‘Scope 2’ Water:
Quantifying water embedded in electricity generation

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‘Scope 2’ water: Quantifying water embedded in electricity generation

What is ‘Scope 2’ water accounting?	Indirect water embedded in electricity production (e.g., water evaporated from steam generation, cooling, or from a reservoir), but not from the production of fuels
	Builds on the GHG Protocol Scope 2 Guidance, and on existing water accounting methodologies
Who is interested in ‘Scope 2’ water accounting?	Private and public organizations that seek to understand upstream water consumption and evaluate exposure to water-related risks associated with electricity
	Example question: “What are the water impacts of a water-cooled HVAC system compared to that of an air-cooled HVAC system?
Why is this important?	Data and methodology for this accounting are not currently available
	Companies and other organizations can prioritize renewable energy investments to optimize for water impacts
What is included in the methodology?	Water impact factors and methodology for ‘Scope 2’ water accounting in electricity generation
	Engagement and insights from technical and stakeholder advisory groups for feedback and case studies

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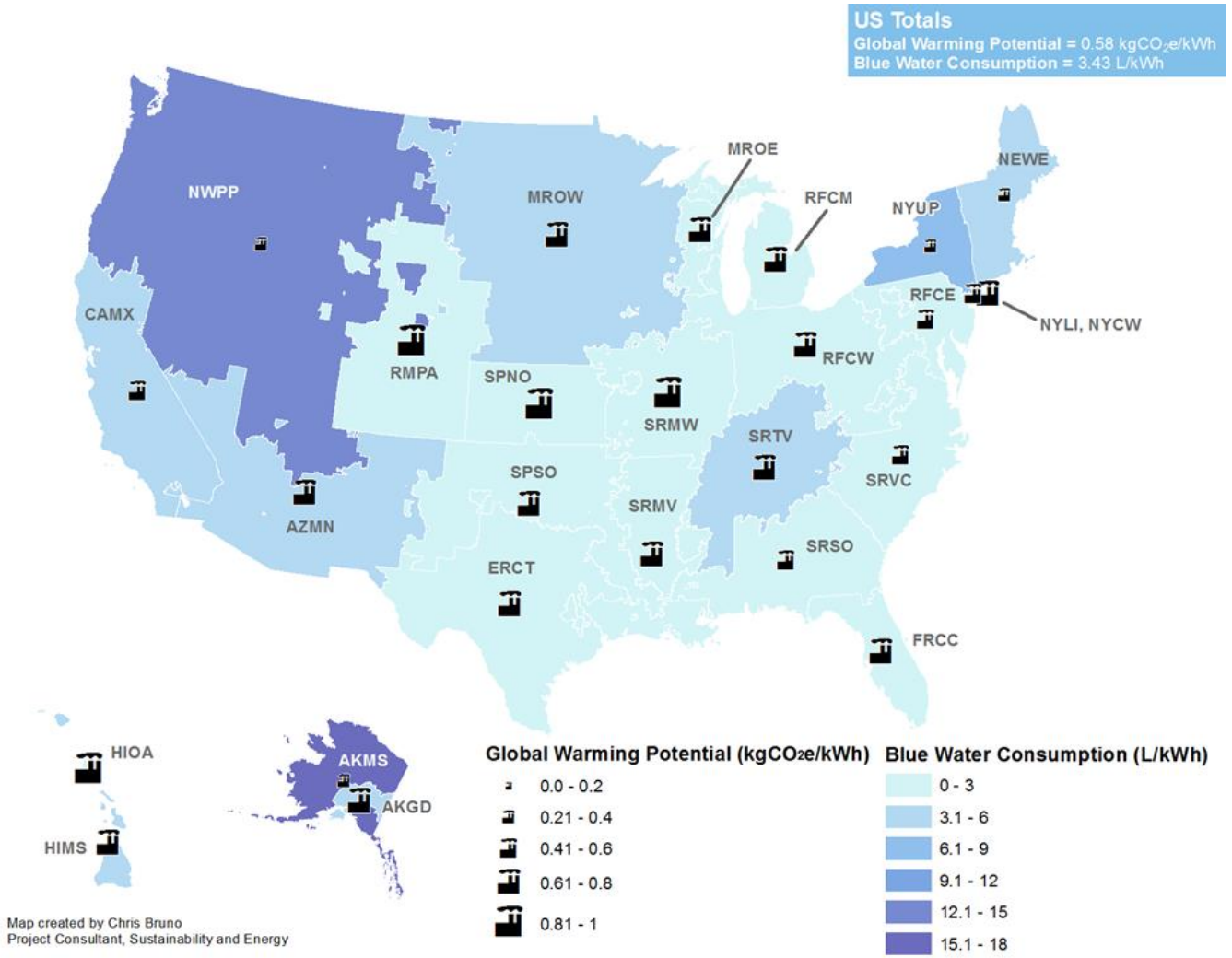
Tradeoffs: Embedded Water vs GHG emissions



- Regions with low GHG emissions from electricity can have high embedded water (NWPP)
- Regions with high GHG emissions can have low embedded water (SRMW)
- This illuminates the tradeoffs between embedded water and GHG emissions in electricity

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Case Study: Facebook

- Goal: 100% clean and renewable energy sources by 2020
  - How has this contributed to water savings?
- Facebook reached out to WRI to calculate embedded water-energy consumption at datacenters
- In locations that currently lack renewables, how does Facebook balance tradeoffs between energy, GHG emissions and water?
- Considering environmental impacts of energy purchases beyond GHG emissions, more nuanced understanding for decision making on:
  - Cooling technology at each site
  - Contract negotiation
  - Site selection
  - Encourage leadership to push forward with 100% renewable energy goal

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Case Study: Mars Inc.

- Global, family-owned company with diverse business centered on branded food and petcare products
- Committed to sustainability:
  - Sustainable in a Generation (SiG) Plan
  - 2010 commitment to decarbonize factories to address climate related impacts
    - Water impacts of renewable energy sources
    - Especially relevant in water-stressed regions
- Quantify 'Scope 2' water to support the business case for renewables projects and to inform purchase of grid electricity, buying from low-water use sources when possible
- Will use 'Scope 2' water methodology to work with suppliers to reduce water impacts in water-stressed areas

Thank you

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Embedded Water in Electricity by Power Source

Power source	Wind	PV	Natural gas	Coal	Nuclear	Lignite	Hydro
Embedded water (m^3/MWh)	0.04	0.37	1.18	1.87	2.26	2.83	22.70

- Blue water consumption (BWC) (m^3) for a variety of electricity generation sources per MWh of electricity ordered from lowest to highest (left to right) – this includes water evaporated and water for fuel extraction.
- Calculated from the GaBi® database on electricity production in the United States.
- Hydropower includes run-of-river, storage, and pump storage. Storage and pump storage hydropower have high embedded water because water is lost to the watershed (consumed) through evaporation from the open surface of water in a reservoir. Studies have demonstrated that an average of 1.5 m^3 of water can be lost to evaporation per GJ of electricity produced, but this water loss can range from 0.01 and 53 m^3 of water per GJ of electricity.[1]
- Even though coal, natural gas and nuclear rely on steam to generate electricity, the quantity of water lost to the atmosphere (consumed) is far lower than that of hydropower per GJ.
- The water consumption of renewables such as photovoltaics and wind are comparatively low since the generation of power by these technologies does not involve evaporating water.

1. Mekonnen and Hoekstra, The blue water footprint of electricity from hydropower, *Hydrology and Earth Systems Science*. 2012. http://www.hydrol-earth-syst-sci.net/16/179/2012/hess-16-179-2012.pdf

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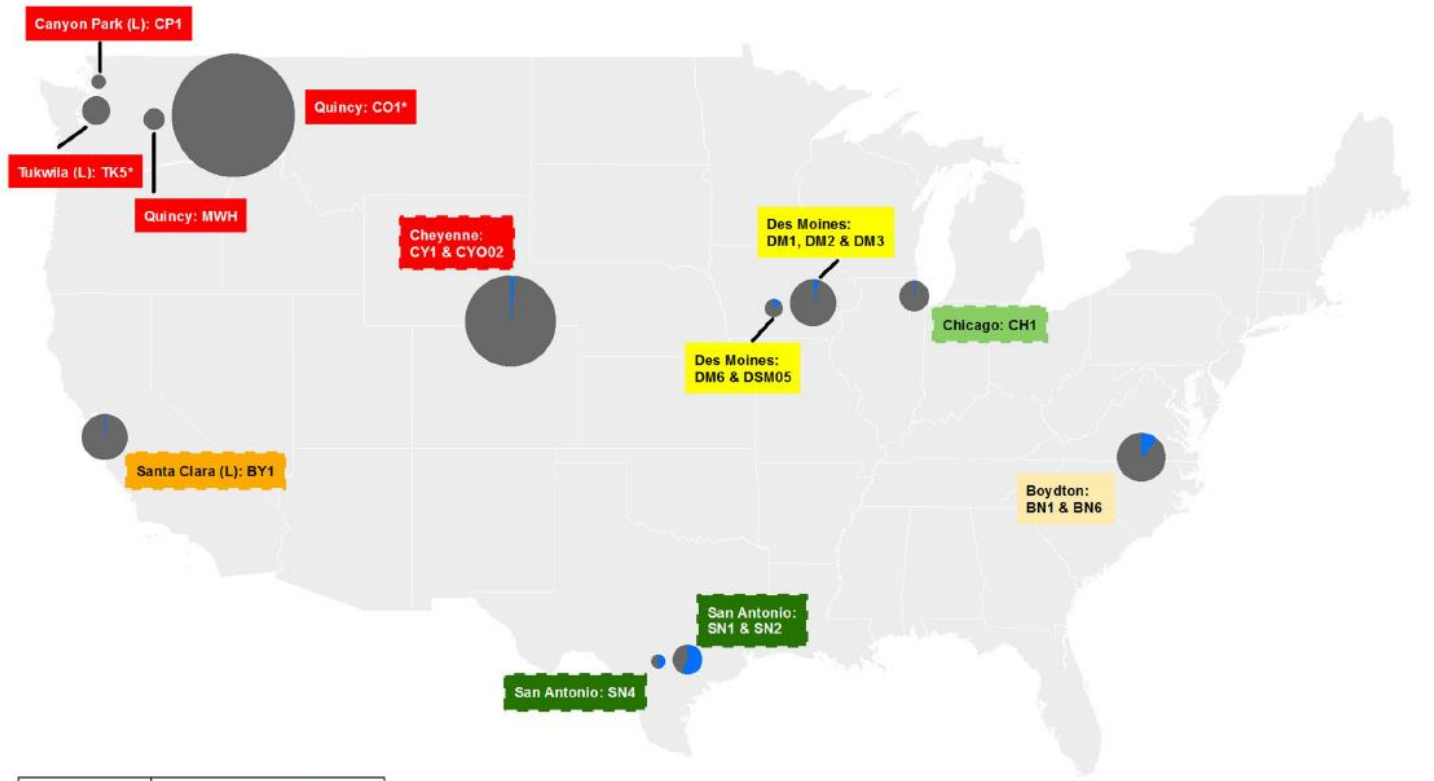
Case Study: Microsoft



eGRID Region	Embedded Water in Power (m^3/MWh)
ERCT	1.5
RFCW	2.0
SRVC	2.5
MROW	5.0
CAMX	5.6
NWPP	13.4

Regional water impacts derived from GaBi®.

Label Legend

Data Center Location: Data Center ID (L = Leased)

- Color Background = embedded water in eGRID energy value.
- Dotted Line Border = High to Extremely High baseline water stress (WRI Aqueduct)
- -All sites not designated as leased are owned.

Total Water Quantity (m^3)

Low High

Direct Water Withdrawal (m^3)

Water Embedded in Power (m^3)

* Site has no direct water withdrawal data

Figure 1: Microsoft Data Center Water Impacts from Direct Withdrawals and Embedded Water in Energy

- Response to Microsoft request to evaluate water embedded in electricity at 17 of its data centers owned or leased (Microsoft only tenant)
- Data centers use a lot of electricity, some locations have high embedded water
- Highest embedded water in Pacific Northwest from hydropower

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