

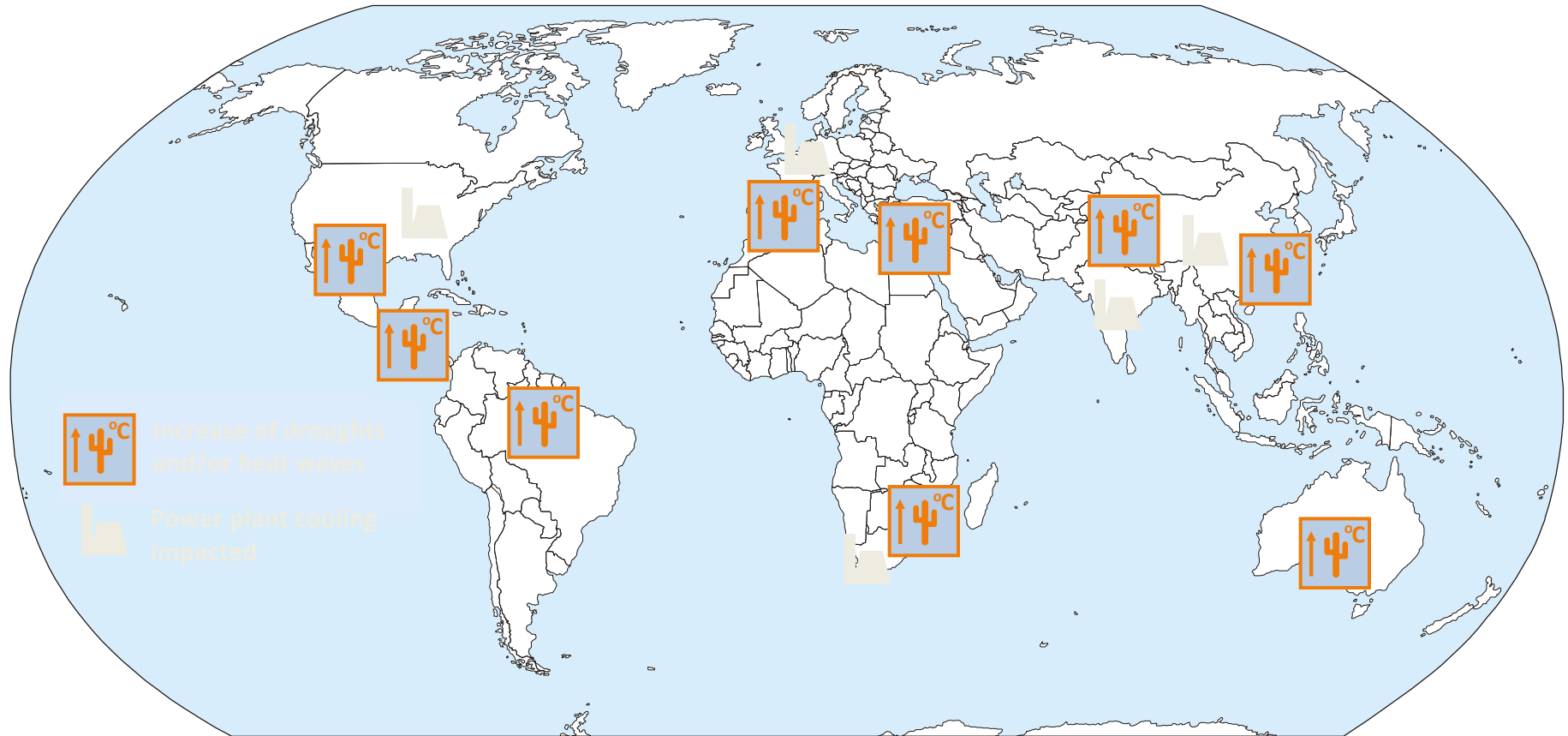
Understanding energy sector resilience

The energy and water nexus as part of future energy sector planning

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IEA Day, COP-21
3 December 2015*

www.iea.org

The energy sector needs to adapt to climate change

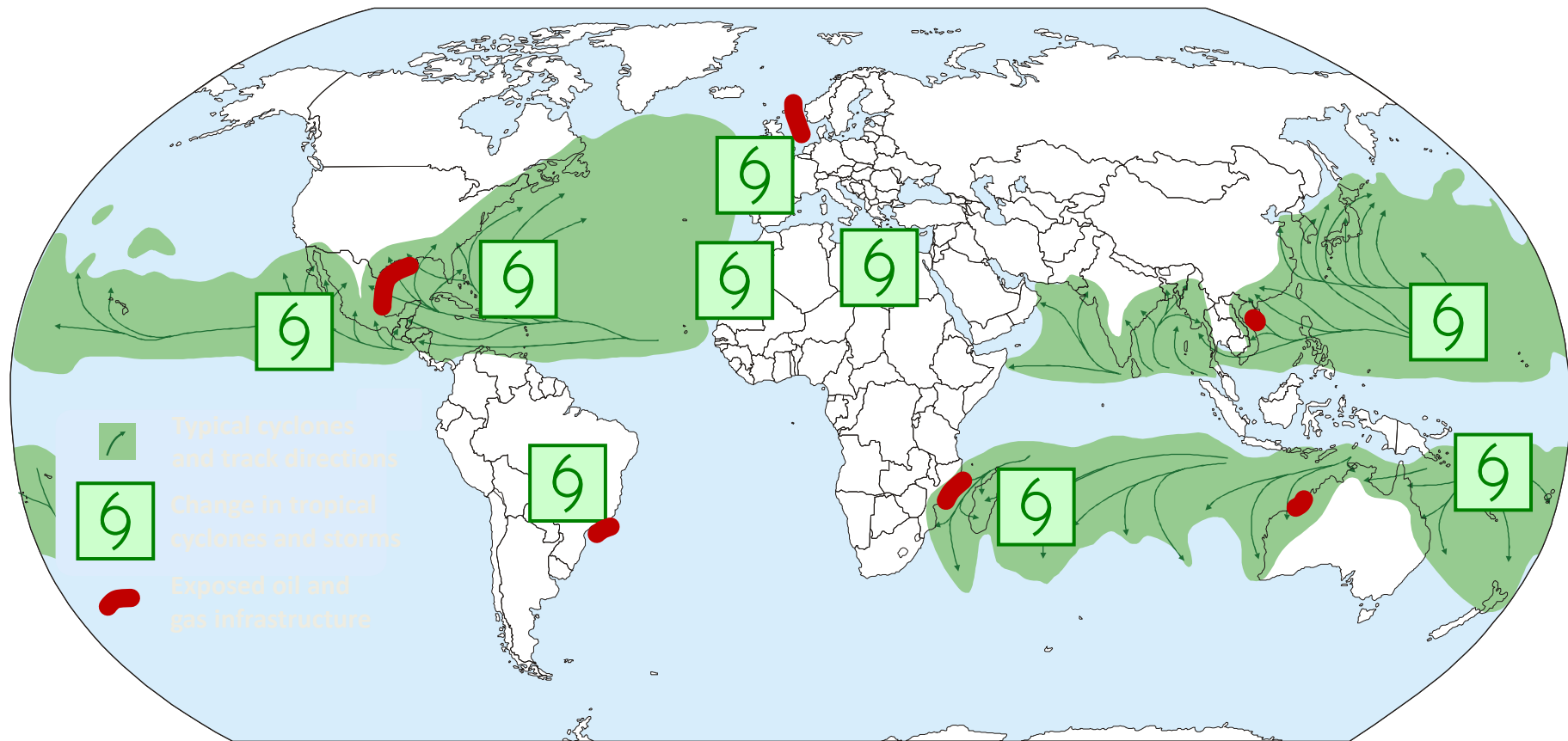


© Natural hazards adapted from Munich RE (2011)

Source: Redrawing the energy-climate map; WEO Special Report 2013, IEA

The energy sector needs to increase its resilience to the physical impacts of climate change

The energy sector needs to adapt to climate change



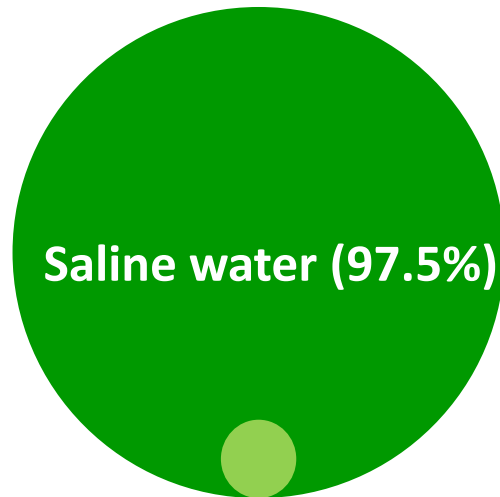
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The energy sector needs to increase its resilience to the physical impacts of climate change

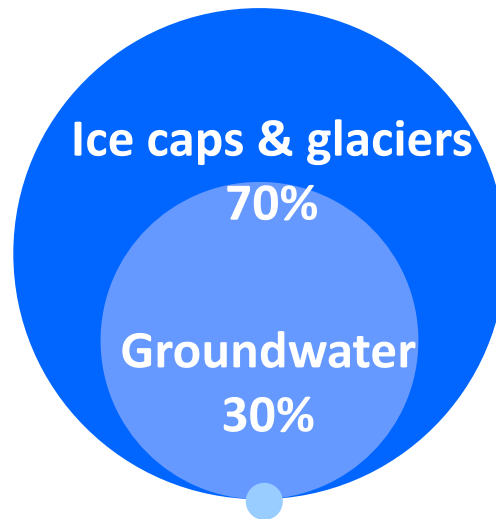
World water resources are not all for energy

Total water resources



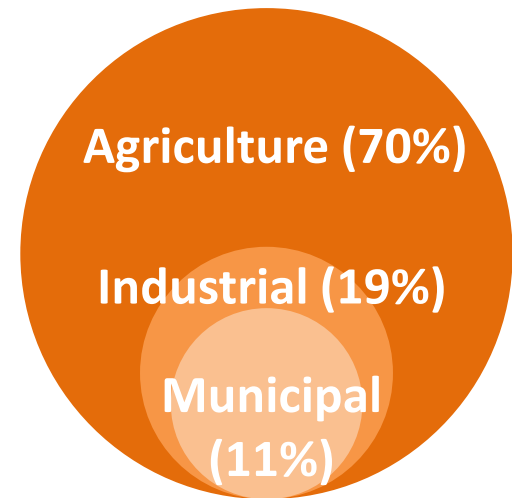
Freshwater (2.5%)

Freshwater resources



Surface water (0.3%)

Human freshwater use

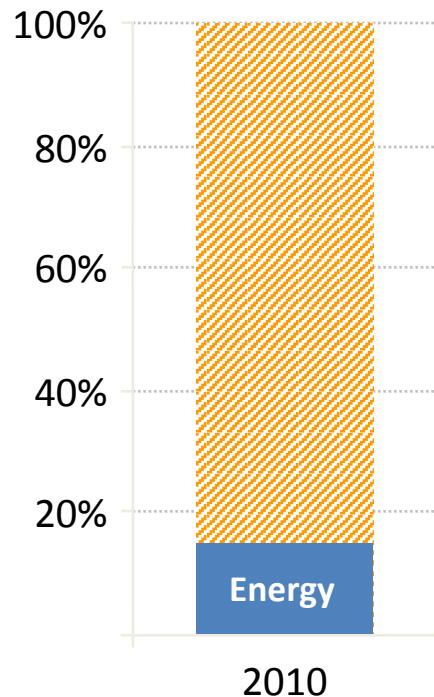


Source: World Energy Outlook 2012, IEA

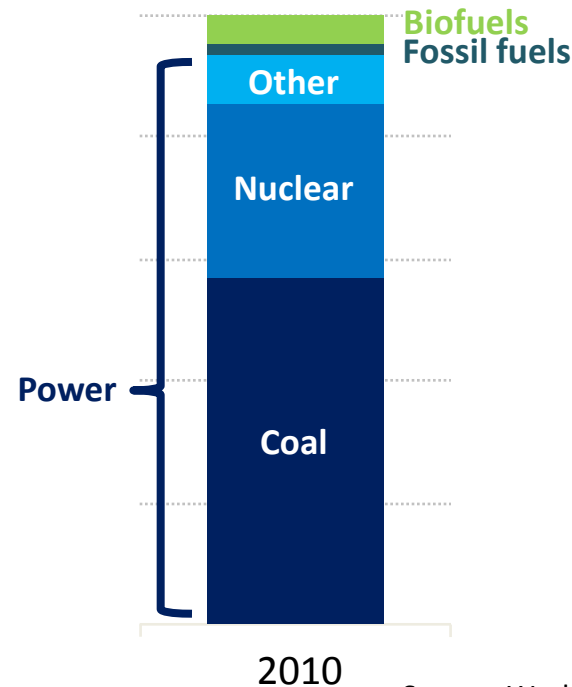
Water is a plentiful resource, but not all can be used for energy purposes; rising demand e.g. for other human needs or through climate change increases competition

Energy is becoming thirstier in the face of growing water constraints

Global water use



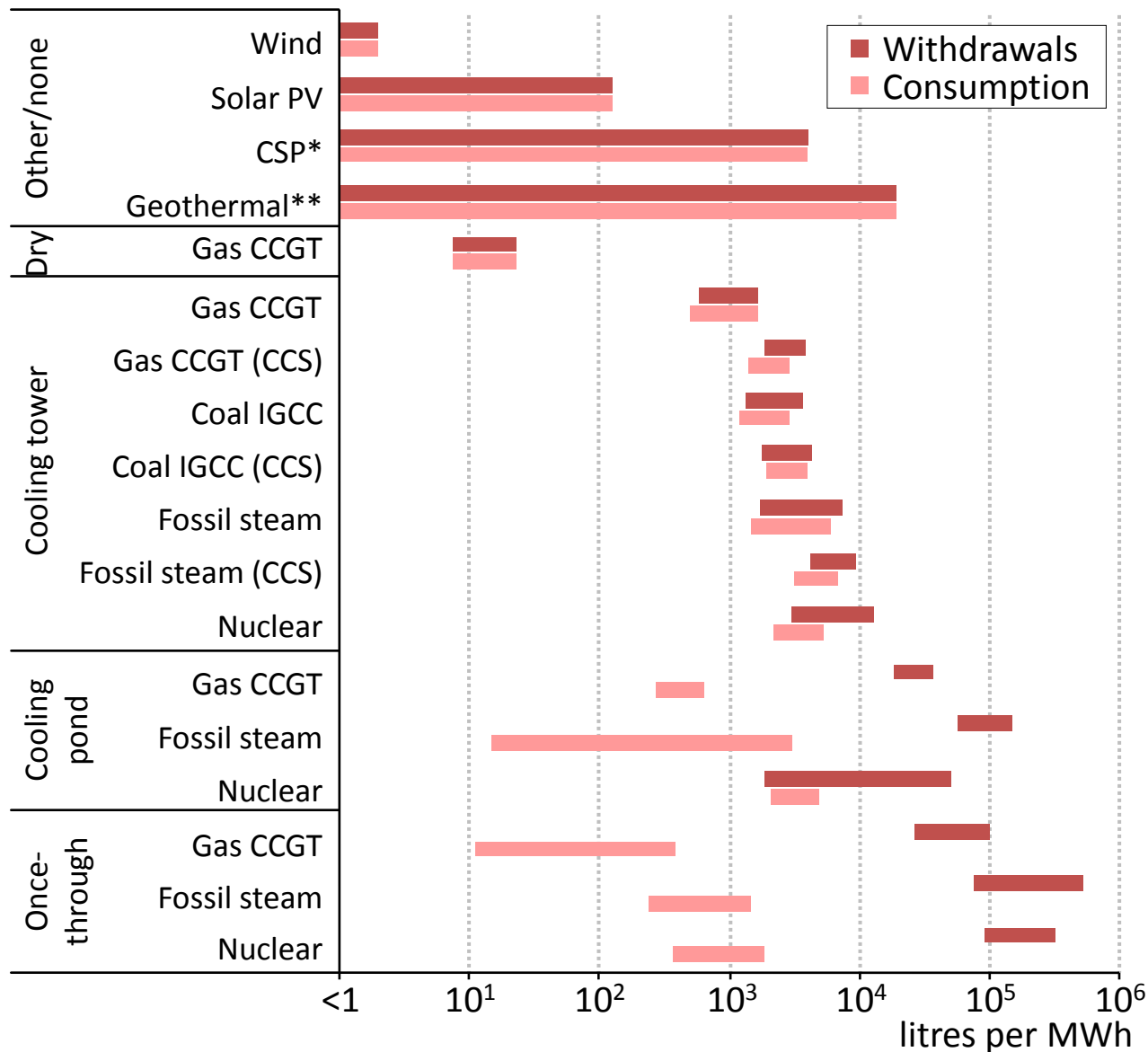
Water for energy



Source: World Energy Outlook 2012, IEA

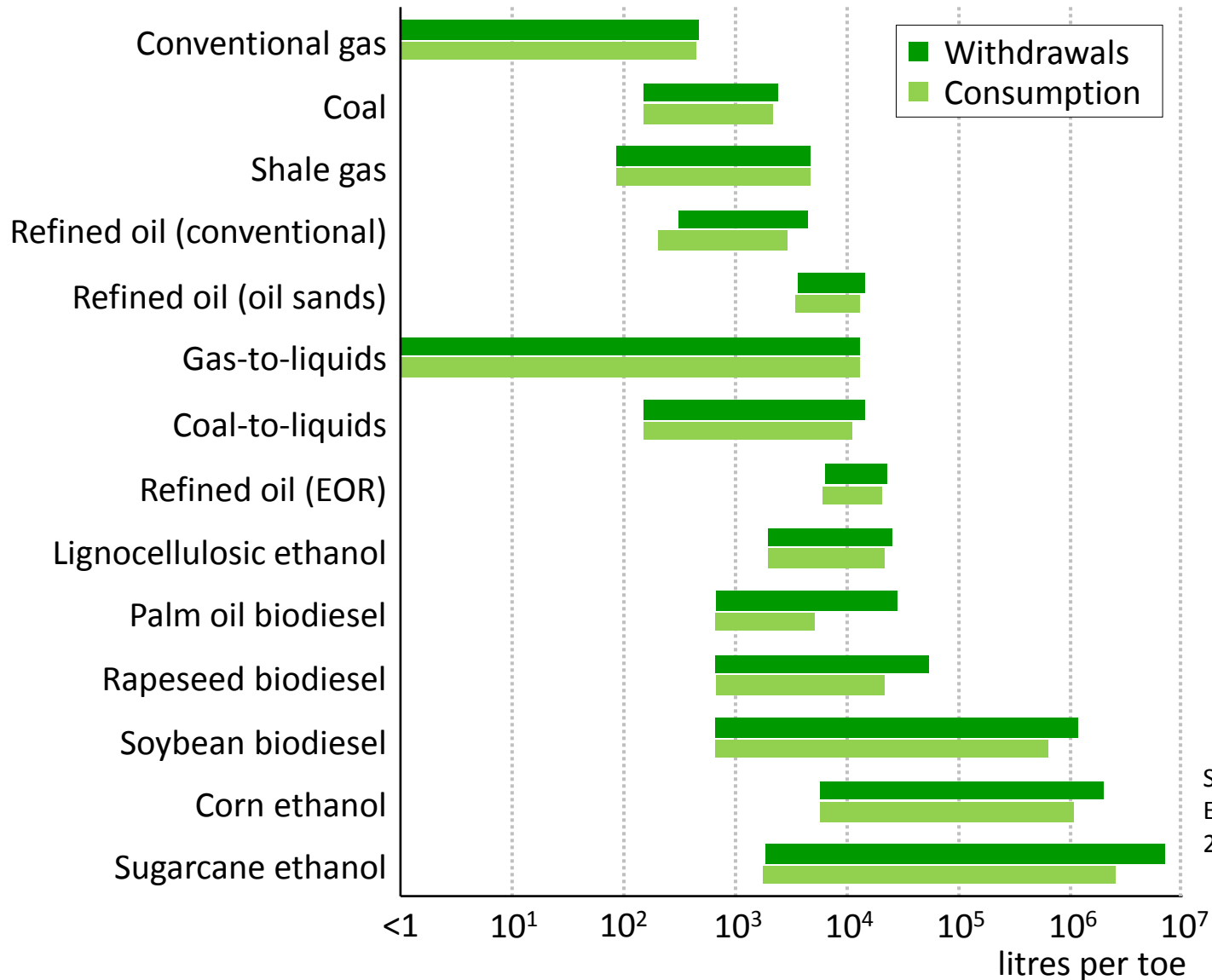
The energy sector's water needs are set to grow, making water an increasingly important criterion for assessing the viability of energy projects

Water use for electricity generation by cooling technology



Source: World Energy Outlook 2012, IEA

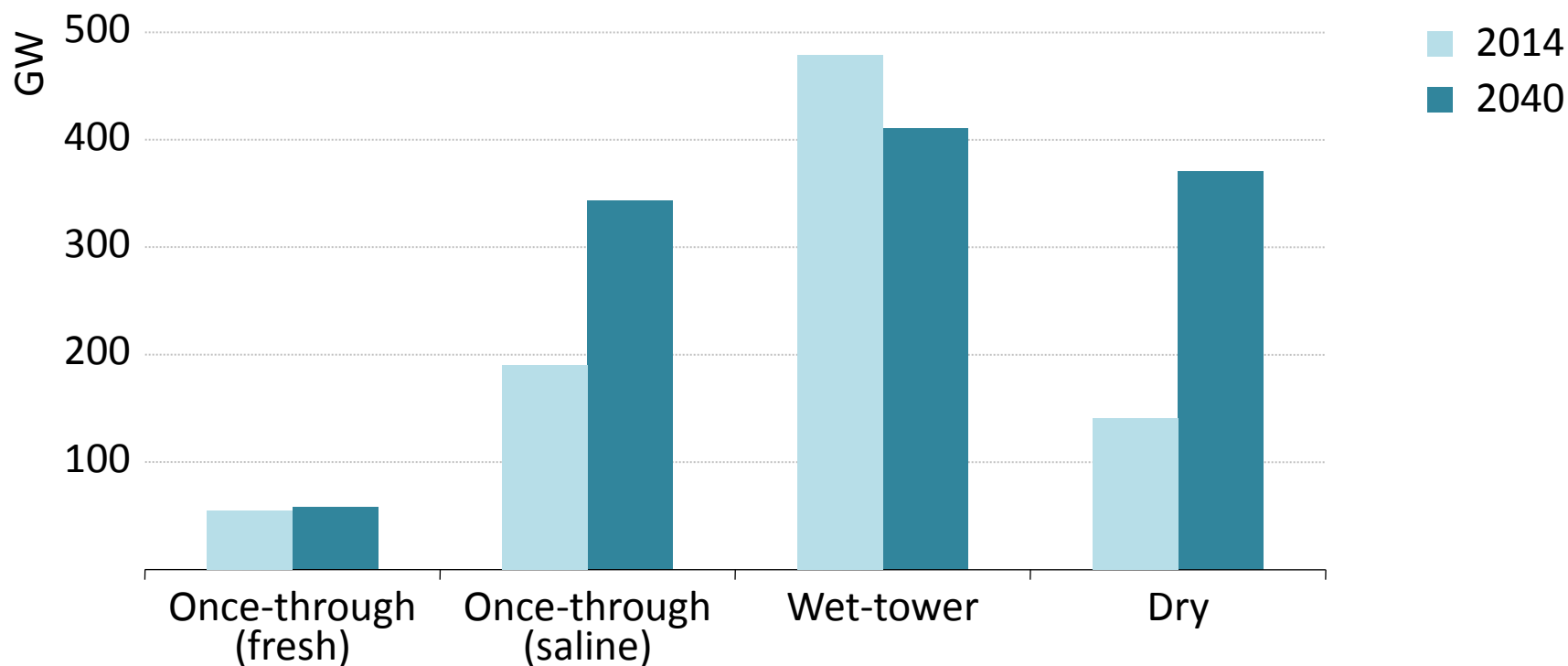
Water use for primary energy production



Source: World Energy Outlook 2012, IEA

Adapting China's power sector to water constraints

Installed coal-fired power generation capacity in China by cooling technology in the New Policies Scenario

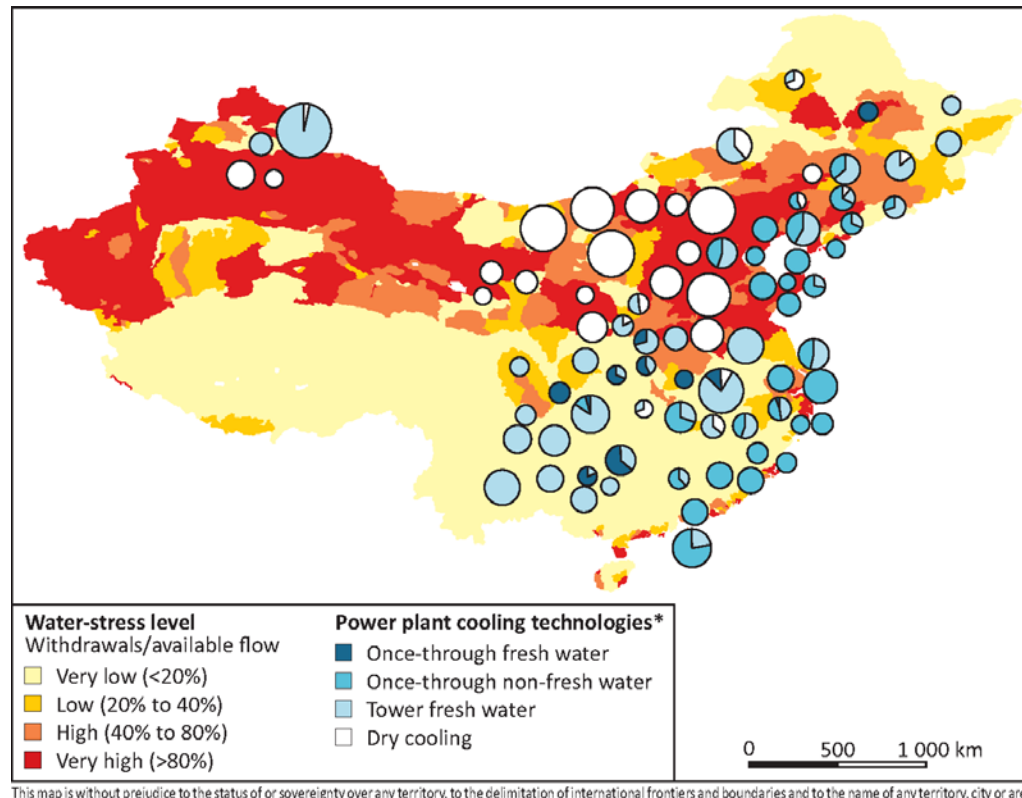


Source: World Energy Outlook 2015, IEA

The balance for coal-fired power generation cooling technologies is shifting from least-cost, water-intensive options to high-cost, dry cooling options.

Mapping future coal power plants under water constraints

Installed coal-fired power generation capacity in China by cooling technology in the New Policies Scenario

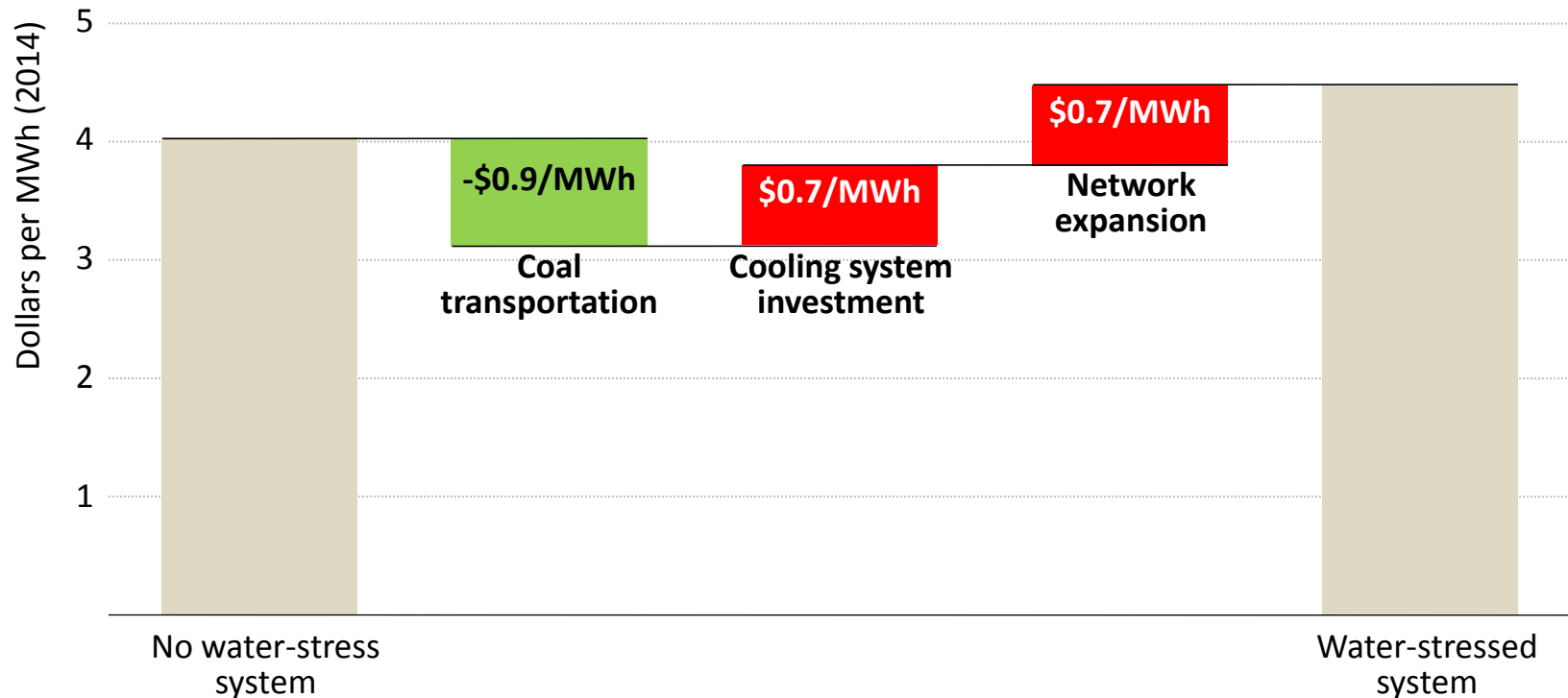


Source: World Energy Outlook 2015, IEA

Future coal-fired power generation sites will consider water as a factor beyond coal transportation cost and electricity transmission cost to load centres alone.

Water stress adds to power generation costs

Impact of water stress on average Chinese location-specific generation cost for coal-fired power plants in the New Policies Scenario, 2040



Source: World Energy Outlook 2015, IEA

Taking water constraints into account boosts cumulative investment needs by 85% to 2040 and increases coal-fired power generation costs.

Conclusions

- The energy sector is not immune to the impacts of climate change and the associated physical risks
- Energy industry needs to assess its exposure to climate risks, which will occur regardless the temperature rise
- Some of the physical impacts of climate change will be gradual, others are likely to be more sudden and destructive
- Water scarcity is likely to become an increasingly important consideration in planning thermal power plants
- IEA will continue analysing energy sector resilience: WEO-2015 will feature an in-depth on the energy & water nexus