











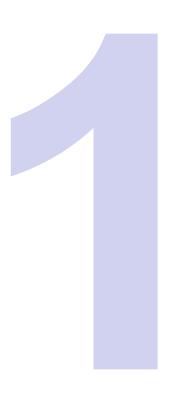




REmap 2030: Renewables for industry sector

- focus on commercial solar thermal -



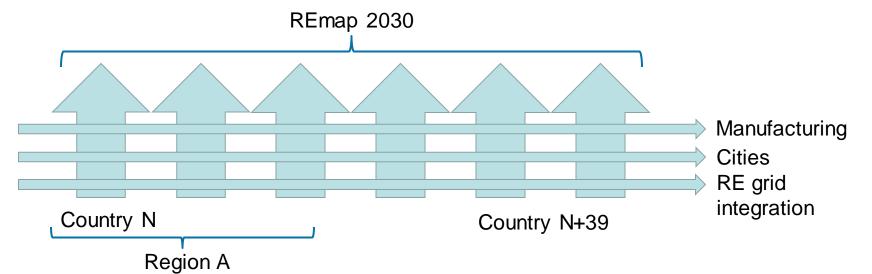


# **REmap 2030**

# REmap 2030 - A roadmap for doubling the RE share



- REmap explores the potential, cost and benefits of doubling the renewables share in the global energy mix
- From RE objective of SE4All, for which IRENA is hub
- Technology options, emphasis on end-use incl. heat
- Coverage: 40 countries; 80% of the global energy use
- Developed together with & validated by country experts

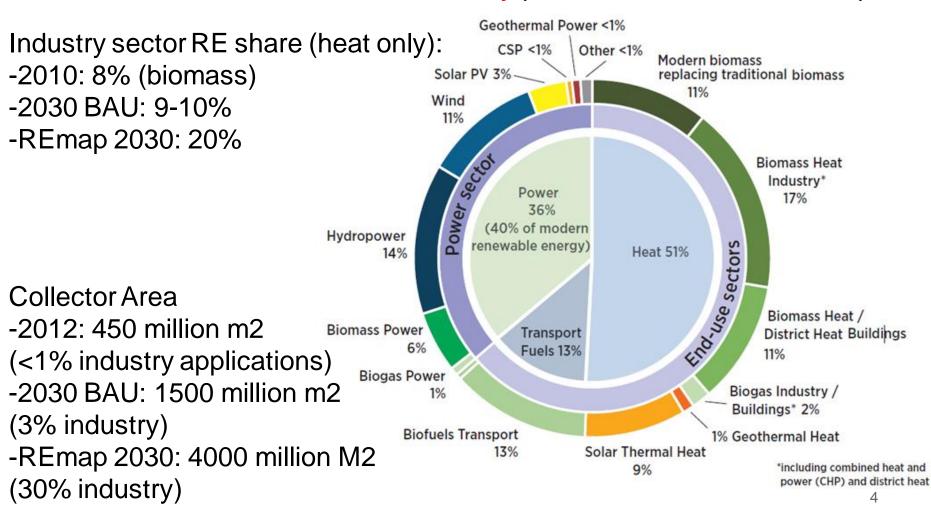


# Global RE Use in 2030 including REmap Options



#### REmap 2030 – 132 EJ (final energy)

60% of total is biomass; and 20% is industry (18% biomass & 2% solar thermal)

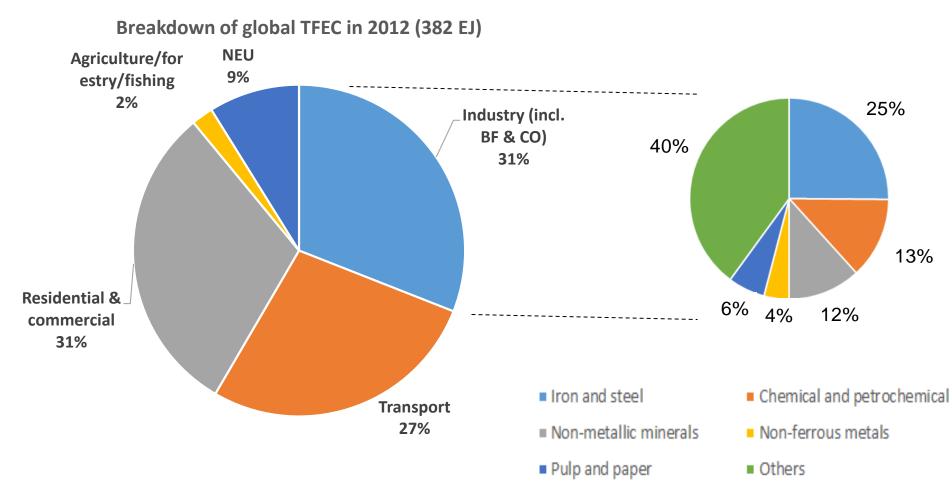




# Renewables in Manufacturing

### Manufacturing sector energy





TFEC: Total Final Energy Consumption

### Methodology



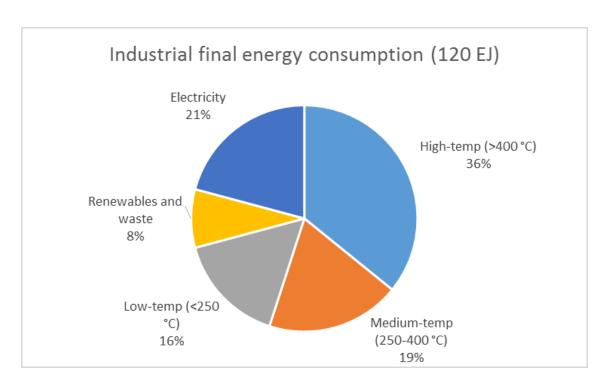
- 1) Projections of industrial energy use: 2010 2030
- 2) Production costs of process heat generation: 2030
- 3) Potentials of renewables
  - 1) Technical potentials, capital stock and temperature level,
  - → two scenarios: **Optimistic** and **Realistic** 
    - **2) Economic potentials,** comparison of process heat generation costs,
      - → two scenarios: Moderate climate policy and Ambitious climate policy
        - L
- 3) Economically realisable potentials, comparison of economic potentials with resource supply (notably for biomass)
  - L
- 4) Allocation of realisable potentials to different temperature levels

### **Key findings Growth and costs**



### Industrial energy use growth

- Total final industrial energy use grows to about 120 EJ by 2030 (excl. NEU)
- 85 EJ fossil fuels, 10 EJ combustible renewables and waste, 25 EJ electricity
- Solar thermal is foreseen to cover a share of up to 13% of the 19 EJ total low-temp process heat demand



## **Key findings Growth and costs**

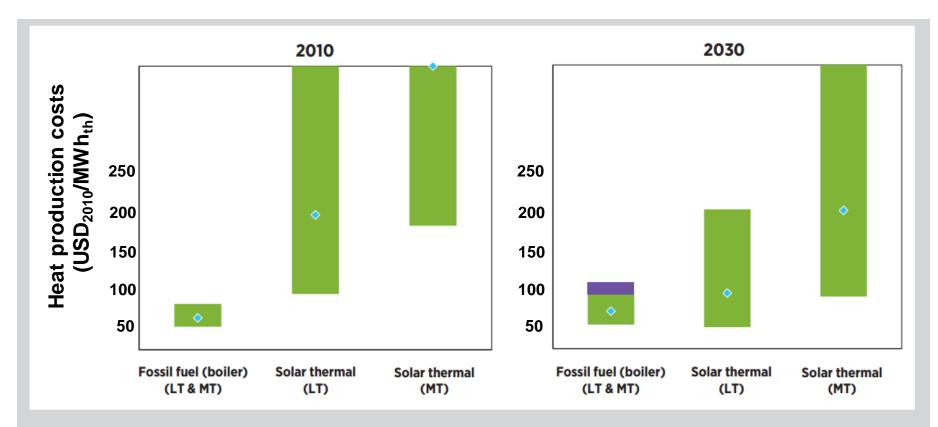


### Process heat generation costs in 2030

- Fossil fuels: average 55-70 USD/MWh<sub>th</sub>
  - But varies across countries: 35-110 USD/MWh<sub>th</sub>, depending on temperature, energy price, fuel type, technology
- Carbon pricing adds another 10-30 USD/MWh<sub>th</sub>
- Solar thermal cost-competitive in some regions with 55-125 USD/MWh<sub>th</sub> India,
   LAC, parts of OECD
- Biomass residues cost-competitive worldwide 30-55 USD/GJ<sub>th</sub>, energy crops only in few regions 70-125 USD/MWh<sub>th</sub>
- Geothermal and heat pumps cost-competitive 35-90 USD/MWh<sub>th</sub> in most regions

# **Key findings Cost-competitiveness**

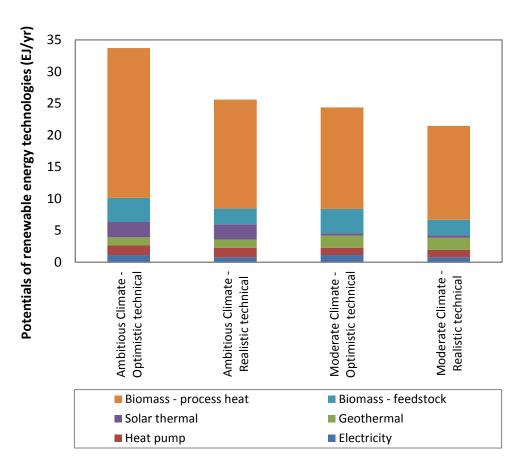




Where: The green bars show that range of costs across the different regions, and the purple bar show the additional costs from a price on CO<sub>2</sub>. The solid blue dot shows the weighted average of the world. LT: low-temperature; MT: medium-temperature.

### **Key findings Scenarios**

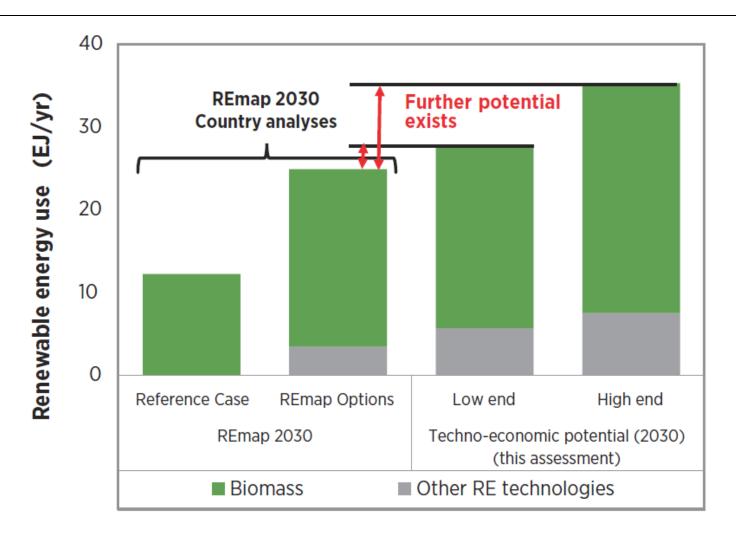




- Additional potentials of RE range from 21 EJ to as high as 33 EJ for the global industry by 2030,
- Low-cost biomass basis for process heat generation: 15-24 EJ (both existing & new capacity)
- Solar thermal for LT heat contributes 0.4-2.4 EJ (new cap.)
- Geothermal and heat pumps for LT heat 3 EJ (new capacity)
- Biomass as feedstock >4 EJ

# **Key findings Techno-economic potentials**





Solar thermal makes up approximately 45% of "other RE" potential

# **RE Deployment considerations**



#### **Limiting factors for Solar Thermal**

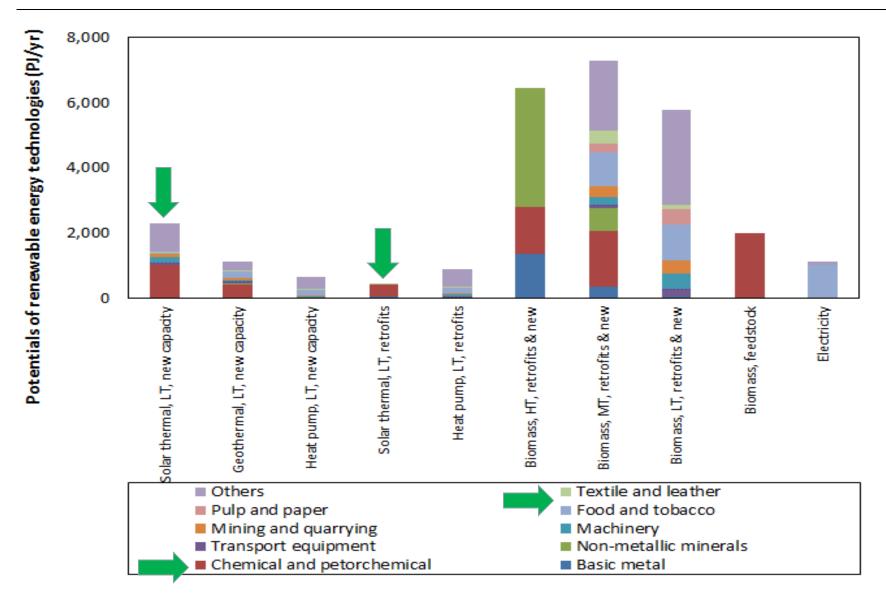
- Current concentrating ST technologies are limited to 250C steam
- Space limitation for ST systems in existing plants therefore potential in new manufacturing plants '
  - New manufacturing plants will be mainly built up in Asia in the coming years
- Large technical and economic potential in small-scale plants and less energy-intensive industries like textile and food
- High price of solar thermal high capital cost with high WACC in many markets

#### <u>Bioenergy</u>

- Logistical/storage limitations to use biomass
- Biomass prices/availability potentially a major barrier
- → So it's not only an issue of carbon pricing/competitiveness

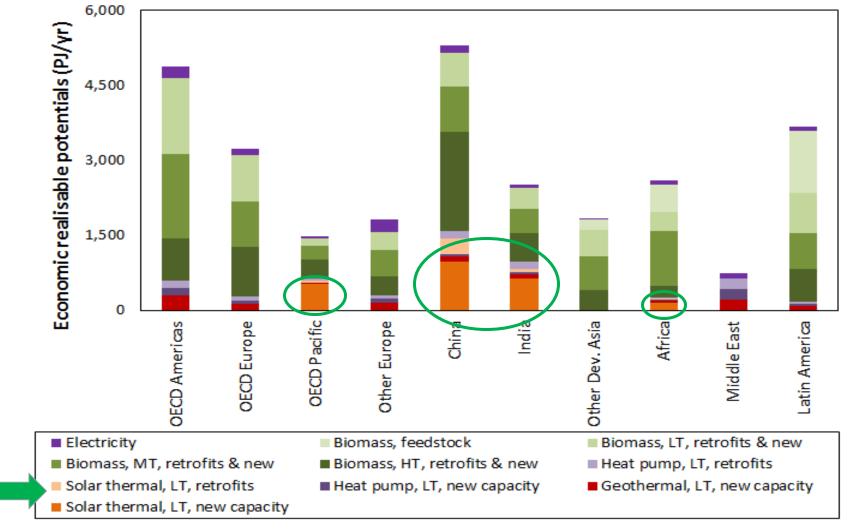
### **Key findings By technology**





### **Key findings By region**





#### Solar thermal tech brief



#### Process and Technology Status

- Solar air heating
- Solar heat collectors
  - LT < 150 C
  - MT 150C-400C
- Solar cooling

Market potential

Industry segments

Performance and Costs

Potentials and Barriers





#### Solar Heat for Industrial Processes

Technology Brief

IEA-ETSAP and IRENA® Technology Brief E21 – January 2015 www.efsap.org – www.irena.org

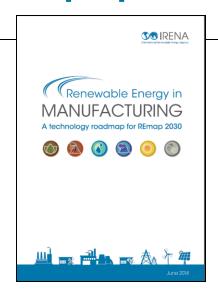
# Study on Developing Quality Infrastructure for solar water heaters International Renewable Energy Agency

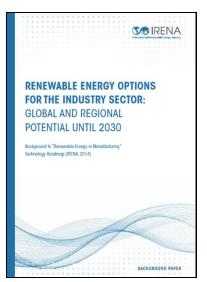
Accreditation: Require for test labs, certification bodies, MATURE training, inspections MARKET QI/Market: Maintain standards; support regional/international QI; Increased reduce SWH incentives and QI development budget International QI: Link with groups developing Global Mark for **SWT Quality** collectors (and future systems) Quality Assurance infrastructure to Certification: Establish certification bodies, design review against SWH standard criteria; component-test-based system ratings and listings be developed Test labs: Approach international standards, ISO9806/ISO9459: collector tests, collector ratings/listing; SWH ratings by component test method hand-in-hand QI/market: Begin end-user incentives requiring QI; maintain national standards; MARKET CONSOLIDATION aid regional/international standards development with country Testing: Establish test labs for reliability testing, as in ISO9806-2; calculate simulated SWH ratings using component estimation method, public postings context and MARKET **Training**: Refine courses/tests/levels 

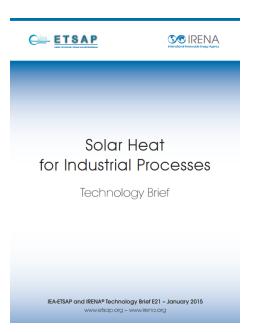
© certified practitioners GROWTH QI/market: Begin end-user incentives. Complete national standards, aid in regional market stage QI development for ST Training: Establish courses for SWH practitioners and import inspectors MARKET Demonstration projects: Build public/consumer awareness; offer hands-on training technologies QI/Market: Develop national standards from ISO9806 and ISO9459; require certified imports. Possibly provide support for in-country SWH manufacturers Studies: Inventory solar resources, current SWH market; identify in-country experts and industry MARKET Analyses: Analyze cost/benefit for SWHs and cost of SWH QI stage options ASSESSMENT Planning: Determine national/regional QI and policy options by market stage

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