Renewable Energy, Clouds, and Networks

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Renewable energy

- Cloud
- Network
- Smart City
Google Hamina Data Center, source: www.google.com
Inside Google Hamina Data Center, source: www.google.com
Inside Google Hamina Data Center, source: www.google.com
Renewables?

Apple: “Powered with 100 percent clean energy” (April 9, 2018)

Google: “100% renewable energy” (2017 and 2018, with a catch)

Demand grows, consumption decreases (more efficient hardware)
From Cloud to User
Green Networks?
Improvement in renewable energy use for network
Smart Cities?
Smart City
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Lot of data from various sources
Smart City

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Often of local interest only
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Where to process?
Smart City

Lot of data from various sources

Often of local interest only

Where to process?
Cloud or somewhere else? (a.k.a. edge)
Smart City

Lot of data from various sources

Often of local interest only

Where to process?

Cloud or somewhere else? (a.k.a. edge)

How to power?
Powering the Edge
Powering the Edge

More devices → More power needed
Powering the Edge

More devices $\rightarrow$ More power needed

Renewables are fickle
Powering the Edge

More devices —> More power needed

Renewables are fickle

How to ensure availability? (of computation, not renewables :-)

Powering the Edge

More devices —> More power needed

Renewables are fickle

How to ensure availability?
(of computation, not renewables :-)

Predict and anticipate?
Energy Weather

Energiasää 19.10.2019
24 tunnin ennuste

Kilowatttuntia (kWh)

14:00 16:00 18:00 20:00 22:00 00:00 02:00 04:00 06:00 08:00 10:00 12:00

Aurinkoenergia 2,5 kWp  Tuulienergia 2,5 kWp

http://www.bcdcenergia.fi/energiasaa
Using Energy Weather
Using Energy Weather

Predict availability of renewables
Using Energy Weather

Predict availability of renewables

Schedule consumption (if possible)
Using Energy Weather

Predict availability of renewables

Schedule consumption (if possible)

Adapt when needed
Using Energy Weather

Predict availability of renewables

Schedule consumption (if possible)

Adapt when needed

Regular power as backup
Renewable Smart City?
Renewable Smart City?

Cloud: Yes
Renewable Smart City?

Cloud: Yes

Network: Maybe
Renewable Smart City?

Cloud: Yes

Network: Maybe

Edge: Mostly not?
Renewable Smart City?

Cloud: Yes
Network: Maybe
Edge: Mostly not?

Is it ok to use more energy if it comes from renewable sources?
Thank you!

Jussi Kangasharju