5G impact to mobile network energy consumption and GHG emissions

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11.02.2020

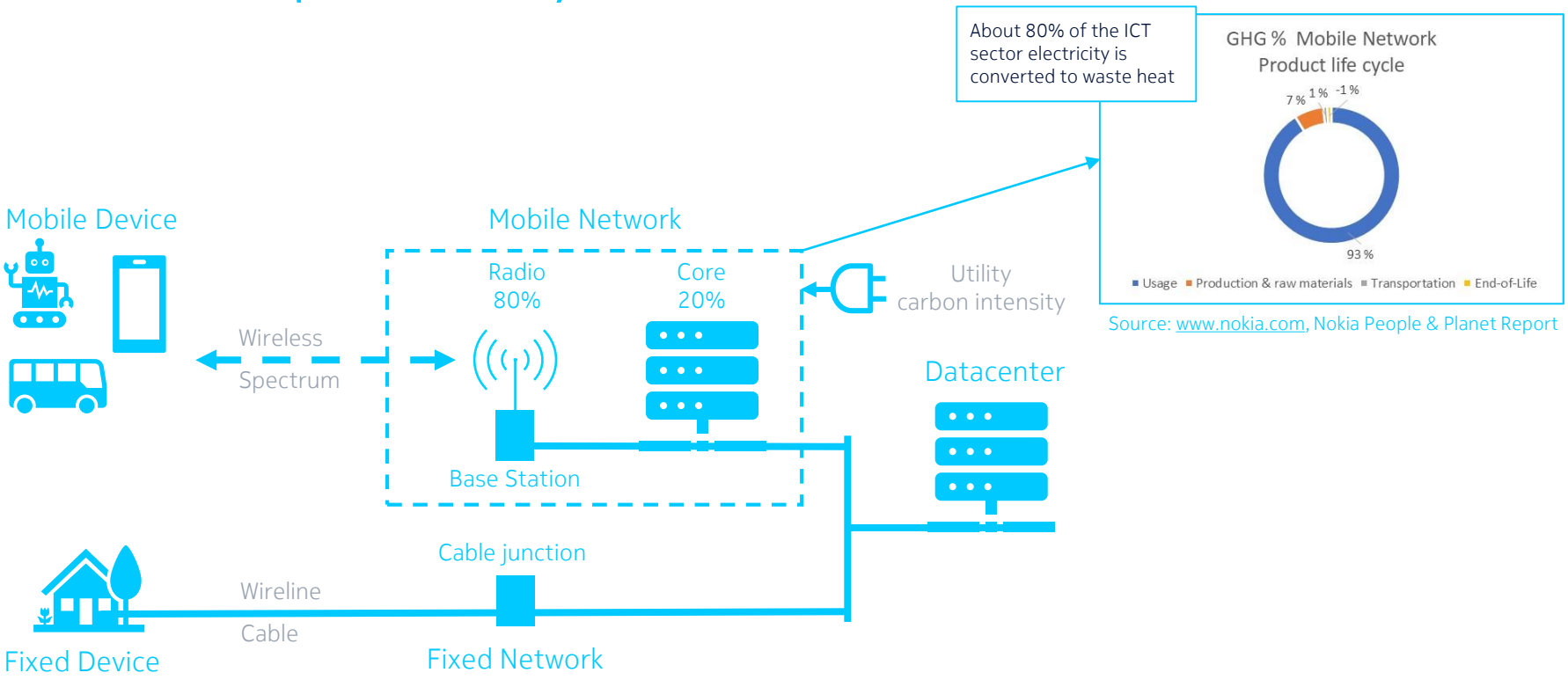
Nokia Mobile Networks

5G Marketing

Harry Kuosa

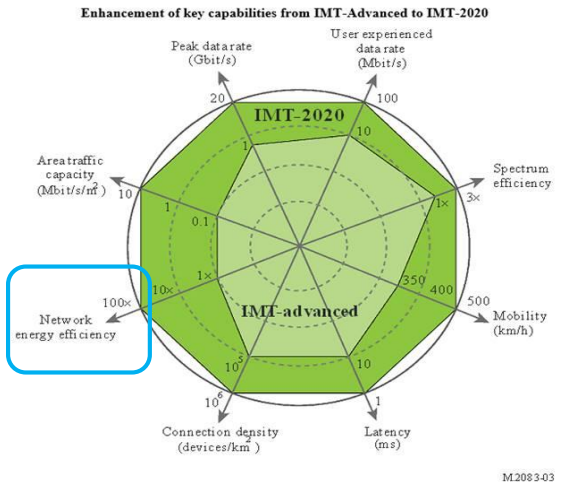
NOKIA

Mobile Network product life cycle GHG emissions



5G design target by International Telecom Union – Radio sector (ITU-R)

ITU-R targets 100x energy efficiency

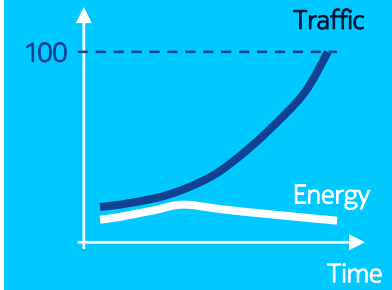


100x energy efficiency

100xCapacity [Gbps]

Same radio energy [Watt]

5G is the only way to decouple energy increase from traffic increase



Source: https://www.itu.int/rec/R-REC-M.2083-0-201509-I/en

Radio configurations and spectrum impact to emissions

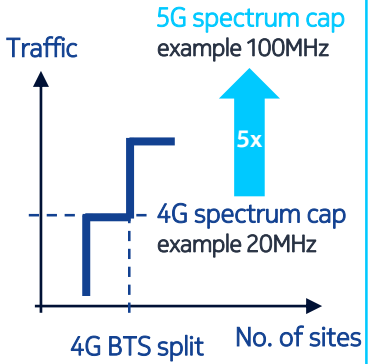
5G radio vs 4G radio

Same configuration, less energy

Different configuration, less energy

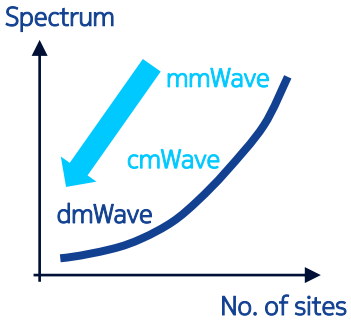
Average -55% *)

Capacity driven densification



Less densification with wider 5G spectrum

Coverage driven densification



Less densification when 5G in lower spectrum

5G radios consume less energy as 4G radios

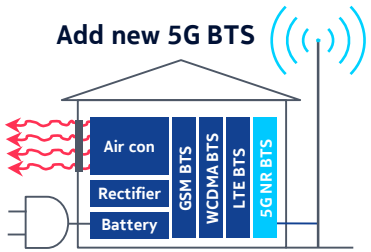
The more spectrum available for 5G the less densification

The less BTS sites, the lower GHG emissions

* Source: Nokia 5G Energy Efficiency White paper

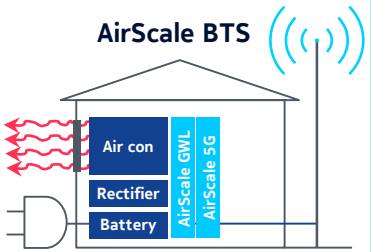
5G is incremental, increases BTS site energy consumption

Incremental addition



+30%…+80% site

BTS modernization



-43% *) site

Nokia Zero Emission

Single RAN BTS SW

-30%

Zero Traffic Zero Energy SW

uDTX	Tx	Unit	Cell
Symbol	PA	Radio	Layer

-10%…-30% site

5G can be compensated by BTS HW and SW modernization

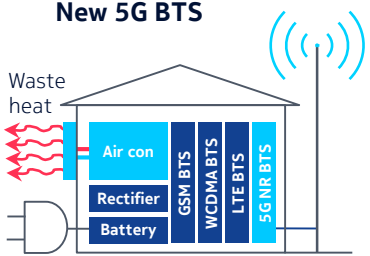
Case Vodafone NZ
5G and modernization total energy -10%

* Source: www.nokia.com, People & Planet Report

5G is incremental, increases cooling energy consumption

5G cooling requires energy

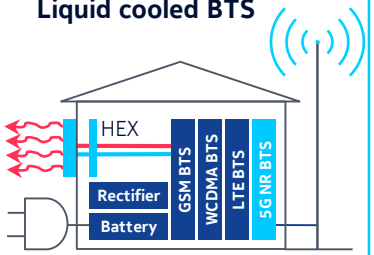
New 5G BTS



+30%…+80% cooling

Liquid cooling is much more efficient

Liquid cooled BTS

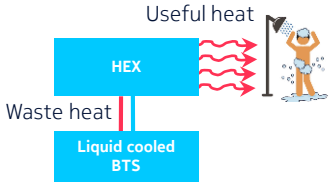


-90% cooling

In pilots

Circular economy

Convert waste to useful heat



Heat re-use 80%

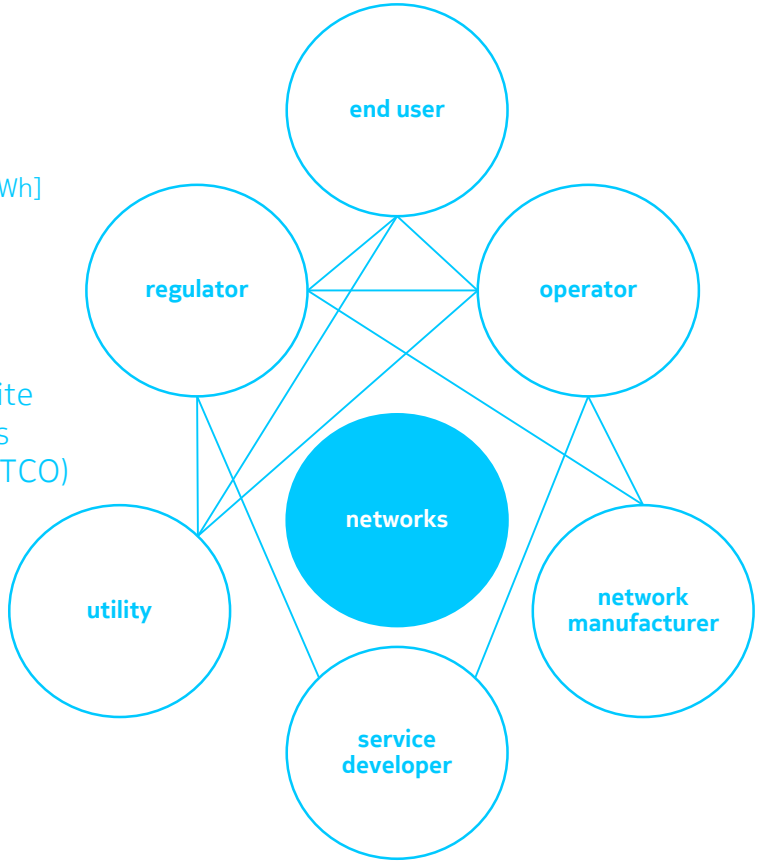
Liquid cooling can reduce needed cooling energy by 90%, and reduce site CO2 emissions by 80%

Source: Nokia World's First Liquid cooled BTS

Radio network carbon economy

Emissions = Energy [MWh] *** fco_2** [tonnes/MWh]

- Radio spectrum availability
- Energy efficient HW+SW design
- Modern equipment in field
- Waste heat - cooling and re-use
- Green electricity – production at BTS site
- CO_2 awareness, regulation & incentives
- Positive CO_2 Total Cost of Ownership (TCO)



Our commitment

SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Targets set June 2017 NOKIA

Target Classification
Well-below 2C

23 September 2019

Nokia steps up commitments to limit global warming to 1.5°C

NOKIA

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