CIGRE STRATEGY 2017-2022
Prelude to next Century

Rob Stephen

President of CIGRE

CIGRE MISSION AND VISION

Contribute to the betterment of the power system and the expertise of the people within it.

- Combine and summarize information on topics from around the world

The foremost global community enabling sustainable electricity for all.

- Unbiased global information on power systems

CIGRE VALUES

- **Independence**-Providing completely unbiased technical information and solutions to electric power systems issues and problems;
- **Accessibility**-Disseminating knowledge without barriers to the global community;
- **Transparency** - Open processes, guidelines, and finances.
- **Making a difference** - Partnering through our national committees to spread technical information for the betterment of society;
- **Advancement** - Growing and encouraging our members, including the young generation and women, through global participation to achieve their individual and collective goals in advancing electric power systems;
- **Cooperation** - Collaborating with other international organisations of related interests;
- **Professionalism** - Always honest and professional in our endeavours
- **Adaptability** – Ability to address and influence emerging issues affecting the electric power sector in a timely manner.
- **Impartiality** - Providing the global forum for the open and honest exchange of technical information without bias

STRATEGIC THEMES AND GOALS

- **Influence and Contribute – Providing key information to executives and engineers for influence and awareness.**
  - Availability of publications– easily searchable
  - Brand awareness
  - Focus in areas where CIGRE is not known (Africa)
- **Vibrant and Inclusive – Excellent Central Office services and enabling National Committee growth and participation**
  - Consistent message on CIGRE purpose, membership, benefits.
  - Support to NC's via tools and website that they can tailor make.

STRATEGIC THEMES AND GOALS (CONT)

- **Power System of the Future – Understand and influence the development of new technology and practices for all voltages and systems.**
  - Keep up to date on developments relating to internet of things, cyber security, inverter based resources. Inform members and stakeholders on all aspects of power system development.
  - Understanding distribution issues, minigrids, storage.
  - Connecting areas with no electricity (electrification) especially rural areas.

STRATEGIC THEMES AND GOALS (CONT)

- **People and Skills of the Future – Increase participation and skills for our growing membership and improve the diversity of our membership to enhance our relevancy to address the electric power system of the future across the globe.**
  - CIGRE is the best organization to develop skills by participation in working groups.

STRUCTURE

- Administrative Council
- Steering Committee
- Technical Council
- 16 Study Committees
- Supported by President, VP Technical and VP Finance
- Supported by Central Office under Secretary General
  - To remain unchanged.

FUTURE GRID CHALLENGES

- Policies for **lower carbon**, renewable energy sources (RES), efficient energy use
- **Integration** of RES and distributed generation (DG) into the grids
- Increased **customer participation** and new needs for distribution grids
- Progress in technology including **ICT**
- End-of-life **grid renewal** (ageing assets)
- Methods to **connect remote areas** with no electricity
- **Market design** and regulatory mechanisms for an equitable, cost-effective transformation
- **Environmental compliance** and sustainability

GRID MODELS

1. Increasing importance of large networks for **bulk transmission**
   - capable of interconnecting load regions and large centralized renewable generation resources including offshore,
   - to provide more interconnections between countries and energy markets.

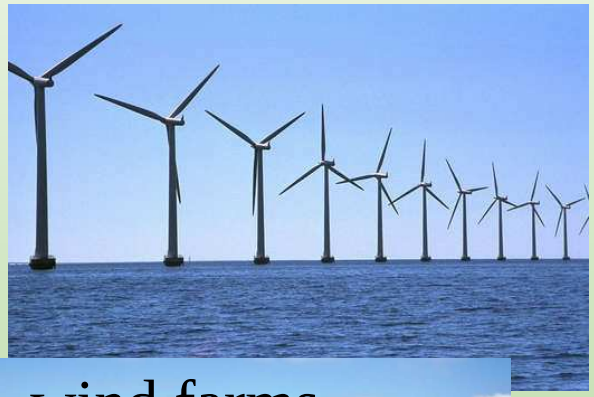
2. The emergence of clusters of small, **largely self-contained distribution networks**
   - which include decentralized local generation, energy storage and active customer participation
   - intelligently managed so that they are operated as active networks providing local active and reactive support.
     - **The best future will likely have a mix of the two models.**

REVOLUTIONARY DEVELOPMENTS

➔ **new key requirements**

- Integration of variable new renewables on a large scale (mainly wind and PV)
- Match of the free market requirements
- Electrification (increase use and connect those without) of households

INVERTER BASED RESOURCES-GROWING

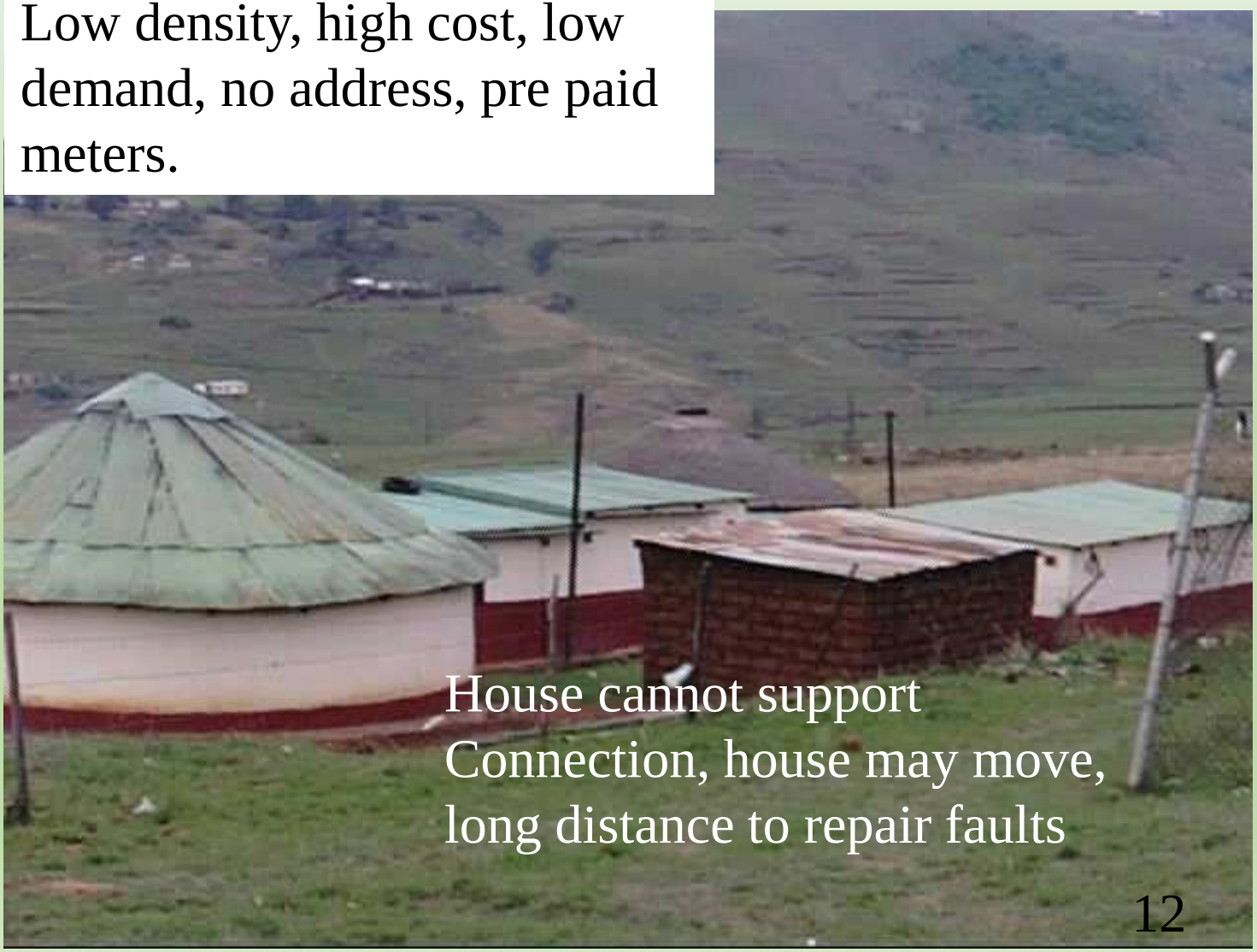


Fastest growing electricity source: by 2030 expected to be a major source of electricity (IEA)

e.g. China: in 2015 wind 128 GW ; PV 43 GW; increase 2 times
by 2020 wind 250 GW, PV 150 GW ; increse 3 times

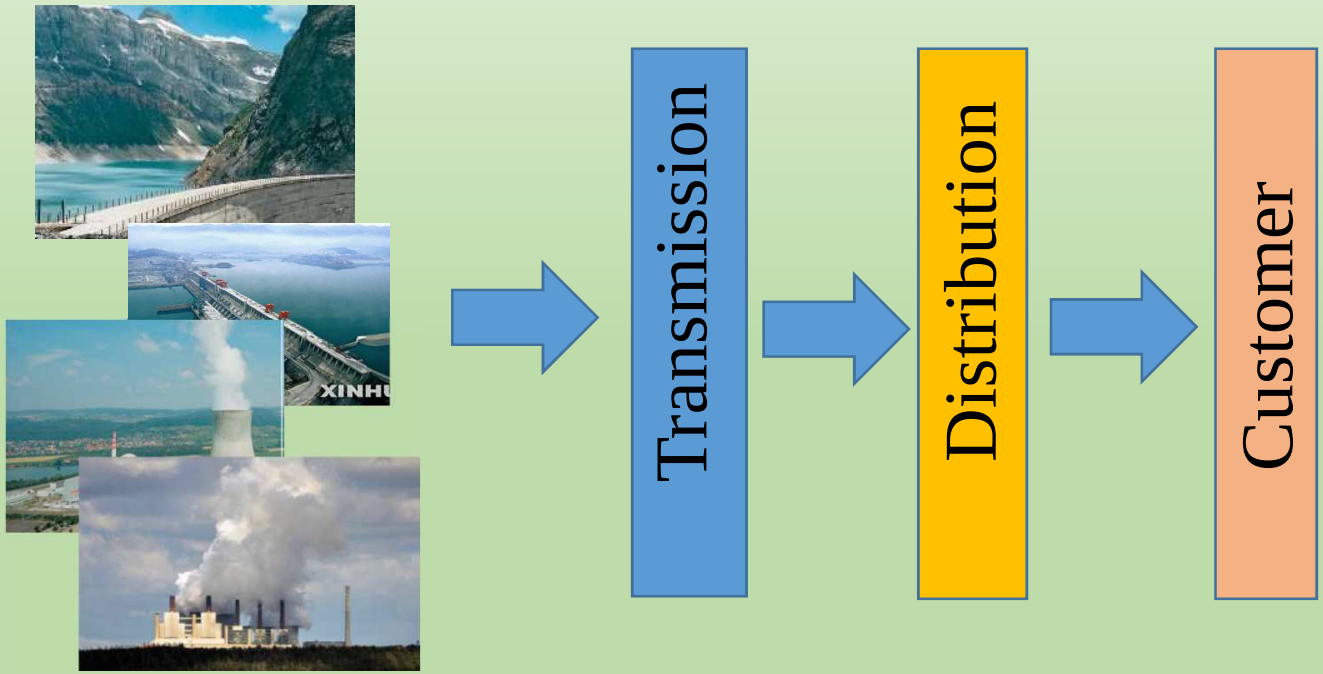
SUSTAINABLE ELECTRICITY FOR ALL

Low density, high cost, low demand, no address, pre paid meters.



PAST SYSTEM

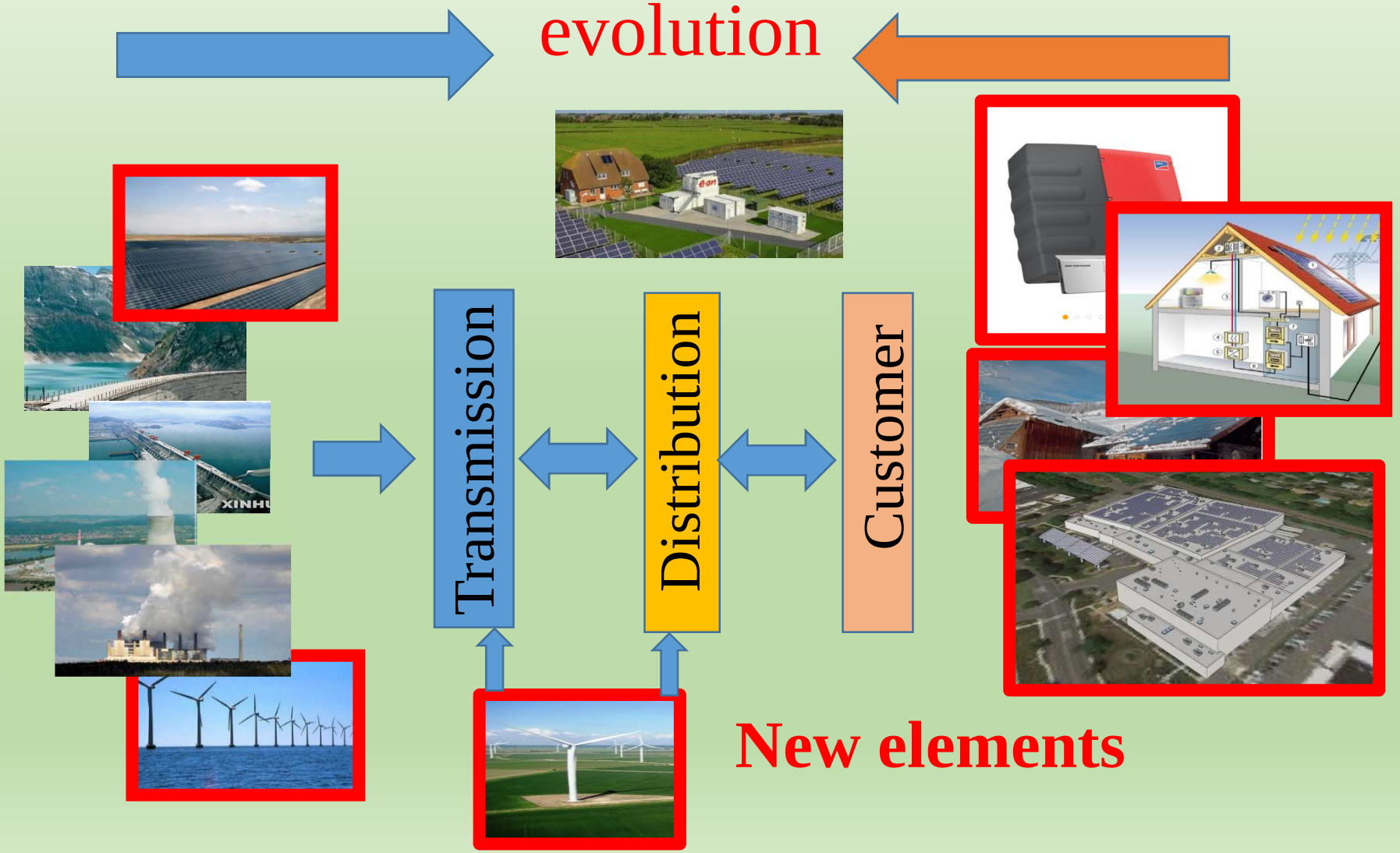
Past



Uni-directional load flow from source to load

CURRENT/FUTURE SYSTEM

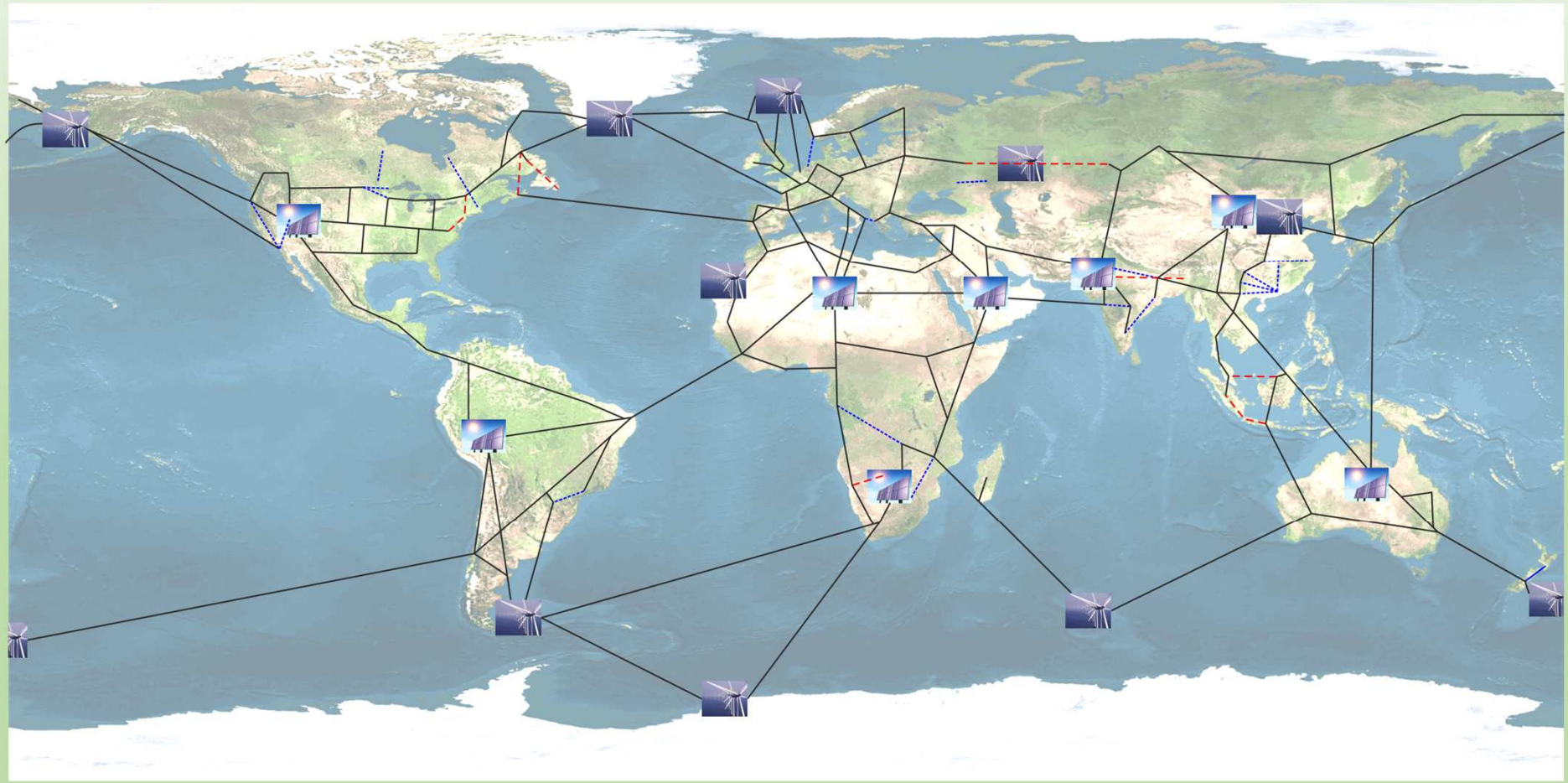
- System development on HV- and LV sides
- Load flow from uni directional to bi directional
- Random generation and load location



NEW KEY ELEMENTS

- Continental and intercontinental (global?) interconnections
- Deployment of variable sources
- Electric energy storage on all voltage levels
- Massive number of residential- and business generation
- Grid control and energy management by digitalization - also on the low voltage side
- Massive increase of new consumers (e-mobility and heat pumps)

GLOBAL GRID – PV AND WIND BALANCE



S. Chatzivasileiadis, D. Ernst, G. Andersson - The Global Grid

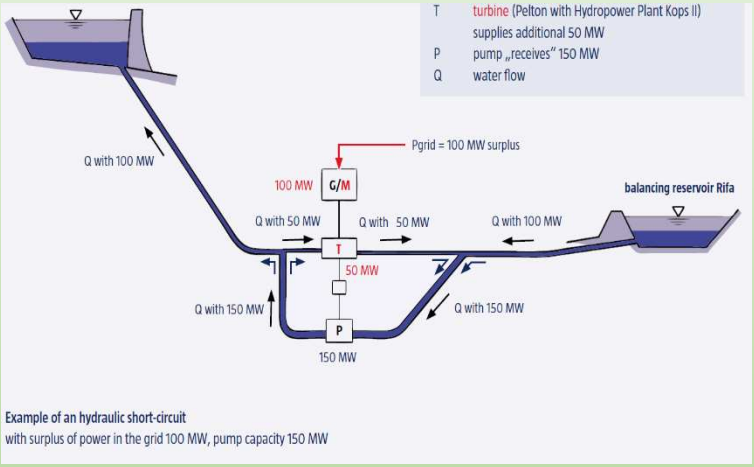
Swiss Federal Institute of Technology, Zurich

Technology for transmission is available

- UHV up to 1200 kV AC and +/- 800 DC (1100 kV DC feasible)
- Submarine cables to a depth of 3000 m
- Digital substations
- Compact GIS substations allow cost reduction and off shore transmission
- Hybrid lines (AC and DC on one tower)

STORAGE CAPACITIES

Global
145 GW (98%)



PV combined with storage
Global : around 2200 MW
In 2025 expected > 21 GW

LOCAL STORAGE

Local PV Production – massive increase of contribution of prosumers

assumption: in 2030 half of the storage capacity will come from households and rooftop business installations

- about 1,5 million PV systems in Germany at 2014, around 35000 already combined with a storage package
- 33MW storage in the US behind the meter

CONCLUSION

- Developing the system is not only a technological challenge. It requires regulatory adaptations and political cooperation in most areas
- In future the medium and in particular the low voltage distribution system will play a significant role in regulating the system – cooperation between TSOs and DSOs have to be intensified
- Control of the system will be of utmost complexity thus stability most likely will be solved by distributed intelligence
- Cyber security needs emphasis

ACKNOWLEDGEMENTS

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