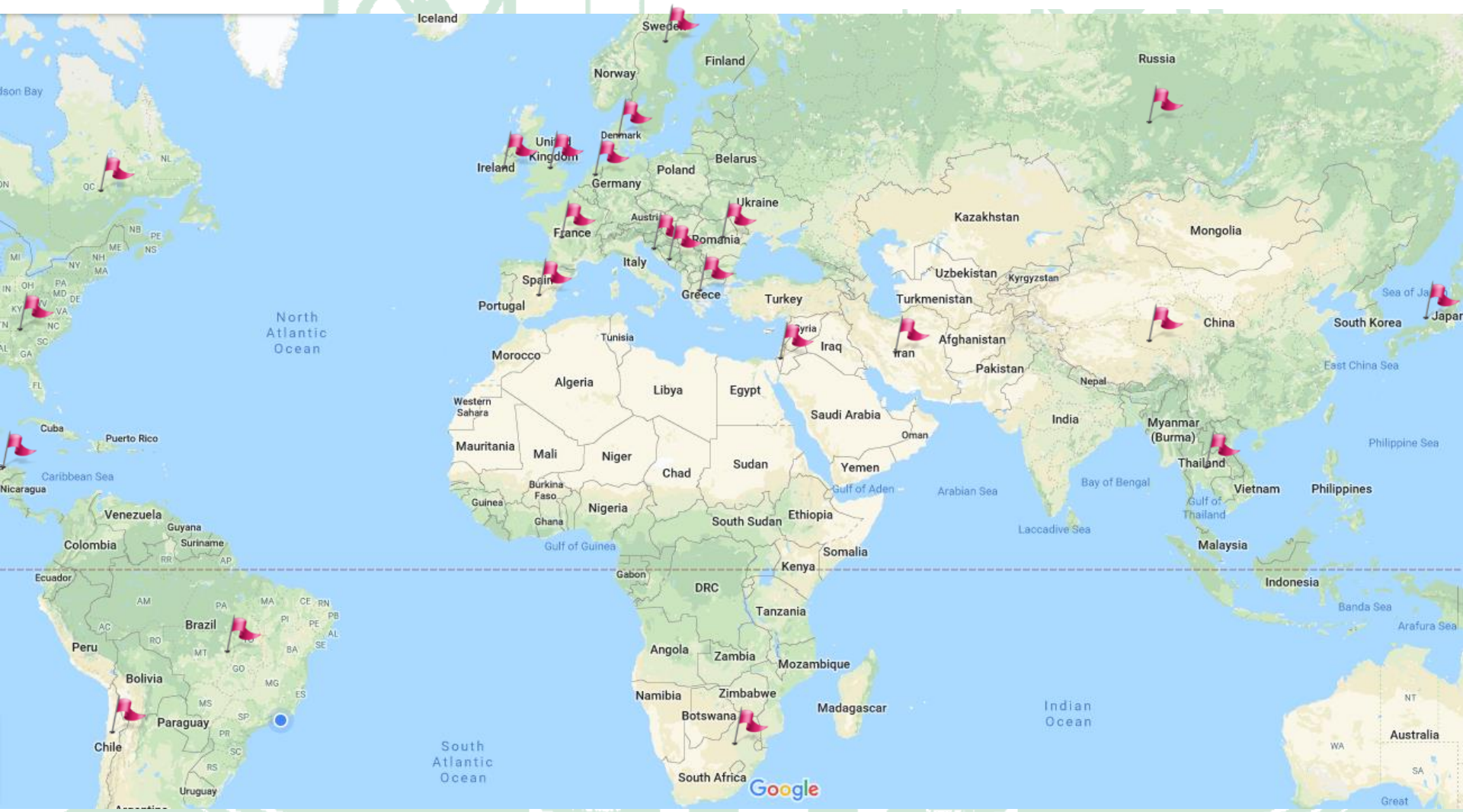


JWG C1/C4.36

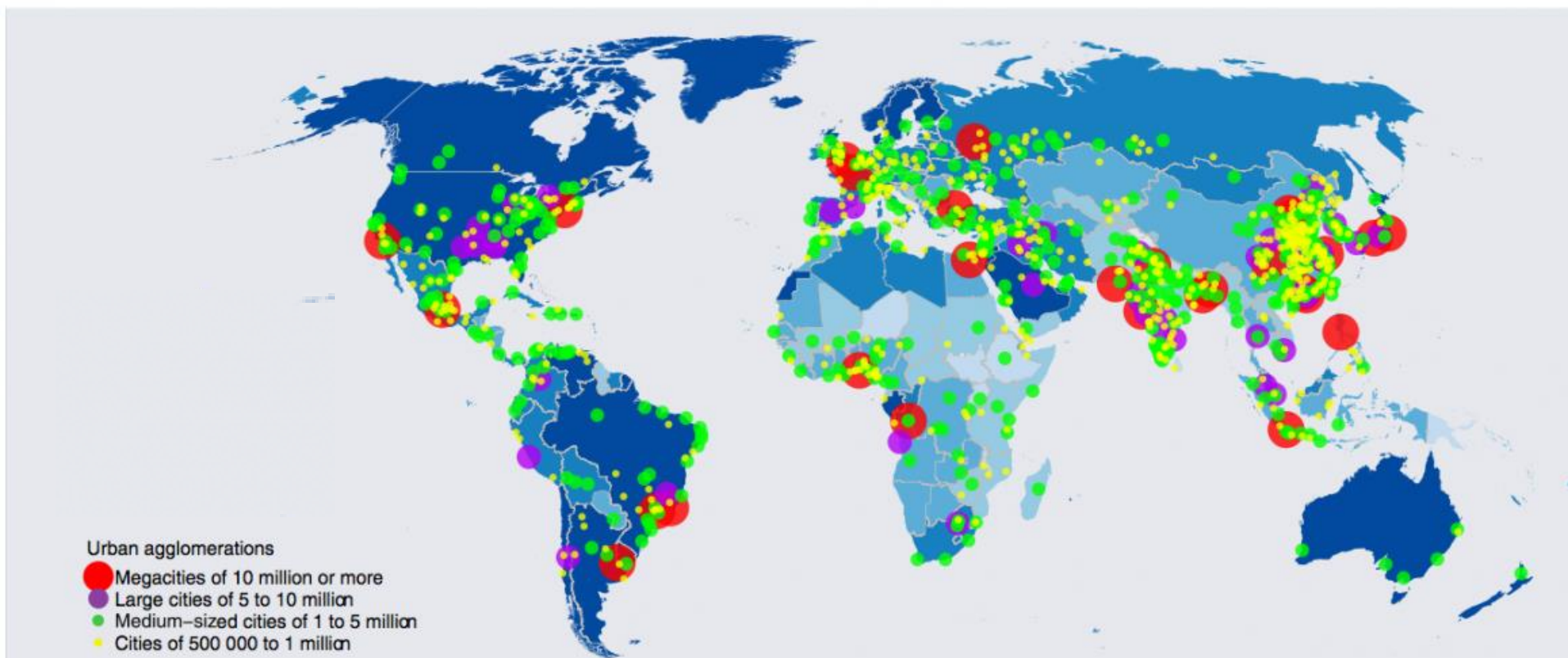
**Review of Large City & Metropolitan Area
power system development trends taking into
account new generation, grid and information
technologies**

- JWG Composition:
 - Convener: Stanislav Utts (RU) & Valdson Simões (BR)
 - 41 members (incl. corresponding, observer, young and liason) from 23 countries
- JWG Timeline:
 - Start Date: March 2017
 - Expected Date for Submitting Final Report to SC Chairman: January 2019

23 countries members



location of urban agglomerations with at least 500,000 inhabitants, 2014



Background...

- The number of Large Cities & Metropolitan Areas (L&M) is increasing in size and in population. So, electricity consumption are growing and concentrated in densely populated areas.
- L&M are important political and economic centers. Loss of load or even load curtailment, can have a significant financial impact on companies and consumers.
- The safety and reliability of power systems must endure when facing today's challenges such as capacity and power balancing adequacy, restoration and modernization of the networks, and the installation of new generating and power system equipment.

- New technologies have been developed since the turn of the century and this coincides with the need to replace ageing, key assets in the power systems which grew rapidly in the middle of the 20th Century.
- Rather than replace assets on a like-for-like basis, however, it is important to recognise that economic drivers have changed and these will influence the power system of the future.
- Cross industry coordination and cooperation is required to successfully manage power system operations for L&M while new technologies are being deployed.
- Criteria and principles for large cities power system operation and development will be proposed.

- Items that will be taken into account at this JWG activities:
 1. Power flows to and from the distribution network;
 2. Application of innovative measurement devices;
 3. Active and reactive power flow control technologies and their increasing automation;
 4. Economic drivers for L&M development;
 5. Large scale HV and UHV cable route penetration;
 6. Development of electric vehicle, rooftop PV penetration; etc.

The L&M power system development trends and operational features will be assessed both for transmission and distribution networks due to their growing interaction.

Scope of JWG C1/C4.36

1. Review the current state of L&M power system supplies with a view to:
 - Defining the terms «Large City» and «Metropolitan Area» in relation to the power system;
 - Identifying power system development trends over the past 10 years in relation to the expansion of Large City & Metropolitan Areas, and analysing how these trends are shaped by the planning process for transmission, distribution and security of supply;

Scope of JWG C1/C4.36

- Defining the characteristics, features, challenges, and common requirements in relation to the planning for L&M power systems, with attention to issues like: high generating capacity and load concentration; electricity consumption structures; power balancing using local electricity generation capacity and external power flows; reliability and stability problems; power factor and power quality issues; effects of reverse power flows; among others; and
- Determining the existing and prospective economic drivers related to the development of L&M power systems.

2. Define the existing and potential prospective technologies at transmission and distribution level to be applied in L&M power systems for improved sustainability and controllability, including:
 - Exploitation of the control capabilities of Renewable Energy Sources (RES) and Dispersed Generation.
 - Battery storage systems, FACTS and HVDC, and other generator technologies for voltage and power flow control, reactive power compensation and power system stability improvement.

Scope of JWG C1/C4.36

- Use of modern HV and UHV cable lines, gas-insulated substations, high capacity substation installation near load centers, underground substation.
- Use of smart metering, demand response approach and other smart grid concepts.

3. Identify L&M power system development trends, highlight common issues, and highlight drivers for the further development of power system security criteria and planning principles.

Current working definitions:

- **Metropolitan area power system** means a capital of the country region power system consisting of a densely populated urban and suburban territory with industry and housing consumers. It can include one or more urban areas, as well as satellite cities, towns and intervening rural areas that are socio-economically tied to the urban core. The population of Metropolitan area is usually more than **3 mln people**, and peak load usually more than **5 GW**.
- **Large city power system** means a city power system including densely populated urban territory with industry and housing consumers. The population of large city is usually more than **1 mln people**, and peak load usually more than **2 GW**.

Questionary survey...

1. Description of the M&L
2. Development programs, power system operation, planning and development standards and grid codes
3. Technical parameters of the power system up to 2017 for development trends assessment
4. Current main problems in power system operation and development
5. Current generating, grid and information technologies that are used in Metropolitan area and Large city power systems
6. Technical parameters of the power system for the near future – up to 2025

Questionary survey...

7. Main problems that can occur in the near future in terms of power system operation and development
8. Future generating, grid and information technologies that can be used in M&L power systems

- **Future Activities**

- Receive contributions by questionnaire survey.
- TB preparation during 2018 using survey and reference papers.
- JWG meeting during Paris session 2018.
- TB final version by the end of 2018.

- **Other Items**

- Need members from some large cities.

Prospective Brochure ToC

- Introduction, Scope, Definitions and Abbreviations
- Questionnaire survey
- Power systems examples (*for transmission and distribution grid*)
 - London, Paris, Rio de Janeiro, Seoul, Beijing, New York, Tokyo, Moscow, Mexico City, Madrid, Tehran, Santiago, Bangkok, New Delhi
- Power systems development
 - Development trends; Correlation between development trends and planning process and security of supply; Economic drivers related to the power system development
- Power system technologies
 - RES, DR and storage; HVDC and FACTS; Cable lines, GIS, GIL and underground substations; Smart grid and Demand response
- Conclusions and further recommendations
- List of References
- Appendix

MUCHAS GRACIAS!!

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