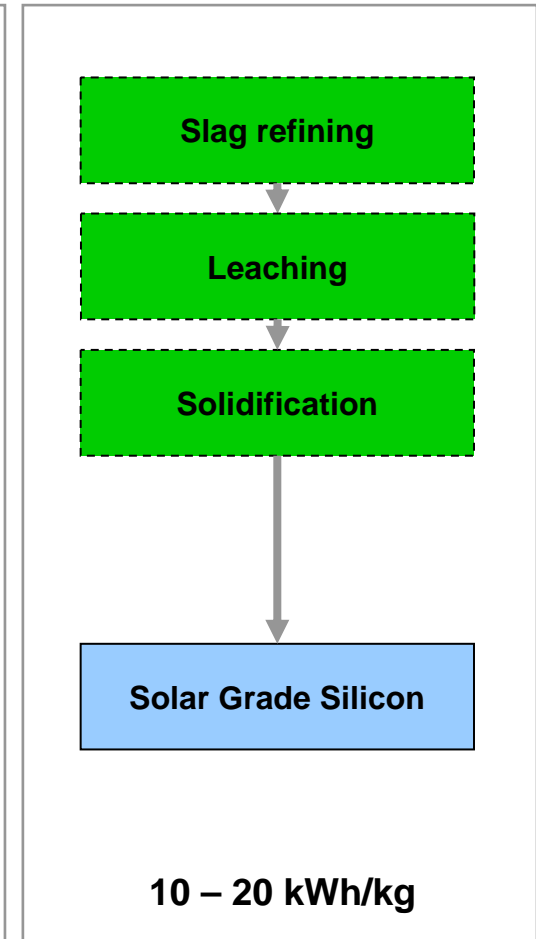
## Traditional Poly silicon



## FBR Deposition

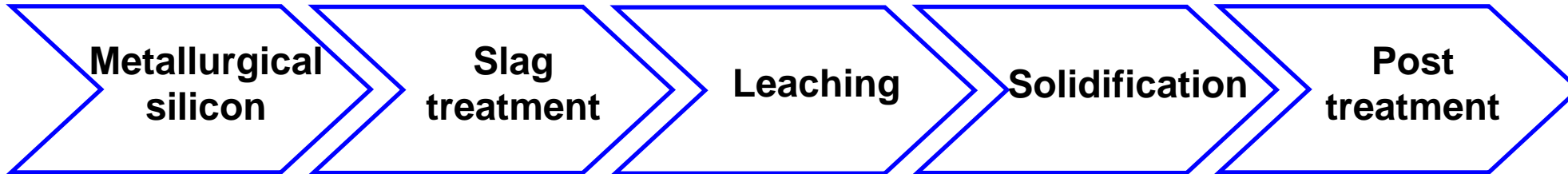


## Metallurgical Refining



1) Source: REC CMD Nov. 2006 Page 9

# Elkem Solar: The metallurgical refining process

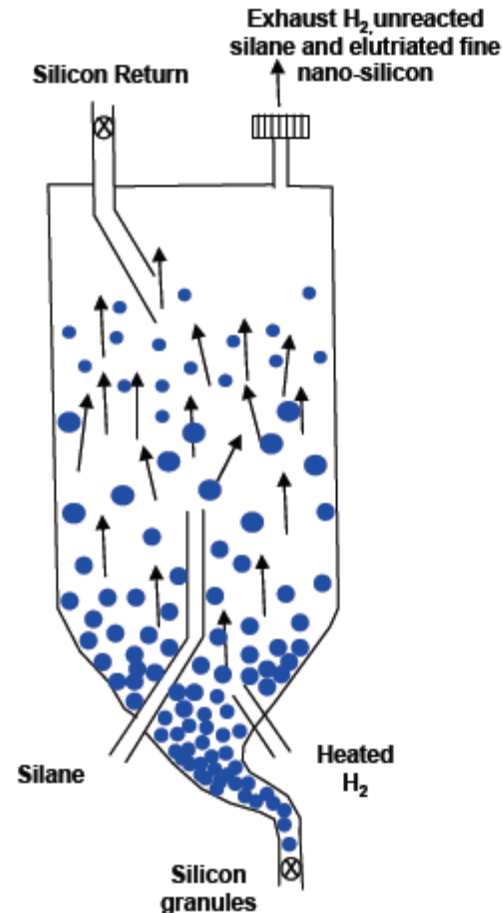


- **Avoids transition to silane gas**
- **Low power consumption**
- **Well known processes operated by metallurgical industry today**
- **Room for process simplification, cost reduction and scale**

# REC: the fluidized bed deposition technology

## Fluidized Bed Deposition Technology developed by REC

- Fluid Bed energy consumption is significantly less than Siemens process:
  - Continuous process versus batch processing
  - Hot Wall design versus cold wall which draws off energy
- Demonstrated pilot unit, qualified by PV customers
- REC has invested over 10 years of research in silane based fluid bed deposition, culminating in a successful process.



# Agenda

**1. The pv solar market**

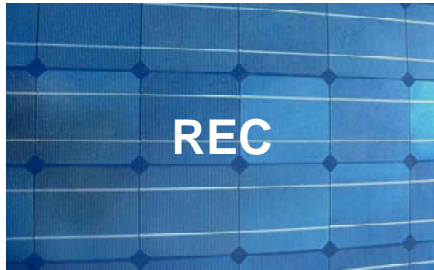
**2. Industry perspective – silicon feedstock**

**3. Orkla's positions in solar energy**

# Orkla has three solar positions

## Ownership

## Characteristics



39.75 %

### Orkla's primary solar interest

- World's largest producer of silicon materials for PV applications
- World's largest producer of multicrystalline wafers
- Significant producer of cells and modules
- Orkla ownership below 40 %



100 %

### Solar silicon production

- New plant for Elkem Solar Grade Silicon ESS® being built
- Cost efficient proprietary polysilicon refining technology
- All capacity until 2012 already sold. Options on further capacity



100 %

### Aluminium building systems installations

- Integrated solar application on building exteriors

# Orkla builds on key areas of expertise

## New 5 000 MT Elkem Solar Silicon® plant in Kristiansand

- Silicon competence for over 20 years
- Expertise in industry development and restructuring
- Successfully combining industrial and financial competence



- |                    |                 |                        |                     |
|--------------------|-----------------|------------------------|---------------------|
| • Investment:      | NOK 2.7 billion | • Capacity:            | 5000 MT             |
| • Total Employees: | 200             | • Expansion potential: | additional 5 000 MT |
|                    |                 | • Shipments from:      | 2H 2008             |

A large array of solar panels is shown in a desert landscape under a clear blue sky. The panels are arranged in a grid pattern and are tilted towards the sun. The text "Thank you for your attention" is overlaid in the center of the image.

Thank you for your attention