DIGITOPIA:

enabling 24/7 corporate sourcing of renewable electricity

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Tomorrow

tmrow.com

The global economy is in the midst of the

most profound transformation in history

A shift to a low-carbon future will require every organisation

to measure and showcase their climate leadership

tmrow.com/**climatechange**

electricityMap: real-time global electricity emissions

- **24/7 location-based carbon accounting**

- **24h-ahead forecasts**
  enabling carbon-aware demand-response

- **Open source**
  1300 contributions[1] led to 90+ countries.
  Most popular #climate-change project.

- **Marginal emissions[2]**
  to understand the impact on the grid of
  demand-response or RE investments

www.electricitymap.org

Our data centers now work harder when the sun shines and wind blows

Used by Google to optimise their data centers

[1] See https://github.com/tmrowco/electricitymap-contrib
[2] See https://www.tmrow.com/blog/tags/electricitymap

Coming soon: democratised 24/7 accounting

www.bloomclimate.com

- **Automated data acquisition**
  using available APIs (e.g. accounting,
  cloud provider, **smart meters**, travel
  agency..)

- **Goal setting and progress tracking**

- ☞ **bloomclimate.com**

Google

Leveraging Data and Digitalization for 24/7 Carbon-Free Energy

Digitopia, 26/11/2020

Google's Energy Journey

Carbon Neutrality
(Offsetting emissions)

100% Renewable Energy
(Reducing emissions)

24/7 Carbon-free Energy
(Eliminating emissions)

Since 2007

Google has purchased enough high-quality carbon offsets and renewable energy to bring our net operational emissions to zero.

Since 2017

Google has matched its global, annual electricity use with wind and solar purchases. However, our facilities still rely on carbon-based power in some places and times.

By 2030

Google intends to match its operational electricity use with nearby (on the same regional grid) carbon-free energy sources in every hour of every year.
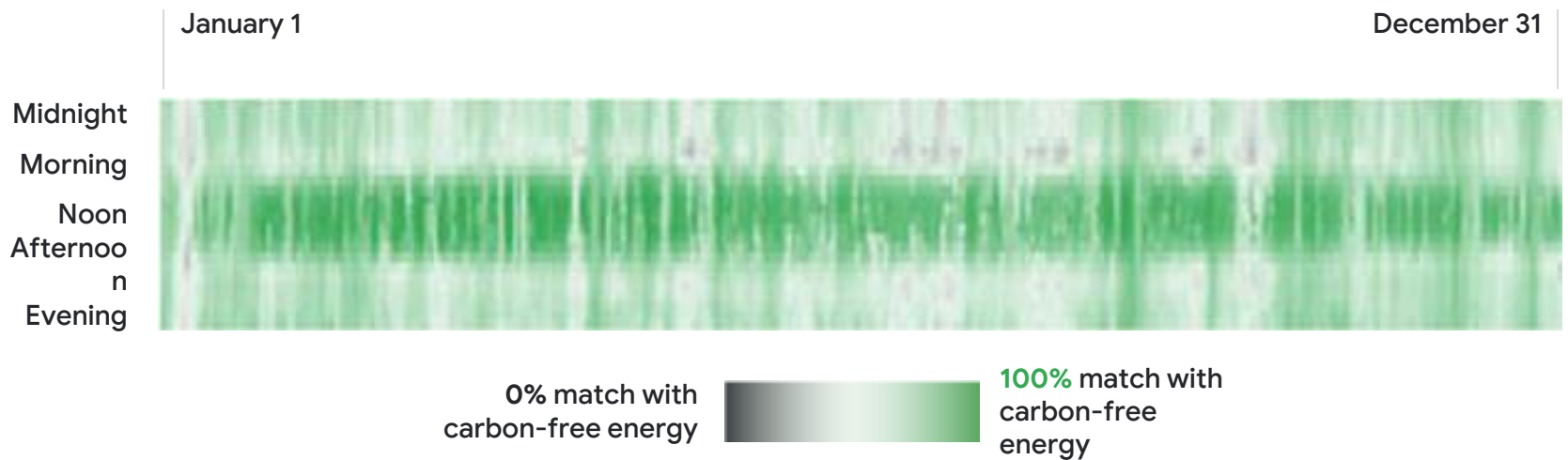
Carbon-intelligent load-shifting

Reducing data centre carbon footprints by shifting flexible compute tasks to align with greener hours on the grid

Conventional compute load

Execution of compute tasks throughout the day regardless of carbon impact

MIDNIGHT   MORNING   NOON   AFTERNOON   EVENING

Google

We aspire to source **100%** carbon-free energy at all times

January 1   December 31

Midnight
Morning
Noon
Afternoo
n
Evening

0% match with carbon-free energy   **100%** match with carbon-free energy

Google

Aligning compute load with carbon-free energy

Google's carbon intelligent computing platform shifts flexible loads to times when wind and solar are abundant on the grid.

MIDNIGHT   MORNING   NOON   AFTERNOON   EVENING

Accelerating the shift to renewables through 24/7 electricity tracking

EnergyTag: an independent, non-profit, industry-led initiative to define a standard and build a market for hourly electricity certificates

KEY BENEFITS OF HOURLY CERTIFICATES:

1.
BUILDS TRUST

by linking actual production to consumption, in real-time

2.
SUPPORTS STORAGE AND FLEXIBILITY

by providing a new incentive

3.
ACCURATE CARBON ACCOUNTING

by tracking hourly carbon data

4.
SUPPORTS NEW MARKET MODELS

such as locational pricing

"A common, tradable instrument that provides traceability across markets for power, flexibility and carbon"

What is the EnergyTag Initiative?

- **Vision:** To accelerate the transition to renewable energy through hour-by-hour energy tracking and accounting

- **Mission:** To define a set of guidelines for hourly* certificates and support the development of a market for them

- **Structure:** EnergyTag is an independent, non-profit, voluntary, global, industry-led initiative

- **Governance:** The initiative is governed by a Council and Advisory Board comprised of expert industry participants, supported by a small secretariat

- **Complementary:** The EnergyTag standard is a voluntary set of guidelines that may be adopted into existing EAC schemes such as GOs and RECs.

Demonstrators: We are looking to showcase existing technologies and projects that are working towards the EnergyTag standard

What are the key ingredients to a demonstrator project?

- *Renewable asset owners* - ideally a mix of wind, solar, hydro etc
- *Flexibility operators* - storage asset owners (pumped hydro, batteries, demand response/VPP)
- *Energy buyers* - commercial and industrial off-takers, green energy suppliers
- *Issuing technology companies* - companies that have built tools to be able to track and record renewable electricity generation and consumption in real-time

Current demonstrators being explored in Netherlands, Denmark, US, UK?

EnergyTag Initiative
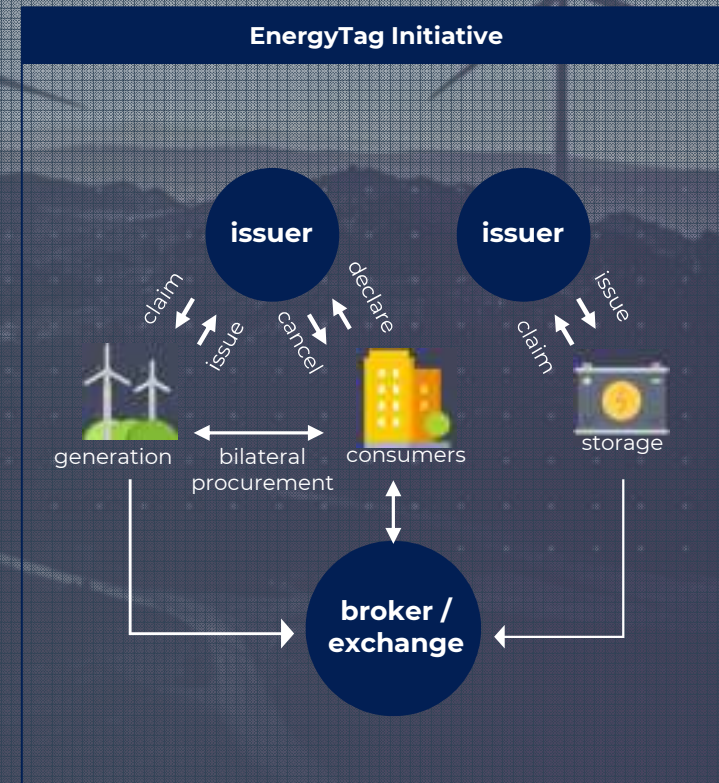
Comprises over 60 participating organisations worldwide and growing...

Founding Advisory Board members include the world's largest renewable producers and consumers, grid operators, start-ups and key organisations in the energy certificates market, including;

Google, Microsoft, ENGIE, OVO Energy, Iberdrola, Vattenfall, Ørsted, Eneco, Energinet (Danish TSO), CertiQ (part of Tennet), Eurelectric, WattTime, Accenture, PwC, Air Liquide, AIB, RECS International, i-RECs, EIT InnoEnergy, Power Ledger, Hartree Partners, Wind Energy Europe, Energy Web Foundation, FlexiDAO, CRS M-RETS, Ofgem and many others