IRENA
International Renewable Energy Agency

REMAP 2030

Renewables for the industry sector

IEA Global Industry Dialogue and Expert Review Workshop

Paris, France

7 October 2013

Outline

1. IRENA's REMAP 2030
2. Methodology
3. Draft key findings, gaps, prioritization areas

About IRENA

International Renewable Energy Agency

	International Renewable Energy Agency
	Established April 2011
	The intergovernmental RE agency
Mission:	Accelerate deployment of renewable energy
Scope:	Hub, voice and source of objective information for renewable energy
Members:	161 partner countries; 118 ratified members
Mandate:	Sustainable deployment of the six RE resources (Biomass, Geothermal, Hydro, Ocean, Solar, Wind)
Location:	Headquarters in Abu Dhabi, United Arab Emirates
	Innovation and Technology Centre IITC, Bonn, Germany
Director-General:	Adnan Amin

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REMAP 2030

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Background

- Assembly requested to explore the **aspirational objective of doubling the global share of renewable energy**
- Inform **SE4ALL initiative** of UN, World Bank and partners
- IRENA is uniquely positioned for this analysis because of its broad **country base** and mandate

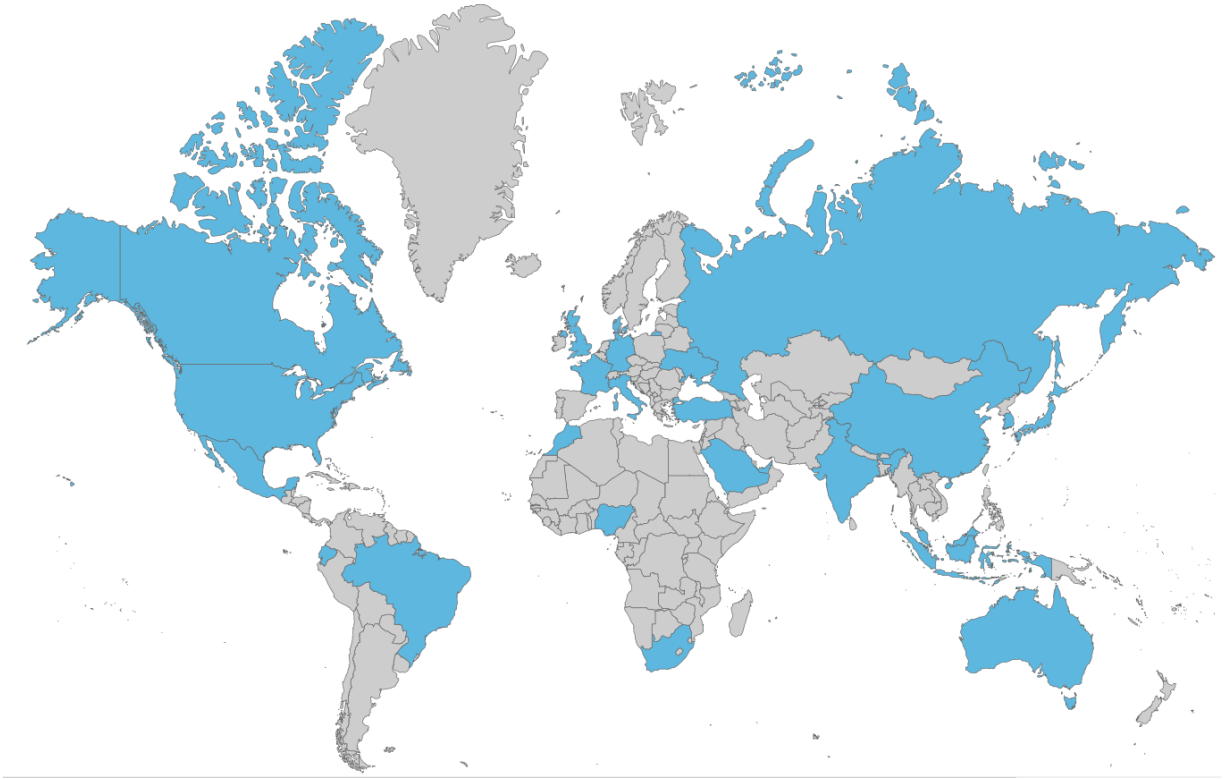
Objectives

- Pathways for a doubling of the global RE share
- Technology options to meet the objective
- Opportunities for international cooperation to realize this vision

Outputs

- What is the outlook for **Business as Usual in 2030** ?
- Which **additional technology options** exist ? What are their **costs** and **benefits** ?
- What **policies** are needed to make it happen ?
- Which **countries & sectors** need to do **what** by **when** to make it happen ?

REMAP - Scope



26 countries, representing

- 75% of total final energy consumption,
- 58% of world population,
- 60% of global GDP

Country dialogue is crucial and ongoing

REMAP Countries:

AUSTRALIA
BRAZIL
CANADA
CHINA
DENMARK
ECUADOR
FRANCE
GEMANY
INDIA
INDONESIA
ITALY
JAPAN
MALAYSIA
MEXICO
MOROCCO
NIGERIA
RUSSIA
SAUDIA ARABIA
SOUTH AFRICA
SOUTH KOREA
TONGA
TURKEY
UNITED ARAB EMIRATES
UNITED KINGDOM
UNITED STATES
UKRAINE

REMAP - Analysis

REMAP analysis benefits from a number of sources

- Country Business as Usual scenarios
- IRENA costing studies (e.g. RE in the transportation sector)
- IRENA technology database
- IRENA/ETSAP technology briefs
- IRENA technology and **sectoral studies** and **stakeholder workshops**
  - Roadmap RE in cities
  - Roadmap RE grid integration
  - Roadmap RE electricity storage
  - **Roadmap RE in manufacturing industry,** based on
    - Potential assessment study (results presented here),
    - Workshops: “Renewables for a New Product Mix”, “Renewables for SMEs in Asia”

2 METHODOLOGY

Methodology (1/2)

1) Projections of industrial energy use: 2010-2030

IEA ETP 2012 demand scenarios for bulk materials and UNIDO energy efficiency improvement potentials, distinguishing between:

- 10 world regions, 8 sub-sectors, 15+ production processes
- The share of retrofits and greenfield investments,
- Temperature levels of process heat (low, medium and high)

2) Production costs of process heat generation: 2030

In USD_{2010}/GJ for fossil fuel and RE technologies, i.e. capital and O&M costs, technological learning, energy price developments & carbon pricing (next slide)

- Biomass (cheap and expensive sources) as fuel for all temperature levels via technologies such as boilers, CHPs, furnaces
- Solar thermal heating technologies for low and medium temperature
- Geothermal and heat pumps for low temperature
- Simple assessment of biomass use as feedstock and electrification

Methodology (2/2)

3) Potentials of renewables

Four-step approach:

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** (high increase in fossil fuel prices, moderate levels of carbon pricing based on IEA's WEO NPS), and **Ambitious climate policy** (low increase in fossil fuel prices, higher levels of carbon pricing based on IEA's WEO 450ppm)

3) Economically realisable potentials, comparison of economic potentials with resource supply (notably for biomass)

4) Allocation of realisable potentials to different temperature levels

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DRAFT KEY FINDINGS, GAPS, PRIORITIZATION AREAS

Key findings (DRAFT) (1/5)

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1) Industrial energy use growth

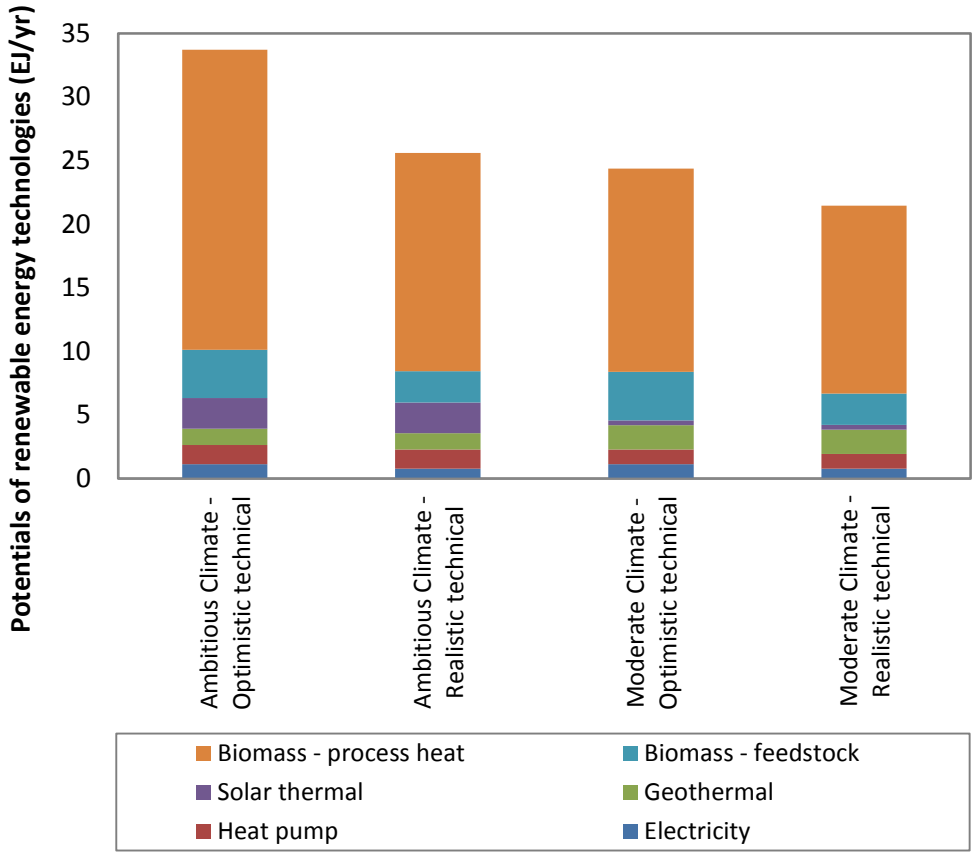
- Total final industrial energy use grows to about 120 EJ by 2030 (excl. NEU)
- 85 EJ **fossil fuels**, 10 EJ combustible renewables and waste, 25 EJ electricity
- 50-60% from **existing capacity**, accounting for 45-50 EJ of fossil fuel use
- About half **high temperature** (>400 ^{o}C) process heat (43 EJ), the remainder 23% **low** (19 EJ) and 27% **medium** (23 EJ) temperature heat

2) Process heat generation costs

- Fossil fuels by 2030: 15-20 USD/GJ_{th} (varies across countries: 10-30 USD/GJ_{th}, depending on temperature, energy price, fuel type, technology)
- Carbon pricing adds another 3-8 USD/GJ_{th}
- Biomass residues **cost-competitive** worldwide 8-15 USD/GJ_{th}, energy crops **only in few regions** 20-35 USD/GJ_{th}
- Solar thermal **cost-competitive** 15-35 USD/GJ_{th} India, LA, parts of OECD
- Geothermal and heat pumps **cost-competitive** 10-25 USD/GJ_{th} in most regions

Key findings (DRAFT) (2/5)

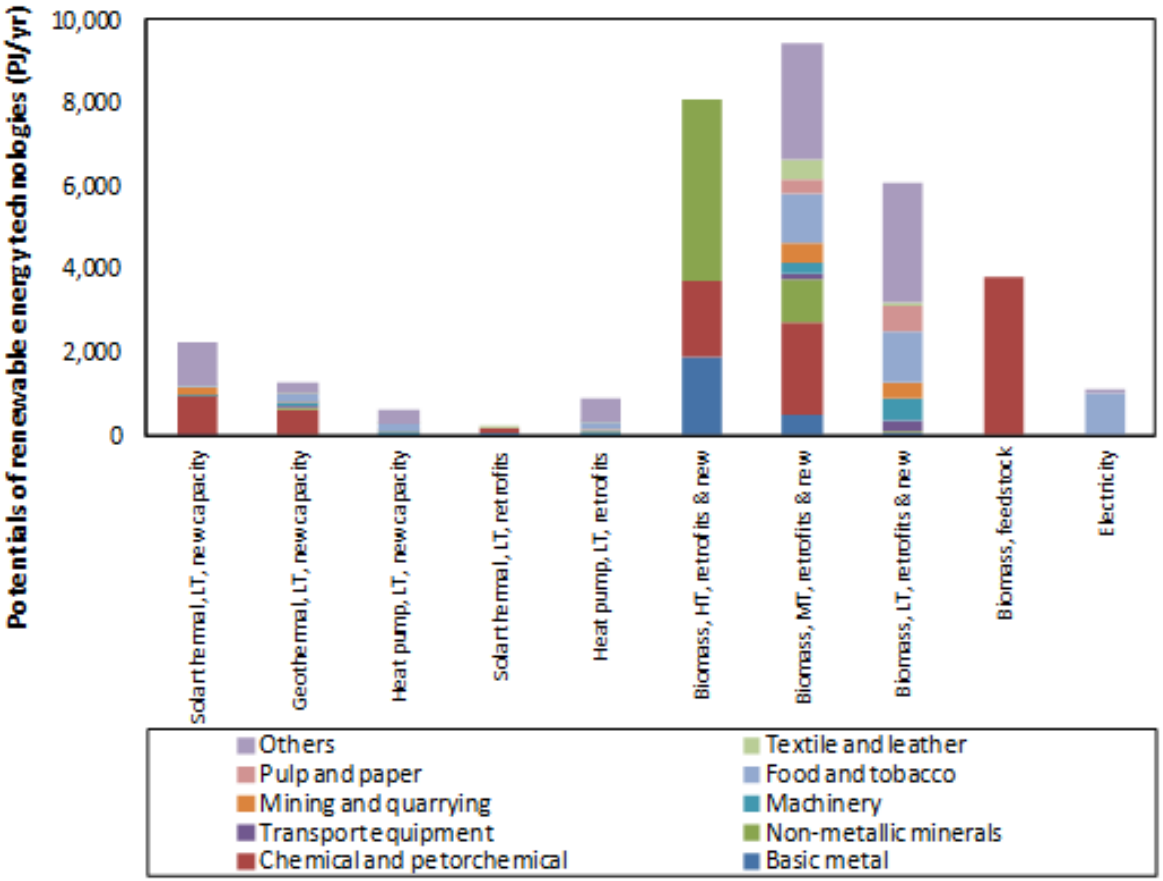
3) RE potentials for the global industry sector



- 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 (DRAFT) (3/5)

3) RE potentials for the global industry sector

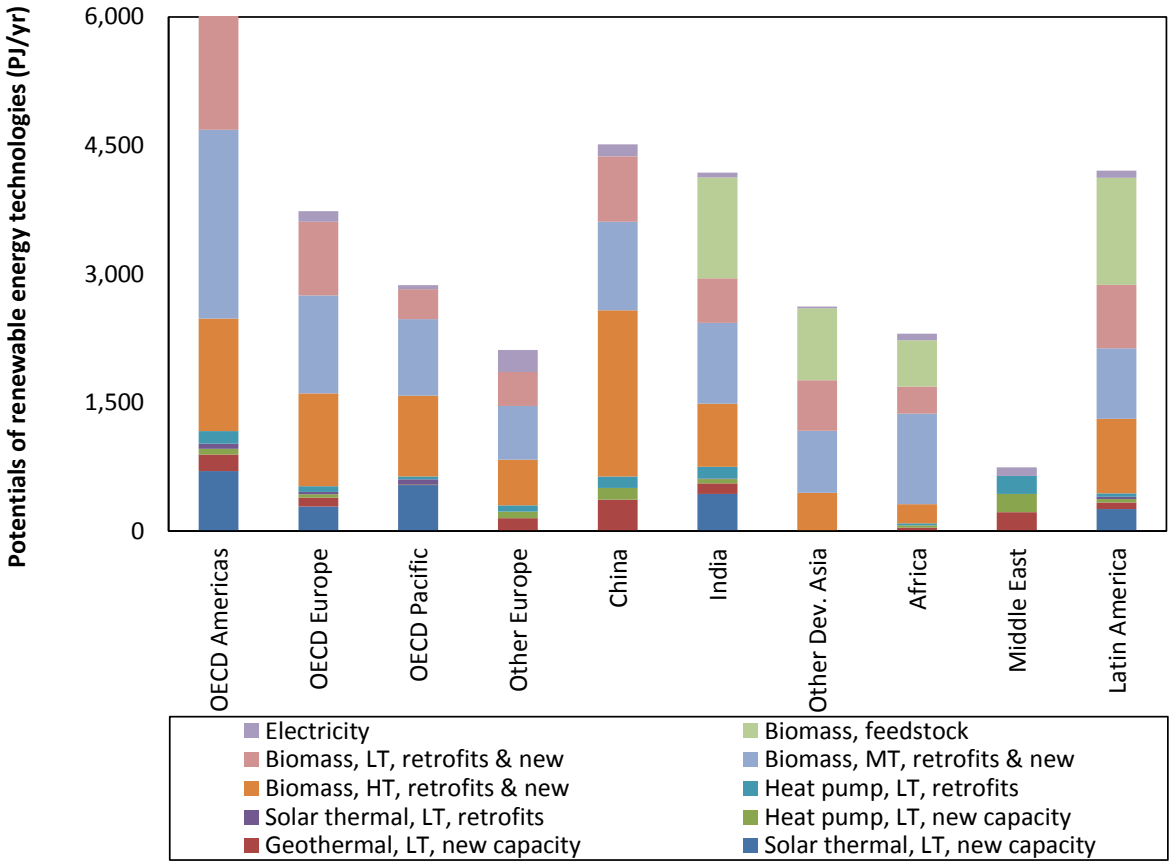


(results for the Ambitious climate policy with optimistic technical potentials)

- Biomass key for HT heat in energy-intensive sectors up to **8 EJ** (half for NM minerals)
- Biomass finds a potential application in all other sectors
- Solar thermal and other RE technologies have large potentials in the chemical and food sectors
- In energy-intensive sectors ~30%, in others ~50% substitution

Key findings (DRAFT) (4/5)

3) RE potentials for the global industry sector

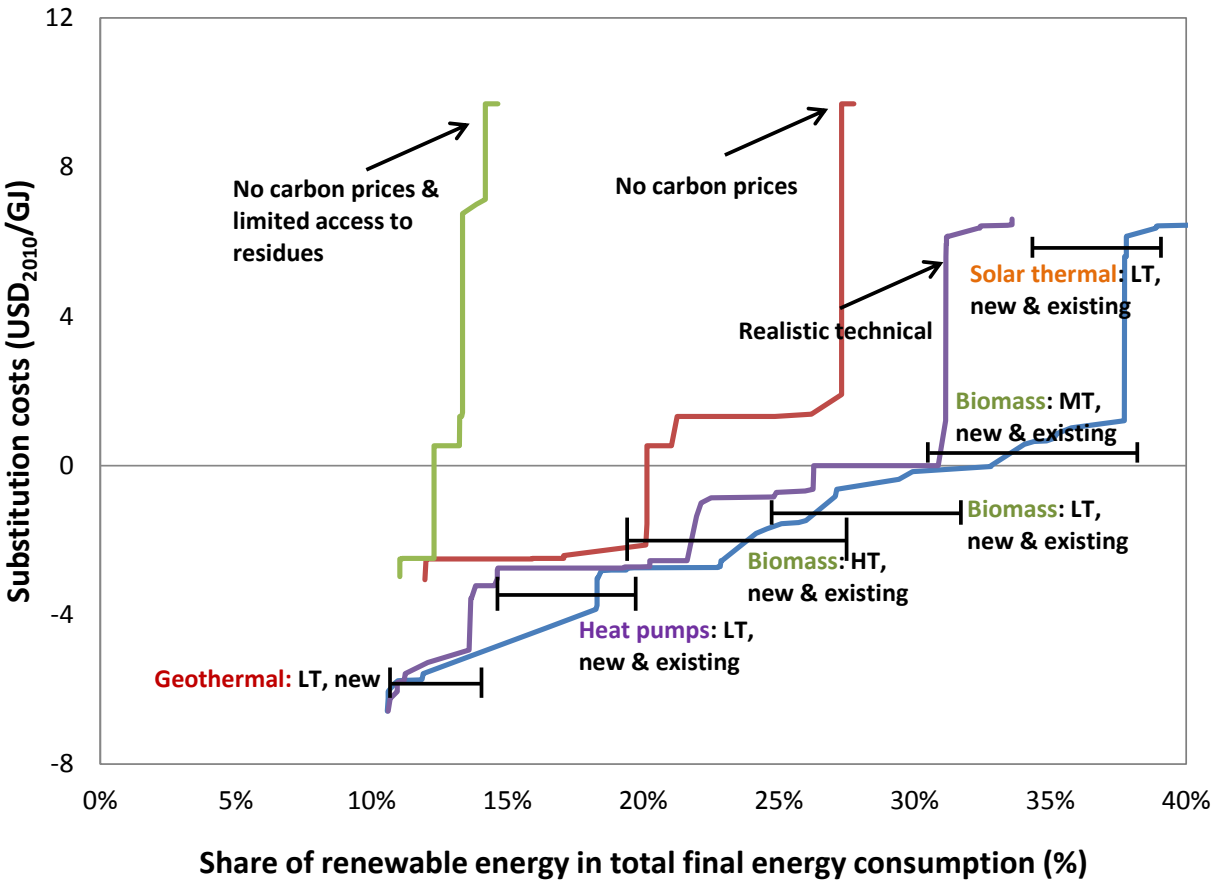


- OECD countries **13 EJ** additional potential (excl. carbon pricing **5 EJ**)
- Asia additional potential **11 EJ**
- Additional potentials in Africa and LAC are **5 EJ** (potentials of RE are high, but industry energy use is low compared to others)

(results for the Ambitious climate policy with optimistic technical potentials)

Key findings (DRAFT) (5/5)

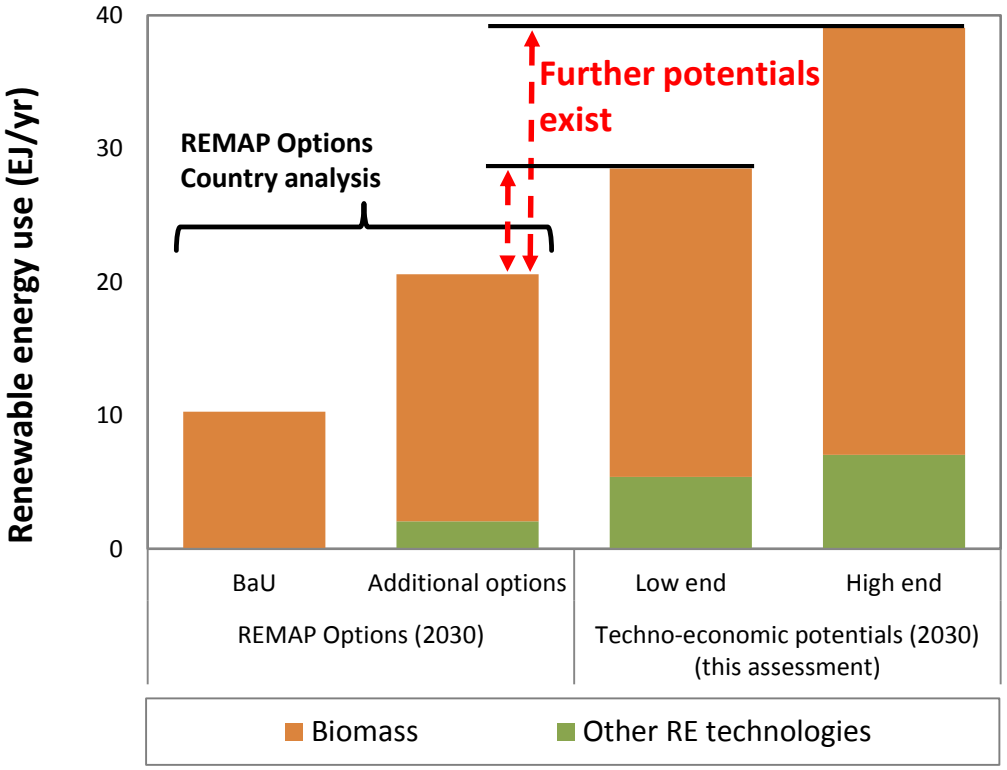
3) RE potentials for the global industry sector



- Techno-economic potentials can raise RE share from 10% to 35%
- Solar thermal most expensive
- Without cheap biomass sources, RE share increase is limited

Gaps & uncertainties (DRAFT)

- Study closes an important gap about RE use in industry sector
- This techno-economic potential assessment study helps **country dialogue** with the REMAP national experts



Deploying further potentials based on assumptions with uncertainty:

- Biomass supply potential and how much available for the global industry sector,
- Biomass price developments (e.g. higher prices as limits of supply are reached),
- Access of industry plants to resources (large volumes biomass transport and supply, geothermal),
- Capacity development & tech learning (mainly for solar thermal),

Prioritization areas

- **Roadmap and technical report January 2014**
- Energy intensive sectors: largest potential,
- Small and medium enterprises: >90% of all industrial plants, low absolute energy demand per plant,
- Biomass: >80% of the potential for different applications, but many issues remain to be resolved,
- Solar thermal systems: potentials exist, but expensive
- Electrification: fuel switching and increased RE share in the power sector,
- Regional aspects: energy pricing and climate policies, growth of industry versus availability of resources

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THANK YOU !

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