
TA 9365
Regional Cooperation
on Renewable Energy integration
to the Grid

TA 9365 Regional Cooperation on Renewable Energy integration to the Grid

Overview

Financed by the Asian Development Bank

Amount : 1.2 millions of US$

Beneficiary : 7 countries of Central Asia : Afghanistan, Kazakhstan, the Kyrgyz Republic, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan

20 month Technical Assistance (commencement Date : January 2018)

Assistance provided by a French consortium between RTE-International and EDF, leaded by RTE-International, with the participation of CORESO

Background

- Paris Agreement: greenhouse gas emissions reduction
- Important solar & wind generation potential
- Increasing needs in reserve exchange
- Central Asian countries are already almost interconnected

Main Outputs

- **Output 1: Grid reinforcement plan, to accept intermittent renewable energy**
  - Task a - Balancing capacity reserve assessment
  - Task b - Dispatching operation practice assessment
  - Task c – Policy and sector review
- **Output 2: Regional cooperation to share balancing capacity reserve**
- **Output 3 : Dispatching operation support tool**
  - Including implementation of a generation forecasting service for RE in Kazakhstan
- **Output 4 : Capacity building**

OUR TEAM
International experts

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Power market design specialist

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Dispatching operation expert

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Dispatching operation expert

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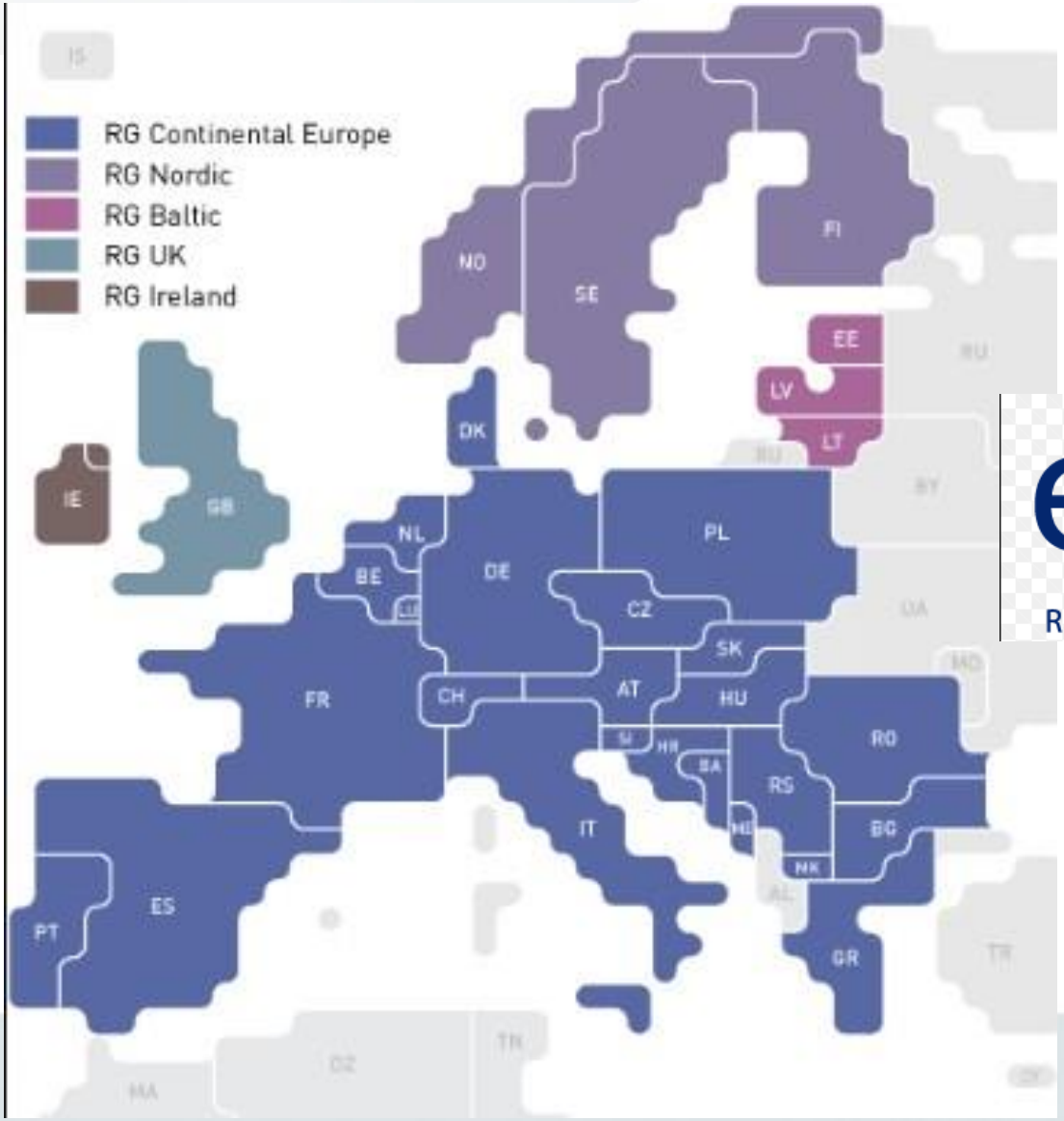
Abdullelah Rasooli

Kyrgyz Republic
Kairat Dzhumailev

Pakistan
Ahsan Maqbool

Approach to services
European examples



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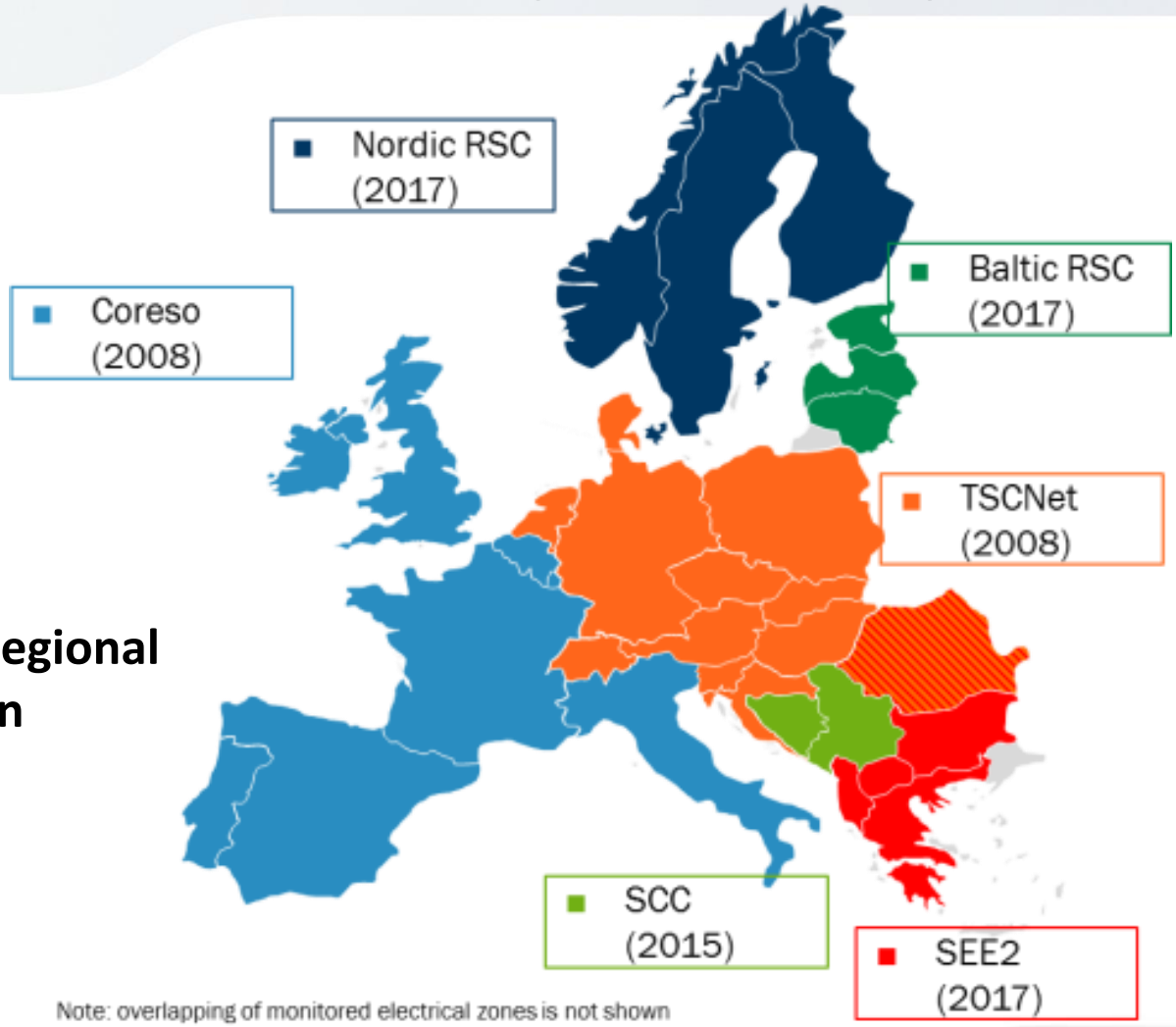
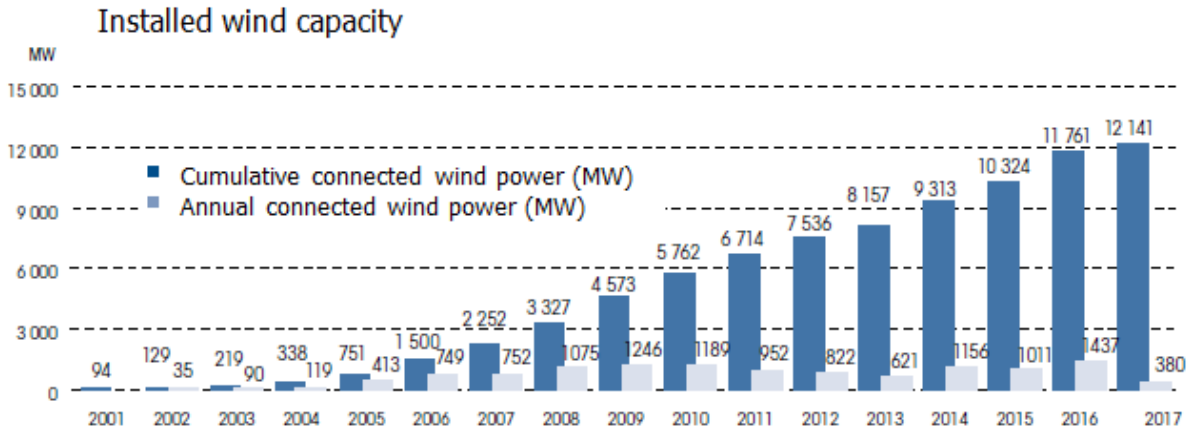
Reliable Sustainable Connected

Approach to services
European examples

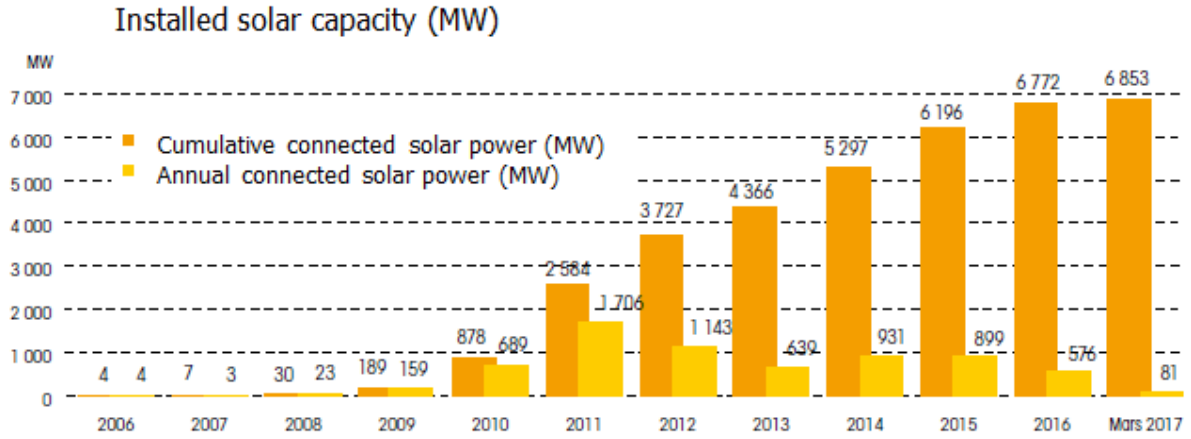
Implementation of Regional Security Coordination Centres (target)



IN FRANCE, GENERATION FROM INTERMITTENT SOURCES CONFIRMS ITS TAKE-OFF…



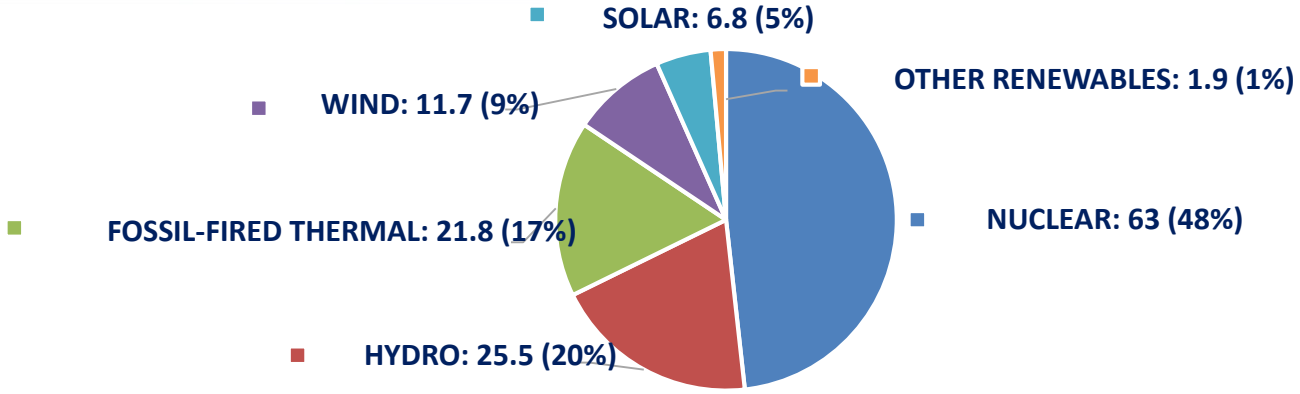
- **Wind energy :** 12 141 MW
  31/03/2017
- **13.3 GW end of February 2018**
- **Thanks to feed in tariffs** : 82 €/MWh for 10 years, then between 28 and 82 €/MWh for 5 years according to efficiency



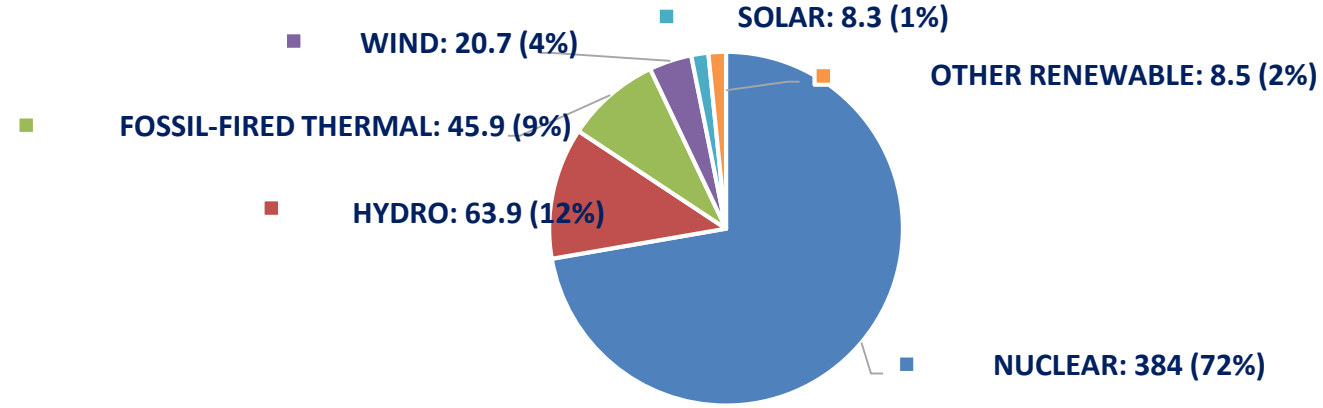
- **Solar energy :** 6 853 MW
  31/03/2017
- **7.5 GW end of February 2018**
- **Thanks to feed in tariffs :** between 105 €/MWh (Ground Farm) and 354 €/MWh (Households)

FRENCH POWER GENERATION MIX

- Installed capacity at the end of 2016 : **130 GW**

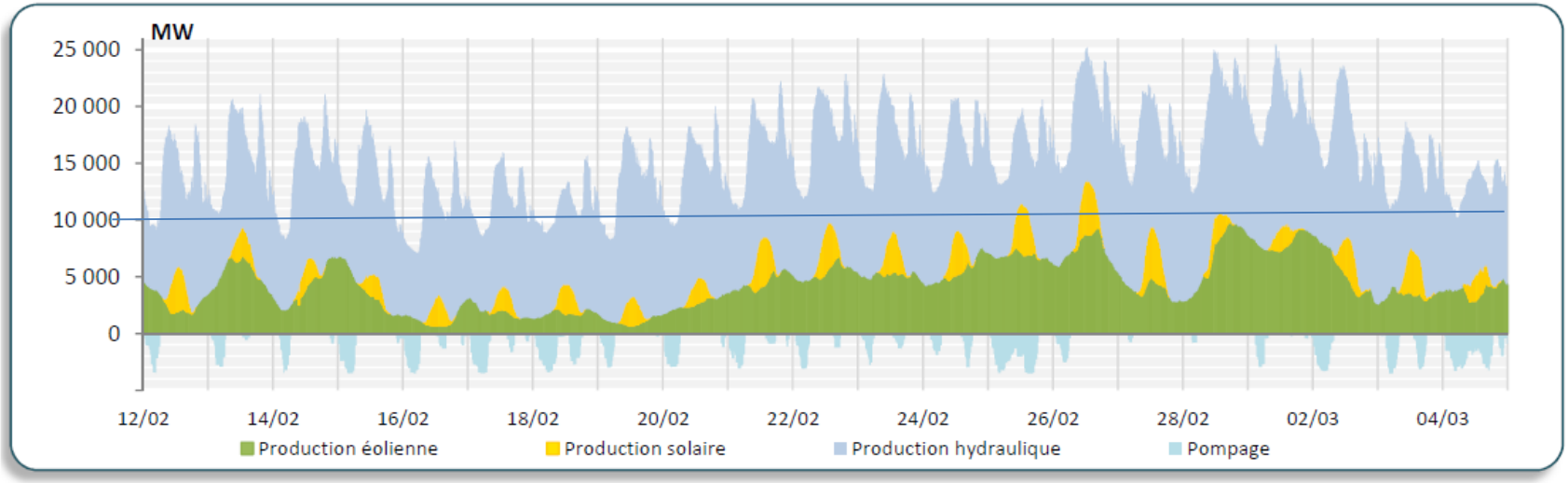


- Electricity generation in 2016 : **531,3 TWh**

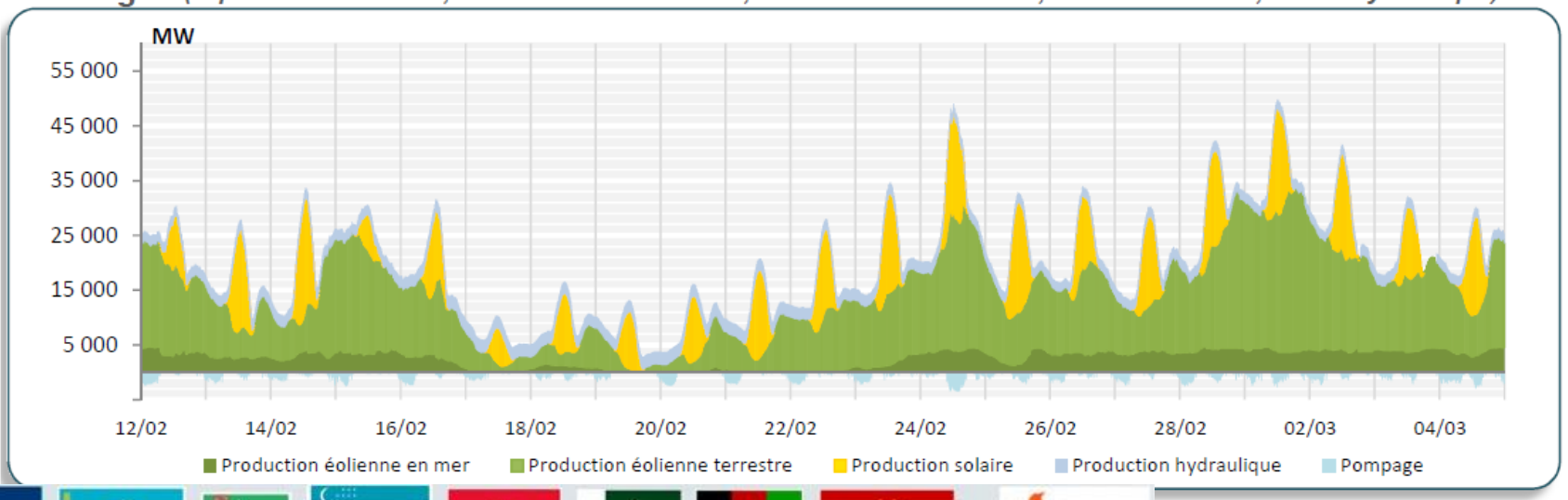


Intermittency during peak load period in France (peak on 28 February 95.1 GW)

France *(capacité installée : 13,3 GW d'éolien 7,5 GW de solaire 25,5 GW d'hydraulique)*



Allemagne *(capacité installée : 50,3 GW d'éolien terrestre 5,3 GW d'éolien en mer 42,8 GW de solaire 5,6 GW d'hydraulique)*



Increasing the controllability and the flexibility of all power system elements, including RES

In the future EU transmission network (2030 horizon) operating conditions with the highest RES injection (typically windy / sunny conditions with moderate demand) present major system challenges, particularly where the high RES penetration extends to a total control area or even more if covering a total synchronous area.

The move towards a more RES dominated system implies a gradual diminution of the large scale generation connected at EHV level and this will be further compounded by this generation having much reduced running hours compared to today's levels.

The main answer to this is to increase the controllability and the flexibility of all power system elements, including RES, to deliver a power system which can react and cope better with the volatility of RES.

Technical challenges ahead related to stable operation of the power systems

Frequency management: RES generation having to be resilient to wider frequency ranges (*) and provide new capabilities for frequency support (fast frequency response and system inertia, frequency sensitive mode for large parks…).

(*) 49 – 51 Hz permanently and 47,5 – 51,5 Hz during at least 30 minutes in continental Europe even for small generators (> 0,8 kW)

- **Voltage management:** RES generation connected at distribution voltages able to provide the necessary reactive power support.

- **Fault level (system strength) management:** RES generation needs to be resilient to system faults staying connected (and generating) during the initial voltage transients (as conventional generation does today).

- **Remote Control of RES including distributed generation units**

PRE-REQUISITES AND MEASURES FACILITATING THE INTEGRATION OF RENEWABLE ENERGY SOURCES

1. Grid Code including high level technical requirements for RES (EU regulation 2016/631)
2. Transparent and no discriminatory connection procedure
3. Anticipating network investments
4. Real-time visibility and accurate generation forecast
5. Adapted reserve and energy markets

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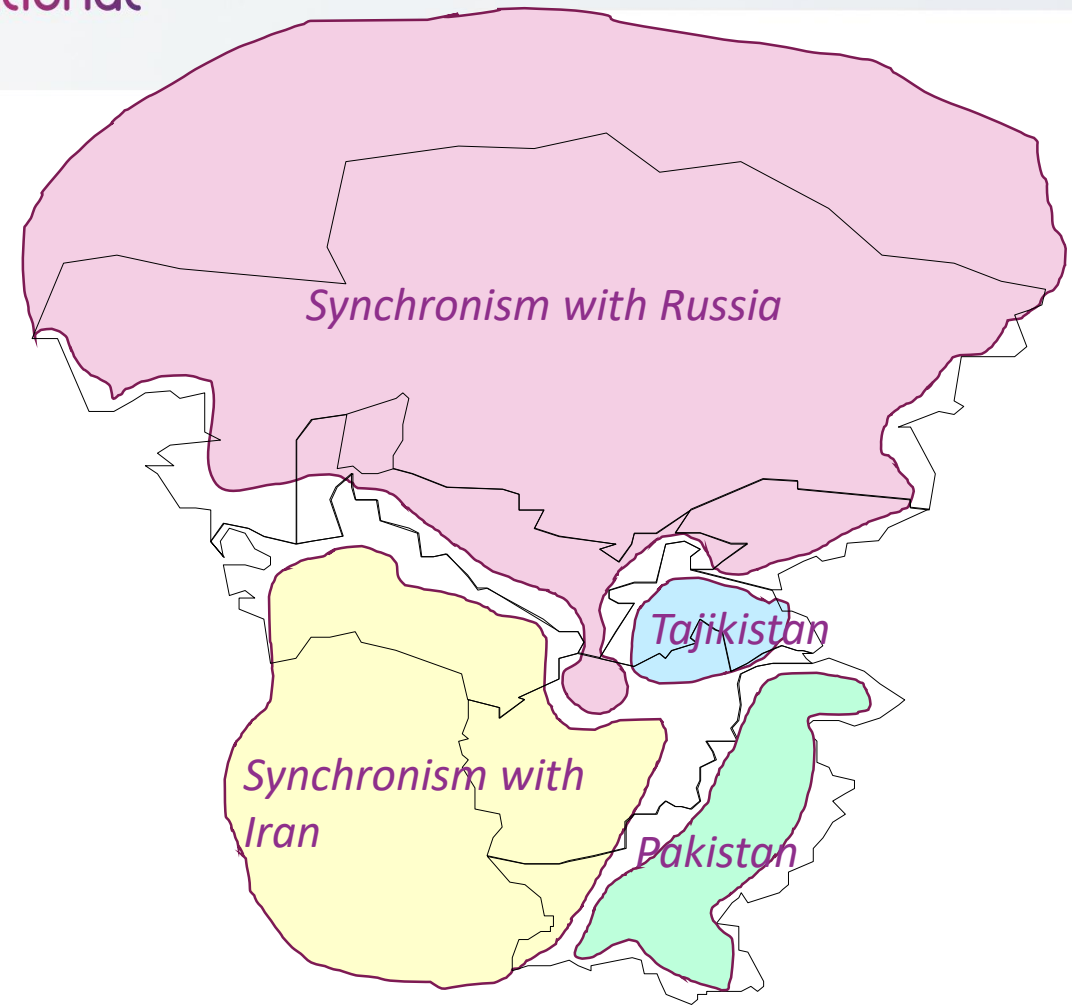
Preliminary findings

Some possible options for Regional Cooperation

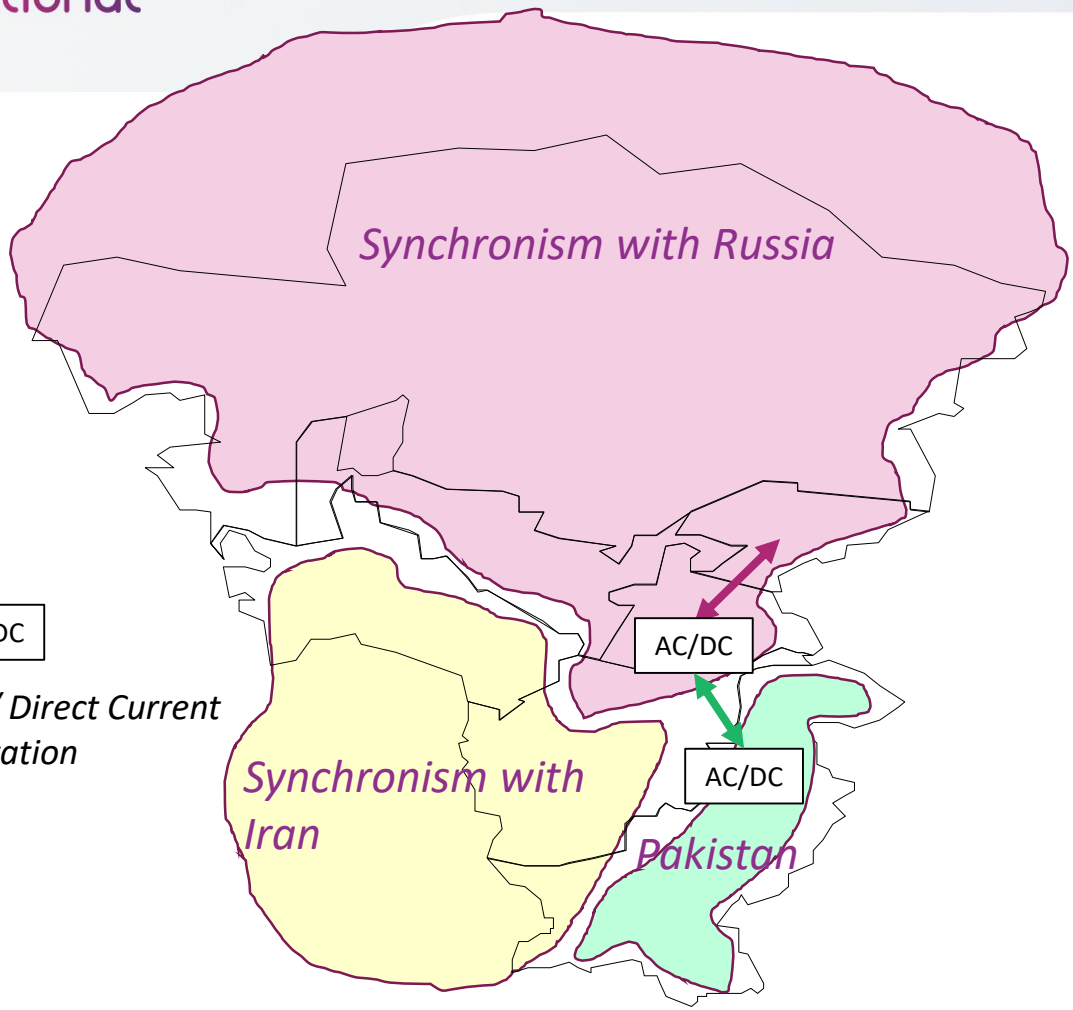
Preliminary assumptions for the project

- The “Region” comprising the 7 countries of the project should not be an islanded system. The countries of the Region shall follow trading electricity with neighboring countries (Russia, Iran….)
- Interconnecting all these countries in AC is not realistic (and probably technically unfeasible)
- DC connections (lines or back to back stations) are key to enable a full interconnection of the “Region”.
- The consultant proposes 3 options for the Regional Cooperation from limited integration to the creation of a specific synchronous area in the “Region”

Existing Synchronous areas



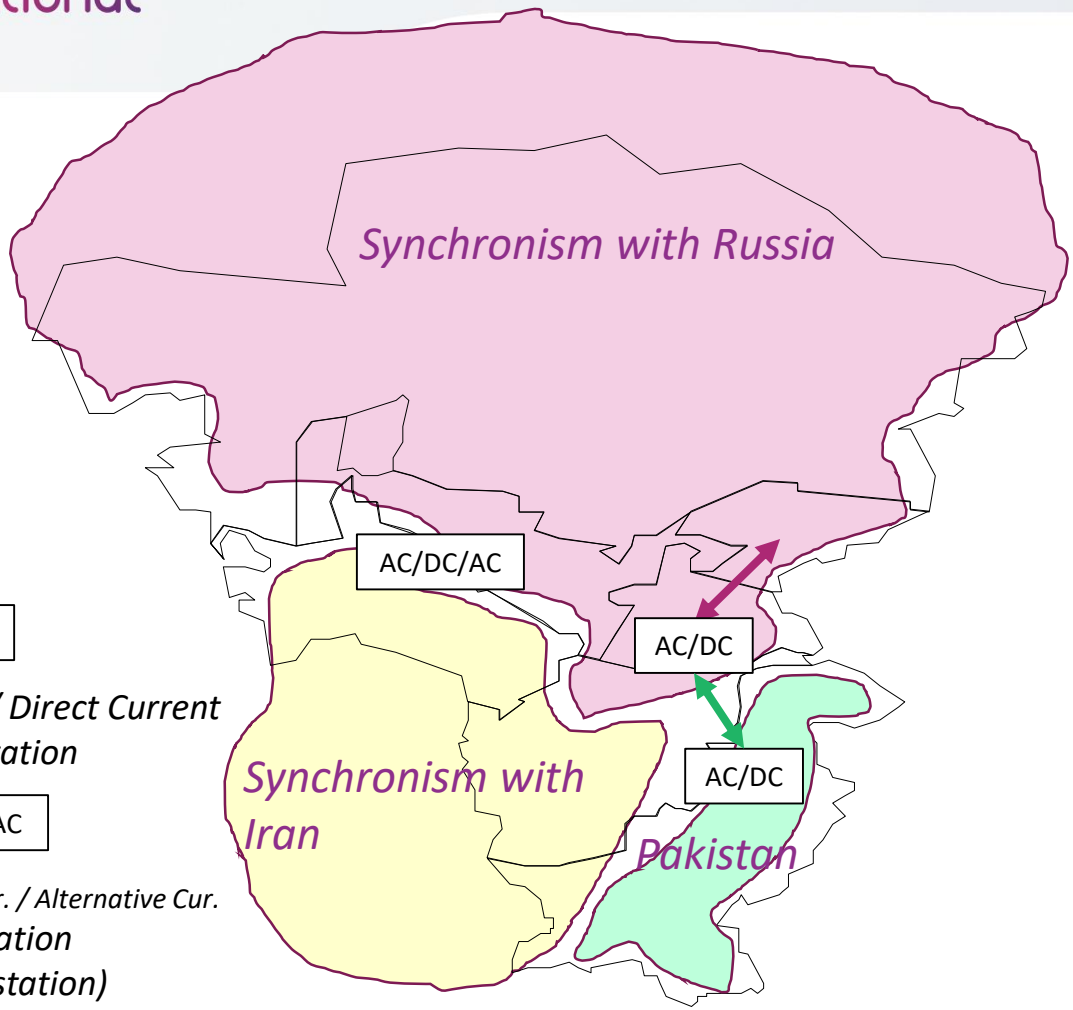
Synchronous areas with on-going projects (CASA)



AC/DC

Alternative Current / Direct Current converter station

Option 1 : Target with limited regional integration



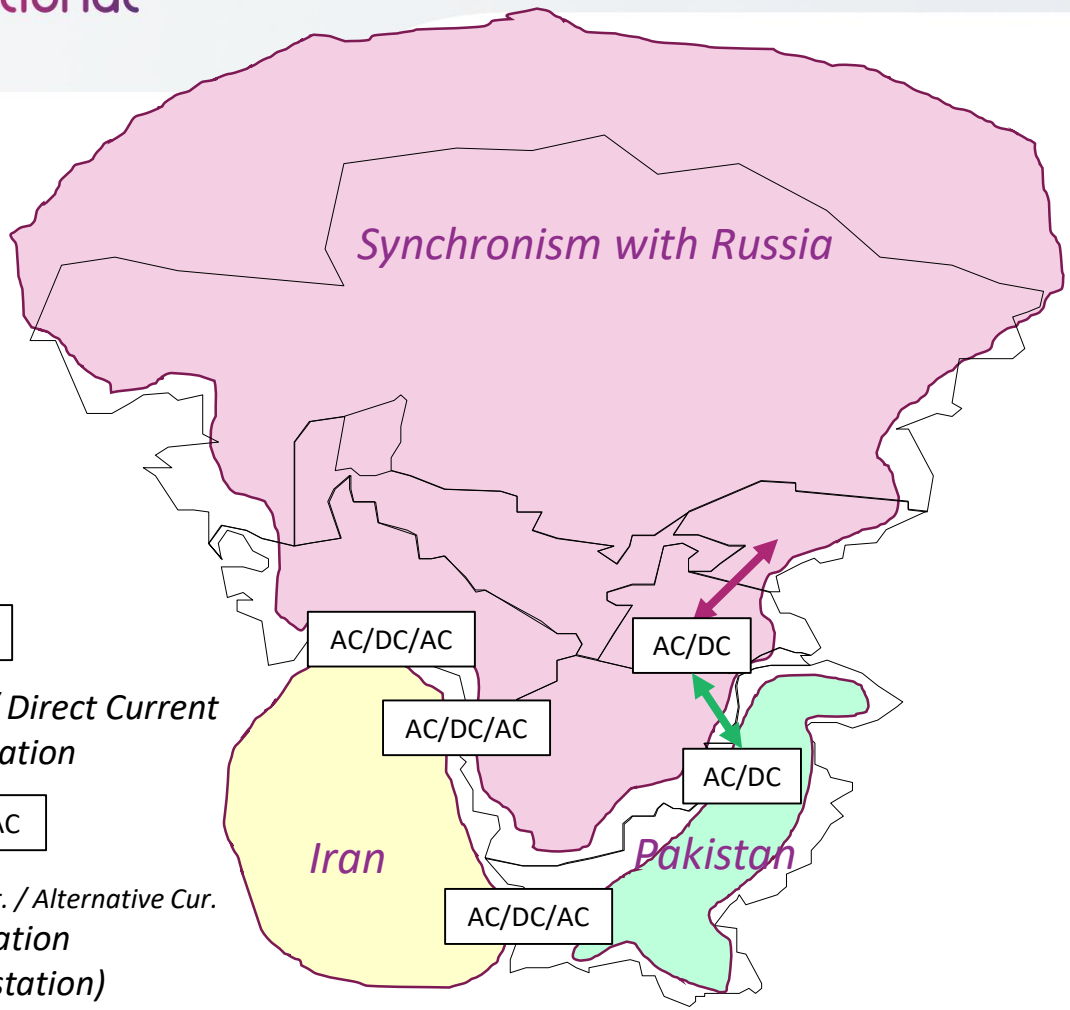
AC/DC

Alternative Current / Direct Current converter station

AC/DC/AC

Alternative Cur. / Direct Cur. / Alternative Cur. converter station (back to back station)

Option 2 : Target with advanced regional integration



AC/DC

Alternative Current / Direct Current converter station

AC/DC/AC

Alternative Cur. / Direct Cur. / Alternative Cur. converter station (back to back station)

Option 3 : Target for Regional cooperation creation of an independant synchronous area