CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

WGEO EXECUTIVE TRAINING COURSE
ON SCALING UP TRANSITION TO A GREEN ECONOMY
ON A PATH TOWARDS IMPLEMENTING THE UNITED NATIONS
2030 SUSTAINABLE DEVELOPMENT AGENDA

FOSTERING GREEN INNOVATION

MODULE "FI"

This module is presented by INES,
on behalf of ISA, the International Solar Alliance
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@pmalbranche

COHORT FIVE
9-10 July 2019
Tashkent, Uzbekistan

By the end of this module you will:

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Understand …..

The holistic approach requested for the massive roll-out of solar energy

Know …..

- The advantages of solar energy
- The diversity of applications in all sectors, thanks to regular innovation
- The main barriers & obstacles to their implementation, which requires also non-technical innovation

Be able to ….

- Identify some resources and contact persons
- Access to information and best practices (financing, capacity building)
- Promote it, for a faster dissemination !

Module structure

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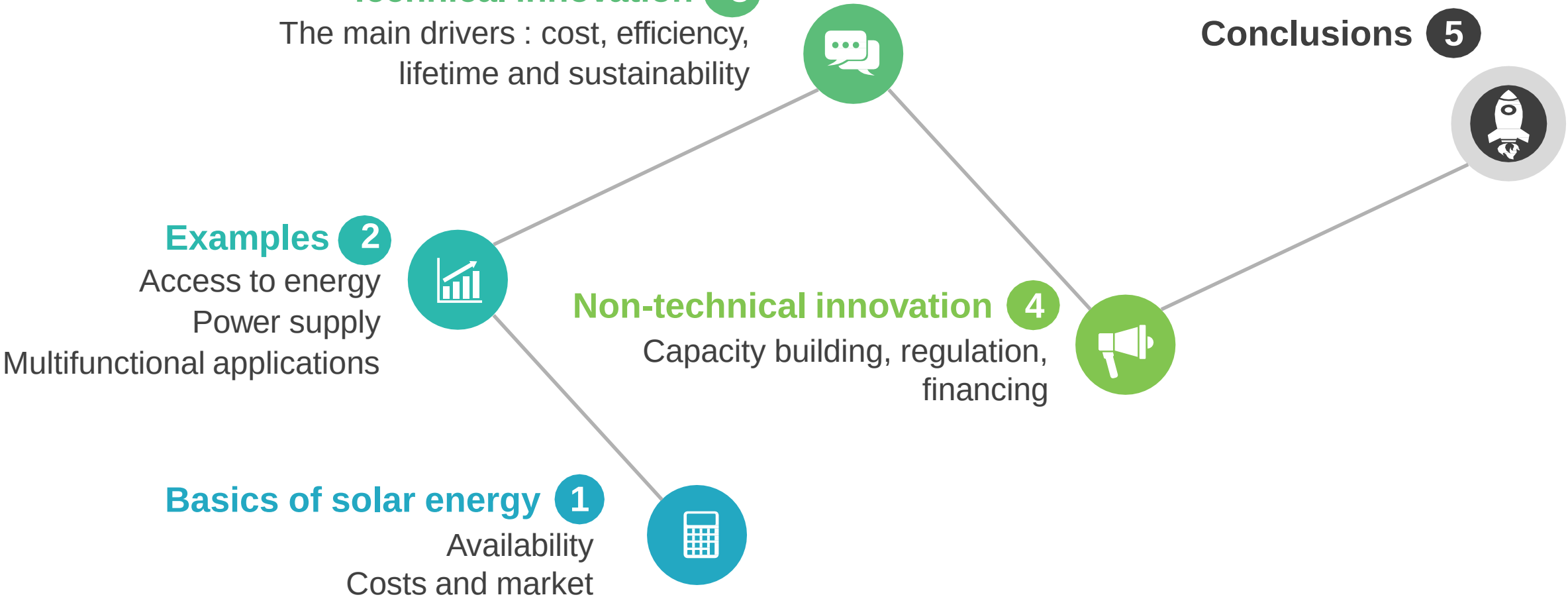
Technical innovation 3
The main drivers : cost, efficiency, lifetime and sustainability

Examples 2
Access to energy
Power supply
Multifunctional applications

Non-technical innovation 4
Capacity building, regulation, financing

Basics of solar energy 1
Availability
Costs and market
Sustainablity

Conclusions 5



Vision & Mission

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To provide a global platform for cooperation among solar resource rich to help achieve the common goals of increasing the use of solar energy in a safe, convenient, affordable, equitable and sustainablemanner.

Governance

- Assembly of the ISA; President-India; Co-President-France
- Eight Committees of the ISA:
  - Standing Committee
  - Programmes; General and Legal; and Finance Committee
  - Four Regional Committee- Asia and Pacific; Latin America and the Caribbean; Africa; and Europe and others
- 6 Taskforces and 2 Working Groups
- Corporate Partners

GOALS

- Lowering cost of financing whilescaling-upvolumesoffinancing
- Mobilize more than USD 1000 billion ofinvestmentsby2030
- Bringing reliable and affordable solar energy toall

Our Presence

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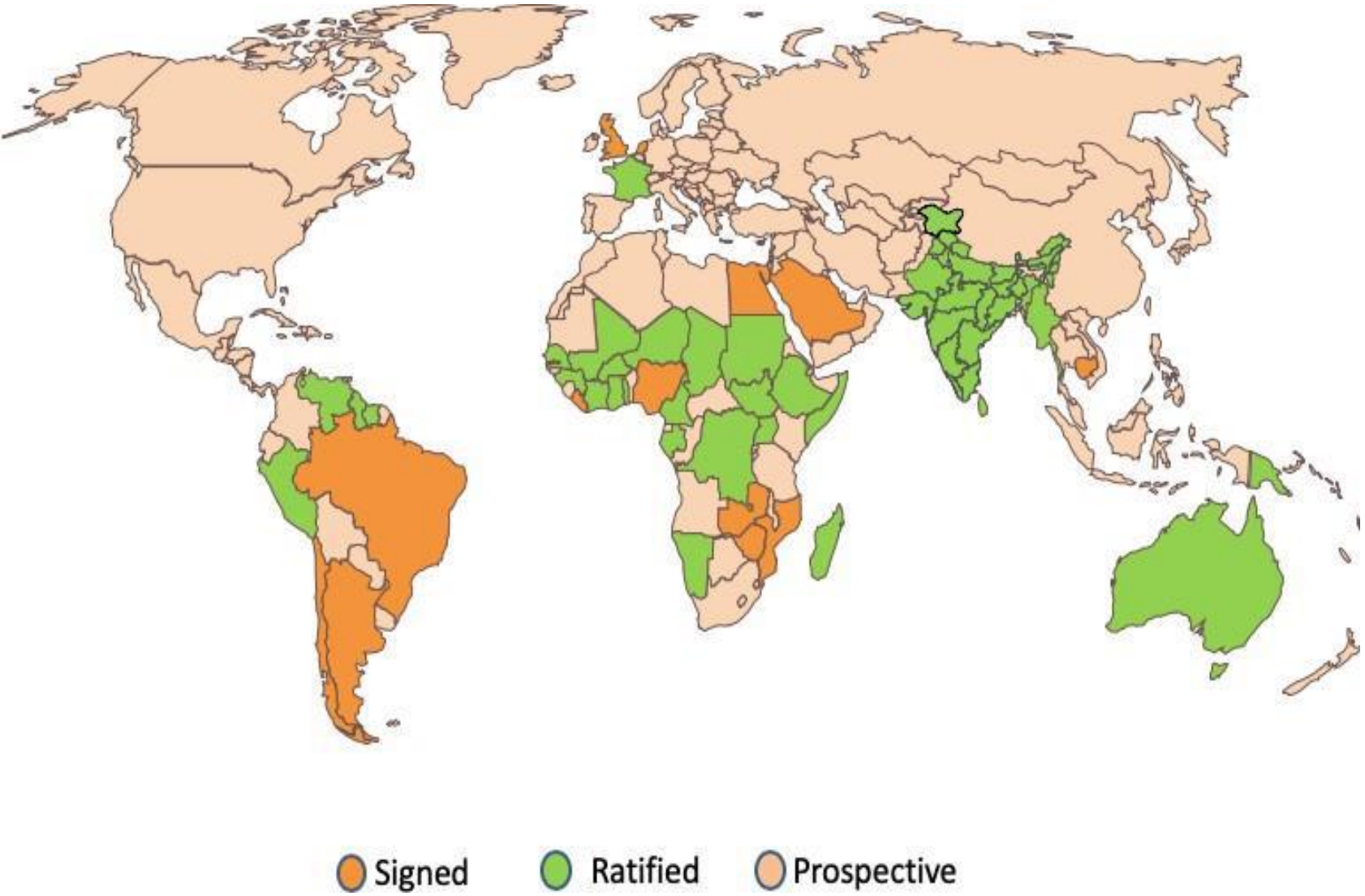
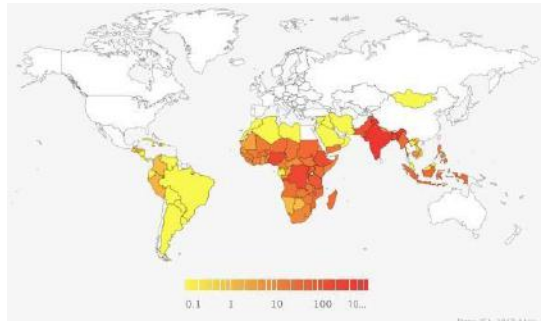


Population without access to electricity



75 Signatory Countries
54 Countries Ratified

Infopedia

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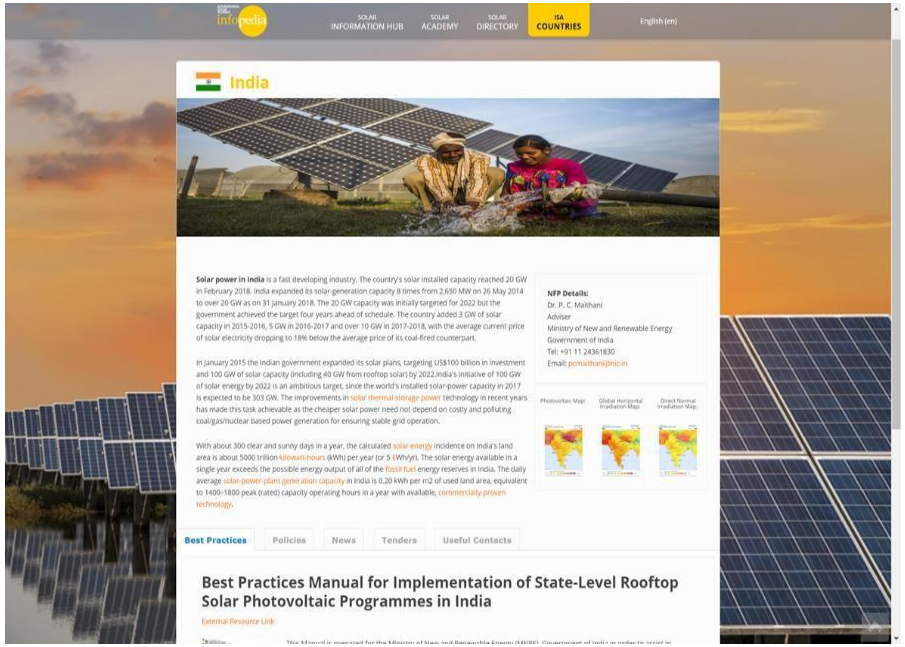
An **online platform** dedicated to the dissemination of information, best-practices and knowledge on Solar Energy:

- To be completed by June 2019

- Launch in October 2019

- Supported by the **European Union**



Project funded by The European Union

- **Country counters :** A dedicated space on the Online Platform for each Member Country to present the most complete solar energy profile

- **Solar Information Hub :** Aggregating solar projects in a central database for best practice sharing among Member countries

- **Solar Academy:** A full-fledged Learning Management System allowing ISA and its partners to create and host courses on solar technology

- **ISA Communication Tools :** Tools and methodologies to facilitate communication among Member countries

- **Solar Directory:** An self-registration directory for the Solar Industry, NGOs, Research Centers and Financing institutions

Star-C

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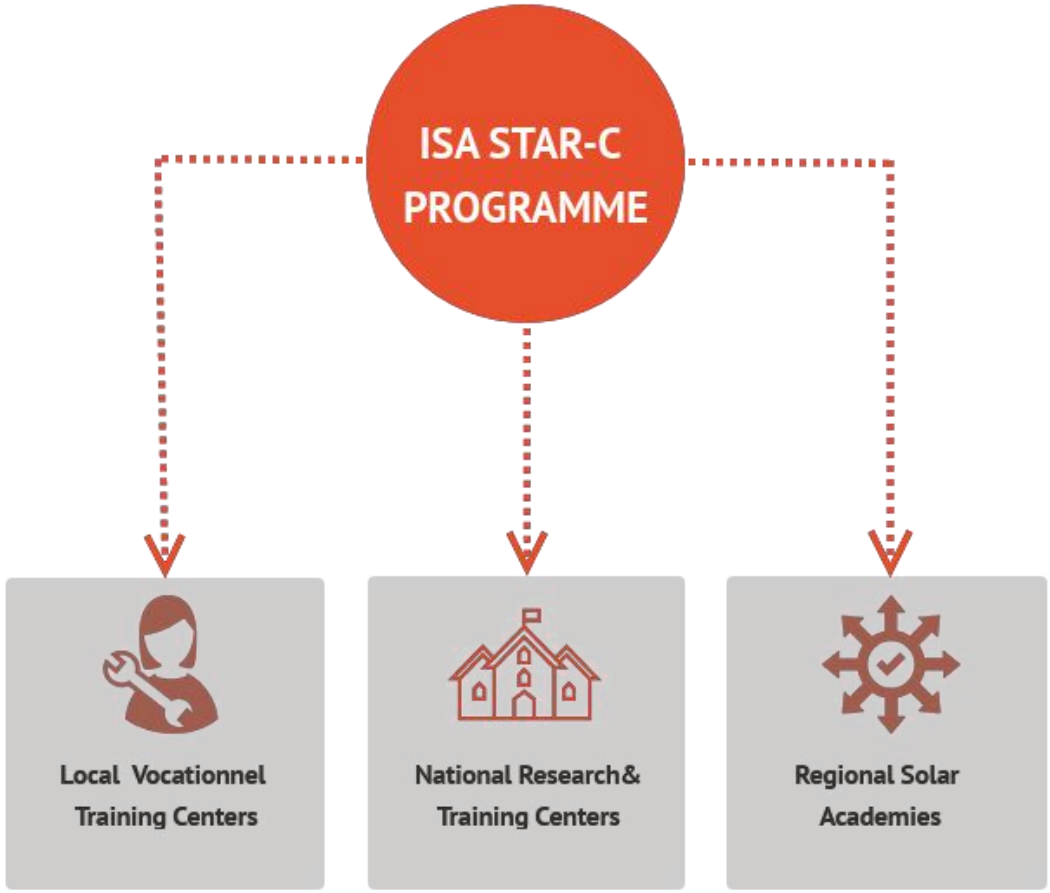
The goals of STAR-C include the following:

- To build a network of training / R&D / standardization / Entrepreneurship STAR-centers working on solar energy

- To develop and disseminate training programs (online and in-personne) for all solar energy stakeholders (technicians, master trainers, project developers, engineers, policy makers, etc), via STAR-Centers & Regional Solar Academies (UNIDO centers for EE & RE)

- To provide testing and technical certification capabilities to key STAR-centers



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Designated by Country

19 Centers

Schneider Electric Foundation

35 Centers

Signify Foundation

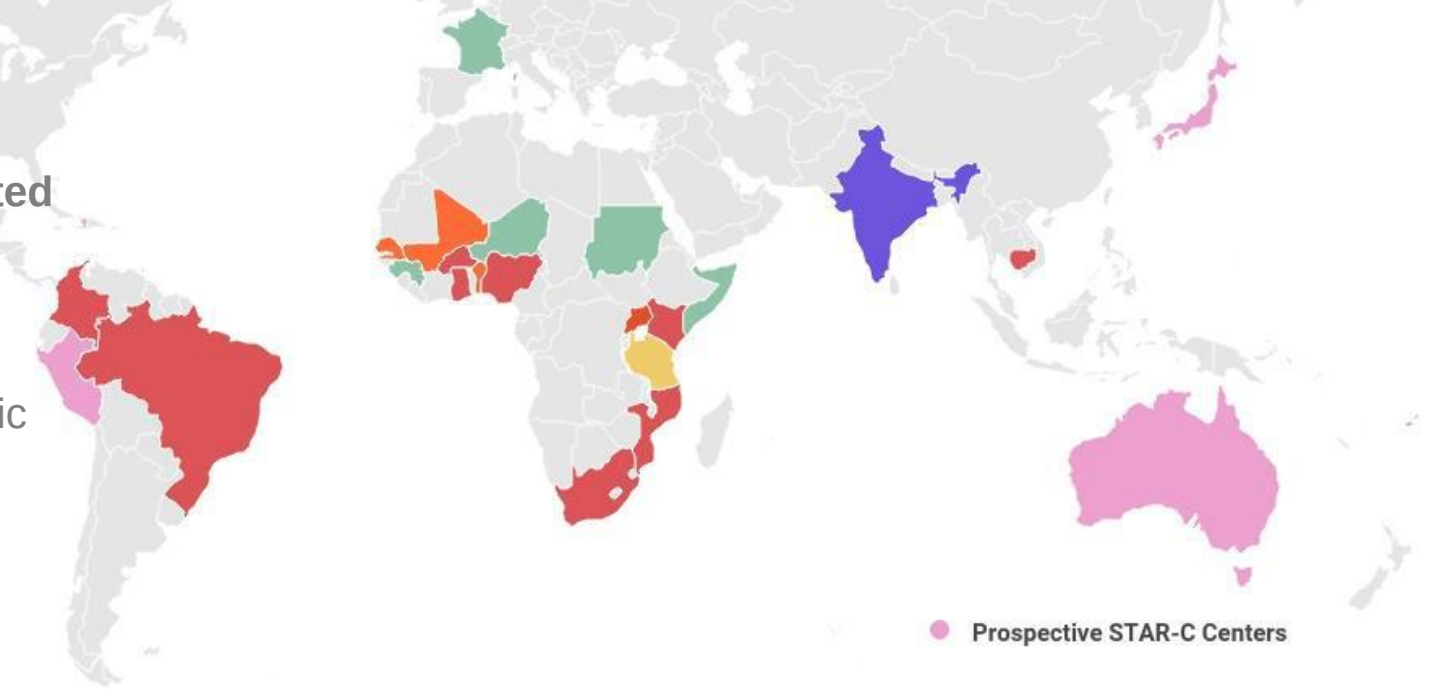
5 Centers

TATA Power Delhi

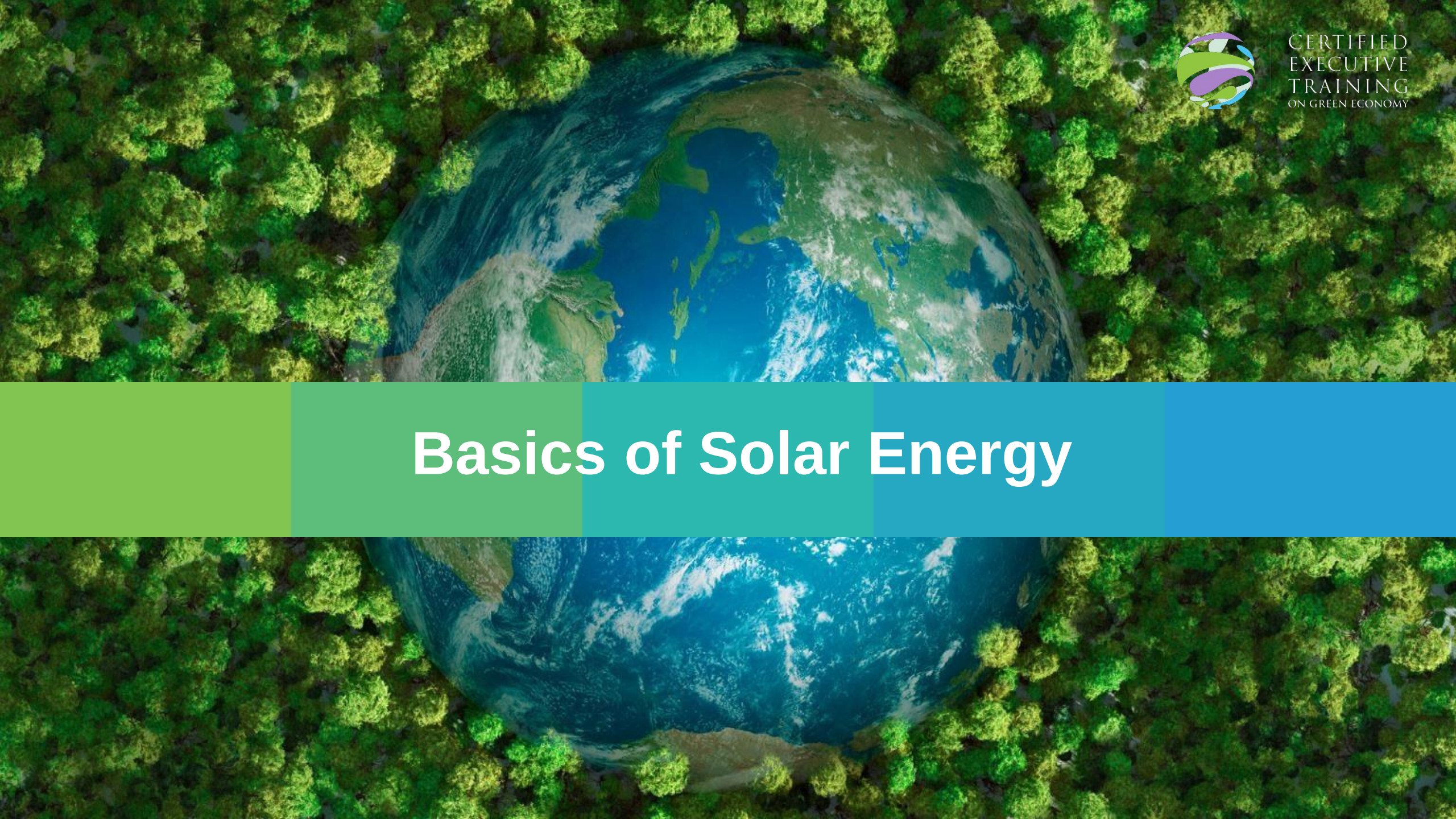
4 Centers

STAR-C network

- **65 STAR-Centers (19 designated by countries)**
- **Support of industry Foundations** (Schneider Electric Foundation, Tata Trust, Philips Foundation, etc.)



INTERNATIONAL SOLAR ALLIANCE



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Basics of Solar Energy

Solar energy is available everywhere

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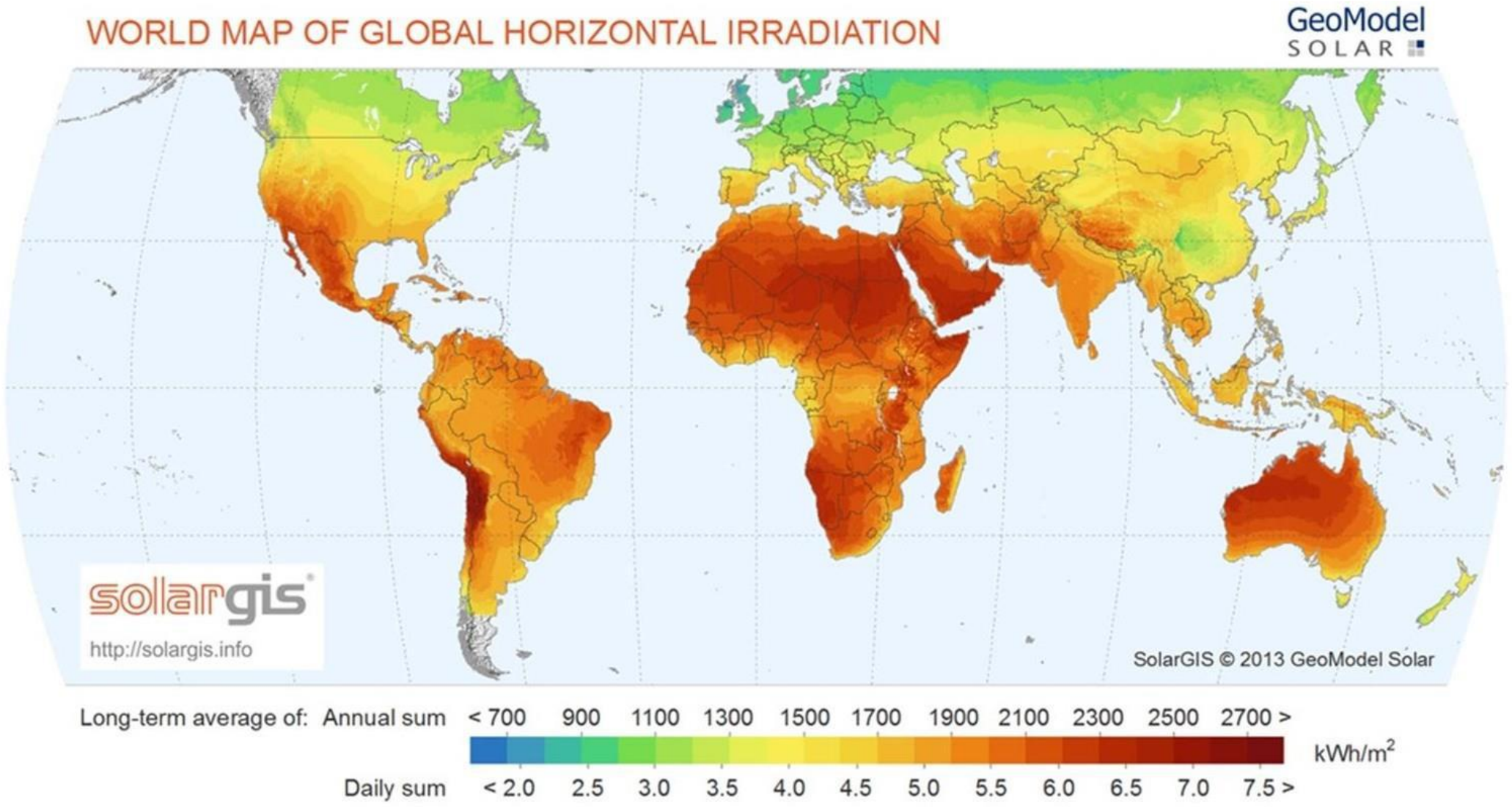
A maximum ratio of 3 between « sun-rich » countries and « no-sun countries »



Costs of PV modules and PV electricity : an impressive decreasing trend

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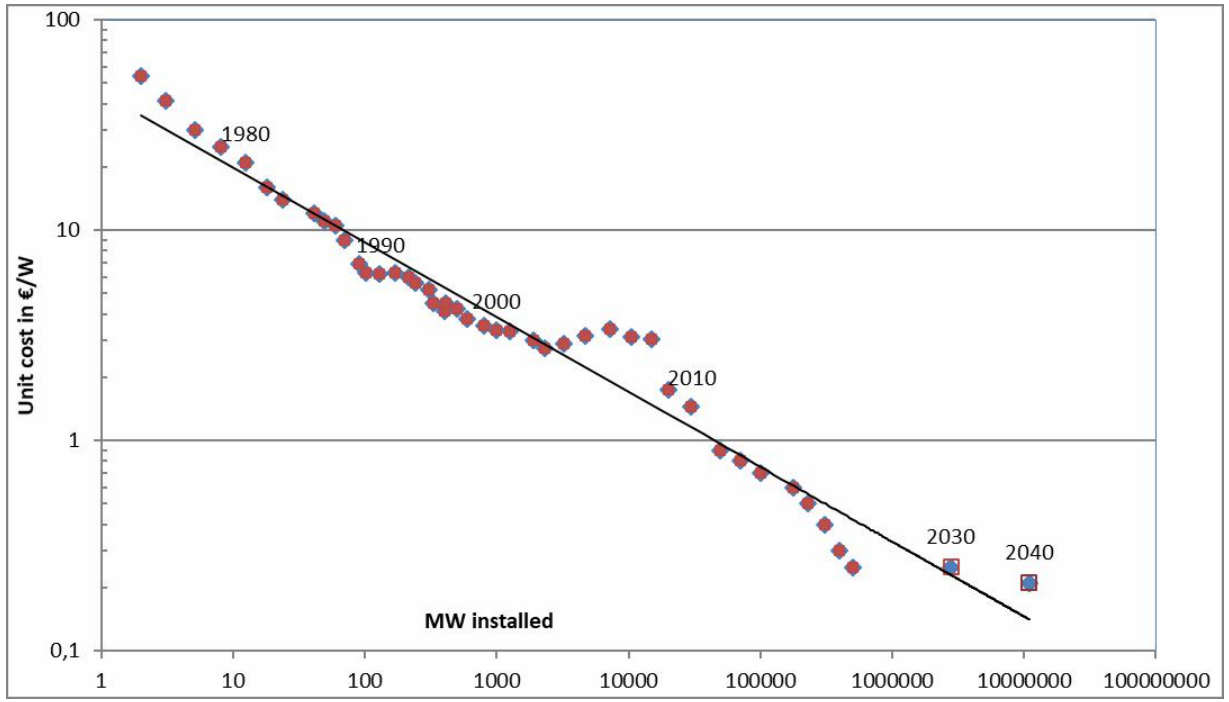
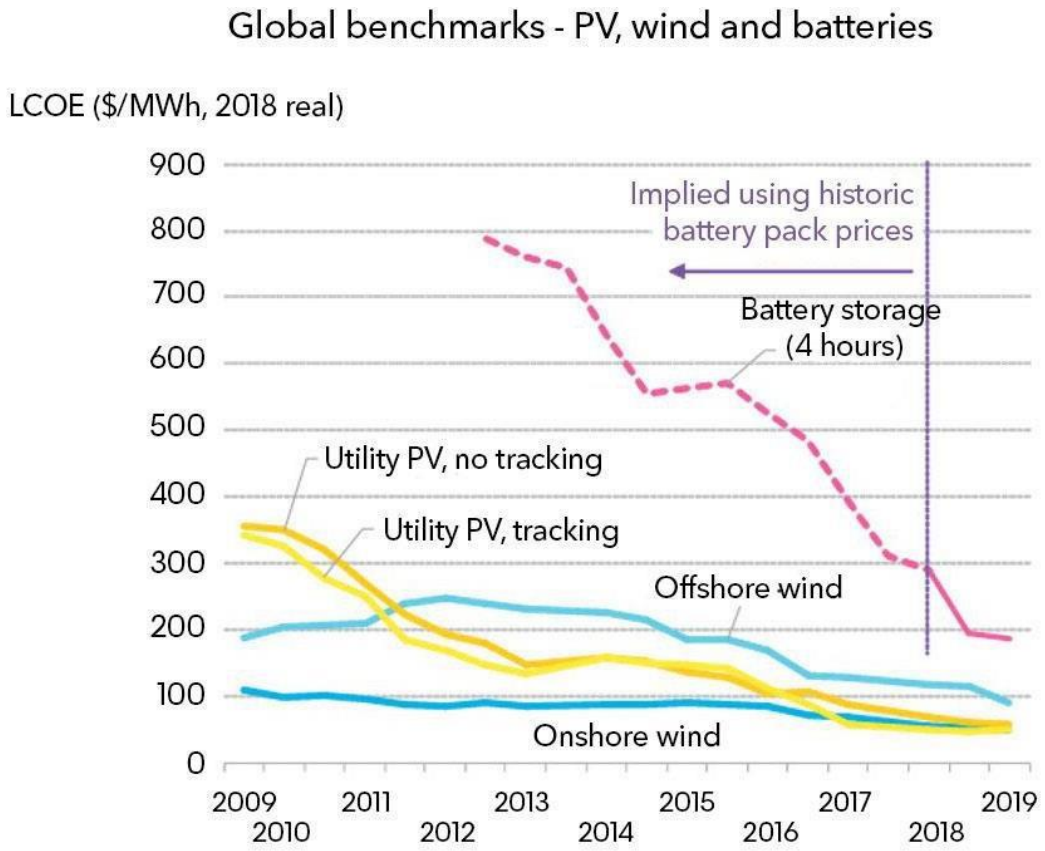
- **The PV module learning curve**



- The LCOE is now the cheapest one :
- 2c/kWh in sun-rich countries (Chile, UAE, etc.)
- Up to 5c/kWh in other countries (Germany)

- **Levelized Cost of Electricity (LCOE)**



Source: BloombergNEF. Note: The global benchmark is a country weighed-average using the latest annual capacity additions. The storage LCOE is reflective of a utility-scale Li-ion battery storage system running at a daily cycle and includes charging costs assumed to be 60% of whole sale base power price in each country.

The cheapest source of electricity in many countri

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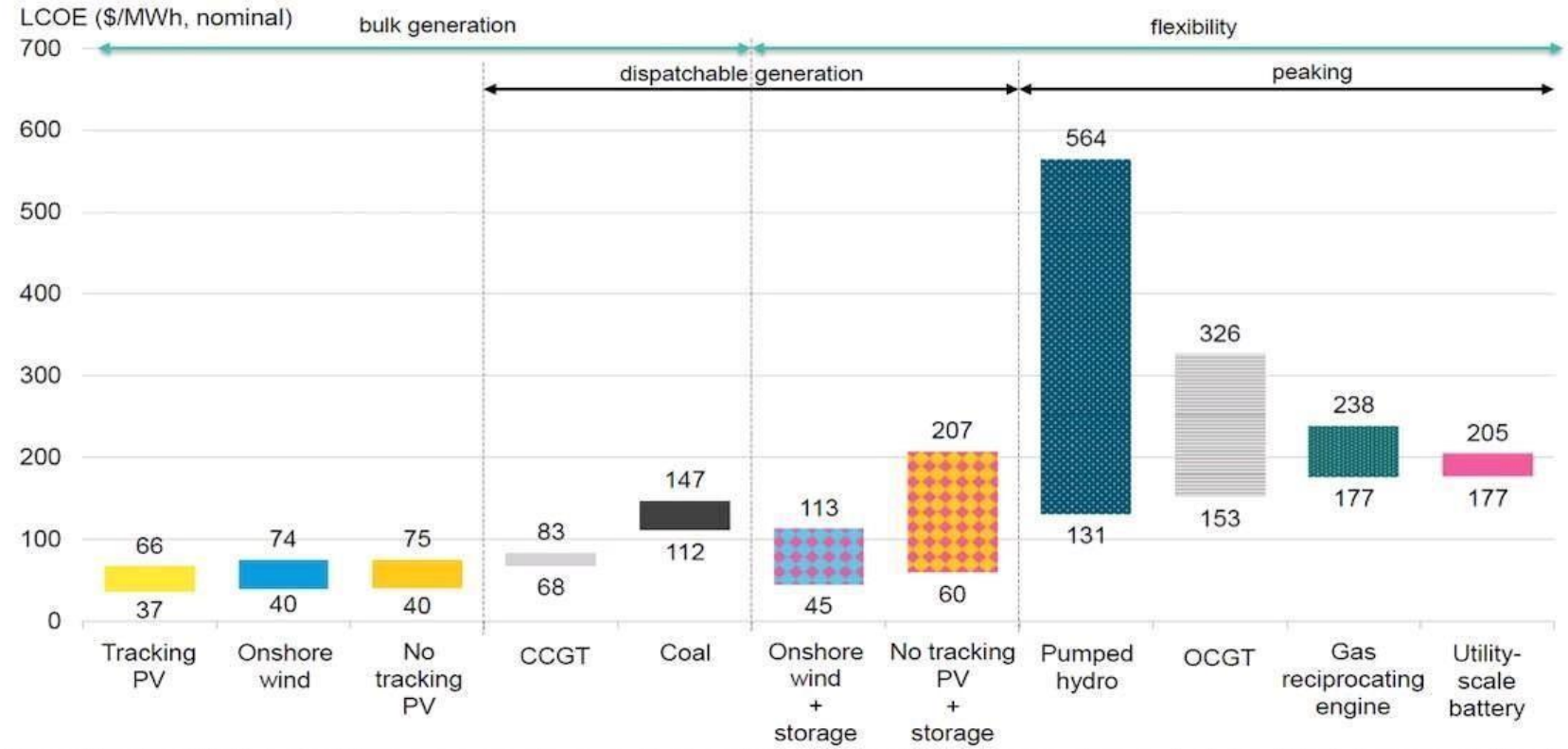
Australia

Levelized cost of electricity



Source: BloombergNEF. Note: The LCOE range represents a range of costs and capacity factors. Battery storage systems (co-located and stand-alone) presented here have four-hour storage. In the case of solar- and wind-plus-battery systems, the range is a combination of capacity factors and size of the battery relative to the power generating asset (25% to 100% of total installed capacity). All LCOE calculations are unsubsidized. Categorization of technologies is based on their primary use case.

Current records : long-term contract prices recently announced

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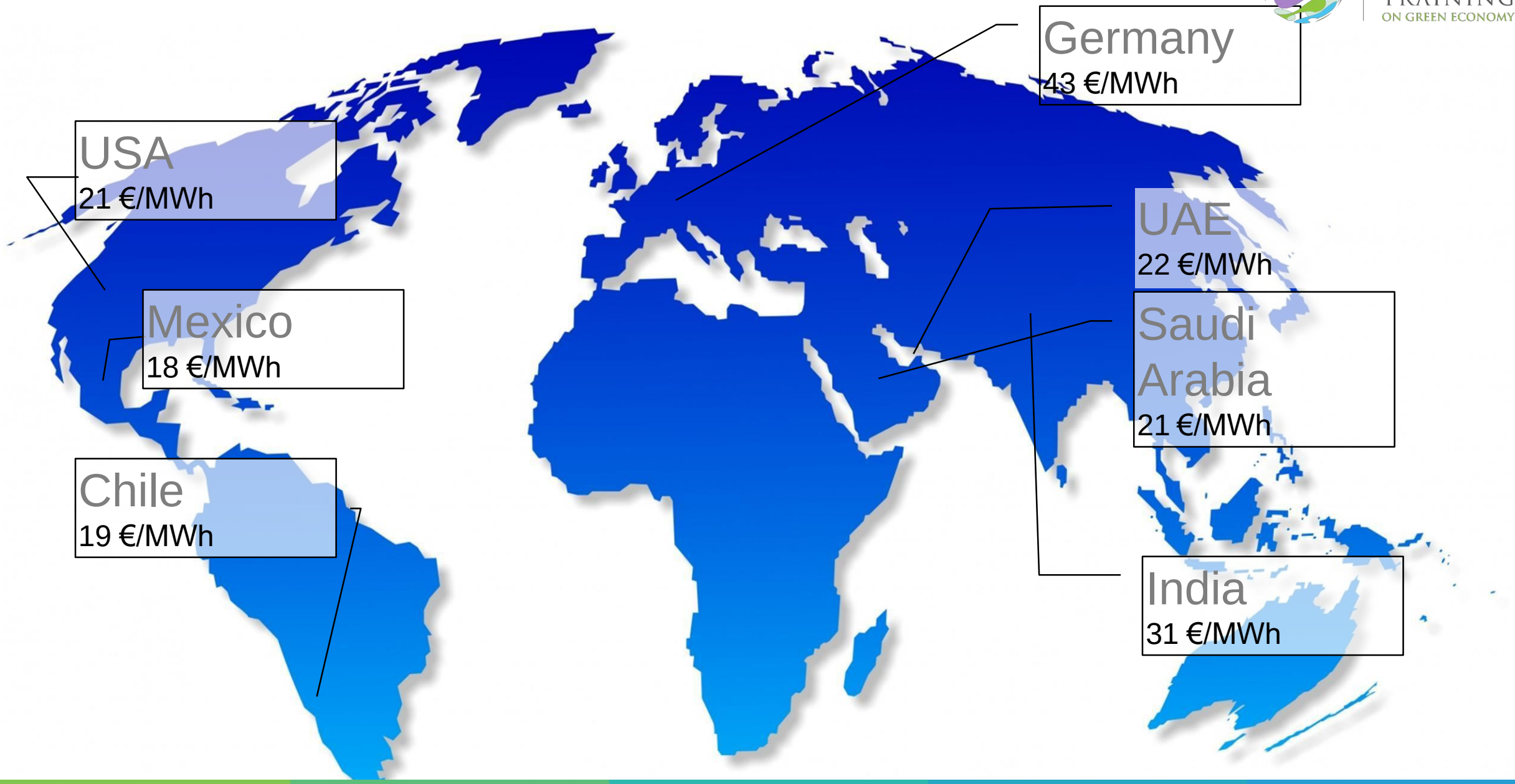

System cost structure

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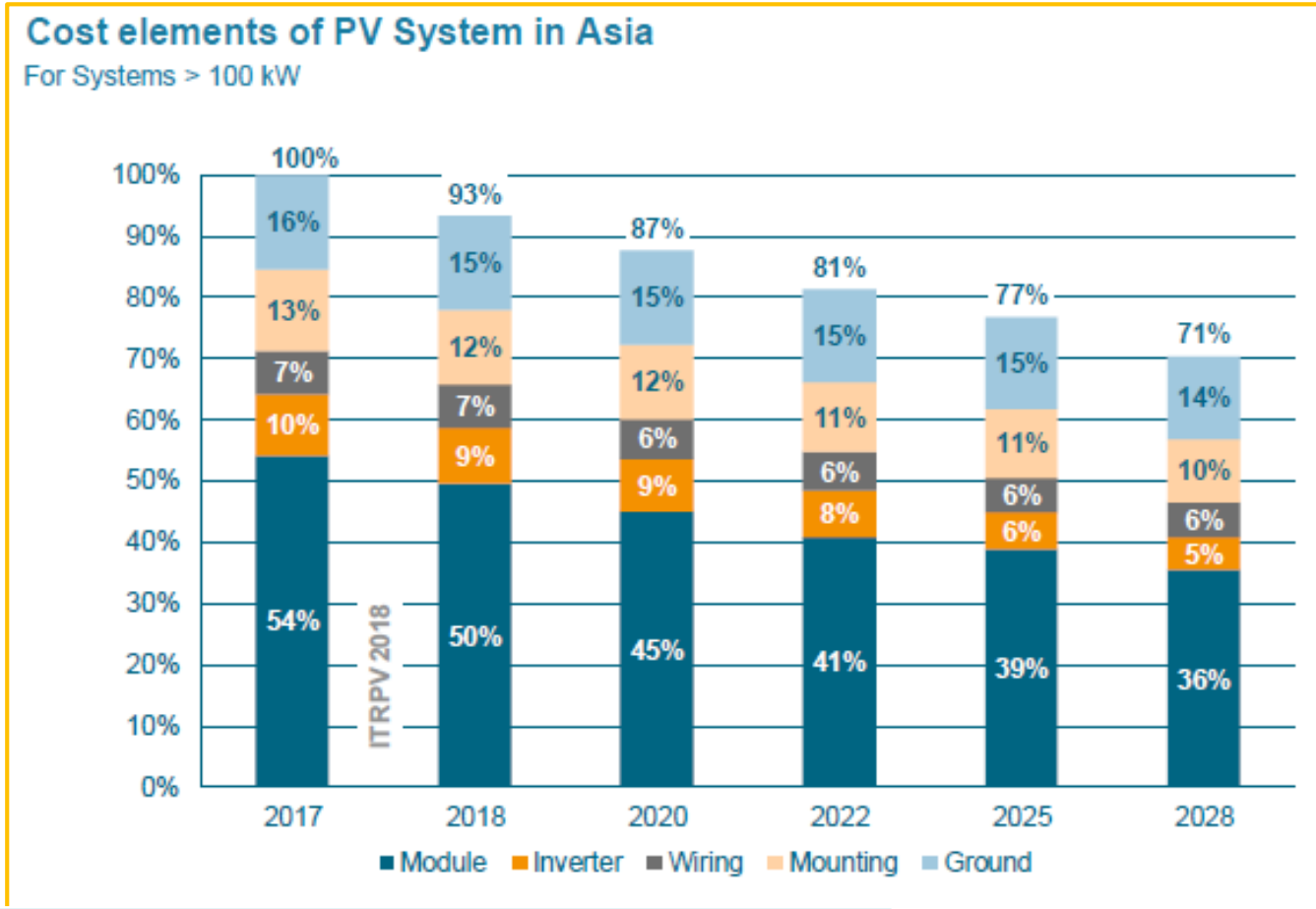
The system cost depends on :

- The type of system :
  - On / off-grid,
  - with ou without storage, etc.
- The size
- The location
- The type of integration

- On average, on-grid system cost is double the module cost



LCOECost Structure

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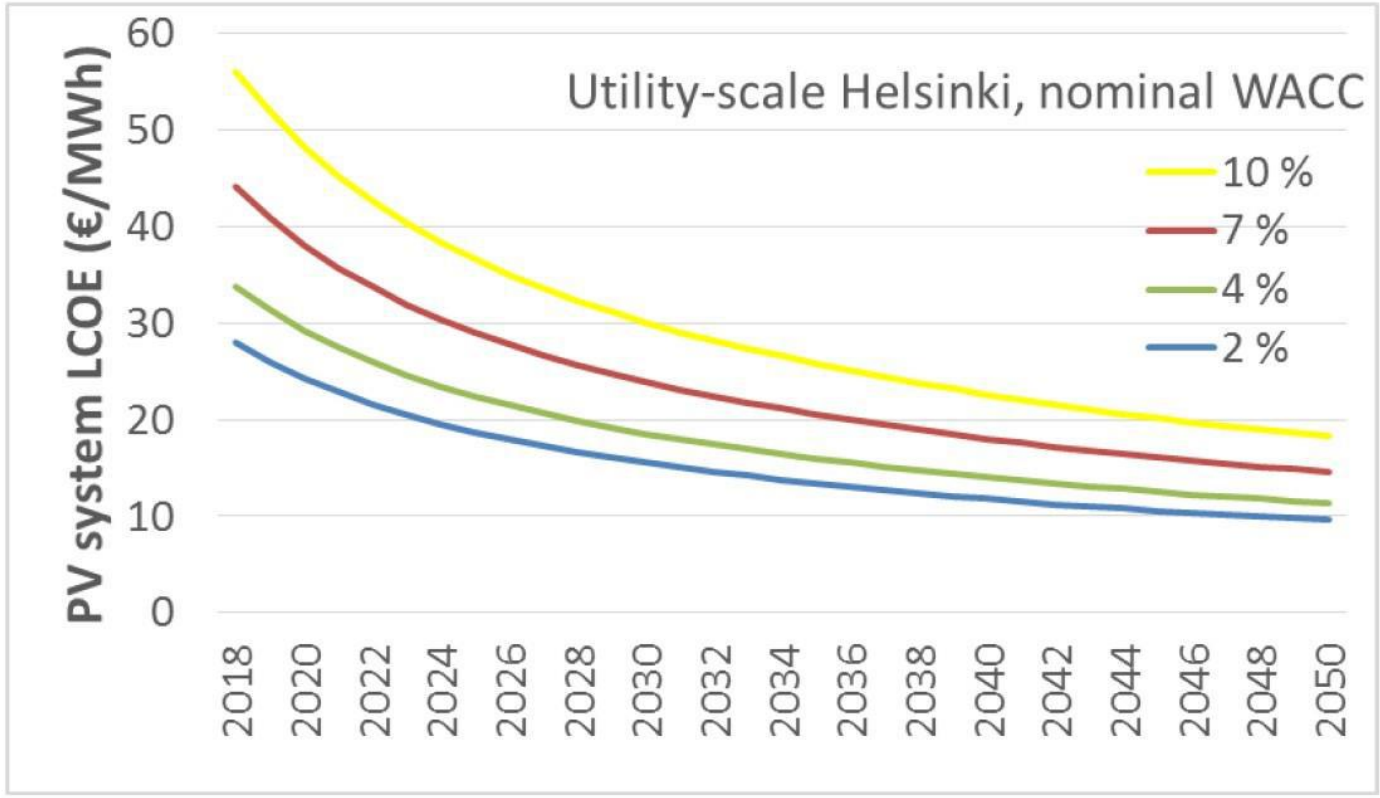
- The importance of the cost of capital

LCOE with 10% nominal WACC is double the LCOE with 2% WACC



LCOE with 2% inflation; w/o taxes

Sustainability : low carbon footprint and efficient use of common materials

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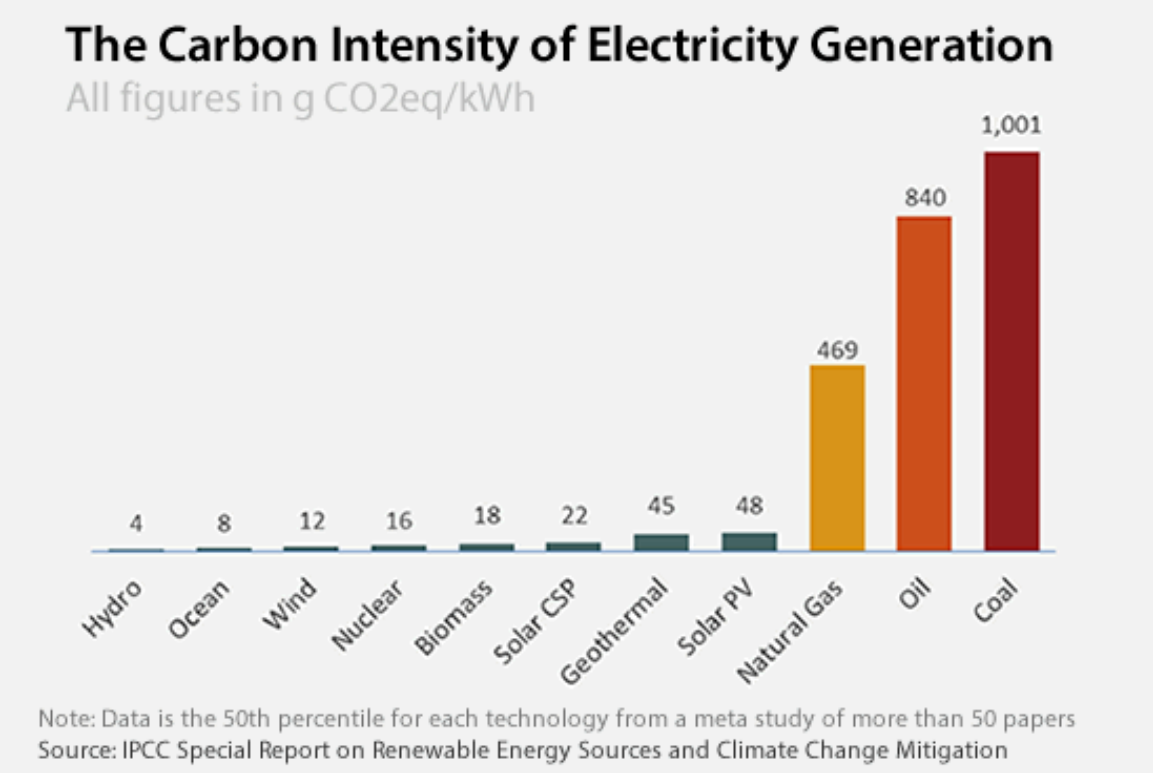
CO2 content :

- still in progress due to decreasing consumption of materials
- Already among the lowest power sources



- Warranty periods : 25 to 35 years on most technologies
- Lifetime : above
- Recycleability : plants available

Worldwide market

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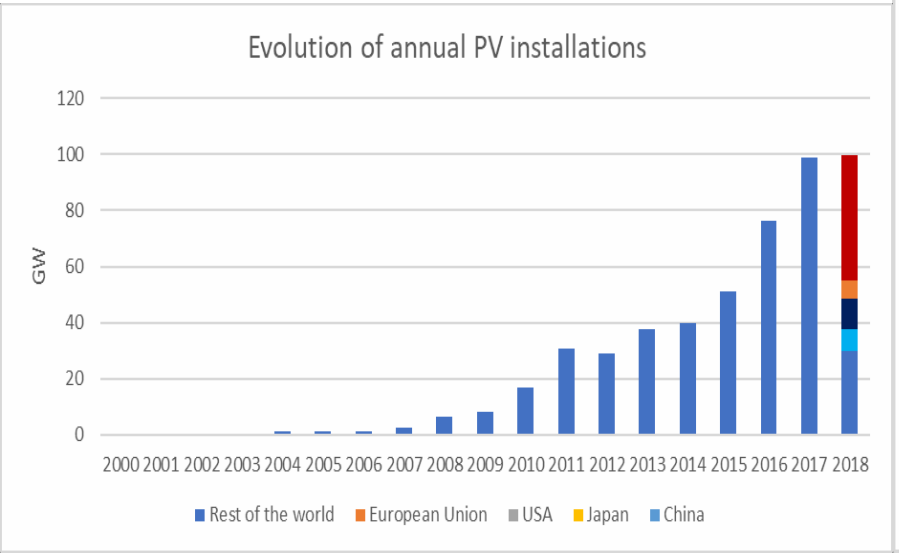
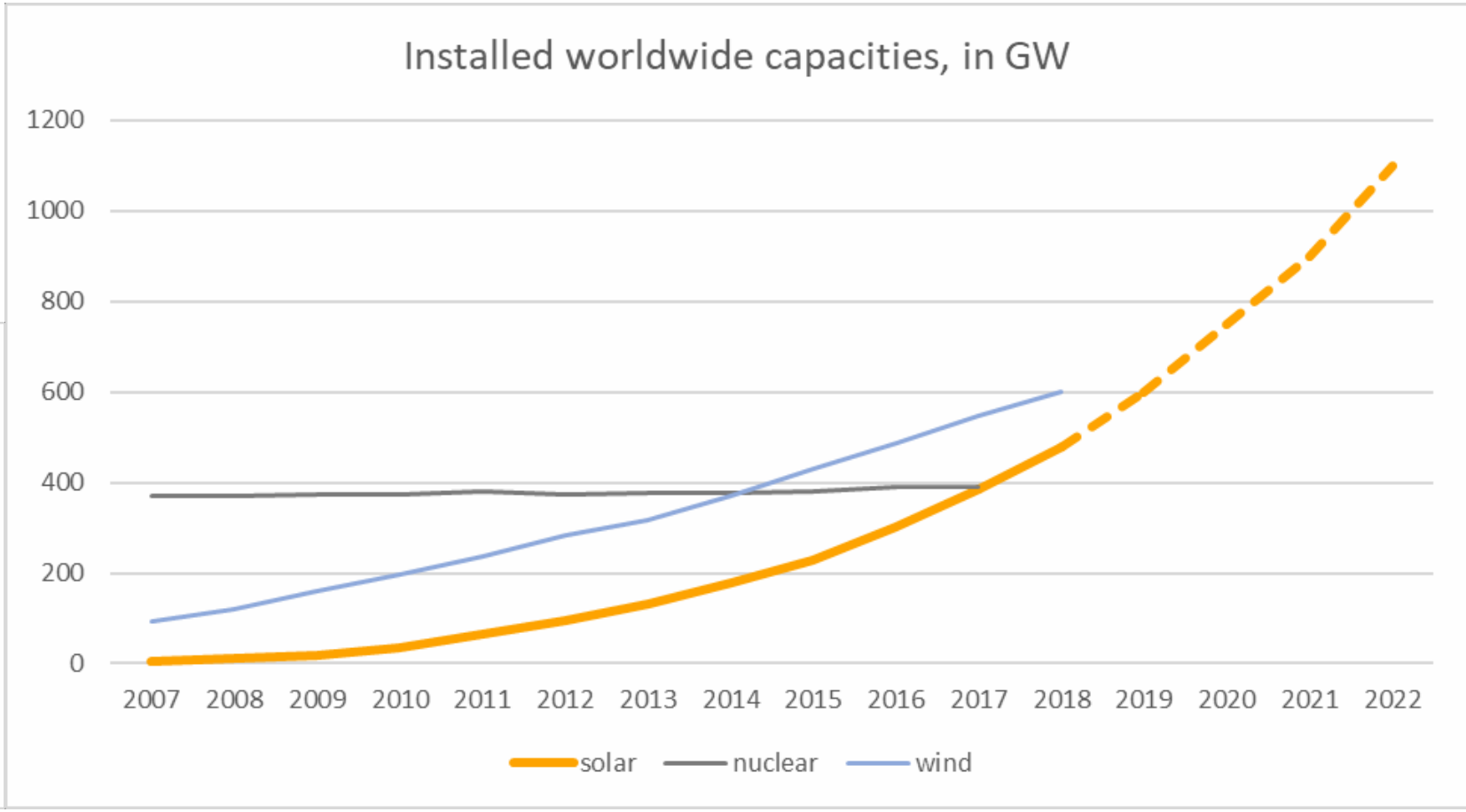
- The largest growth among renewable, with an annual market of 100 GW
- On the way to 1 TW installed capacity within 3 to 4 years
- A potential of 30 to 60 TW





Solar Growth Trajectory

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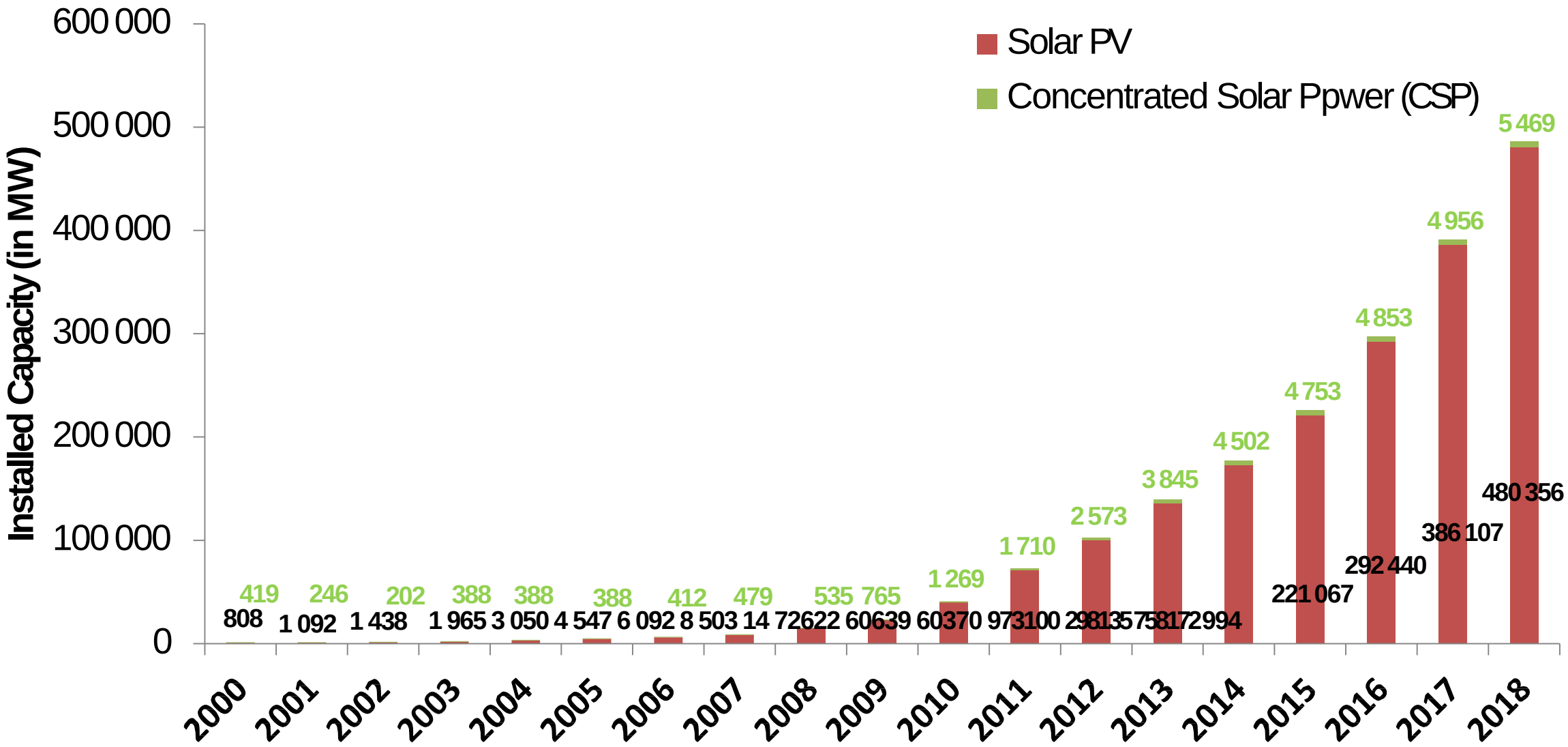

(Ref : IRENA)

This growth will carry on

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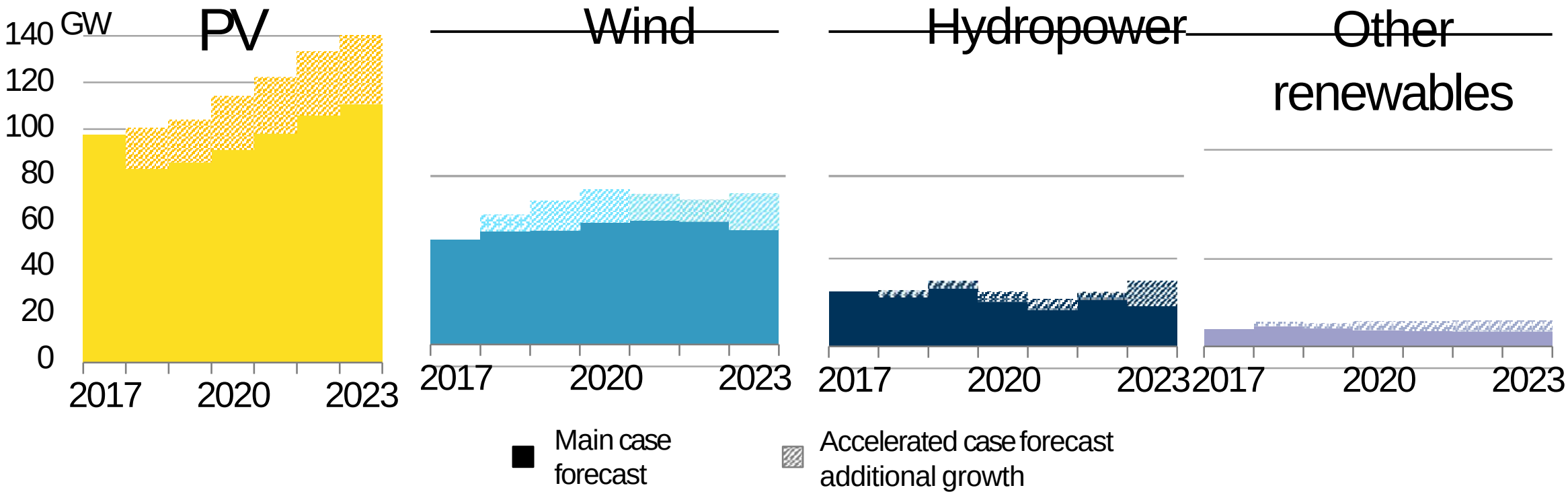
- According to the IEA, the strongest growth to come among renewables



Source: Renewables 2018

Achievement so far

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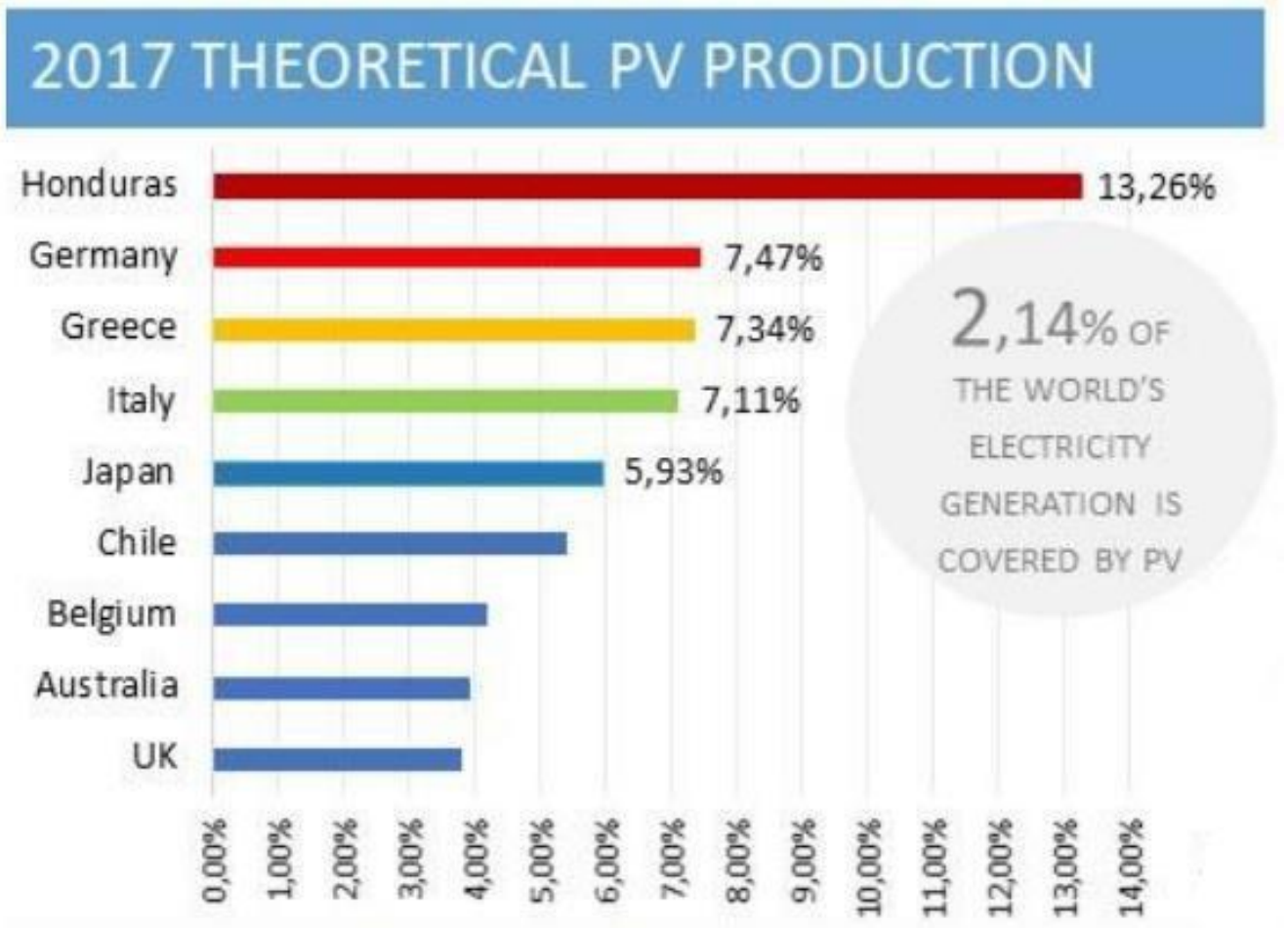
- 2% of the worldwide electricity mix in 2017



Key takeaways from this section

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The cheapest source of electricity

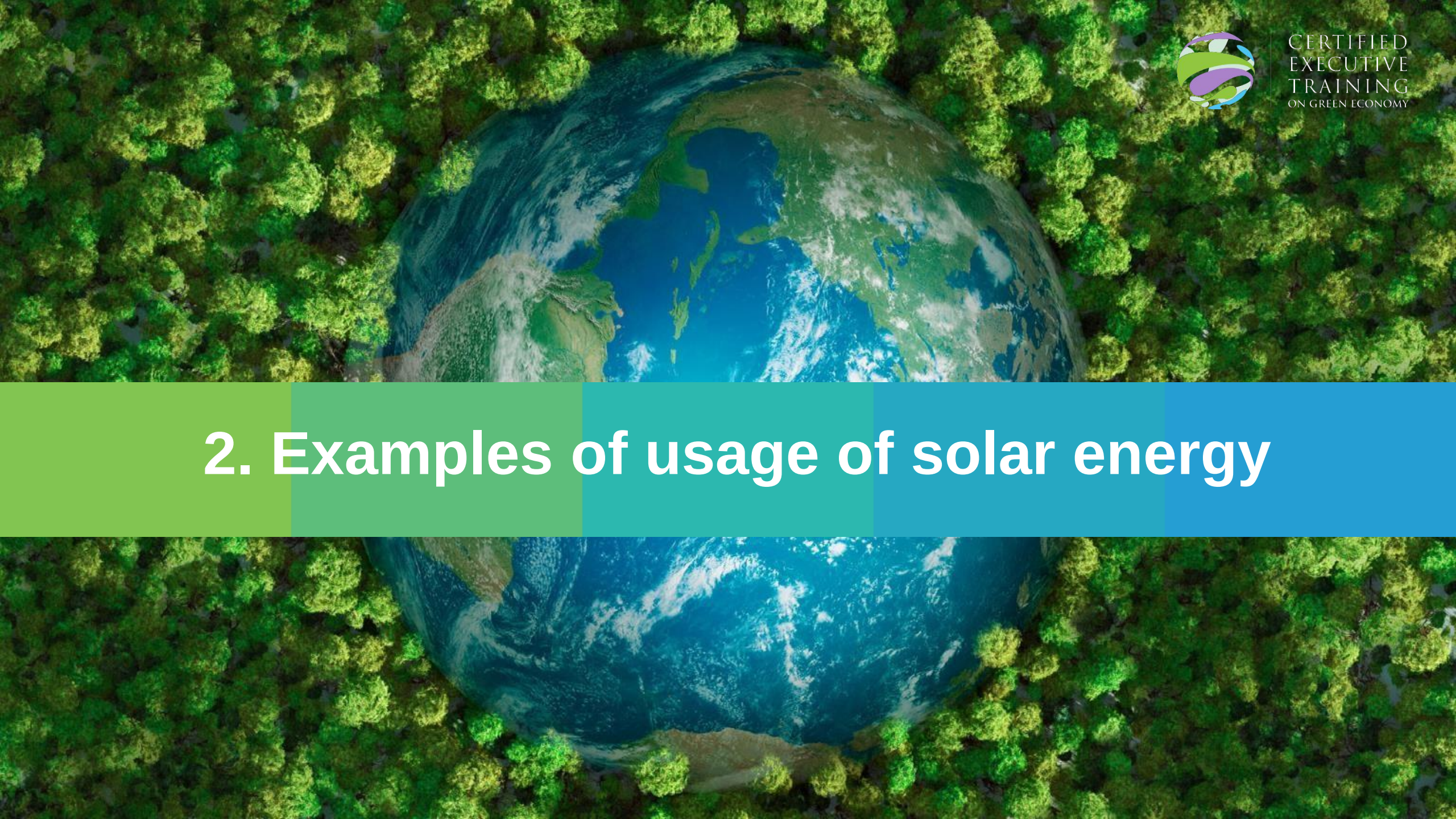
- Available everywhere
- Decentralised
- Decarbonised & Sustainable
- Manageable using digital economy

One main issue

A capital-intensive solution

Progress is going on ….

- People underestimate what will be the consequences of such a low-cost energy
- We are at the dawn of a massive development



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2. Examples of usage of solar energy

Overview of Solar Applications

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Solar Applications

1. Utility Scale Solar PV

- Solar Farms
- Large solar projects
- Floating solar

2. Distribution level Grid Connected

- Solar Rooftop
- Canal top solar

3. Decentralized Applications

- Village electrification
- Solar Lighting
- Solar pumps

4. Heat Applications

- Solar water heaters
- Solar cookers
- Process heat applications

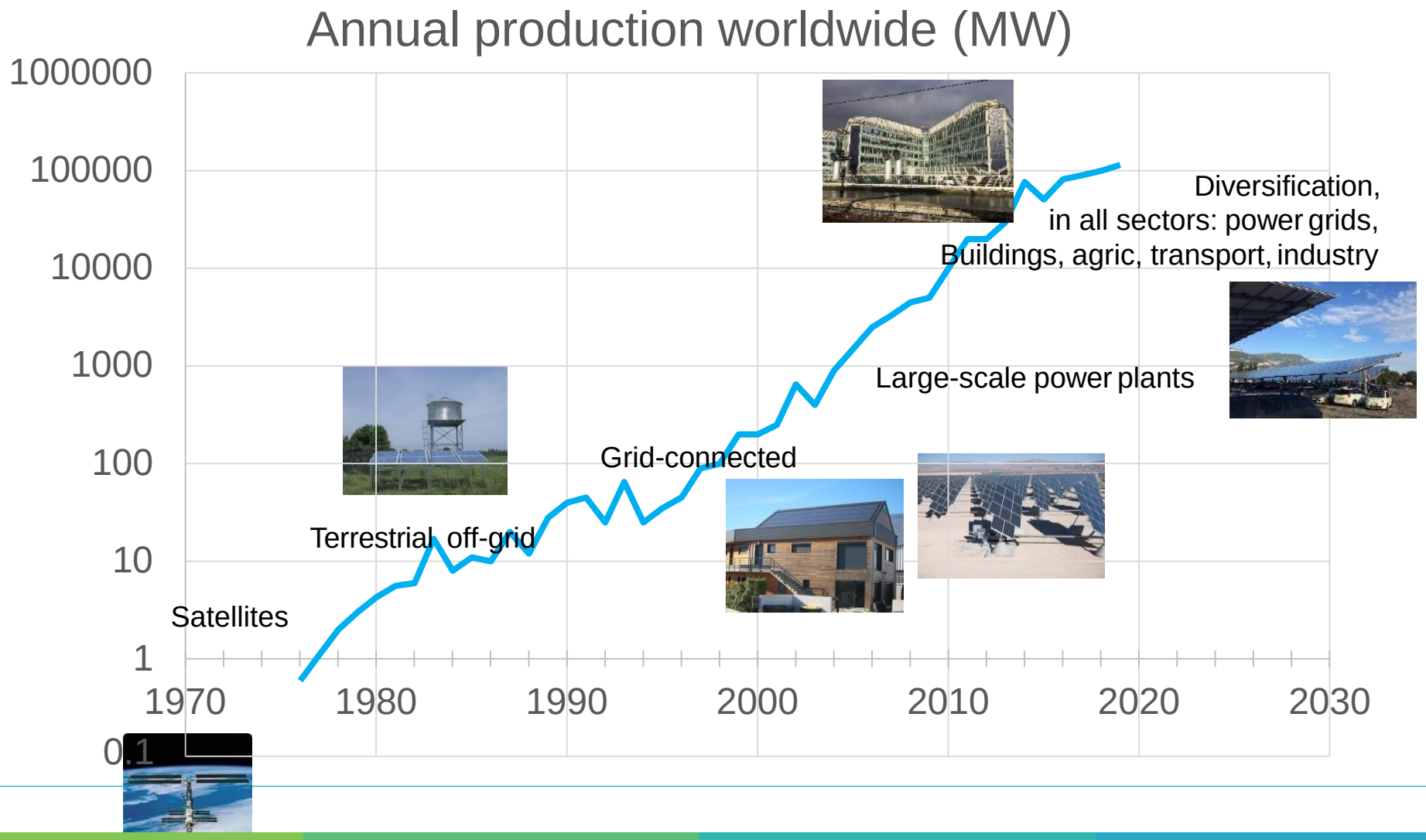








A gradual market penetration with an increasing number of applications



In the future, we could have equal shares between power, transport, industry

Access to energy : changing lives

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"I have saved money with my solar lamps, I no longer buy kerosen, paraffin or dry cell batteries. I use the money for my children."

Changing lives : Solar Pumps

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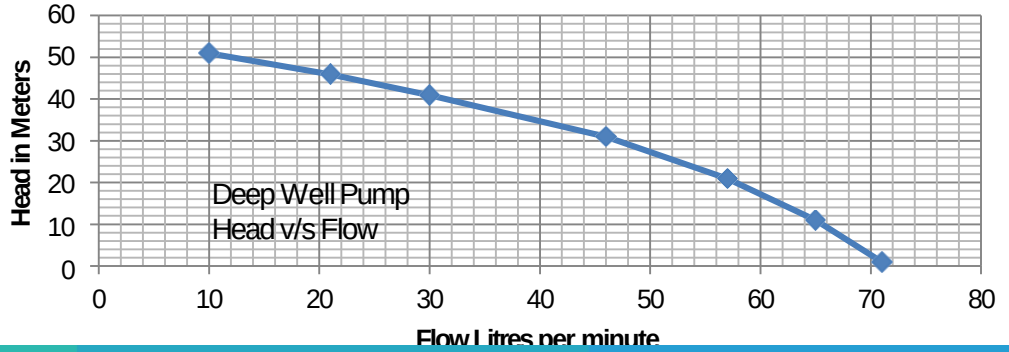
For Irrigation and Drinking Water applications

- Major components: PV module array of capacity ranging from 200 Wp to about 10 kWp, a DC/AC surface mounted/floating motor pump set/submersible pump set, electronics and an ‘on-off’ switch.
- Surface pumps (both AC & DC) are used with canals, open wells, lakes, other shallow sources (up to 15 m depth)
- Submersible pumps (both AC & DC) with number of stages can be used to lift the water from the ground, from the depths up to 150 meters or more.




APB - ENERGY

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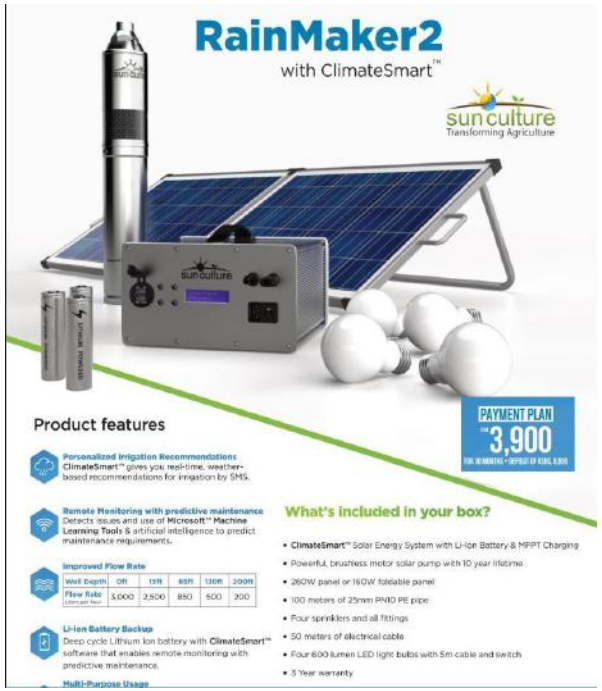
RainMaker2
with ClimateSmart™
sunculture
Transforming Agriculture
PAYMENT PLAN
3,900
Product features
Personalized Irrigation Recommendations
ClimateSmart™ gives you real-time, weather-based recommendations for irrigation by SMS.
Remote Monitoring with predictive maintenance
Detects issues and use of Microsoft™ Machine Learning Tools & artificial intelligence to predict maintenance requirements.
Improved Flow Rate
Well Depth | 0ft | 15ft | 65ft | 130ft | 200ft
Flow Rate | 3,000 | 2,500 | 850 | 500 | 200
Li-ion Battery Backup
Deep cycle Lithium Ion battery with ClimateSmart™ software that enables remote monitoring with predictive maintenance.
Multi-Purpose Usage
What's included in your box?
ClimateSmart™ Solar Energy System with Li-Ion Battery & MPPT Charging
Powerful, brushless motor solar pump with 10 year lifetime
260W panel or 160W foldable panel
100 meters of 25mm PN10 PE pipe
Four sprinklers and all fittings
50 meters of electrical cable
Four 600 lumen LED light bulbs with 5m cable and switch
5 Year warranty

Containerized Solar Solution

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Uses:

Doctor's clinic • Health screening by para medics • Cold storage of milk, vegetables and fish before collection • Vaccination centre • Centre for disaster management • Water purification systems

Specifications:

- Solar Panels: 4 – 8 kWp
- Inverter Rating: 6 – 12 kVA Hybrid
- Battery: Tubular gel, 3 – 4 hr at 60% Load
- Standard 20' marine container, 6 m x 2.45 m
- Free Area= 8 sq. m.
- Walls/Roof: Insulated with PUF

Solar Energy Corporation of India

Canal Top and Canal Bank Solar Power Projects

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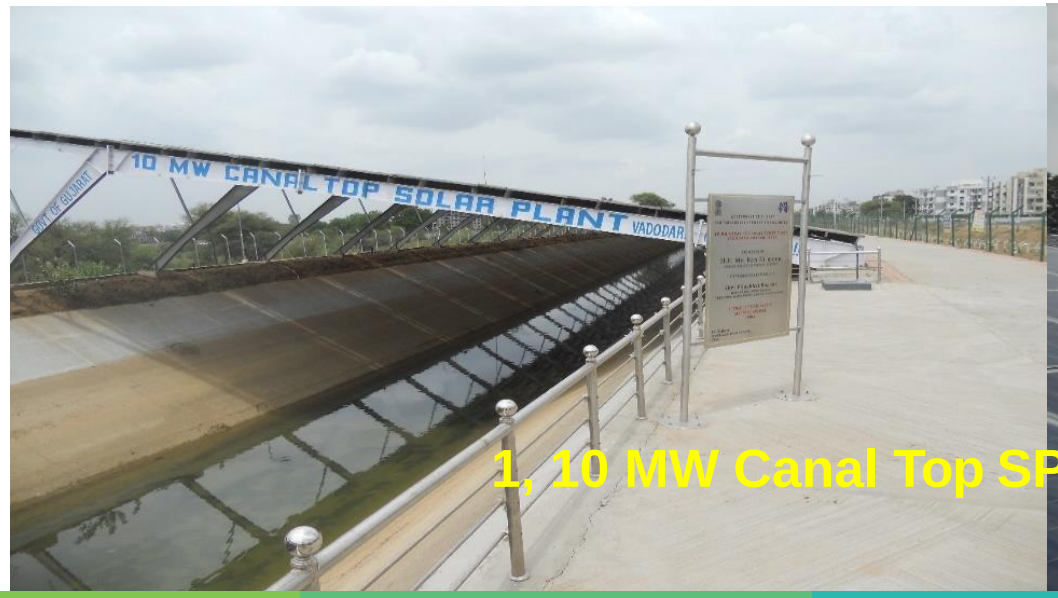
1 MW Canal Top SPV Power Project in Karnataka



1, 10 MW Canal Top SPV Power Project in Gujarat

Rooftop PV for residential applications

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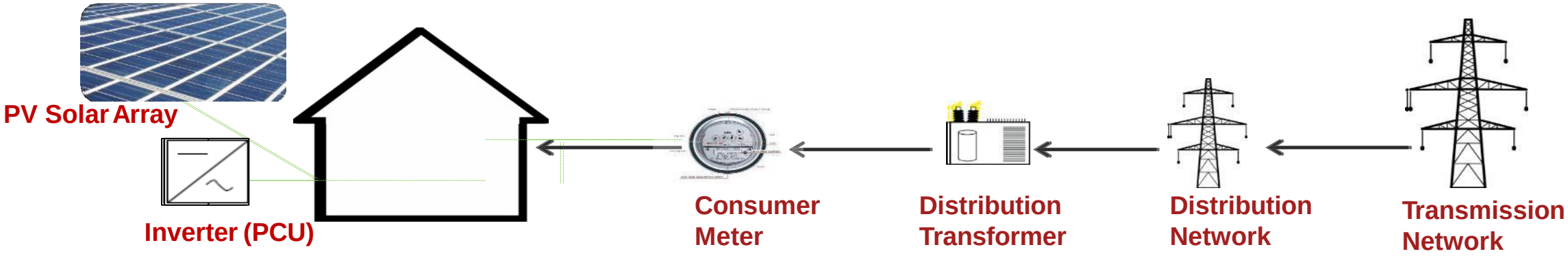

- Rooftop PV is an arrangement to utilize the vacant roof space to generate electricity.
- The electricity generated can be utilized for ***self-consumption and/or grid feeding***.
- Different types of inverters/PCUs are used for this purpose viz. Off-grid, Grid-tied and Hybrid.

Required Policy Framework

- ***CONNECTIVITY NORMS***
- ***METERING POLICY***
- ***SOLAR TARIFF POLICY***


PV Modules On PF-2 (Middle)
Katra Railway Station

400 kWp Plant : Chinnasawamy Stadium, Bangaluru

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648 MW Solar PV Power Plant in Tamil Nadu, India

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Floating Solar PV

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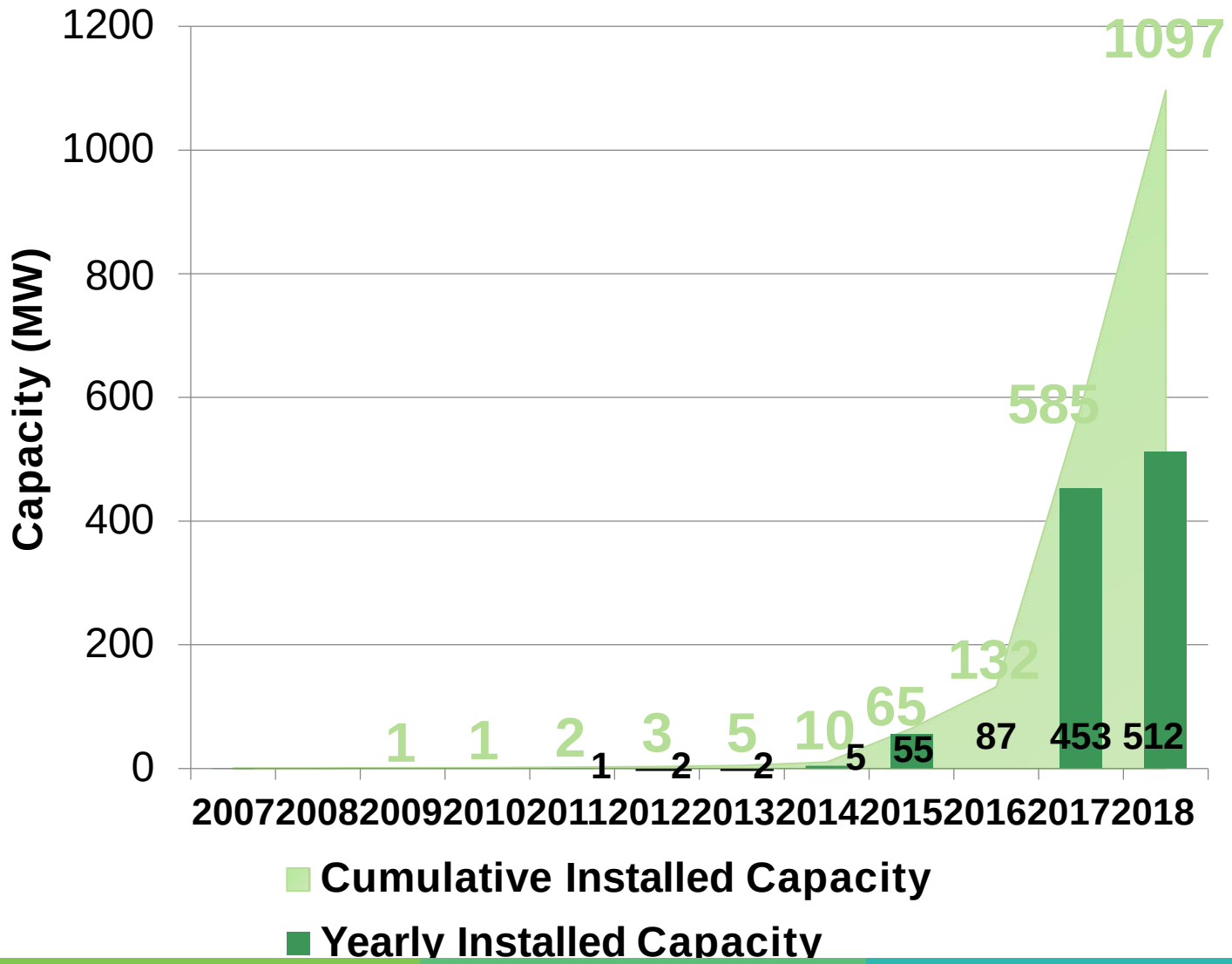

World's largest 150 MW plant in China

Solar energy and seawater

- *A desalination unit, without battery can produce few m³ up to hundred of 100m³ per day, or more when powered by hybrid energy sources.*
- **Gaza Province, Mozambique :** *30 m³ / day*

- **Cape Province, South Africa :** *100m³ per day*
- **Abu Dhabi, UAE :** *40m3 / day*

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Synergetic approach : solar energy & agriculture

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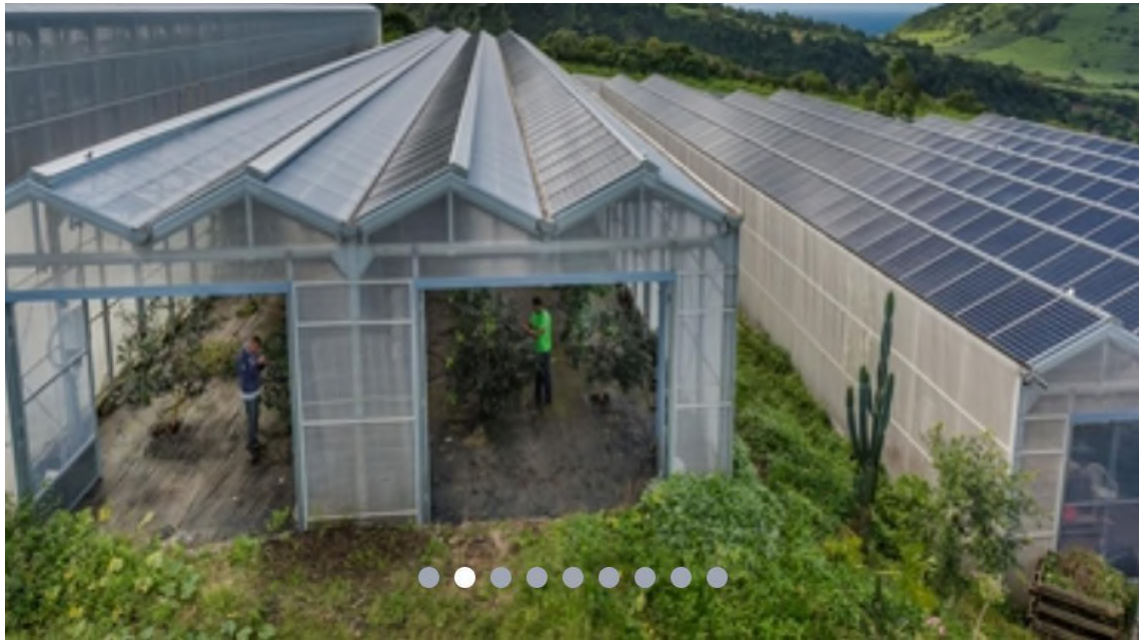
- No loss of agricultural land
- Greenhouses bring energy and food autonomy



Akuo Energy

- Species still to be adapted

Synergetic approach : solar energy & agriculture

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- Hail protection of orchards :
- Vineyards
- Apple trees

Solar Energy and aquaculture

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- No additional land required for fish farming

- Example in the Indian Ocean

Power and water management

- In slightly hilly areas, two reservoir tanks help in regulating fluctuating PV power.

Lanes, places

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Lanes in parking lots

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PV charging station, with storage and grid connection

Corsica Sole / Driveco

1 m² supplies « 1 000 km / year* »

One parking place allows 15 000 km / year*

* : average in France

Transport applications

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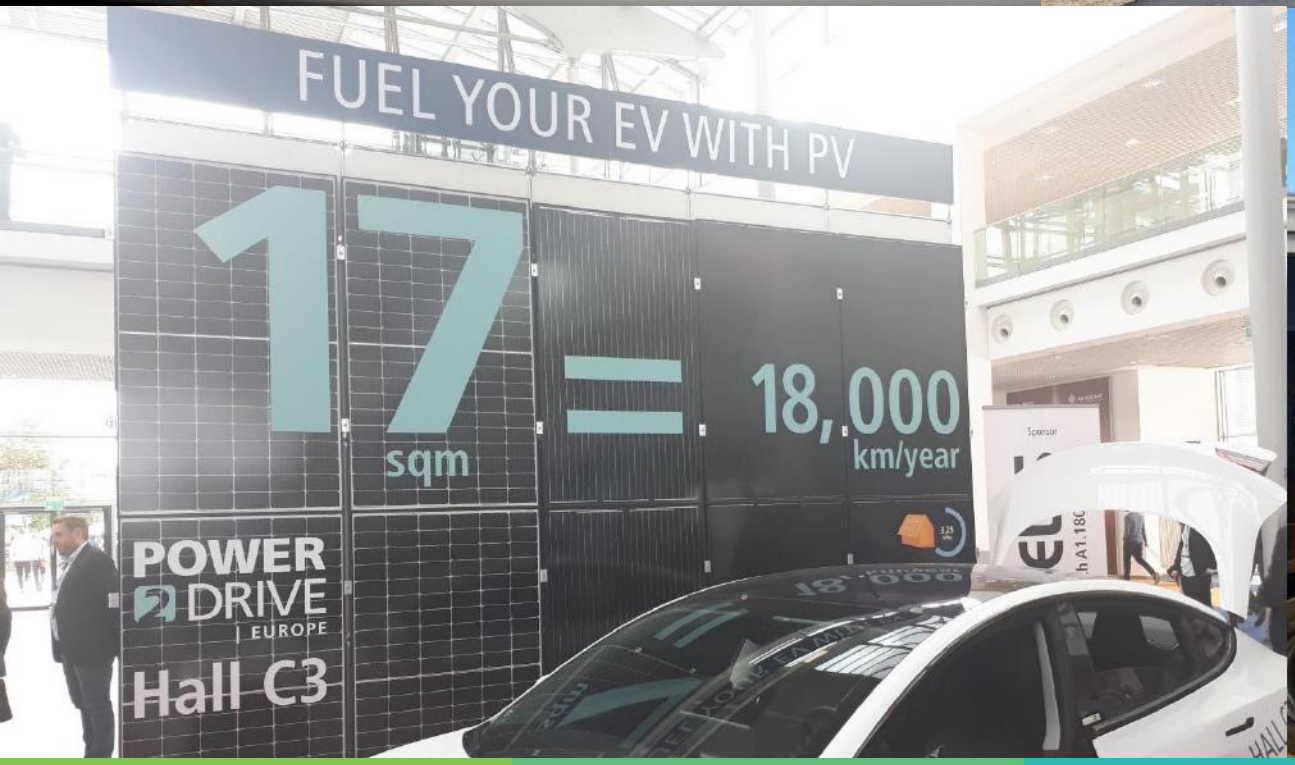

Mobility services in emerging countries

Vehicle-Integrated PV

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Family sized Solar Electric Vehicle with 255 km range (WLTP), an additional natural air filtration system, at a retail price of €25,500 incl. battery

Integrated solar cells that recharge the Sion, for up to 34 km/day in Munich

34km / sunny day in Munich

> 10,00 Reservations

Innovative peer-to-peer services such as carSharing, rideSharing and powerSharing

Open source strategy for O&M and repairs

Ein Bild, das Auto, Himmel enthält.

Automatisch generierte Beschreibung

2019

SONO MOTORS

Within airports

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Future applications

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FRANCE EXPO 2020 DUBAI

COFREX

Distributed PV share will gradually increase

Key takeaways from this section

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An increasing variety of applications :

- Off-grid, for improving living conditions in rural areas, and now for productive uses
- On-grid : from small-scale domestic use in villages and cities to transport applications and large-scale power plants

Many advantages :

- Modular, easily installed, evolutive,
- Limited externalities
- Multifunctionality and integration, towards local revenues optimisation and increased resilience

All sectors & ministries are concerned….

- Power grid, buildings, transportation, industry, agriculture, etc.

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3. Technical Innovation

A technology with many potential materials & Designs

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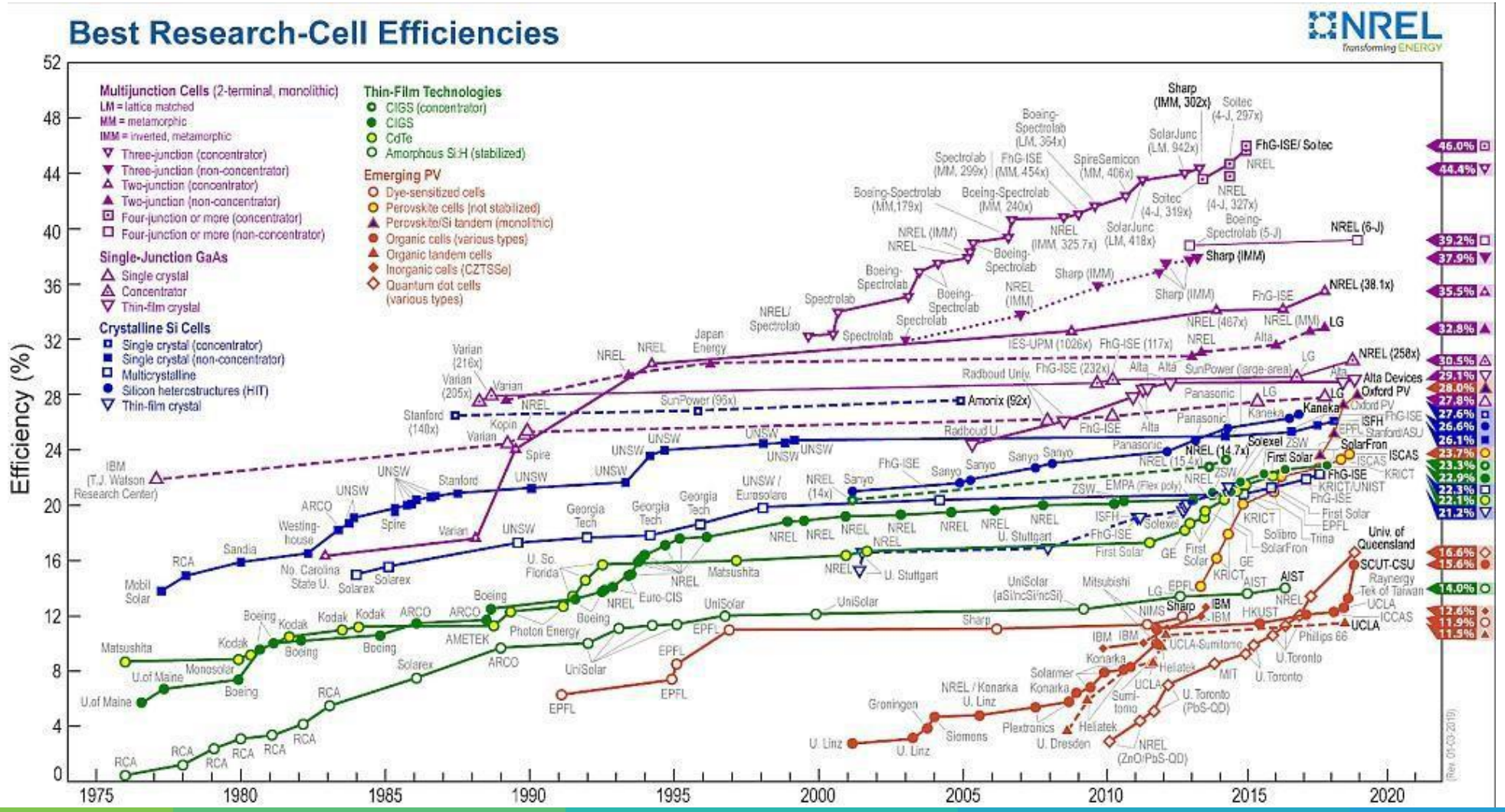
Four decades of innovation, with still new candidate materials coming in :

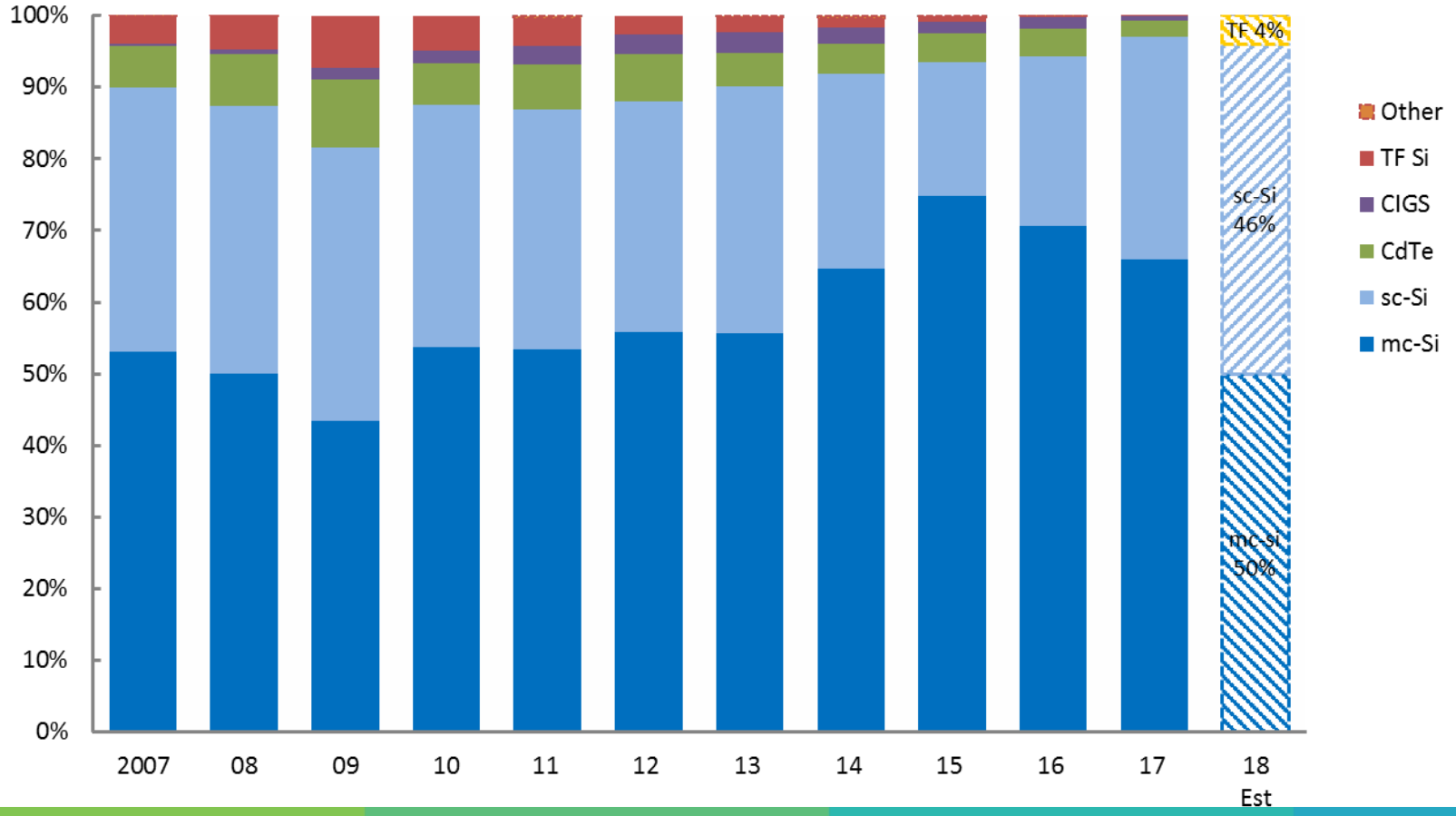


PV module production by technology

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

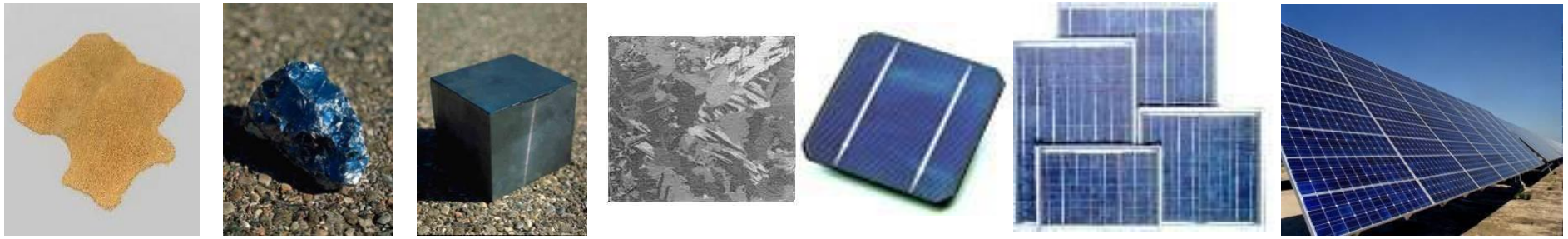
Silicon technologies are dominating all others, due to the best trade-off between :

- Cost
- Efficiency
- Lifetime



The silicon technology value chain

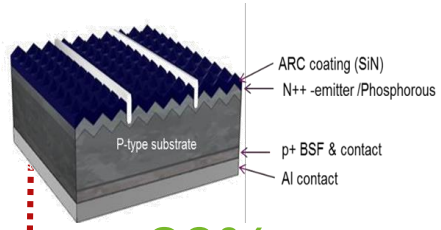
- From silicon to modules and systems



Silica	Purified Silicon	Ingot	Wafer	Cell	Module	Systems
	Various processes Cast or Cz		Sawing	Surface treatment	Lamination	Mounting, wiring

Silica is the second abundant material on earth, (28%) after oxygen (47%).
Around 900 000 tons of silicon are used by industry.

EVOLUTION OF SILICON TECHNOLOGIES

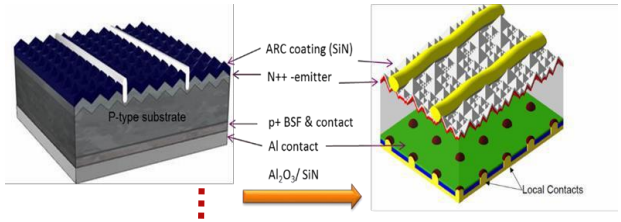


20%

AlBsf

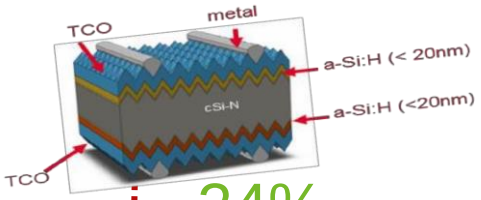
State of the art

22%



PERC

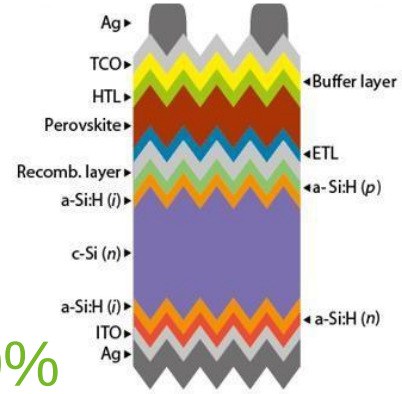
Incremental innovation



24%

SHJ bifacial

Breakthrough



30%

SHJ Tandem

Disruption

Innovation results from long-term support

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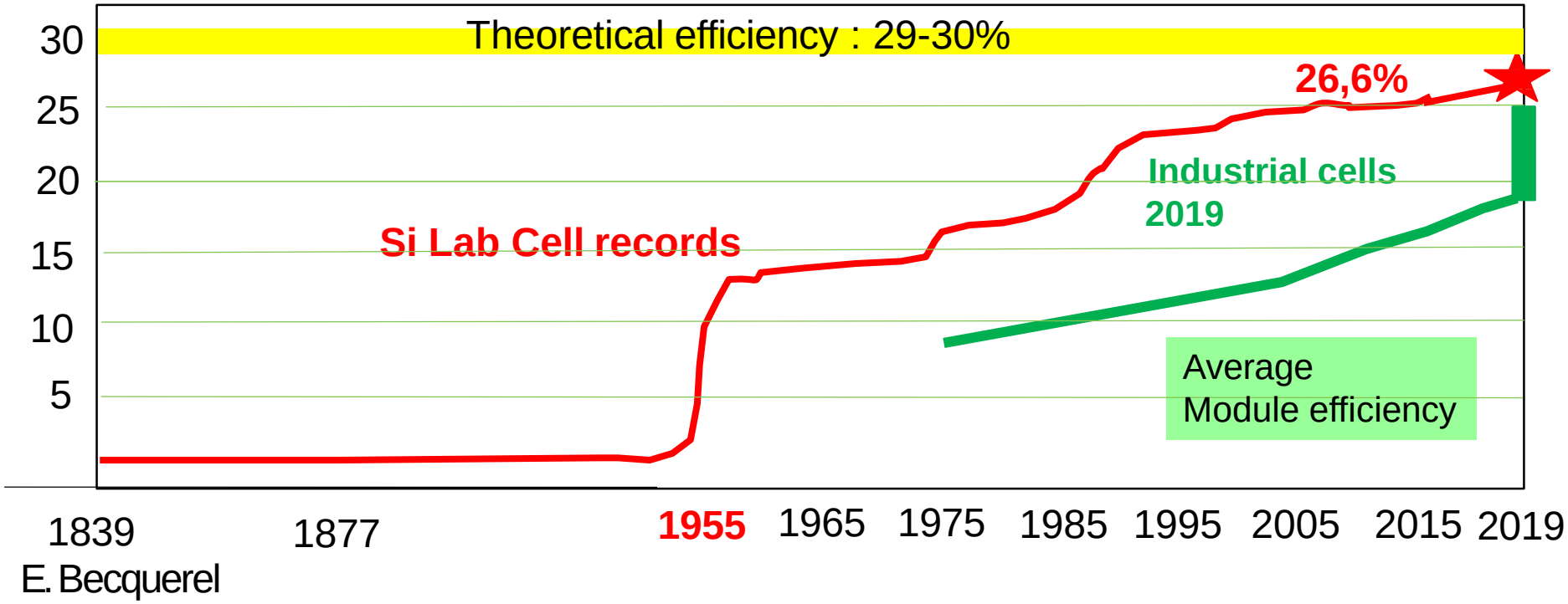

- Innovation : new concepts, new designs, new processes for increased throughput capacity in order to end up with the best cost-effective solution
- Innovation takes time : at least 10 years between lab results and manufacturing at scale

Innovation at the system level slightly quicker

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Main objectives, main features :

- Higher performance
- Higher reliability
- Higher throughput

- Better integration
- Easyness of installation
- Plug and play approach
- Data management, for better valorisation of the energy and lower cost of maintenance, through increased prediction

Fostering Innovation on all solar energy aspects

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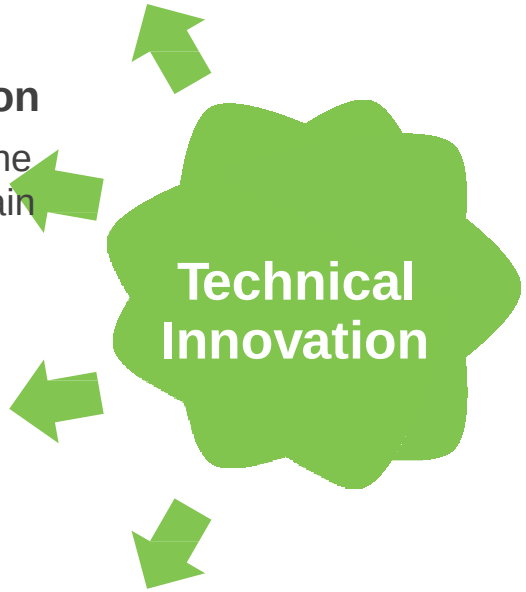
Lab research
Basic and applied

Pilot lines, industrial innovation
Upstream and downstream the value chain



Demonstration projects
In all sectors

Large-scale Dissemination
involving all stakeholders

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4. Non-Technical Innovation

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How to act ?

- How to start solar implementation ?
- How to speed up existing dissemination ?
- How to optimise the benefits to the local economy ?

Usual obstacles to the scaling up of solar energy

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- The lack of awareness, lack of local know-how, lack of finance, lack of quality project and equipment are common

Lack of awareness, scepticism, lobbies

Local policy framework

- Energy policy
- Regulations
- Planning
- Information dissemination

Local know-how

- Human resources
- Project management
- Quality

Financing

- Risk mitigation
- Business models

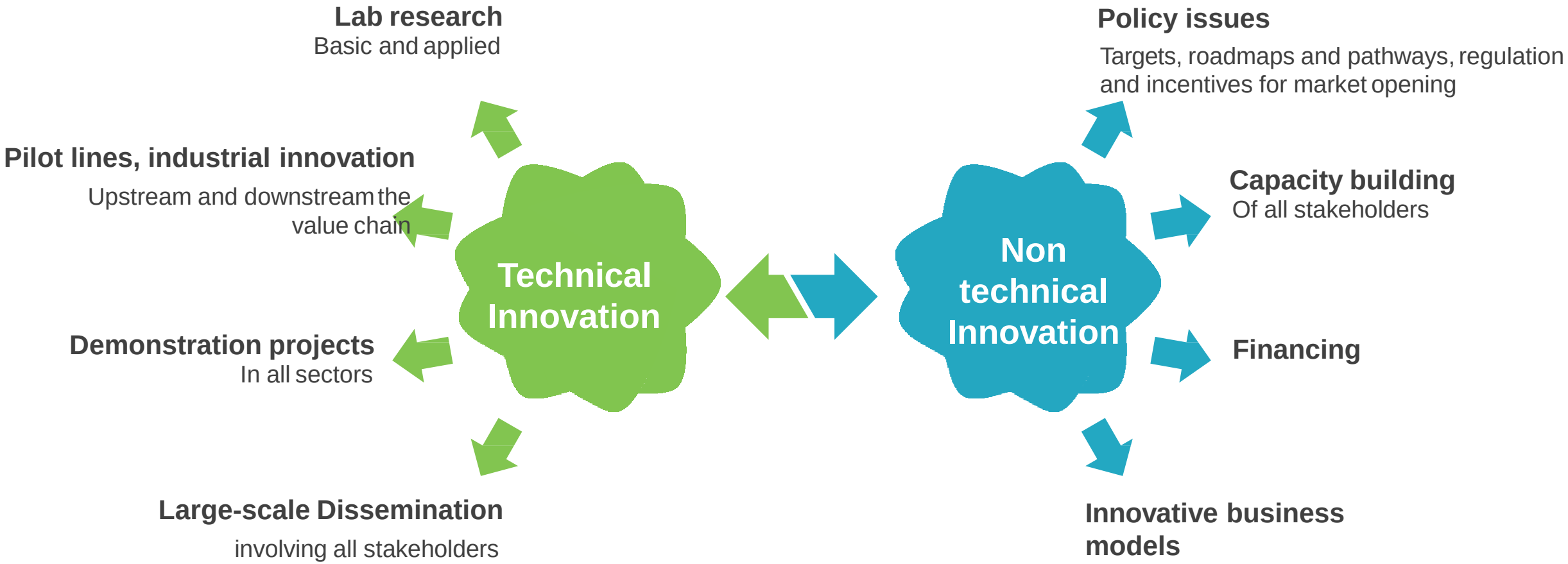
Innovation

R&D, tech transfer, availability of equipment

Perception of obstacles may be different, according to the various stakeholders

Fostering Innovation on all solar energy aspects

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY



Defining and disseminating targets : X % RE by 2030, 2050…

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1. First step is a review of the needs
2. Second step is to define ambitious goals at the government / regional levels :

- Planification and priorities, in terms of share of renewables within the energy mix
- Short-, medium- & long-term objectives :
  - by applications and technologies : off-grid rural electrification (residential kits, minigrids PV-genset), grid-connected applications
  - among regions, cities, communities

3. Third step is to share this information among all ministries : energy, finance, economy, agriculture, health, education, industry, transportation, buildings, for them to take actions :

- Enabling environment, regulatory framework, financial incentives, etc.
- Demonstration projects, programmes, etc.

Many studies available now regarding 100% RE scenarios

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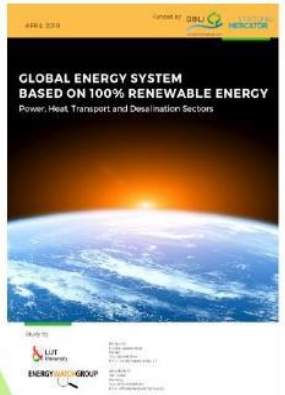
New Study by LUT shows:

ENERGYWATCHGROUP LUT University

The energy transition is not a question of technical feasibility or economic viability, but one of political will.

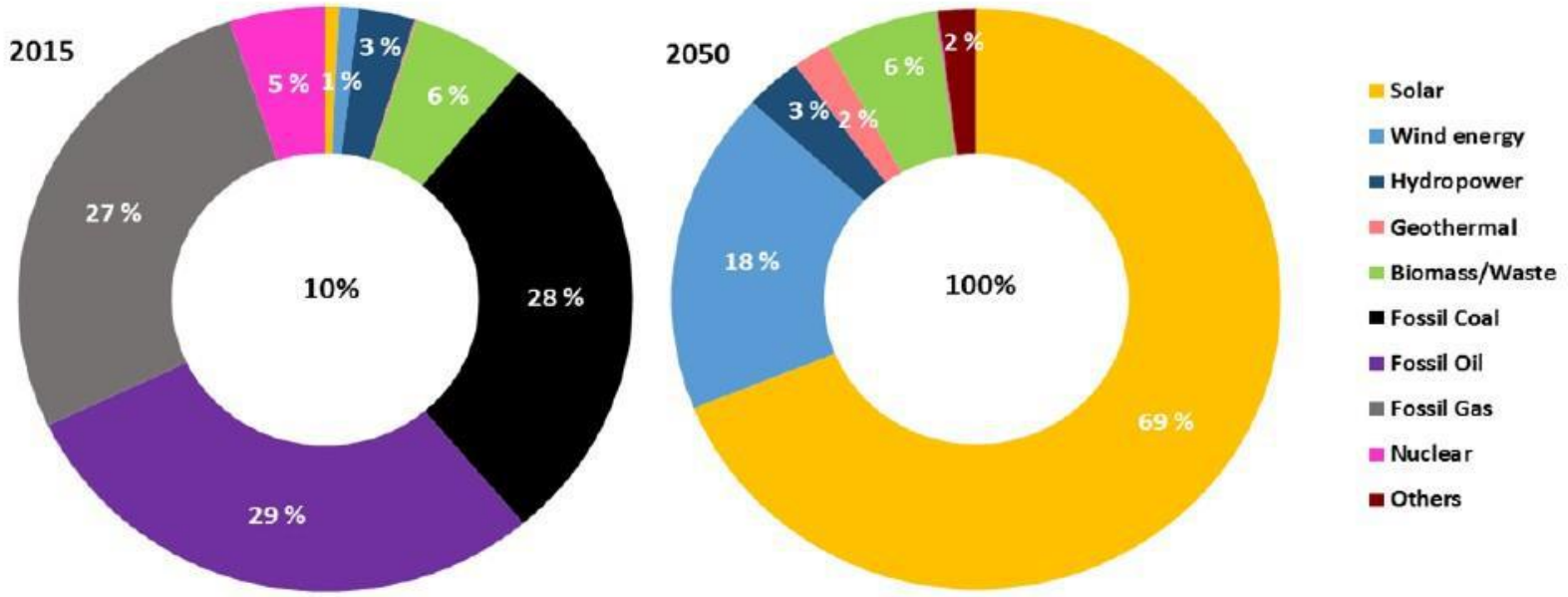


100% renewable energy worldwide is more cost effective than the current energy system and leads to zero emissions before 2050.

Largely domestic energy systems based on 100% renewables will create energy independence and support millions of local jobs in the energy sector.

STIFTUNG MERCATOR DBU

Solar and Wind Will Dominate the 100% Renewable World



Primary energy source	Solar	Wind	Biomass/ Waste	Hydro	Geo-thermal
Share in 2050	69%	18%	6%	3%	2%

Policy pathways : many options

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Other kinds of support

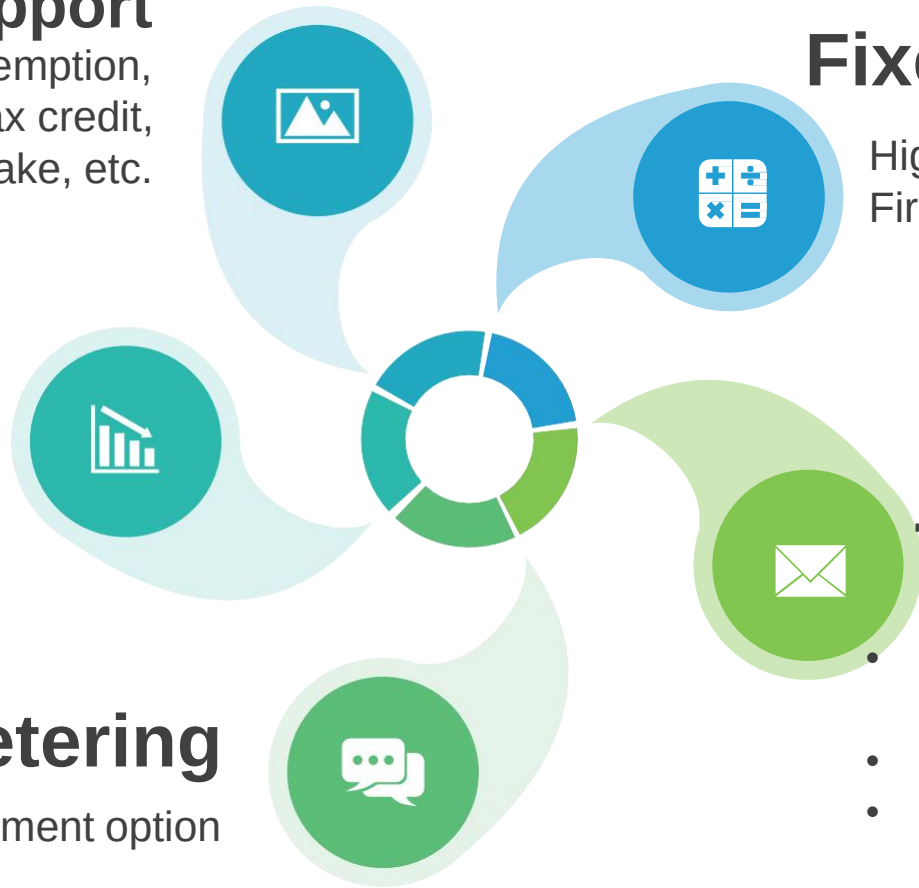
Solar parks, tax exemption, investment tax credit, guaranteed off-take, etc.

Fixed Feed-in tariffs (FiT)

High visibility,
First used in Europe in 1990s

Renewable Portfolio standards

Commonly used in the USA



Tendering + FiT

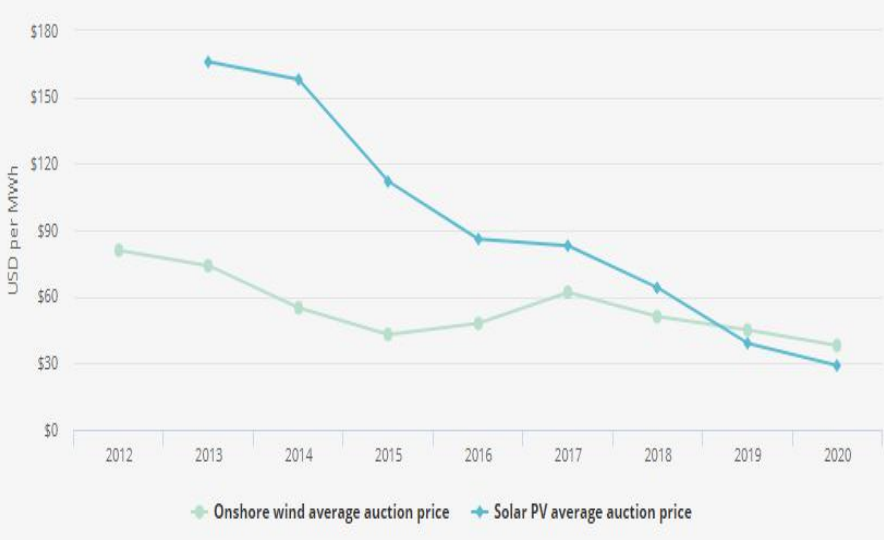
- Commonly used worldwide for large power plants
- Least-cost option
- Orienting the solutions towards the needs

Net metering

Easy to implement option

Competitive bidding or reverse auctions : a powerful tool The least cost option

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY



$30-45$_{/MWh}$ PV (India, Mexico, UAE, Argentina)
$35-50$_{/MWh}$ onshore wind (India, Morocco, Egypt, Turkey, Chili)

Denmark's wind-solar auction ends with average price of €0.031/kWh, and almost 40% of capacity assigned to solar

Although wind power had the largest share with 165 MW of capacity, solar was able to secure the same number of projects and a total capacity of 104 MW. The Danish Energy Agency had received 17 bids, including 280 MW of solar projects.

DECEMBER 3, 2018 EMILIANO BELLINI

MARKETS POLICY UTILITY-SCALE PV DENMARK

Evolution of Solar Tariff: Indian Example

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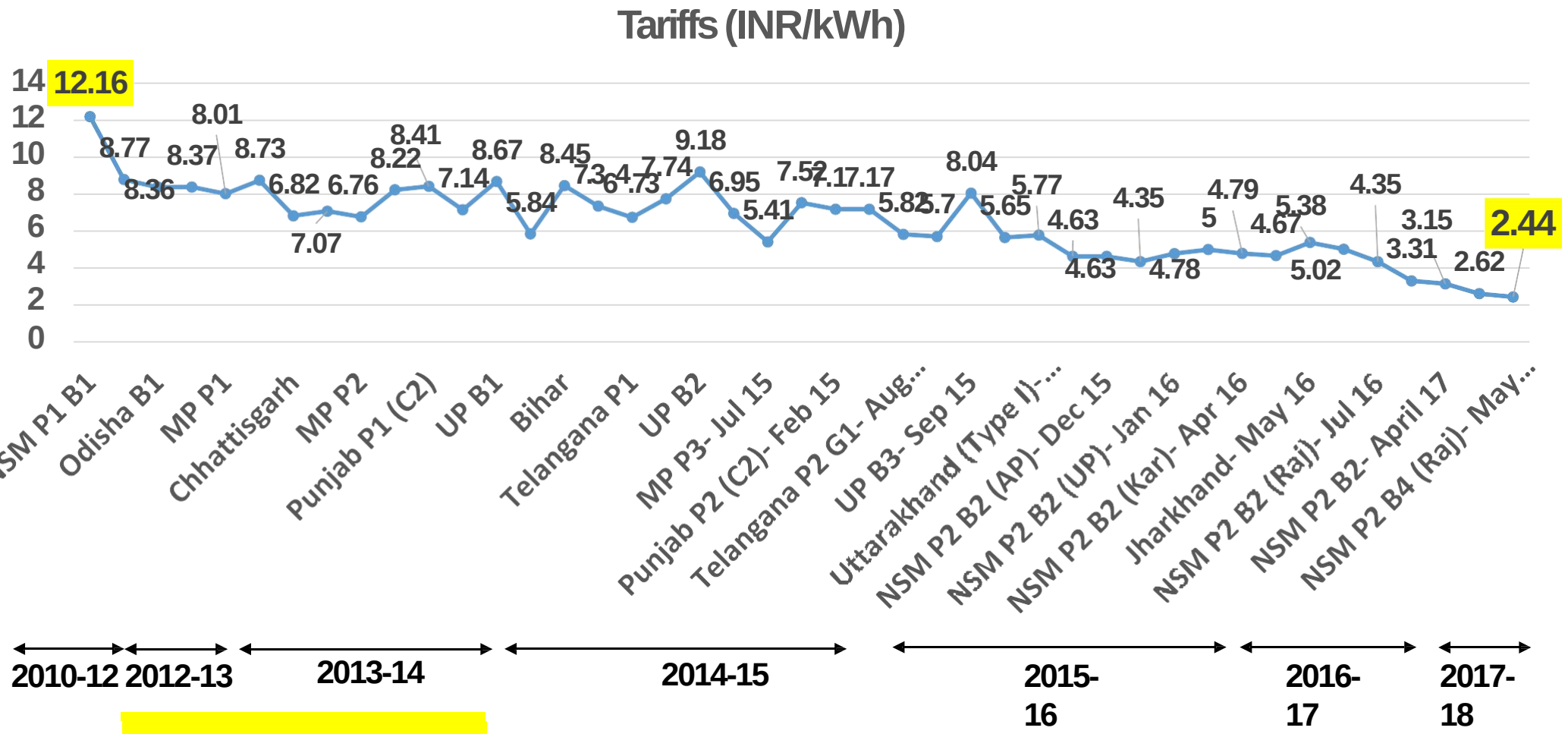

INR 12.16 = US$ 0.174
INR 2.44 = US$ 0.035
1 US$ = INR 69.67

Competitive bidding, or reverse auctions : a powerful tool

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

1. The least cost option
2. An option with **specific criteria**, to drive the process according to priorities and policies

Criteria	**Objectives**	**Examples**
High efficiency modules	Support innovation and industry	« Top-runner programme » in China
PV + Wind, PV + storage, specific applications : Buildings, carports, etc.	Response to needs and priorities, support innovation	Denmark, Germany, France
Use of hazardous substances, eco-labelling	Environmental, health	EU
CO2 content	Climate	France
Aesthetics	Architecture	France
Use of specific lands (damaged)	Territorial planning	France
Citizen participation into the investment	Social acceptance	France

Solar Parks: Concept and Approach

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- Solar Parks aim to achieve solar targets through
  - providing well characterized and properly infra-structured land provided with transmission and evacuation facilities, and
  - thereby ***minimizing the risk as well as the permitting process***.
- SOLAR PARKS are established jointly by Central and State governments.
- Land area by the State Governments and support to setting up infrastructure by the Central Government (***up to 30% of the project cost subject to INR 20 lakhs/MW***).
- Solar Park may hold several solar power plants each developed by separate or the same groups/promoters.
- Filling up of Parks through solar projects under Government's schemes; generated power could be procured by any of the States. Host State to buy at least 20% of the capacity of solar park.

Key takeaways from this section

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

Innovation through a variety of policy options

On-grid applications : No standard recipe. Visibility is a must to reassure investors, flexibility also to follow the roll-out

Off-grid applications : public / private initiatives to align

Whatever the selected option, guidelines are a must

The devil is into the details

A strong need for reforms and changes

- A major geopolitical change underway

Fostering Innovation on all solar energy aspects

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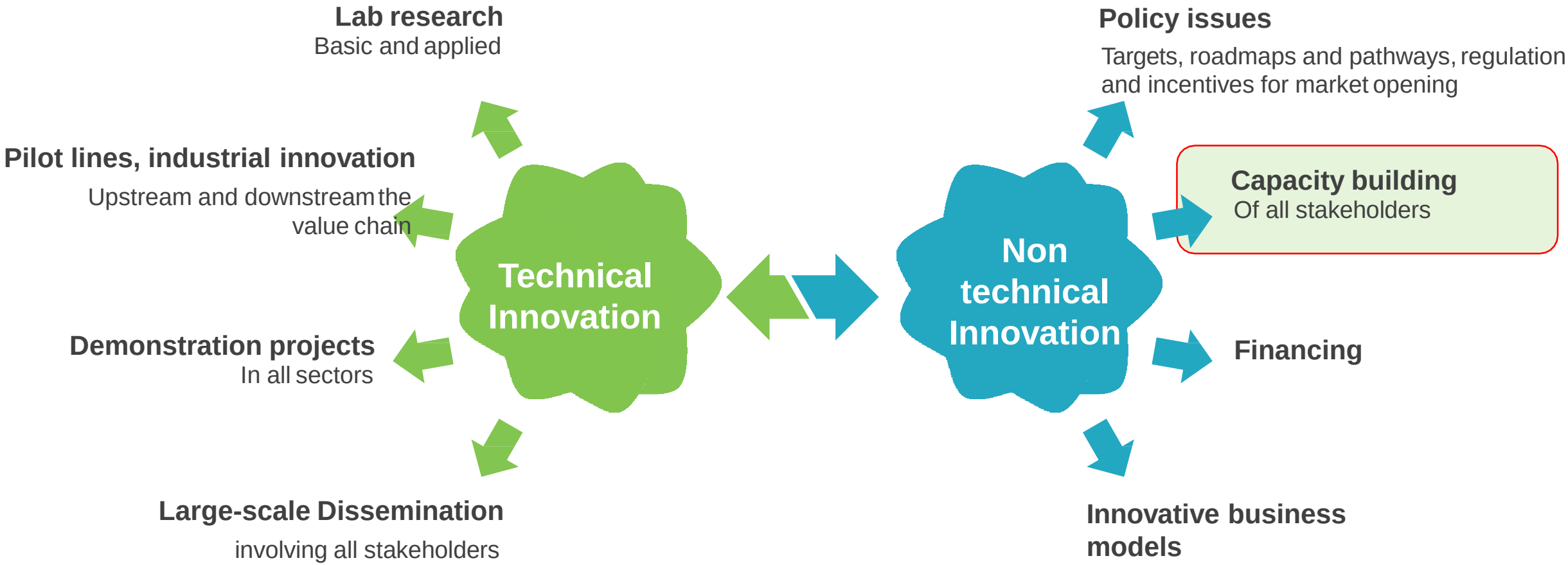

Capacity building

- Of all stakeholders, in a coherent manner, in order to incentivize them and to increase :
  - The number of programmes and projects,
  - Their bankability,
  - Their local content,
  - Their overall quality, therefore the end-user satisfaction

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Capacity building

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- The ISA' STAR C programme is designed to address all of these activities

- Bundling these activities on a regional level could speed up the learning process :
  - Exchange of practices
  - Reuse of existing training material

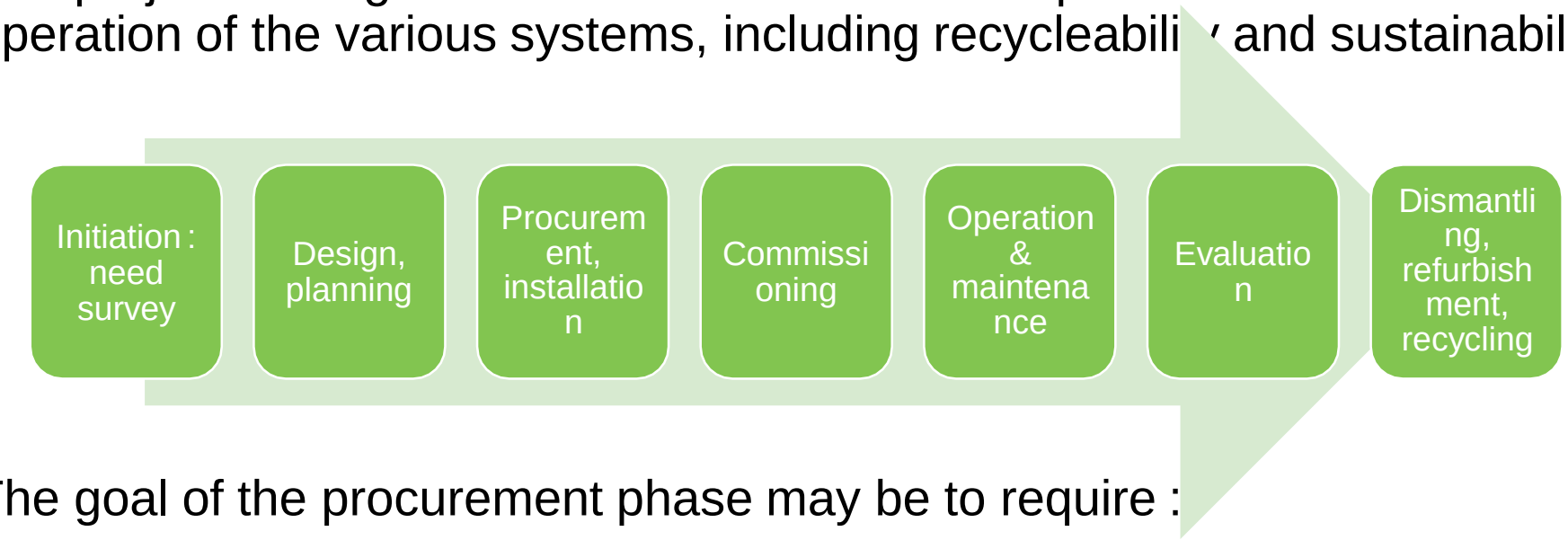
Strengthening local infrastructures		
Training (face to face & e-learning)	Benchmarking, testing	Technical innovation, customisation

Innovation in project management

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

- Long-term objectives at the country level are necessary :
- To help in the alignment of all stakeholders within implementation programmes
- To make each project implementation easier

- The project management should cover all the steps from the need survey to the long-term operation of the various systems, including recycleabili y and sustainability aspects



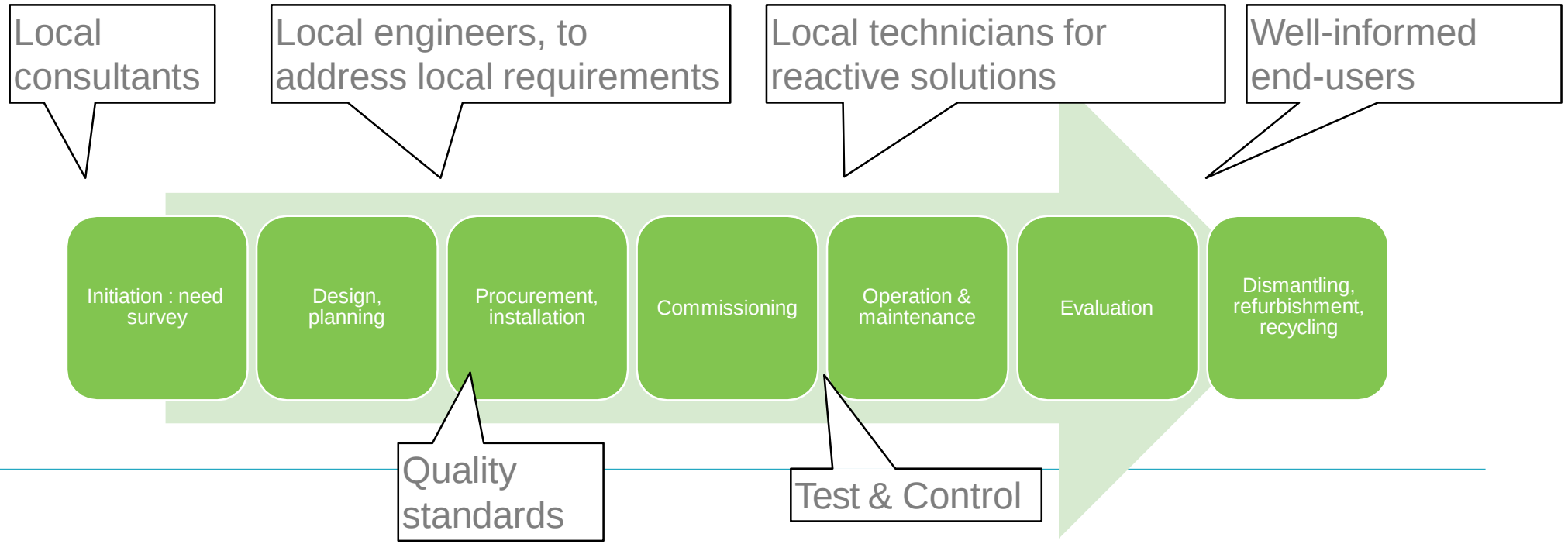
- The goal of the procurement phase may be to require :
  - The provision of equipment and systems,
  - A service-oriented approach over a long period to ensure customer satisfaction

Guidelines, Standardized tendering documents

Quality assurance

- Quality is of utmost importance in order to avoid user dissatisfaction, poor image and increased overall costs (Buy « cheap stuff », buy twice).

- It should be ensured at all stages of project implementation, with skilled project managers, acting with well-trained stakeholders :



Technology transfer, local content

- Innovation supports technology transfer and local content, provided the tax policy is coherent.

- Local content requirements may also be added :
- Training / employment of workforce for local assembly, installation, operation & maintenance, repair, etc.
- Use of local materials (foundations, supporting structures, wiring, etc.)

Job development

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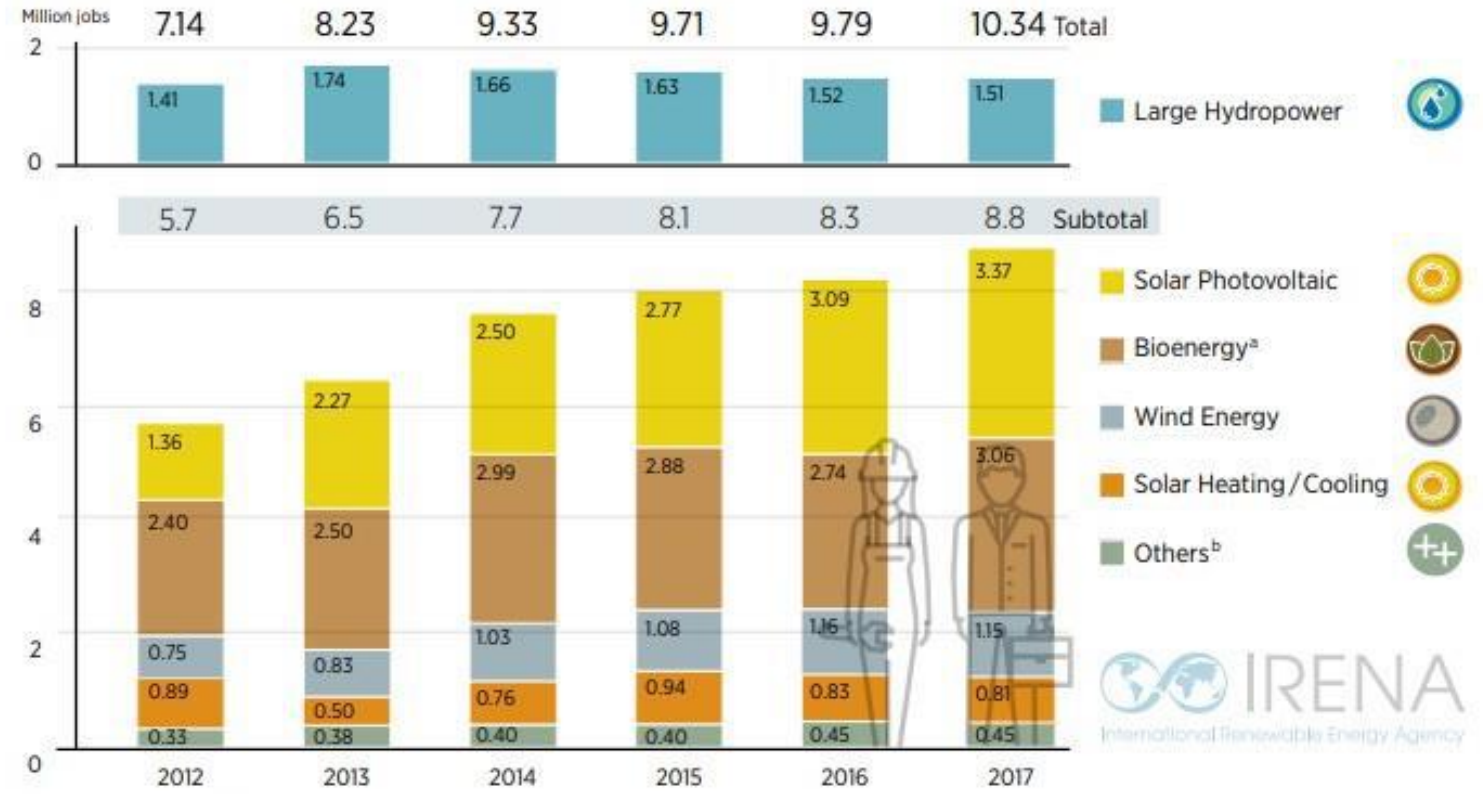
- The Solar PV industry sector is currently the largest employer among renewables, especially in China and India.
  - almost 3.4 million jobs
  - up 9% from 2016 to 2017



Source: IRENA jobs database.

Note: The numbers shown in this Figure reflect those reported in past editions of the Annual Review.

a Includes liquid biofuels, solid biomass and biogas

b Other technologies include geothermal energy, hydropower (small), concentrated solar power (CSP), heat pumps (ground-based), municipal and industrial waste, and ocean energy.

Job development

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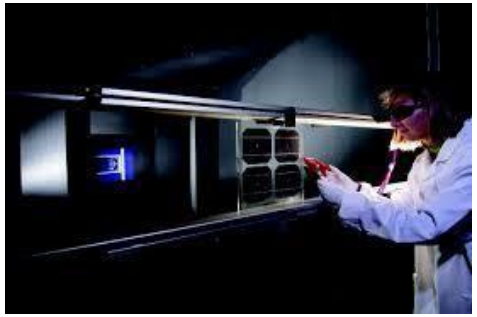
Which talents, for which positions ?

Installer

Construction

Design, sizing

O&M



Technician

Teacher / researcher

Bank, financing

Insurance

Socio-economic impacts, in general

1. For all end-users, reduction of the electricity cost, for an improved purchase power

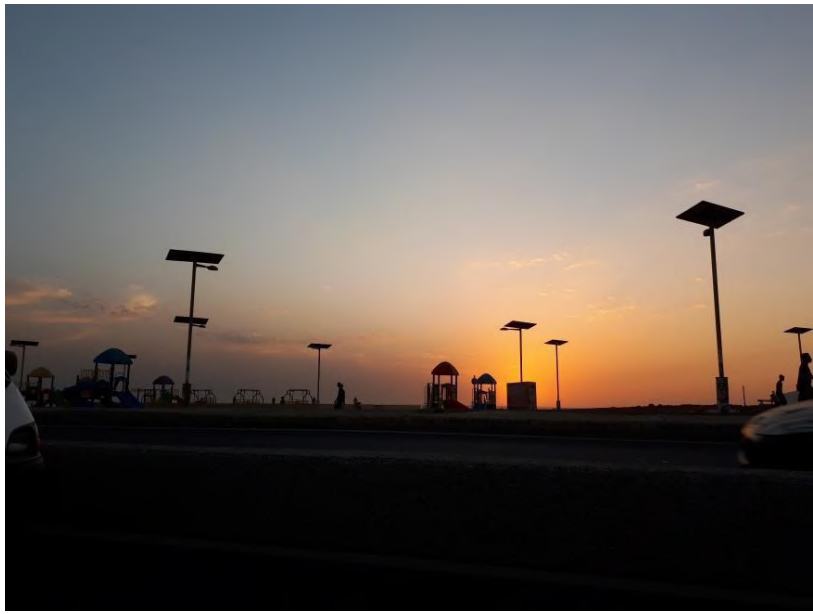
2. At the country level :
   - Reduction of the balance of payment deficit, when fossil fuels are imported
   - Job creation :
     - Cell and module manufacturing (when available)
     - Related to local content activities : supporting structures, wiring, module customisation, etc.
     - Installation and maintenance
   - On the long-term, access to the cheapest power supply to energy-intensive industries

Socio-economic impacts: energy access

- Changing lives by bringing light, water, telecommunications, and productive uses

  Upfront investment or third-party financing and then « Pay as you go » or « Pay as you grow » services :

  - Lighting,
  - Phone charging
  - Cooling,
  - Watering,
  - Etc.



- Therefore reducing rural-urban migration and negative impacts of growing slum areas

Fostering Innovation on all solar energy aspects

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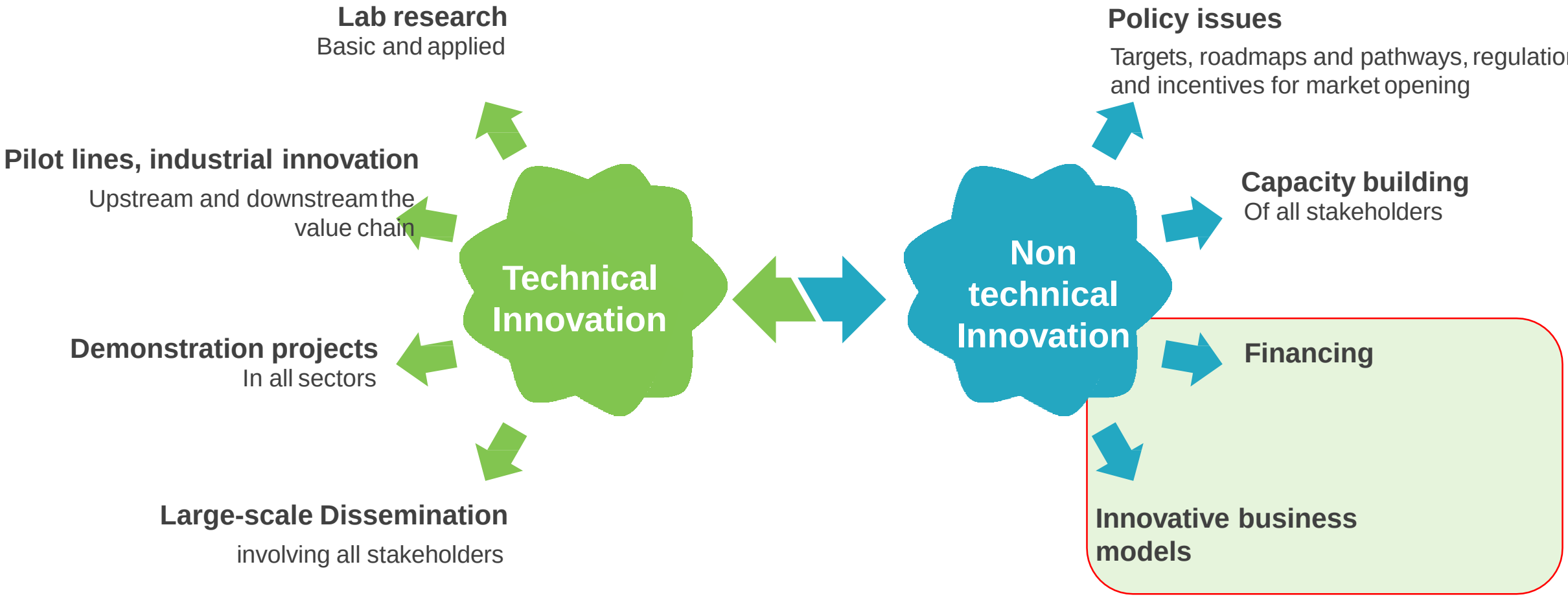
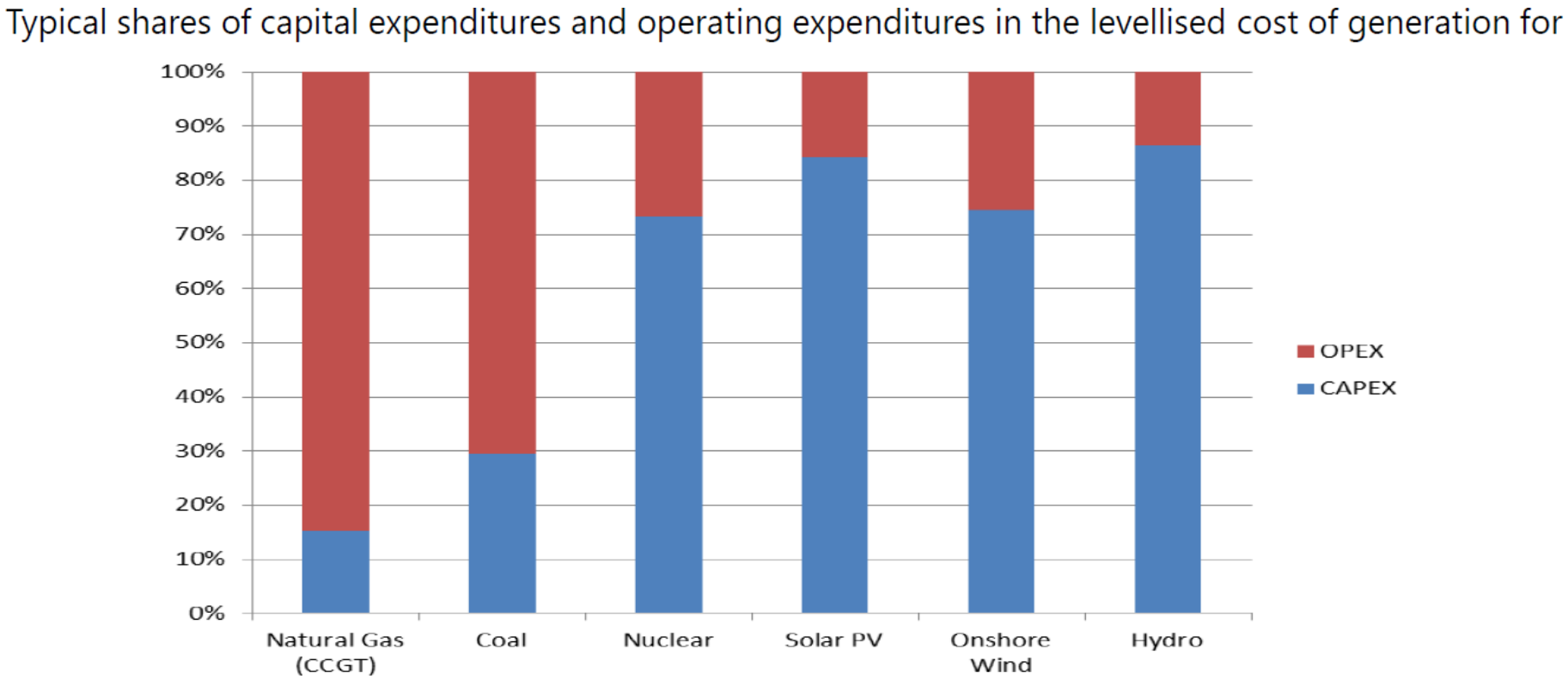


Renewables are more capital intensive than other energy sources



- The upfront cost of solar projects is significantly higher than of thermal and gas projects, even as per unit of electricity solar is now competitive with other sources of power in most economies
- The large upfront capital requirements makes the total costs more vulnerable to risks

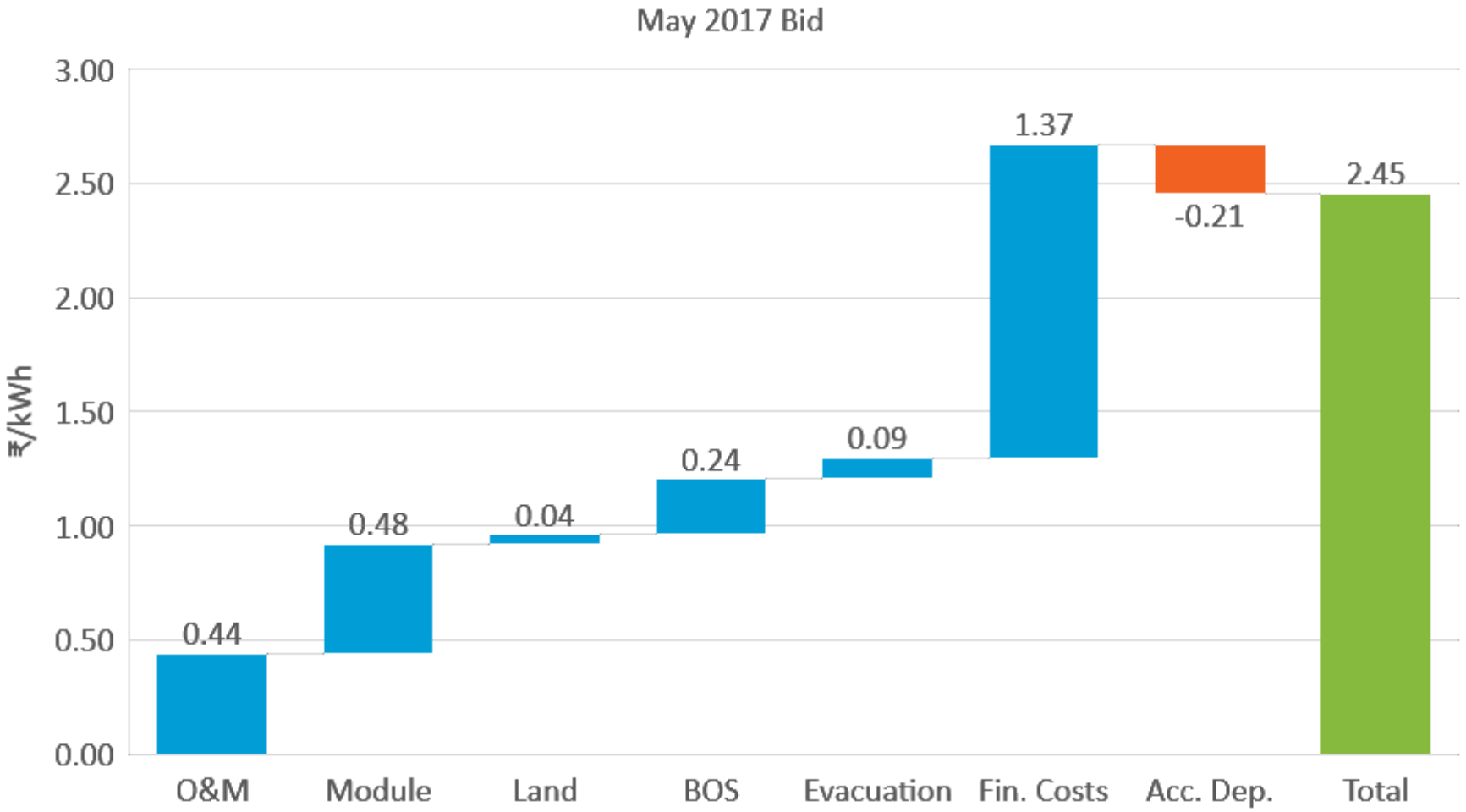
Source: IEA; CEEW

Risks identified by the market

- **Offtake Risk (Delays or defaults in payments)**
- **Curtailment risk**
- **Foreign exchange risk**
- **Land acquisition and construction risk**
- **Policy uncertainty and change in law risk**

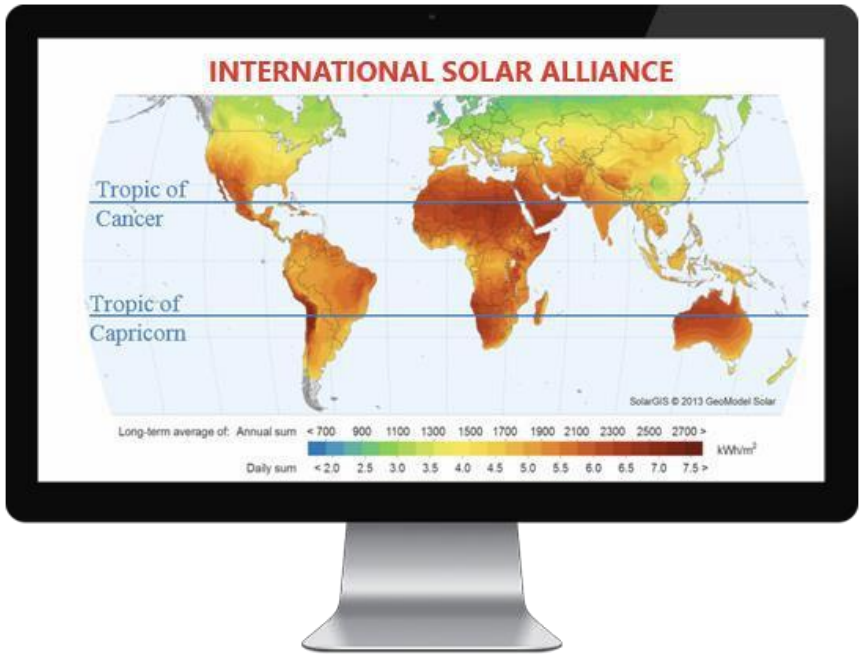
Source: Authors

Anatomy of an REtariff: risk perceptions determine costs of finance



SOURCE: CEEW (2017)

International Solar Alliance: A new kind of energy partnership

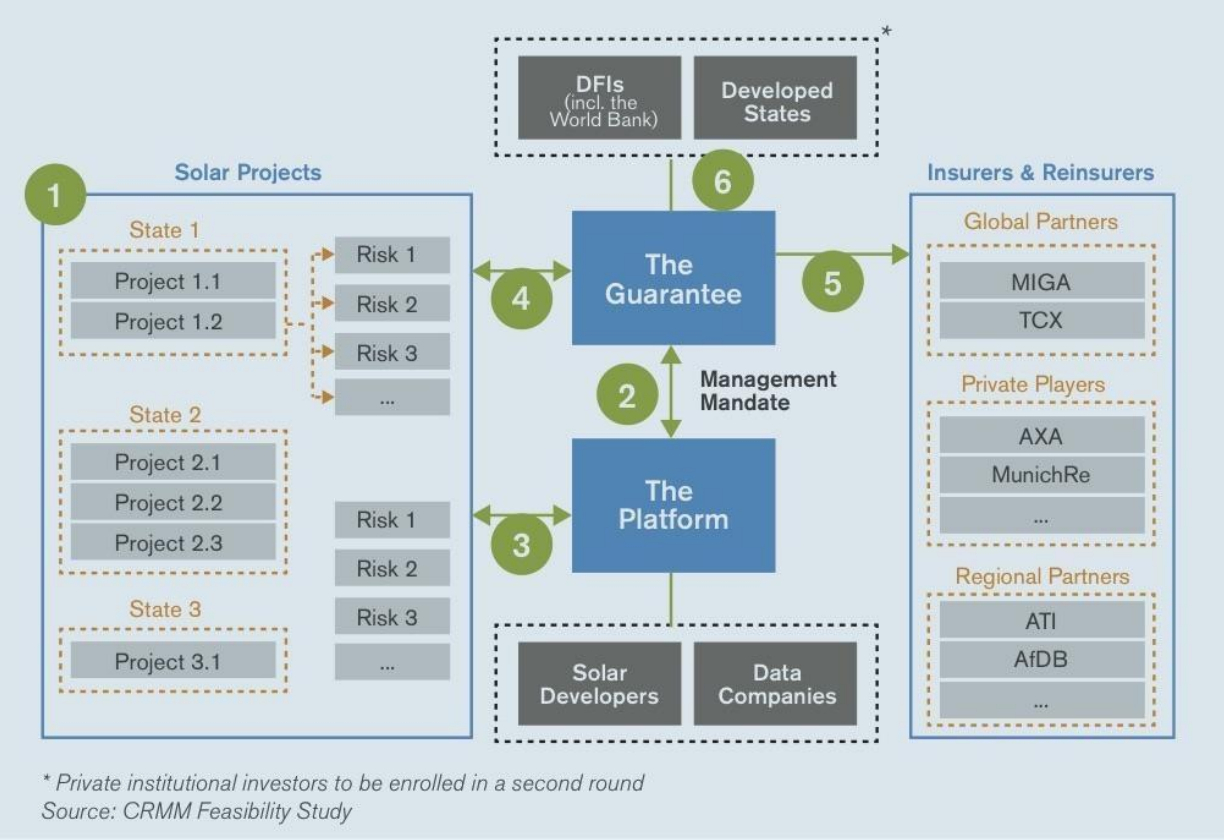


Recognizing that sustainable development, universal energy access, and energy security are critical to the shared prosperity and future of our planet, and acknowledging that clean and renewable energy needs to be made affordable for all, we do hereby declare our intention to support India's proposal to launch an international solar alliance as a common platform for cooperation among solar resource rich countries lying fully or practically between the Tropics of Cancer and Capricorn.

SOURCE: PTI; www.isolaraliiance.org

Designing a silver bullet…

Common Risk Mitigation Mechanism (CRMM), for mitigating non-project specific risks (currency, offtaker, and political risk)



www.opensolarcontracts.org

Now available for review :

- Power purchase agreement
- Implementation agreement
- O&M agreement
- Supply agreement
- Installation agreement
- Finance term sheet

Source: CRMM Feasibility Study (2017)

Key takeaways from this section

CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

A holistic and innovative approach is required

Capacity building of all stakeholders is a must to ensure :

- Bancability and the optimisation of the added value to the country
- Quality of the systems and services
- Job creation

Gradual and coherent actions in all directions

- Avoid a « stop & go » approach, encouraging gradual investments
- Standardise procedures, especially for financing
- Aim at long-term job creation

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5. Conclusions

Solar energy & the green economy : Conclusions

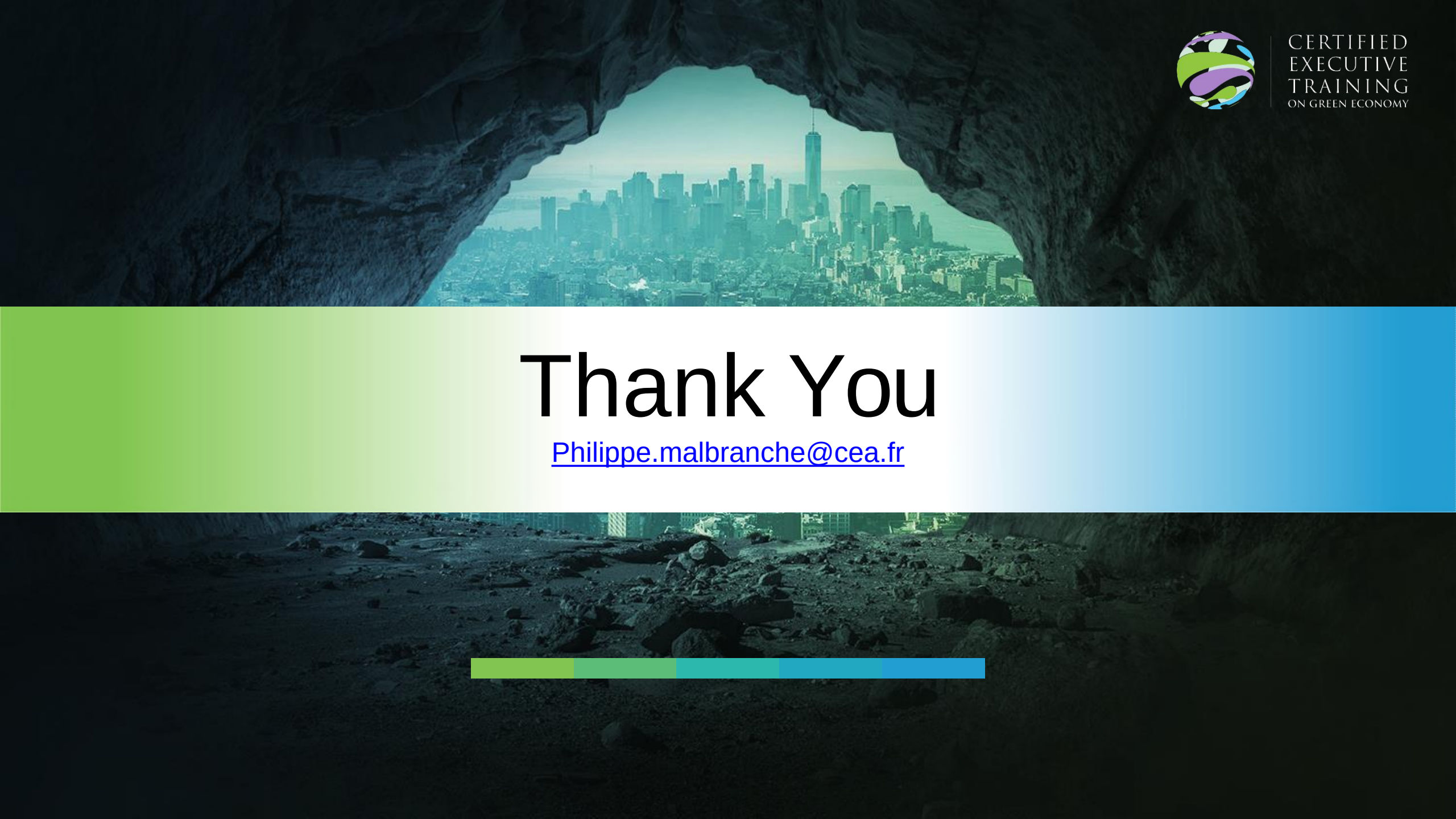
CERTIFIED EXECUTIVE TRAINING ON GREEN ECONOMY

1. A major technology to address climate emergency by speeding up the transition off fossil fuels.

2. Four decades of gradual and impressive improvement, allowing energy access or reaching grid parity everywhere.

   However solar energy is only at the beginning of a peaceful revolution, in which solar energy will be key to implement a green economy in most countries.

3. A very hopeful future : once we know, once we realise, then we change, then we act. We need finance, speed, scale and therefore skills for the required large-scale implementation, and that's what ISA is dedicated to.



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Thank You

Philippe.malbranche@cea.fr