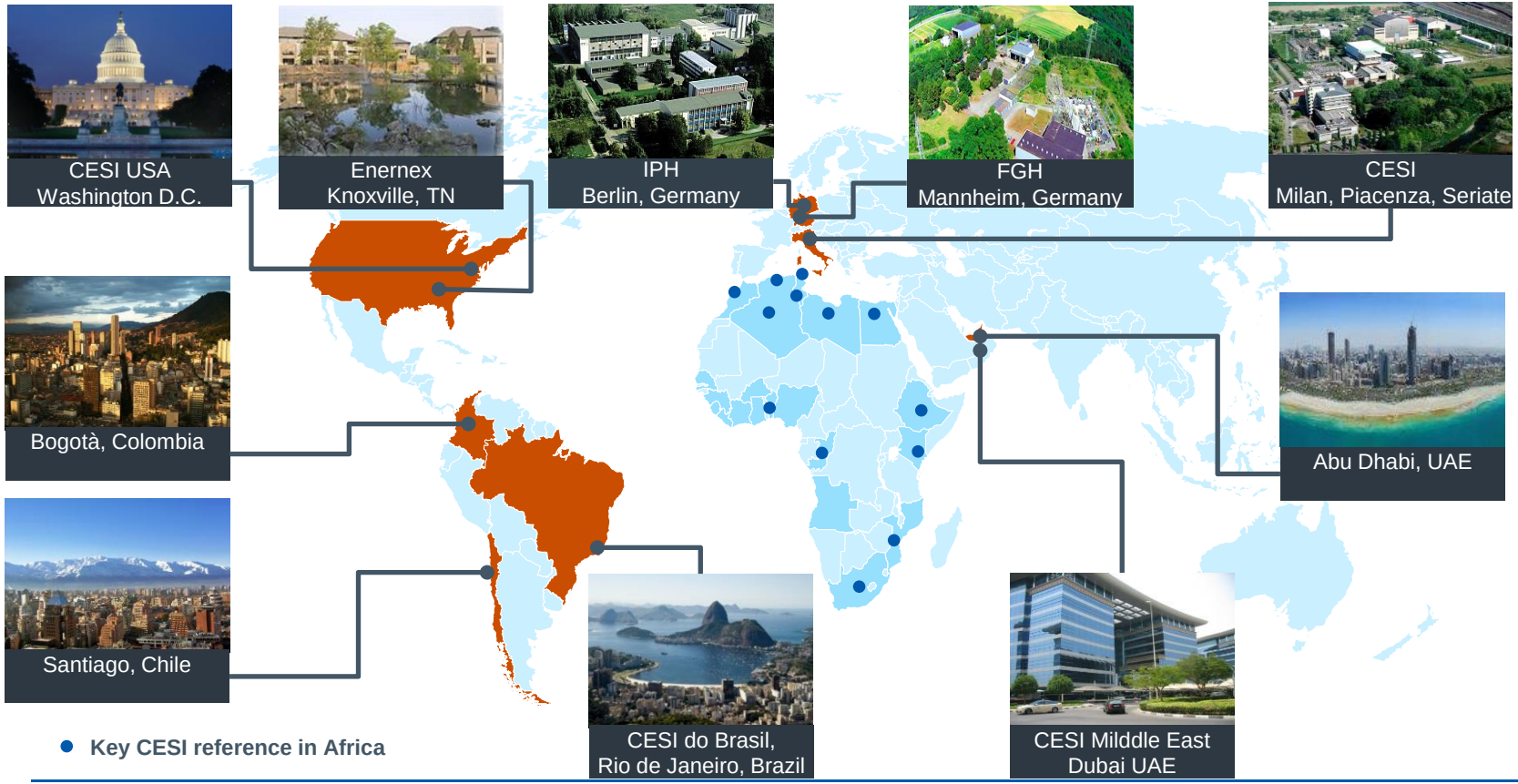
Mr. Matteo Codazzi
Rome, 24.10.2018

Africa's renewable energy transition: What does it take?

IEA RIAB Special Session

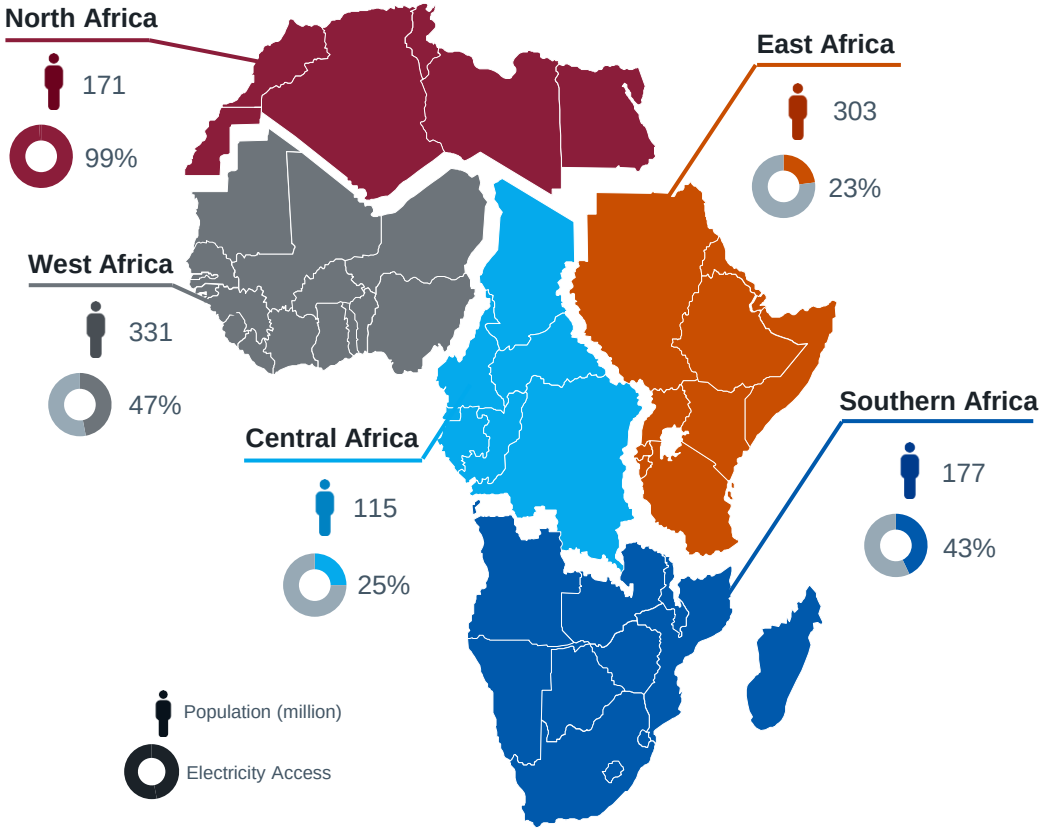
CESI
Shaping a Better Energy Future

CESI is a leading player in engineering, testing and power systems consulting for the electricity sector worldwide

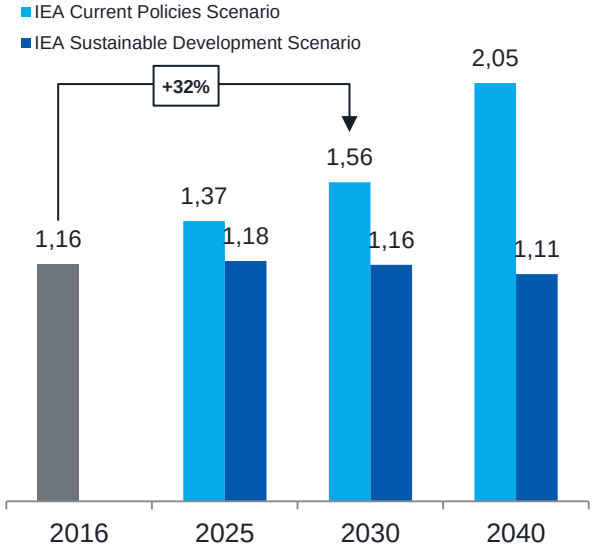


- **Key CESI reference in Africa**

African electrification is an opportunity to pursue CO_2 emission reduction through a sustainable power system design



Annual African total CO_2 emissions, Gton



Africa's Share of Global CO2 emissions*, %

2016	2025	2030	2040
3,6%	3,9%	4,1%	4,8%

Source: IEA WEO 2017, RES4Africa
*in the IEA Current Policies Scenario

Different ways to secure power supply to the African urban areas: two complementary approaches

North Africa

Rich in natural resources with high electrification rate and good RES potential

- **99% electrification rate**
- **Rich in NG & oil resources and huge wind and solar potential**
- **Diffused Transmission and Distribution grid**

Sub-Saharan Africa

High RES potential with low electrification rates

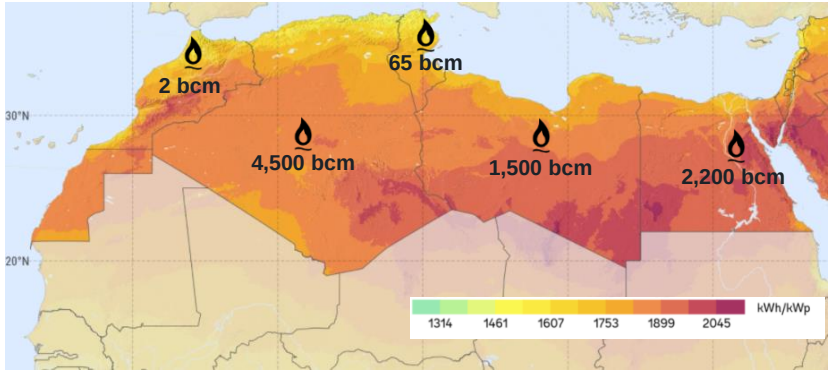
- **43% electrification rate**
- **Hydro resources in the Central and South-West regions and relevant wind and solar potential**
- **Underdeveloped Transmission and Distribution grid**

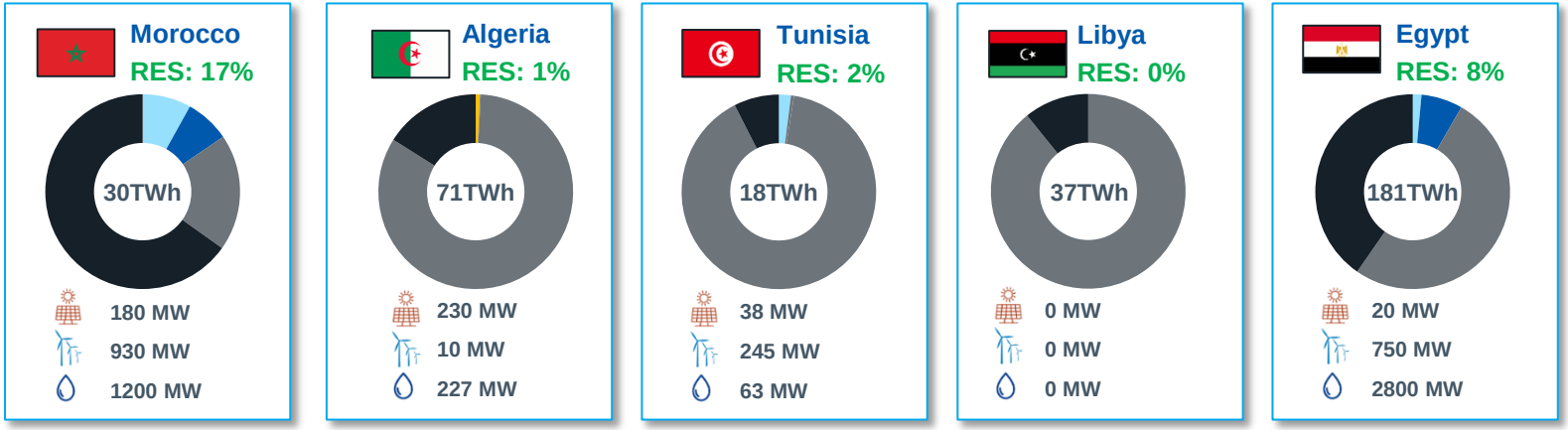
Complementary approach to foster sustainable power supply to Africa

- **Bulk power regional interconnections to convey RES generation to consumption centres**
- **Development in urban and peri-urban areas of distributed mid-size RES power plants**

North Africa is extremely rich in natural resources but still lags behind in electricity mix decarbonization

- **Uneven distribution of NG & oil resources**
- Still **lagging behind in RES generation** deployment
- **Ambitious RES targets** approved to sustain demand growth



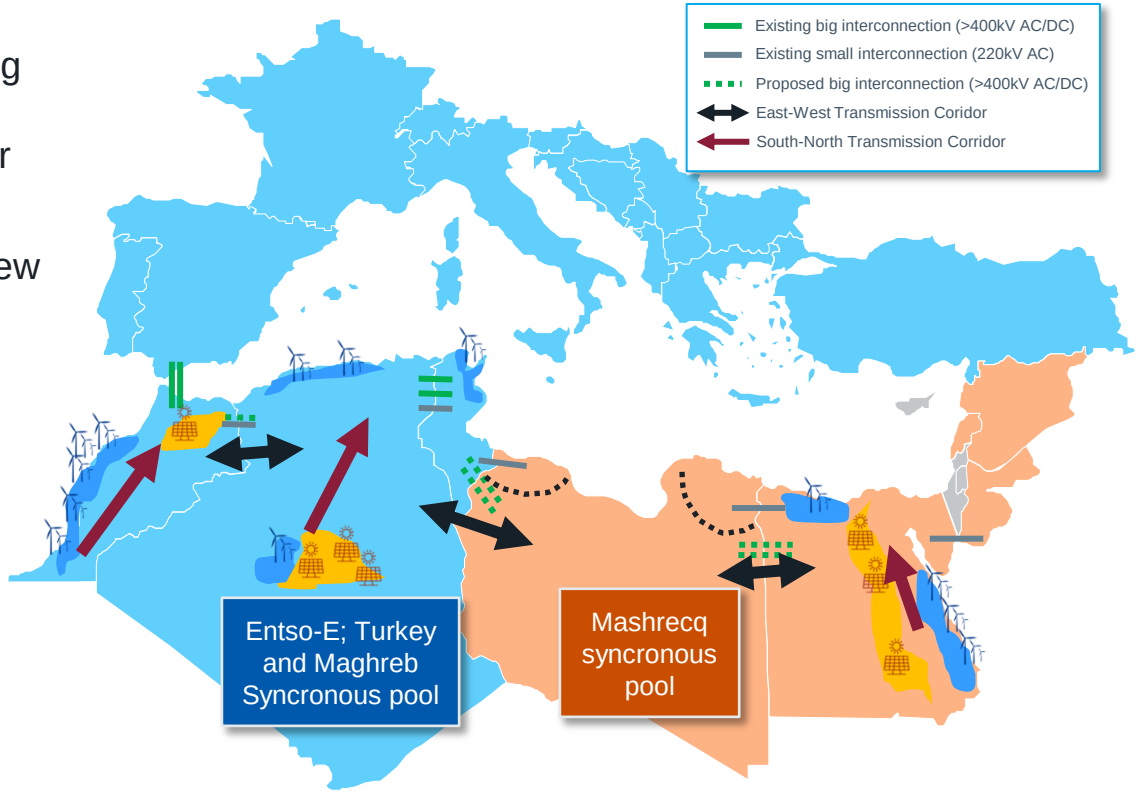


Hydro Generation | Wind Generation | Solar Generation | Gas Generation | Other Fossil Generation (coal, oil)

Source: Irena 2017, Arab Union 2017 and CIA World Factbook 2017

To solve bottlenecks, East-West and South-North transmission corridors shall be deployed

- **East-West:** need for strengthening the existing interconnections and adopt appropriate mechanisms for CBT
- **South-North:** need for building new power corridors in a challenging environment to convey RES generation to load centres



Sub-Saharan Africa needs infrastructure and distributed RES to secure the electric supply and sustain economic development

Sub-Saharan Africa

Combination of large RES power plants and large transmission infrastructures with decentralized RES deployment

- **Enhanced security of supply**
- **Better flexibility** to cope with V-RES and drought periods
- **Increased resilience** to extreme events
- **Optimal mix of CAPEX** intensive and mid-CAPEX intensive power plants

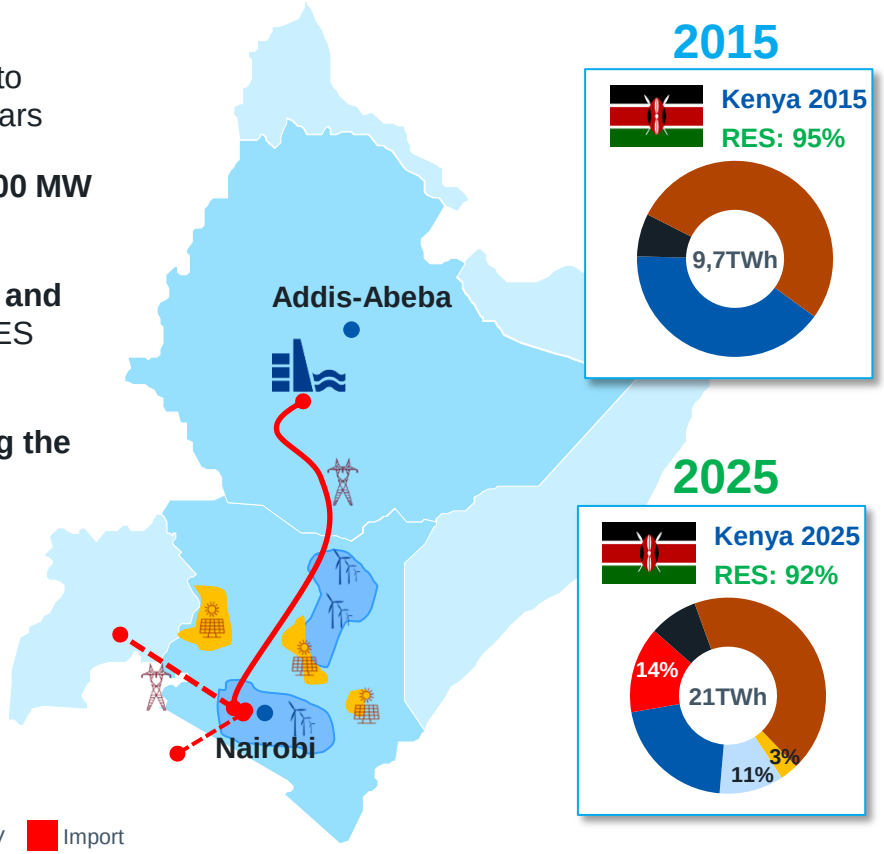
Res4Africa and CESI looked into Kenya RES development leveraging such approach to satisfy increasing power demand

Target: Sustainable and diversified RES development to sustain a 2x increase in the electricity demand in 10 years

1. **Import of hydropower from Ethiopia** through **2.000 MW HVDC** corridor
2. **Distributed mid-size RES development in urban and peri-urban** areas with **ca1.000 MW** of installed VRES resources in 2025
3. Opportunity to **limit coal generation while keeping the same reliability of power supply**

-52% CO_2 emission*

+20% security of supply*



Hydro | Geothermal | Other Fossil (coal, oil) | Wind | PV | Import

*With respect to BAU scenario
Source: RES4Africa and CESI

An enormous natural potential and ambitious RES development plans. Few takeaways for discussion.

3As

- **Affordability:** power available at a reasonable price
- **Availability:** power available as required
- **Accessibility:** possibility to access to the necessary amount of power

Key ingredients to develop a secure and sustainable power system in Africa:

- **Reinforce transmission infrastructure**, to avoid that the RES generation is curtailed
- Develop a **diffuse distribution grid** to effectively supply urban areas
- Definition of **clear and flexible mechanisms to attract investments** on RES generation (e.g. auctions)
- **Regional approach**, not only national. Key role of cross-border infrastructures

Source: IEA