WORLD ENERGY COUNCIL
CONSEIL MONDIAL DE L'ÉNERGIE
Österreichisches Nationalkomitee des Weltenergierates

World Energy Resources

Charting the Upsurge in Hydropower Development

2015

May 2015

WEC Austria

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World Energy Council – who we are

“The world energy leaders’ network”

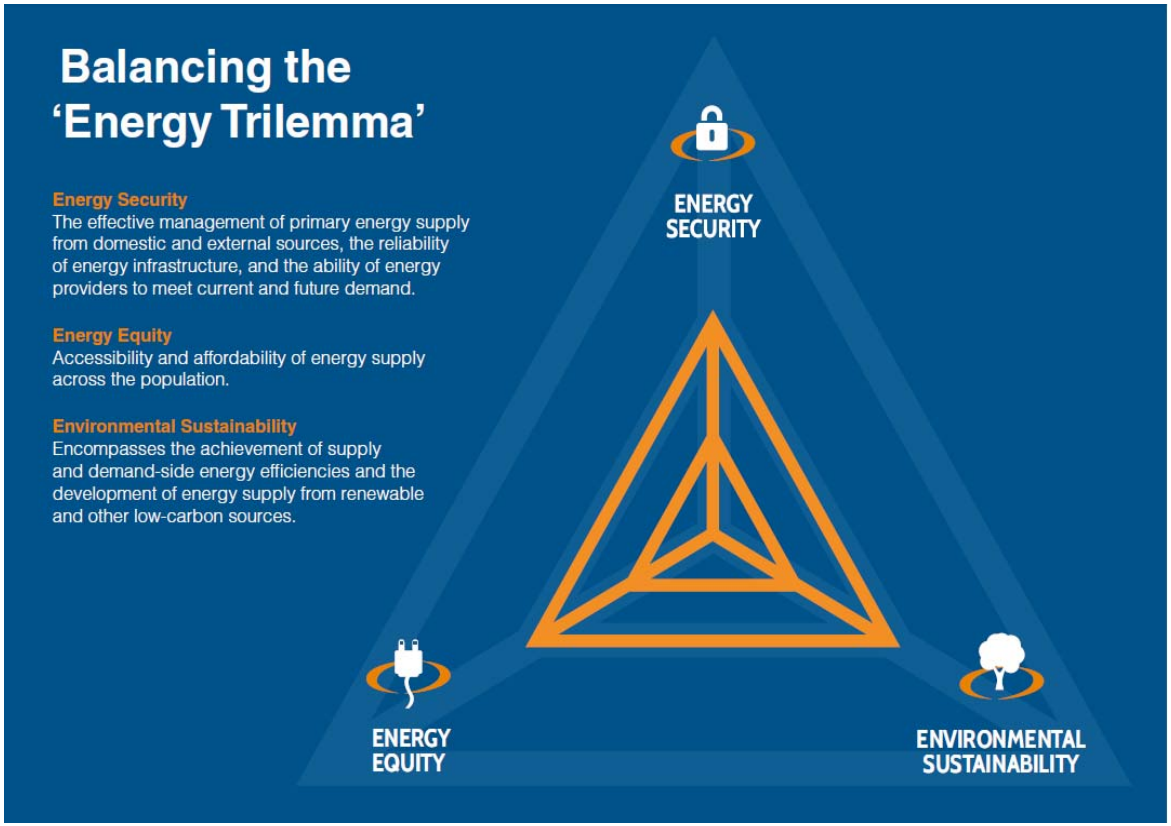
- Truly global
- Inclusive and impartial
- Committed to our sustainable energy future since 1923
  - 95 national committees chaired by energy ministers, leading CEOs and practitioners
  - Represents over 3000 government, private sector and experts organisations
  - Flagship event: World Energy Congress, every three years, 2013 in Daegu, South Korea. Next Congress, 2016 in Istanbul, Turkey

Our mission and vision

- The energy leaders' network promoting the sustainable supply and use of energy for the greatest benefit of all

  – All resources and technologies are needed

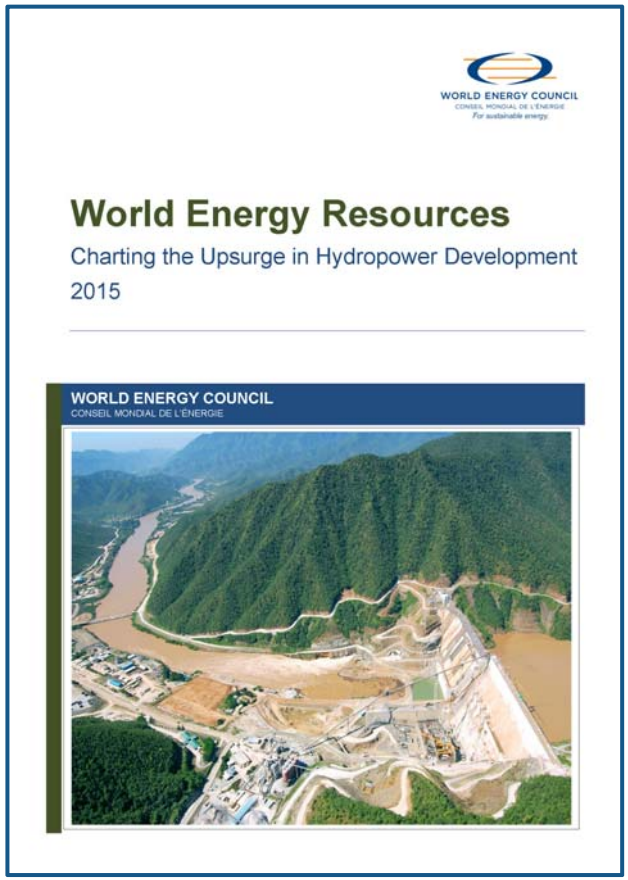
  – The concept of the 'energy trilemma' guides policymakers and industry leaders to make sustainable choices.

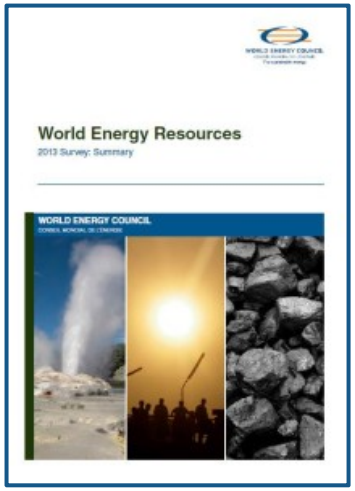


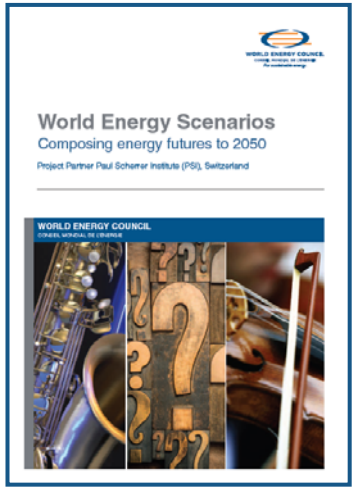
WEC Studies

- **World Energy Scenarios** – exploratory assessments providing a realistic vision of alternative future energy landscapes
- **World Energy Resources** – surveys the global availability and production of all major energy sources, with national and regional assessments
- **World Energy Trilemma** – assesses how well countries are addressing the energy trilemma
- **World Energy Issues Monitor** – assesses the issues on top of the global and regional energy agenda
- **World Energy Perspectives** – specific issues and technologies

This report will form part of the Hydropower Chapter in the World Energy Resources report 2016 and feed into the Scenario process

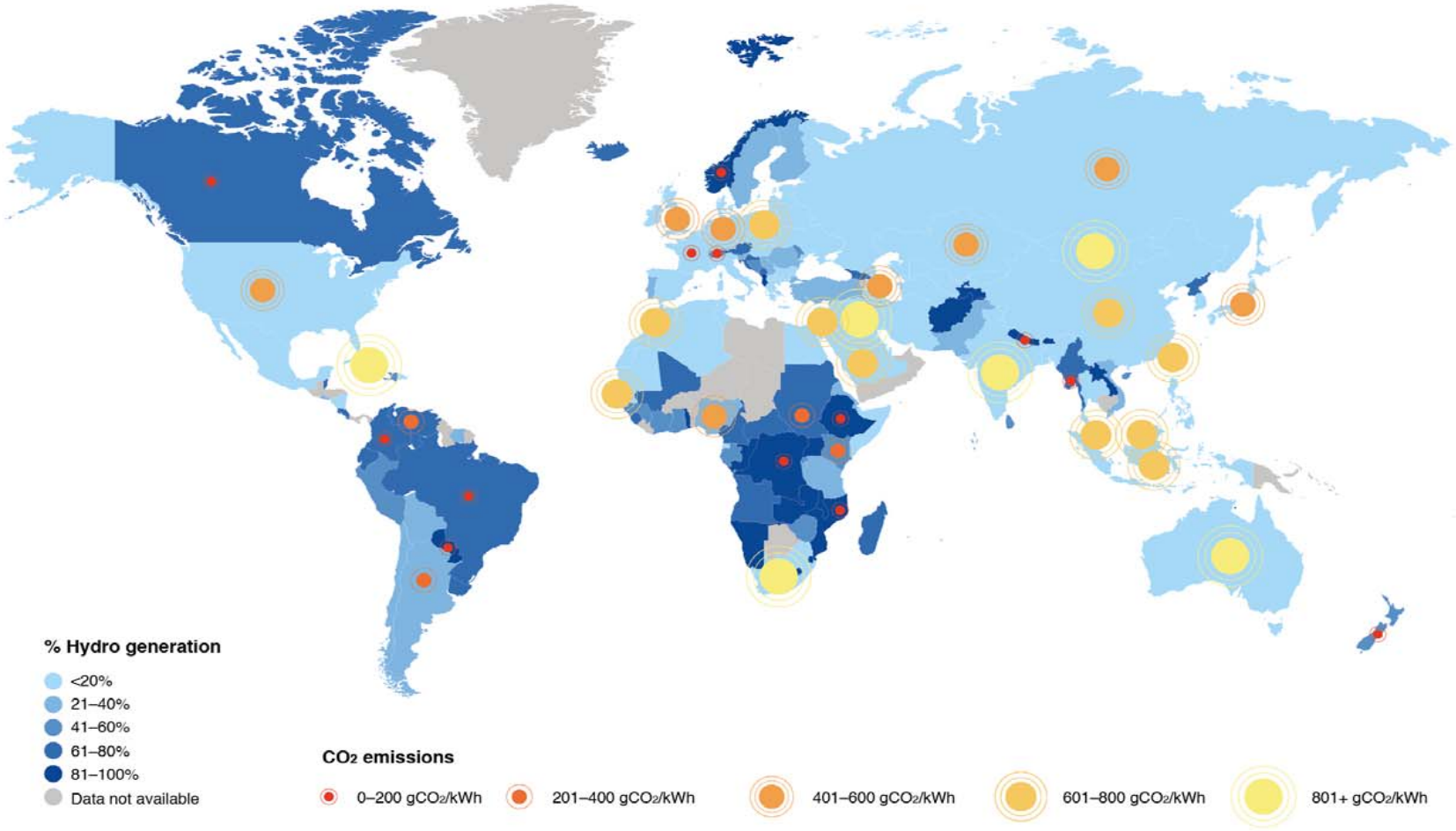






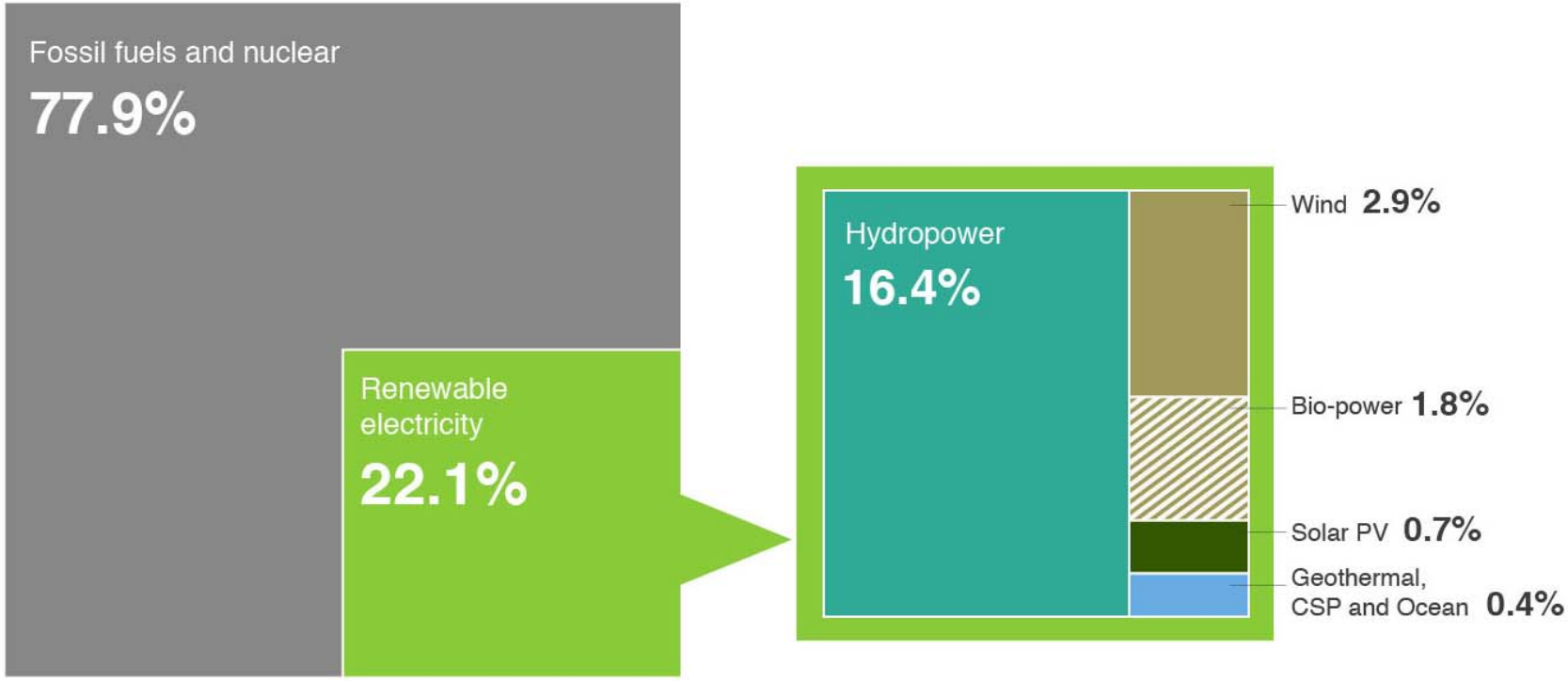
Key messages

Hydropower can serve as a tool for climate mitigation in offsetting fossil fuel technologies



Key messages

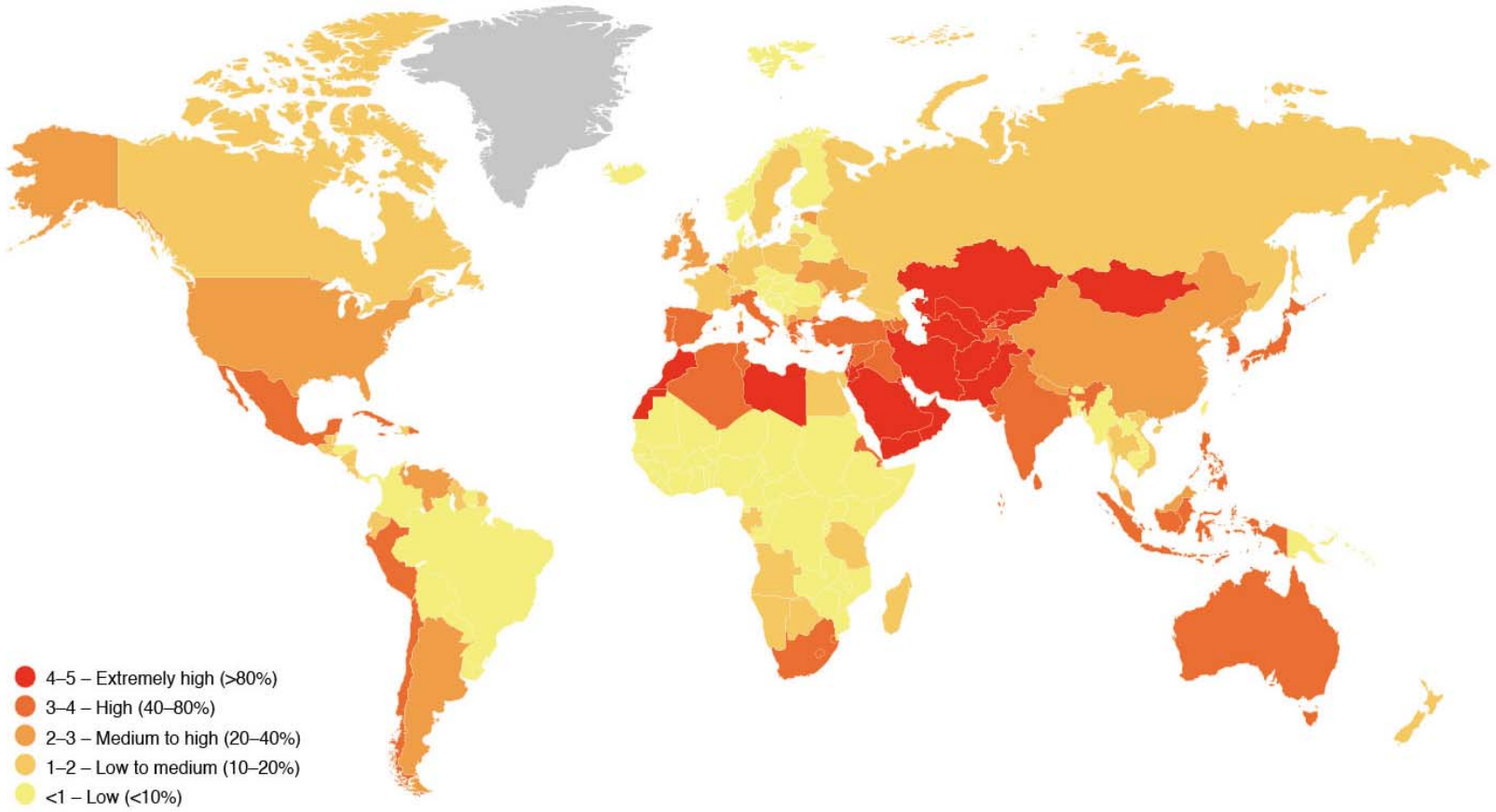
Hydropower remains the dominant renewable source of electricity



Hydropower supplied 16.4% of global power supply in 2013

Key messages

Energy-Water: Co-operation between the energy and water sectors is important, as is driving the operational efficiencies of the major energy and water consumers



Key messages

- Globally, an estimated 10,000 TWh/year of undeveloped potential remains for new development. Together with improved performance of existing assets, hydropower growth is expected to continue its current trend over the next several decades.
- As so many water resources span across more than one country, government decisions, policies and co-operation with neighbouring countries, are crucial to the success of such projects. Governments further have the responsibility to ensure that sustainability requirements – economic, social and environmental – are met and that benefits, especially for local communities are realised.
- Opening up new markets through cross-border trade and power pools and devising appropriate market conditions, such as renewables incentives, clearer price signals for ancillary services and flexible generation, could all have a positive impact on hydropower development.
- Project developers and owners of hydropower projects will increasingly be expected to demonstrate climate resilience at the financial and regulatory approval stages. This may include provision of improved data analysis on climate change impacts, increased flexibility in project design to accommodate uncertainty, increased storage volumes, and revised operational regimes.

Key messages

Hydropower facilitates multi-purpose uses for reservoirs, including irrigation, flood control, navigation, and recreation

Three Gorges Dam - multi-purpose dams

Key messages

Hydropower provides energy storage and other ancillary services that contribute to the more efficient management of the electricity supply system and balancing of the grid.

Hydropower (including pumped storage) represents **99%** of world's energy storage

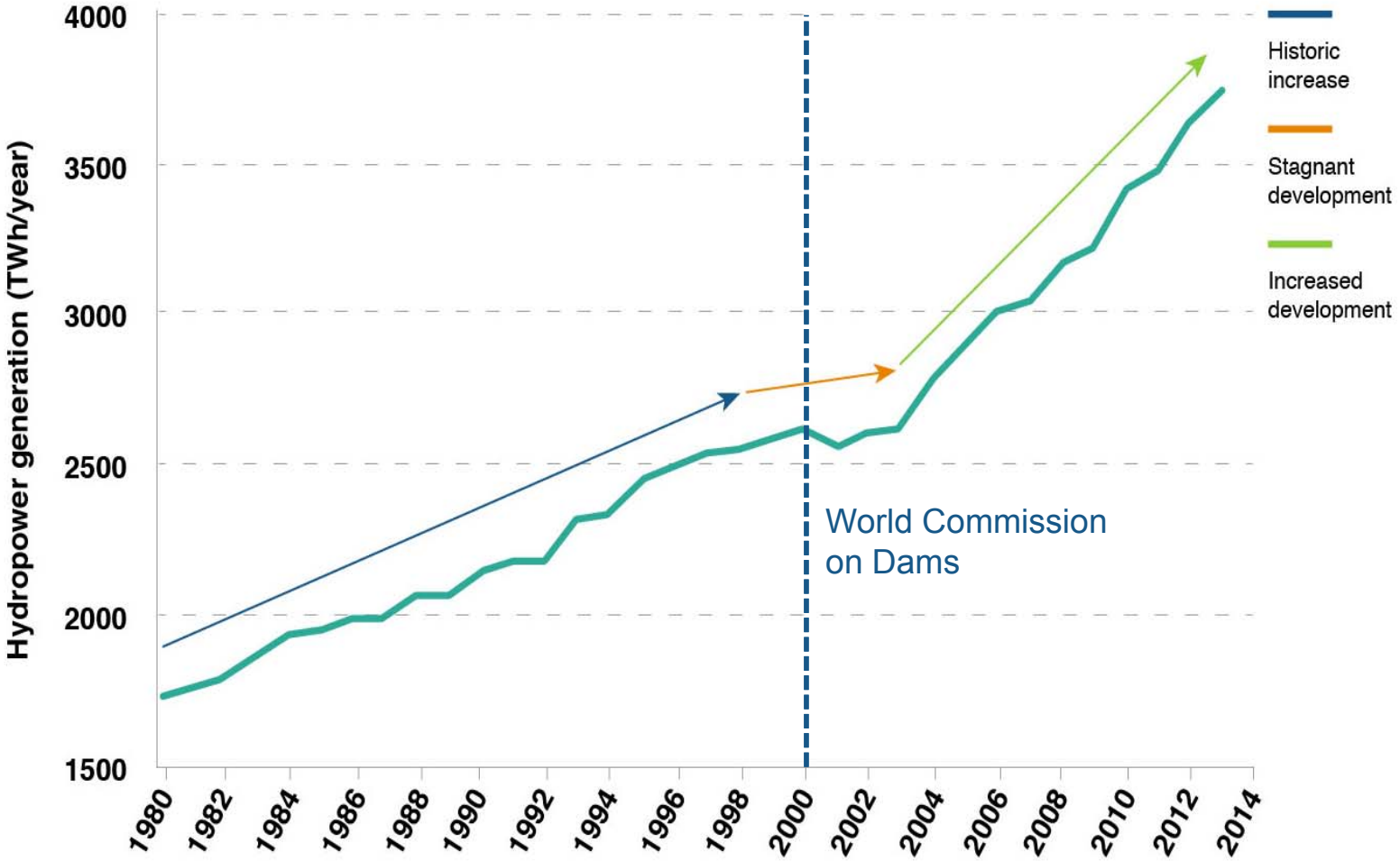
Key Figures

Hydropower exceeded 1000GW of installed capacity worldwide

	Total Capacity GW	Added in 2013 MW	Generation TWh
China	260	28.7	905
Brazil	85.7	1.7	415
USA	79	0.3	269
Canada	76.1	0.1	388
Russia	46.7	0.7	175
India	43.7	0.8	143

Key Figures

Growth of hydropower



Key Figures

Hydropower supplies

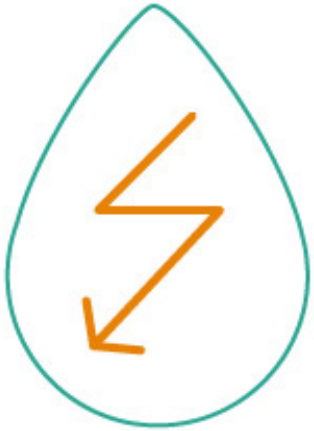
16.4%

of global power supply

Hydropower supplies

76%

of all renewable energy

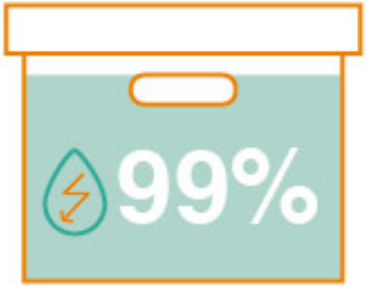


Globally, an estimated

10,000 TWH/YEAR

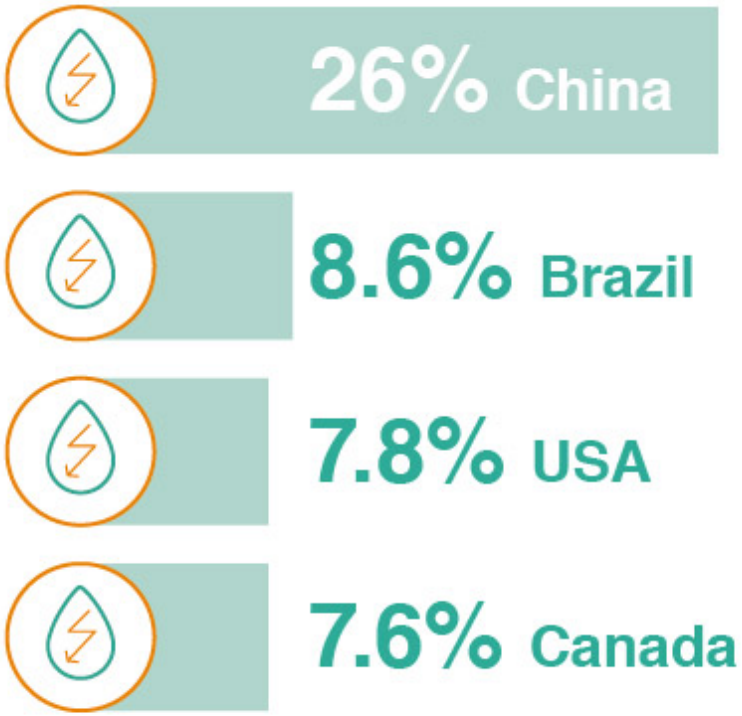
of undeveloped hydropower potential remains for new development

Storage hydropower (including pumped storage) represents 99% of the world's operational electricity storage



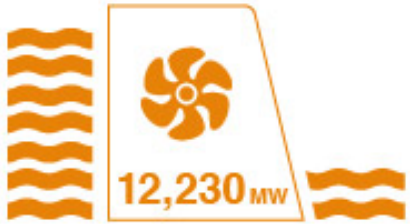
Key Figures

Global installed capacity:



The two largest hydropower plants currently under construction in the world are both over 10,000MW:

Baihetan
CHINA



Belo Monte
BRAZIL

Hydropower Outlook
Challenges

- Sector knowledge and human resources
- Project delays
- Water consumption
- Water storage capacity
- Sedimentation
- Greenhouse gas (GHG) footprint
- Climate change and resilience

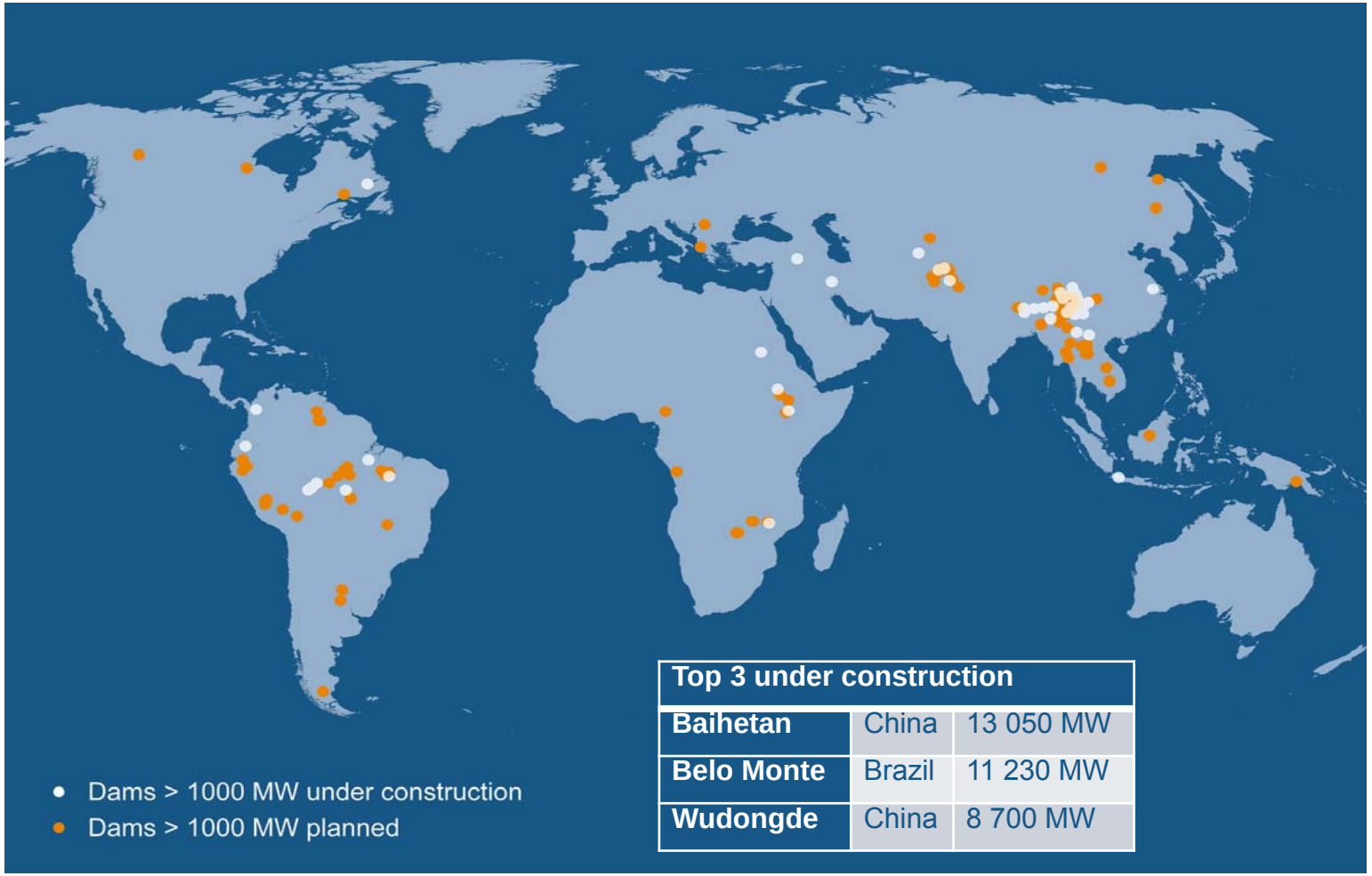
Hydropower Outlook

Opportunities

- Regional hydropower development
- Bilateral trade
- Attracting domestic markets
- Clean energy demand
- New demand for electricity
- Evolving energy mix and market dynamics

Hydropower Outlook

Future hydropower development



Top 3 under construction		
Baihetan	China	13 050 MW
Belo Monte	Brazil	11 230 MW
Wudongde	China	8 700 MW

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