



RENEWABLE ENERGY SOLUTIONS
FOR THE MEDITERRANEAN



*Ministero degli Affari Esteri
e della Cooperazione Internazionale*



La Geopolitica delle Rinnovabili



Antonio Cammisecra

AD, Enel Green Power
Presidente, RES4MED&Africa

Il ruolo delle energie rinnovabili: opportunità di crescita globale ed investimenti nelle economie emergenti

*Ministero degli Affari Esteri e della Cooperazione Internazionale
Roma, 11 maggio 2018*

Atmospheric CO₂
concentration (ppm)

1958

Global mean land-ocean
temperature (°C)
deviation from 1951–1980 mean



Global Trends

Key dynamics affecting the power sector

World population growth
(from 7 to 8 billion people in the next 10 years) and life expectancy increase



Urbanization & Megacities:
two-thirds of the world's population will live in cities by 2050
now it's 50%



Technological breakthroughs:
and deeper penetration of new technologies
with significant cost reduction



Growth of emerging economies:
by 2030 the E7 will overtake the G7

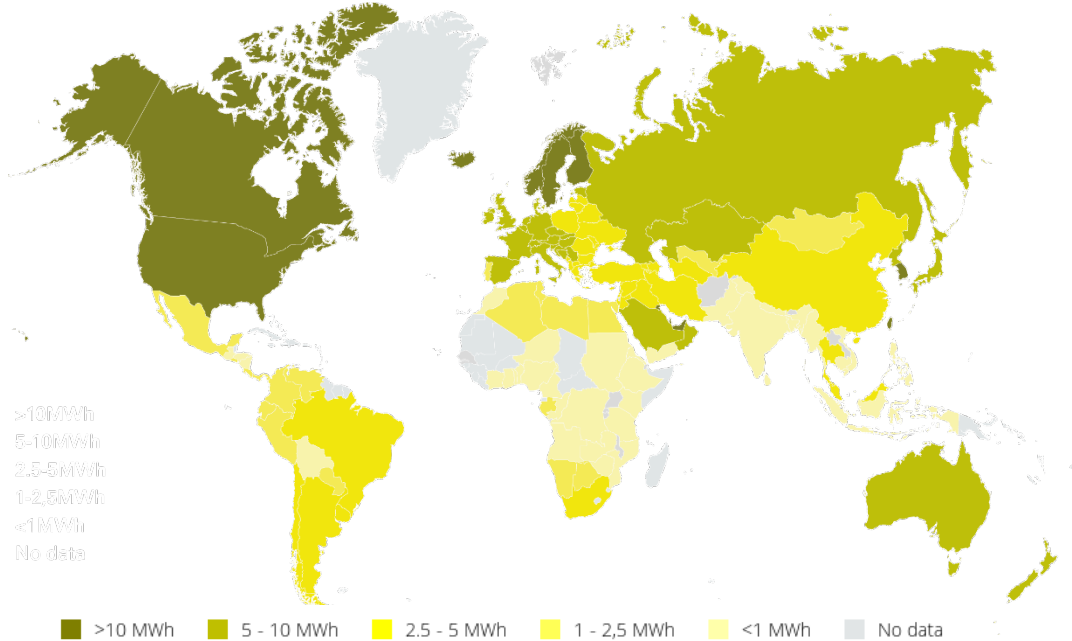


Global demand growth:
though limited
natural resources; fight against
climate change

Megatrends impacting and driving the energy sector, especially in developing countries



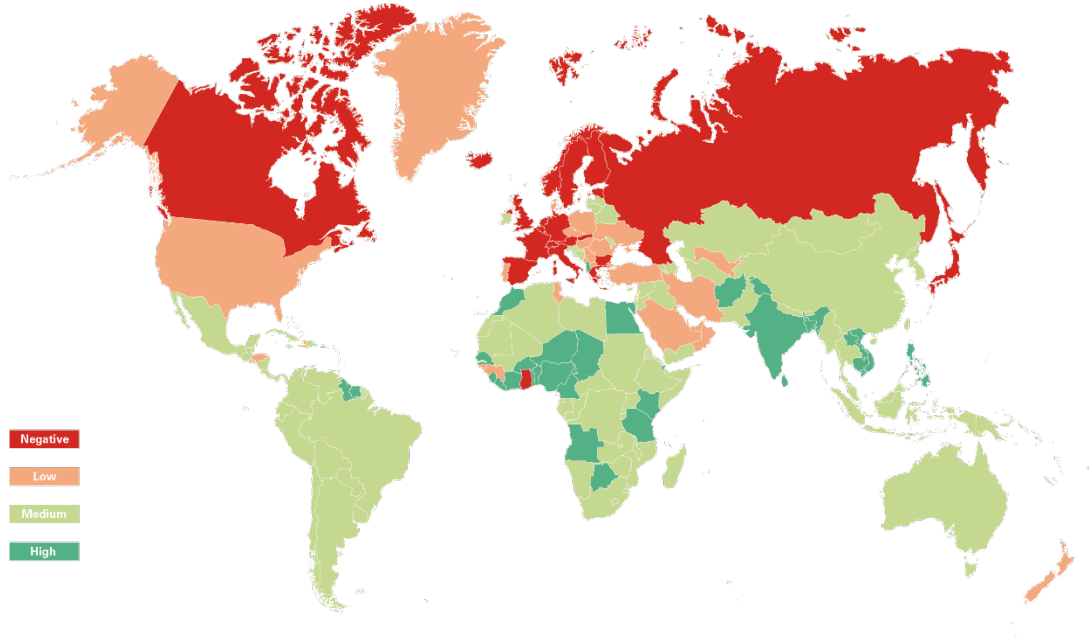
Electricity Consumption per Capita 2015



- ❑ There is a vast gap in electricity consumption between mature and emerging countries
- ❑ The southern regions have a consumption lower than 5 MWh/p.c.



Electricity Demand Growth 2012-2040



- ❑ The expected electricity demand growth in Africa, Asia and Latin America will be soaring in the next decades
- ❑ Over 60% of electricity demand growth expected from emerging economies

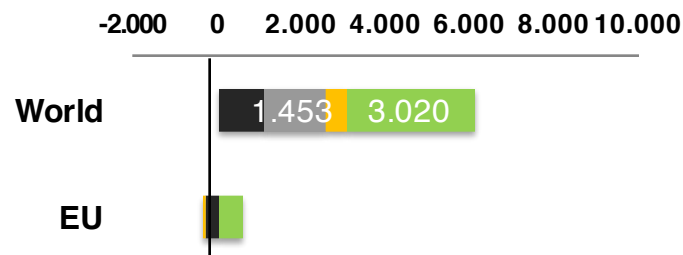
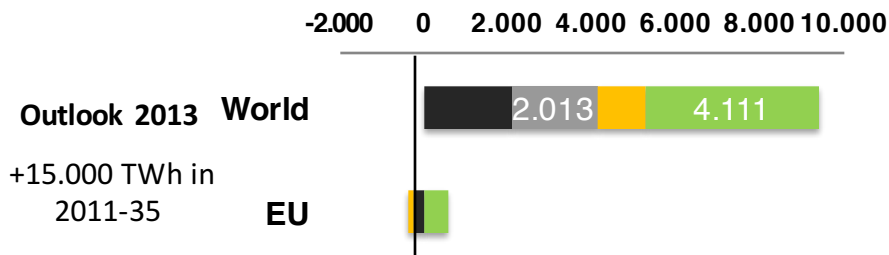
Energy Transition Roadmap

Generation Mix Changes

Net Additional TWh by Source

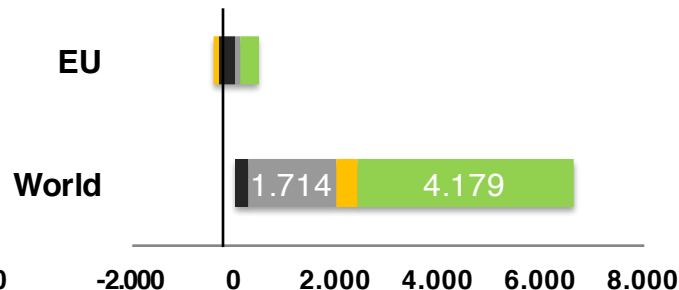
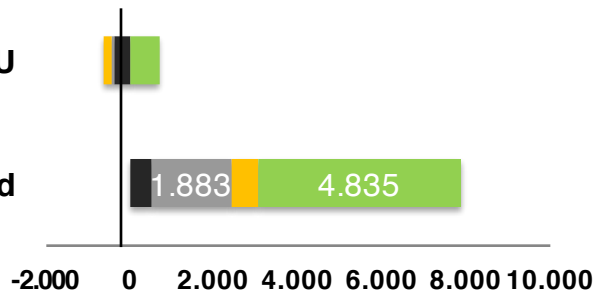
2011-2025

2025-2035



Outlook 2017

+14.000 TWh in 2011-35



Legend:

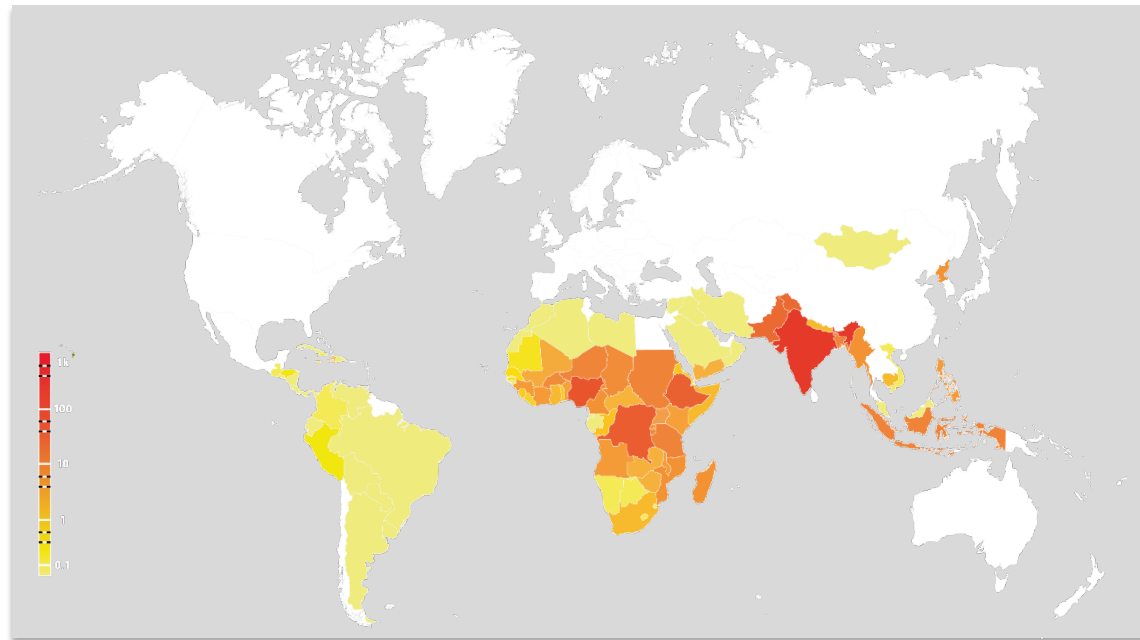
- Coal
- Gas
- Nuclear
- Renewables

Population without access to electricity

Current status

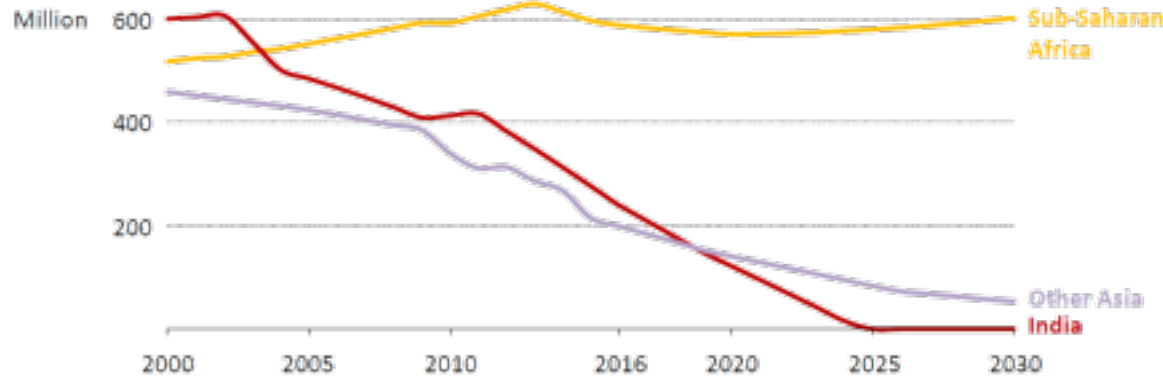


People without access to electricity 2016



	Millions of people	Of which
Sub-Saharan Africa	588 M	
Developing Asia	439 M	India: 239 M
Middle East	17 M	Yemen: 14 M
Central & South America	17 M	Haiti: 7 M

History and future prevision Populations gaining access to electricity

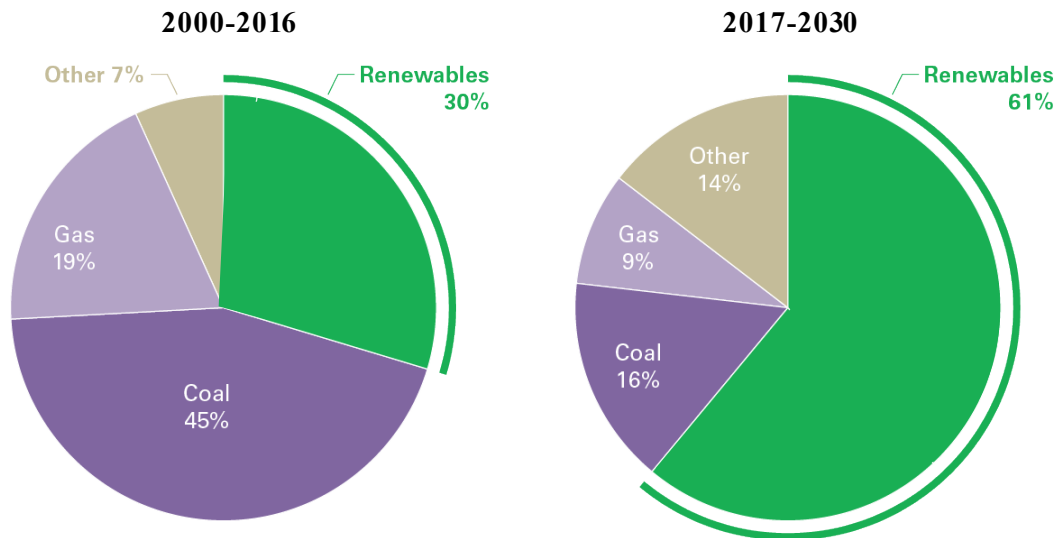


- ❑ Progress on electric access is being made in all parts of the world, in particular in **India**.
- ❑ Also **Sub-Saharan Africa** in the latest years registered a slight improvement, but the impact of policies is over-shadowed by population growth
- ❑ By 2030, **90%** people without access to electricity will live in **sub-Saharan Africa**

Renewables are the solution

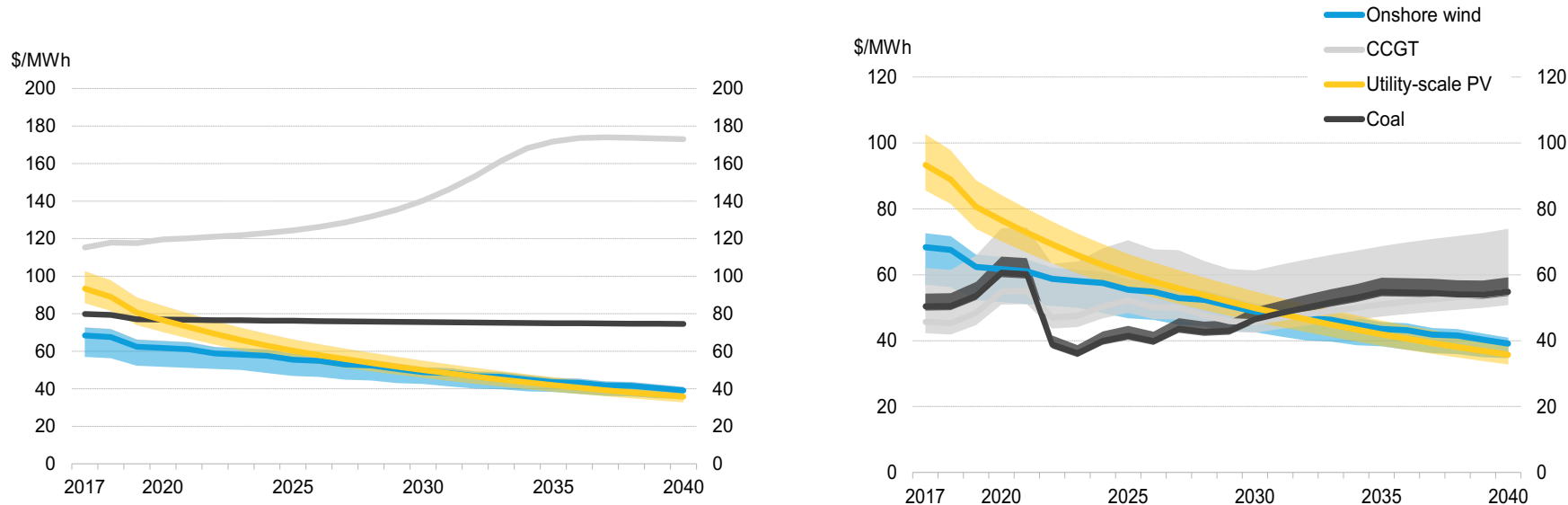
Population gaining access by source

Population gaining access by source



- By 2030, 61% of population will have access to electricity coming from renewables sources

Cost of technology What can we expect?



By 2030 it will be more convenient to produce electricity from renewables generation than from any other fossil one

Wind and PV Auctions Awarding Bids

Average awarding bids - \$/MWh

Canada	'17
Wind On	\$86

UK	'15	'16	'17
Wind Off	\$165		\$82

Germany	'15	'16	'17
Wind On			\$57
PV	\$94	\$79	\$64

Spain	'17
Wind On/PV	\$47

Italy	'16
Wind On	\$77*

Mexico	'16	'17
Wind On	\$46	\$19
PV	\$38	\$21

Morocco	'16
Wind On	\$30
PV	\$45

India	'14	'15	'16	'17
Wind On				\$46
PV	\$104	\$87	\$71	\$48

Perù	'16
Wind On	\$38
PV	\$48

Brazil	'14	'15	'17
Wind On	\$46	\$56	\$31
PV	\$72	\$89	\$46

UAE	'15	'16
PV	\$59	\$30

Saudi Arabia	'17
PV	\$18

Chile	'16	'17
Wind On	\$42	\$36
PV	\$29	\$25

Argentina	'16	'17
Wind On	\$56	\$41
PV	\$57	\$43

Zambia	'16
PV	\$67

South Africa	'15
Wind On	\$46
PV	\$58

Source: BNEF – as of Feb 2018; *Wind Onshore Italy 66€/MWh with 1,2 fx rate, Wind Offshore '17 UK 64 GDP/MWh

Different solutions to energy access

A mix of technologies is already available for last mile connectivity

Few Watts



**Small Lighting
Systems**

<150W



**Stand-Alone
Systems**

<1MW, scalable



Microgrids

MWs, scalable



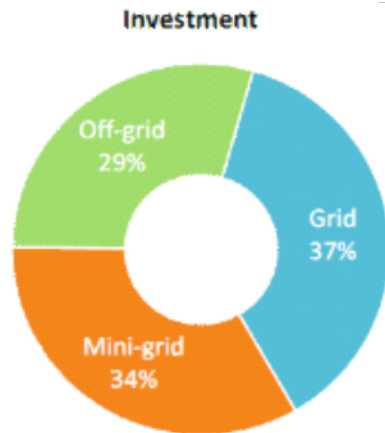
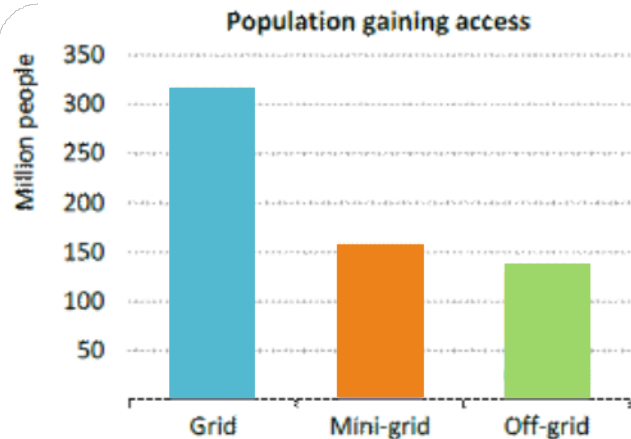
Grid expansion

Technology selection depends on:

- size of community
- population density
- distance to national grid
- potential power demand

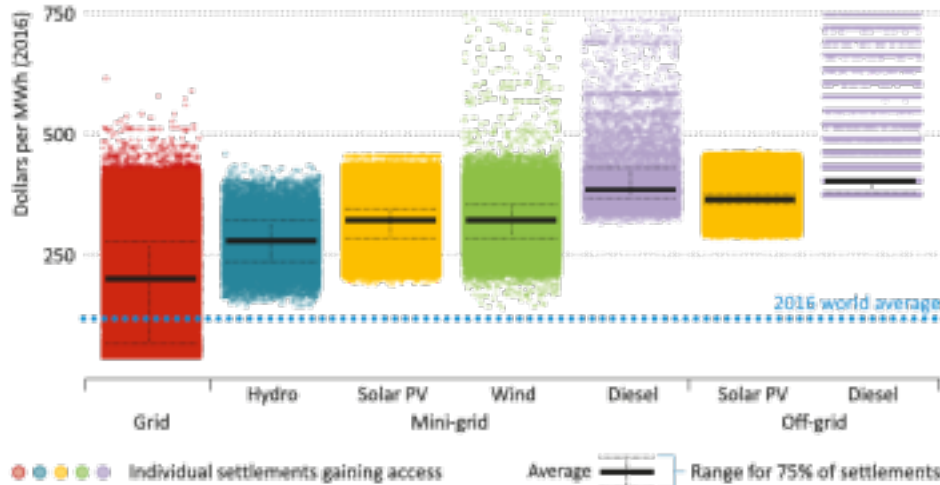
Pathways for providing access

Population gaining access and Investments in 2017-2030



- ❑ Centralized power grids remain the primary means for electrification, especially for **urban areas**
- ❑ Two-thirds of the **rural population** gains access with decentralised solutions

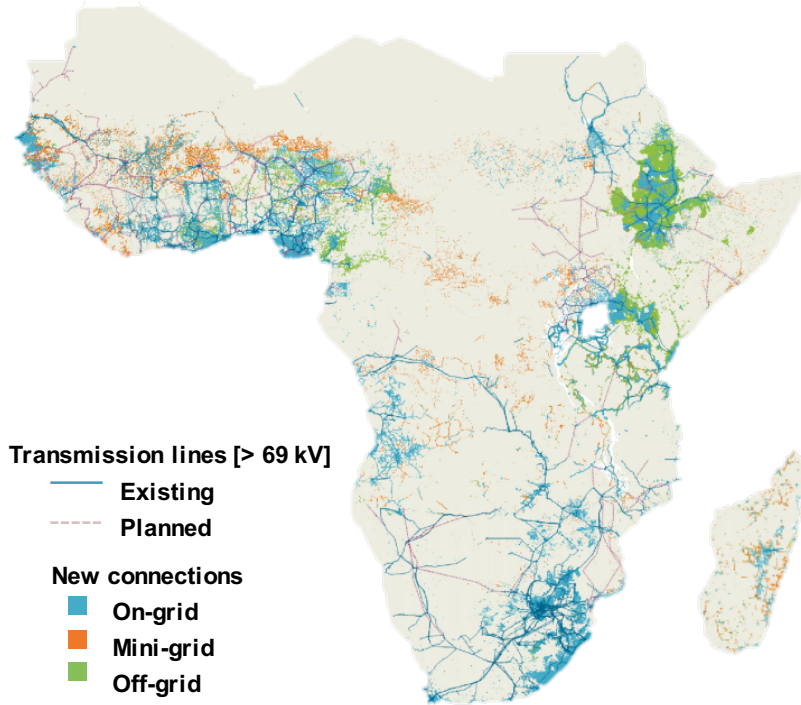
Electricity access solutions cost



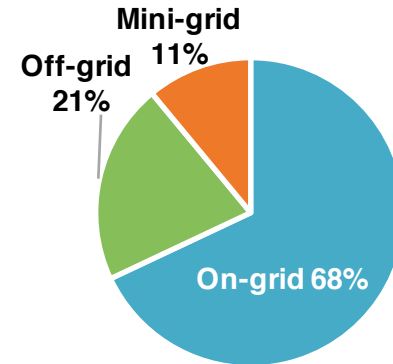
- ❑ On-grid solutions will be the most convenient and massive to electrify rural areas of Africa and Asia
- ❑ Mini-grid and off-grid systems will be an effective option for areas far from existing grids

Focus on Sub-Saharan Africa

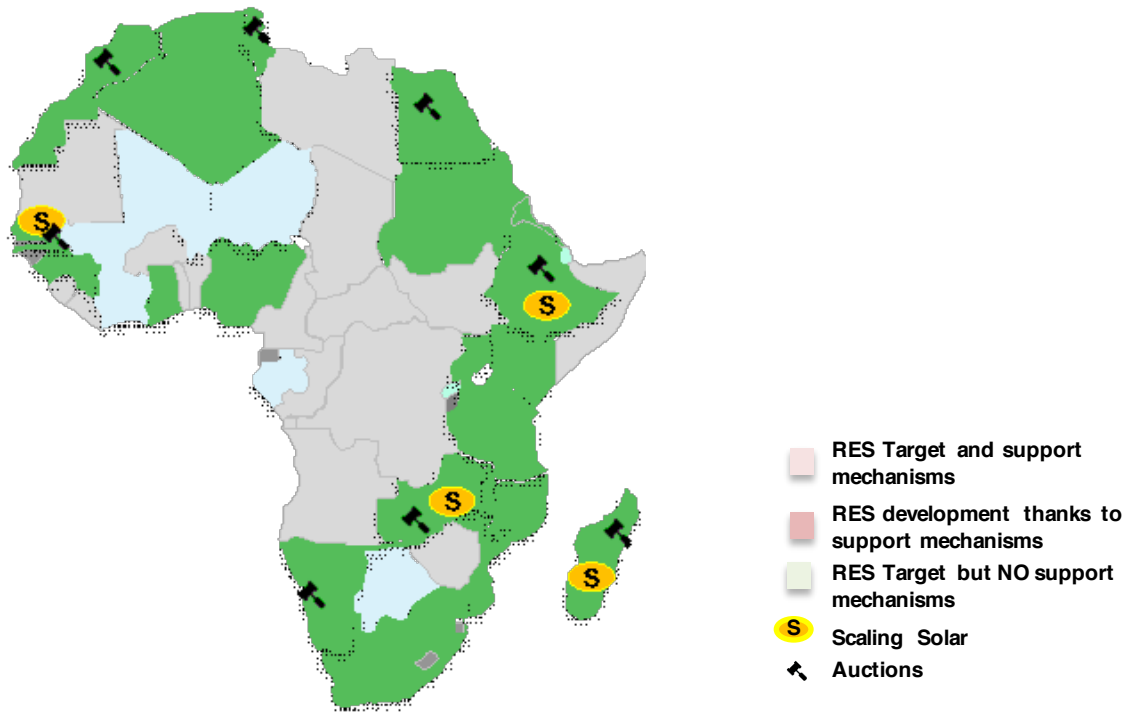
How different solutions will be spread



Population gaining access 2017-2030

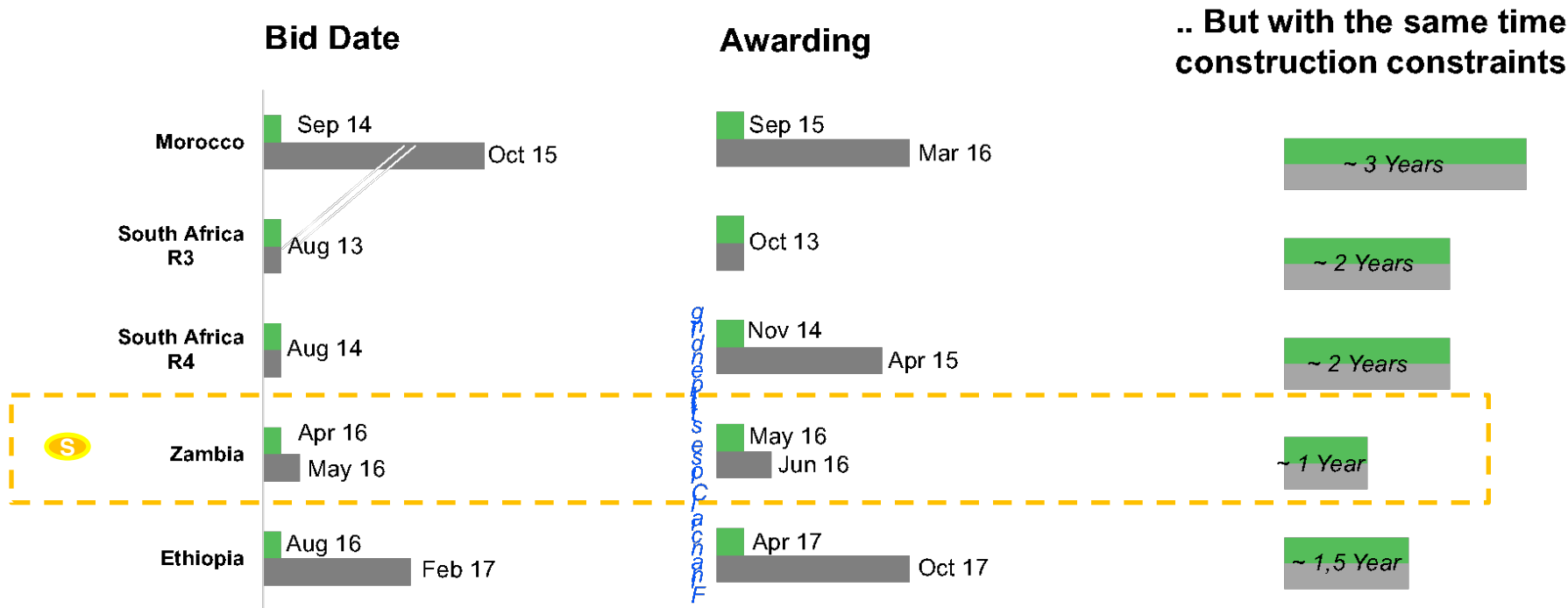


Renewable Regulations in place in Africa



Over 20 countries adopted dedicated regulation for RES Development
mainly through tenders and the recent IFC's Scaling Solar program

Planning and Execution



Time to market is the critical issue
to be addressed to boost RES development in Africa



Program designed by the World Bank group to make it easier for African Governments to quickly procure solar power minimizing all financial transaction risks through

Transparent and competitive tendering process

Pre-set financing and insurance products

Legal and regulatory analysis

Technical and economic studies for the selection of the optimal size and location of the solar plants



Scaling Solar

**Governments and
Utilities**

**Project Developers and
Investors**

STANDARDIZATION AND SPEED

MARKET CREATION

CERTAINTY

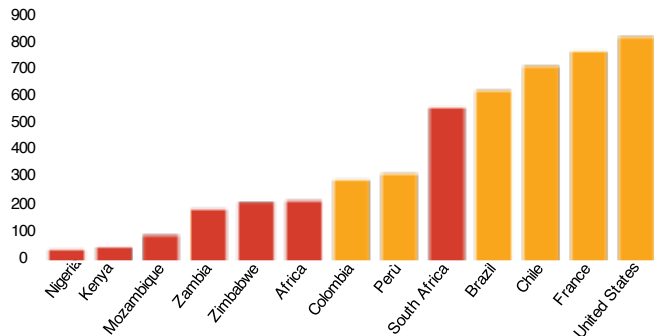
**REDUCED DEVELOPMENT TIME AND
COSTS**

HIGH-LEVEL COMPETITION

PARTIAL RISK MITIGATION

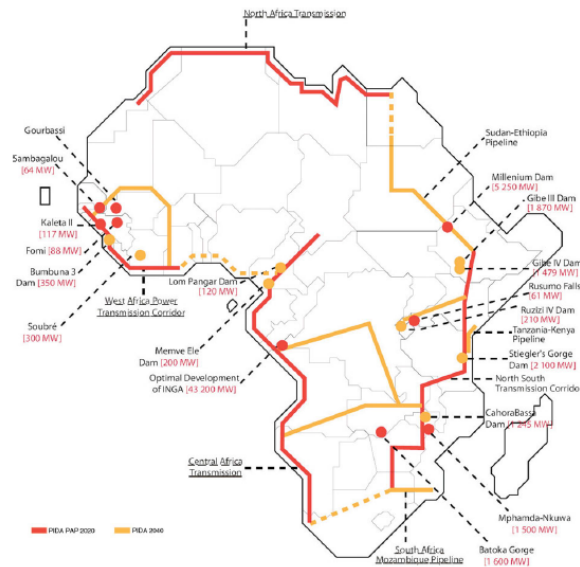
SUSTAINABLE GROWTH

Transmission lines per capita (km/Milion people)



Independent power transmissions are the most broadly applicable business model for increasing privately financed transmission in Africa

Major transmission projects in Africa



What we experienced

- ☐ **LOW** unitary power demand and **LIMITED** availability to pay
- ☐ **FEW** anchor loads
- ☐ **High** investment required in distribution

What we have learned

- ☐ Stand alone systems could be a valuable stop-gap solution
- ☐ Holistic approach
- ☐ **SITE-BY-SITE** analysis
- ☐ Cost reduction measures

Decentralized solutions

Major barriers

TECHNICAL

- High development costs
- High upfront cost
- Limited local infrastructures
- Limited trained workforce

REGULATORY

- Over-complex Permitting
- Uncertain Tariffs
- National grid arrival
- Complex Public Private Partnership

LOCAL MARKET

- Limited number of beneficiaries
- Uncertain power demand
- Availability to pay
- Lack of proven business models
- Lack of follow-up and high abandonment



Conclusions

Population & economic growth will lead to urbanization and an increasing energy appetite



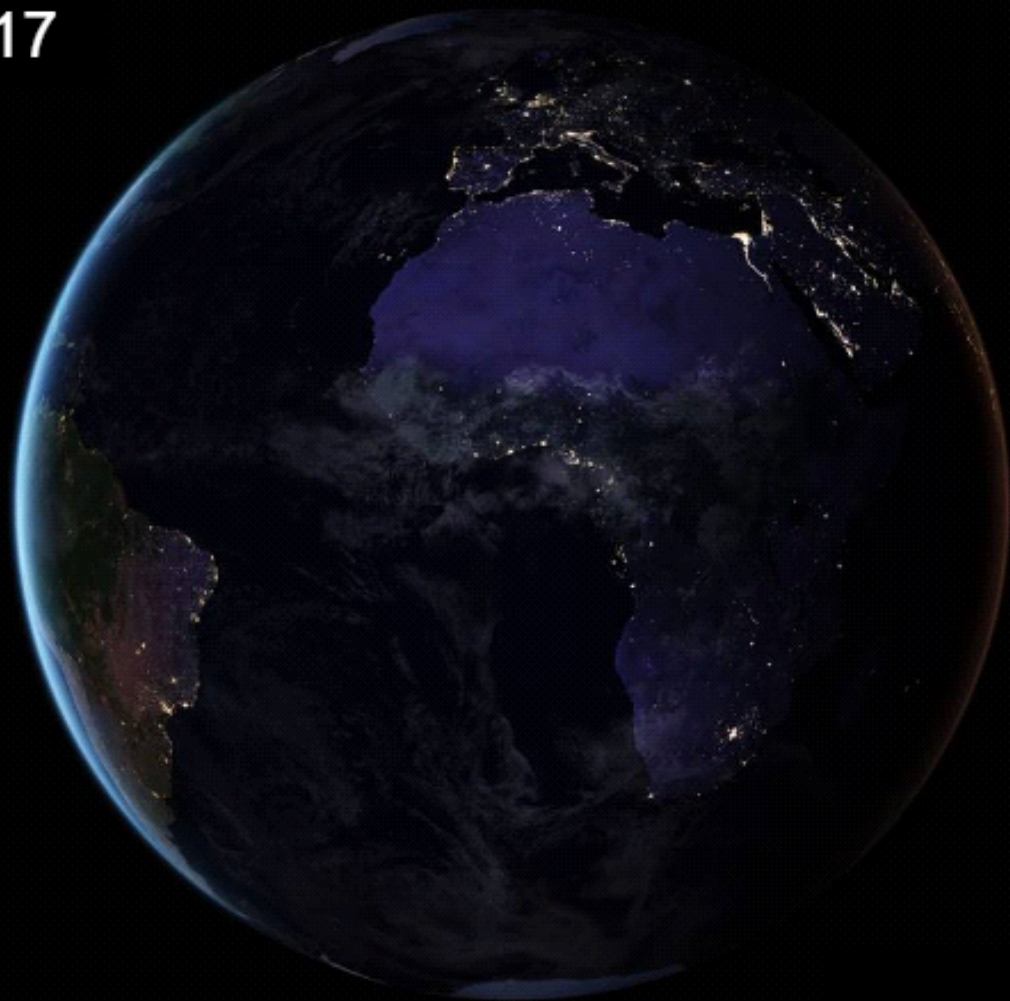
Renewable energies can satisfy this energy appetite because they are competitive, sustainable and have a short time to market



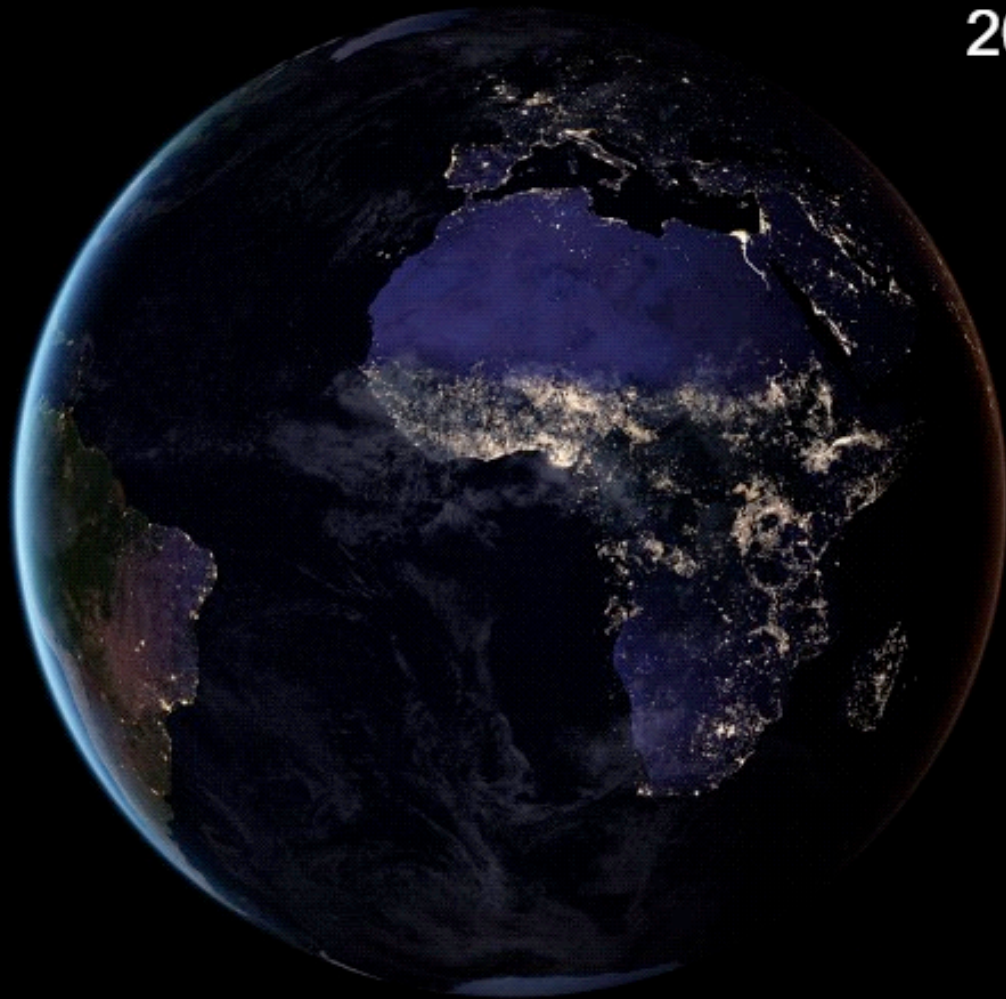
A bright and universally electrified future is possible only through regional programs supported by international institutions

In case this will not happen, millions of people worldwide will remain in the darkness or will be forced to live in energy frugality

2017



2030





RENEWABLE ENERGY SOLUTIONS
FOR THE MEDITERRANEAN



RENEWABLE ENERGY SOLUTIONS FOR AFRICA

Grazie per l'attenzione



Antonio Cammisecra

AD, Enel Green Power

Presidente, RES4MED&Africa

antonio.cammisecra@enel.com