Solar energy beyond power, an industry in transition - Opportunities in the urban landscape
Overview

• The big picture – facts and scenarios
• Energy landscapes
• Solar PV applications and trends
• Opportunities and challenges
• Conclusions
What happened 2016

For the first time a single renewable fuel became the largest source of net capacity growth, while all renewables provided an all-time record two thirds of global net capacity additions.
Tipping the energy world off its axis

- Four **large-scale upheavals** in global energy are underway:
  - The **United States** is turning into the undisputed global leader for oil & gas
  - **Solar PV** is on track to be the cheapest source of new electricity in many countries
  - China’s new drive to “make the skies blue again” is recasting its role in energy
  - The future is **electrifying**, spurred by cooling, electric vehicles & digitalisation
- There are many possible pathways ahead & many potential pitfalls if governments or industry misread the signs of change
The cost of wind and solar PV have fallen sharply, with further reductions expected; cost-optimal integration requires interconnections, flexible generation, storage and demand response.
Costs: Enormous reduction

-75% over 10 years,
2017: ≈ 20 USD/MWh in the best cases
Photovoltaic market worldwide (cum.)
Renewables dominate capacity additions to meet sustainability goals

Renewables account for 63% of total world electricity generation by 2040 in the SDS, with wind and hydro becoming the largest sources of generation. China and India account for over 40% of net renewable additions.
Scenarios
Saudi Arabia’s plan for a 200 GW PV system
Potential of building integrated PV

The diagram shows the potential contribution of building-integrated photovoltaic systems to electricity supply in various countries. The bars represent different countries, with their potential contributions ranging from 0% to 60%. The countries included in the diagram are Australia, Austria, Canada, Denmark, Finland, Germany, Italy, Japan, Netherlands, Spain, Sweden, Switzerland, United Kingdom, and the United States.
New possibilities emerge

1. Glass
2. Encapsulant
3. Solar cell
4. Encapsulant
5. Glass

Coatings, filters, ceramic printing, etc.

Schematics after S. Wittkopf, HSLU
Opportunities and challenges of BIPV

- Solar cell & glass treatment technologies
- Building material, building skin & building products
- Multifunctionality
- Aesthetics, design & architecture
- Standards
- Process integration
- Industrial manufacturing & (customized) mass production
- Cost & energy performance
- Building energy systems & energy system integration
- Business models, social acceptance & cultural change
Some final thoughts

PV starting to form our energy landscape

- The unique selling proposition of PV
  *Very high potential, very low cost, big diversity*

- Need for a much broader view
  *Beyond technology, beyond PV, beyond power, energy system integration*

- New opportunities arise
  *Competitiveness, new applications, system view*

- PV as a backbone of the energy system
  *Entering many areas of the energy system, possibly becoming the most important source of electricity / energy*

- Sense of responsibility
  *Trust and confidence*

- Sustainability in all dimensions
  *Environment, economy, society, decarbonisation of the energy system*
Imagination

Steve Jobs, Apple
“It’s not a faith in technology. It’s faith in people.”

Chris Luebkeman, Arup
“The future, always oversold and under-imagined.”
Thank you

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