Enabling sustainable & cost-efficient data centers
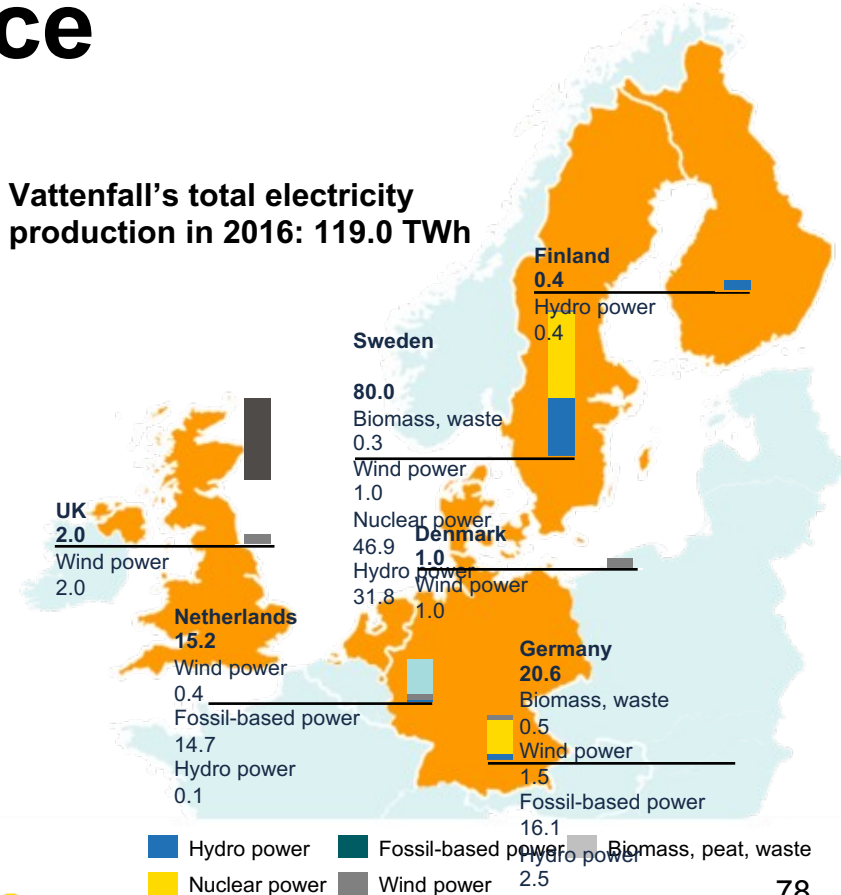
Vattenfall Markets

Red Hat Forum Helsinki, 11th of October 2018, Max Schulze

Vattenfall at a glance

- One of Europe's largest producers of electricity and heat

- 100% owned by the Swedish state

- Main products: electricity, heat, gas, energy services

- Main markets are Sweden, Germany, Netherlands, UK, Denmark and Finland
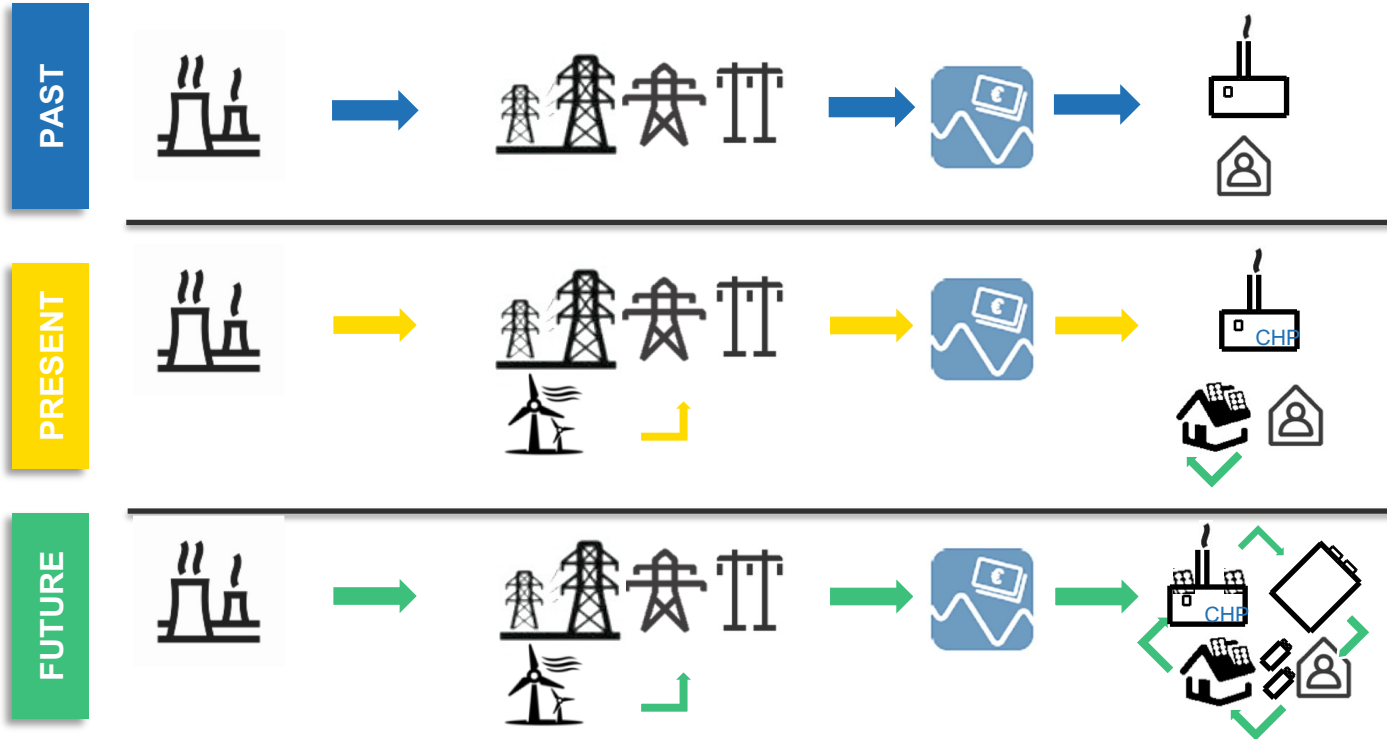
- 20,000 employees

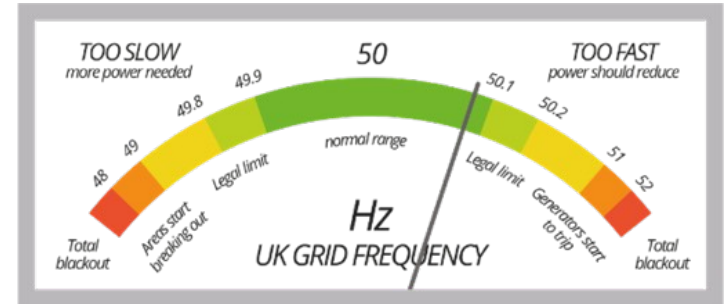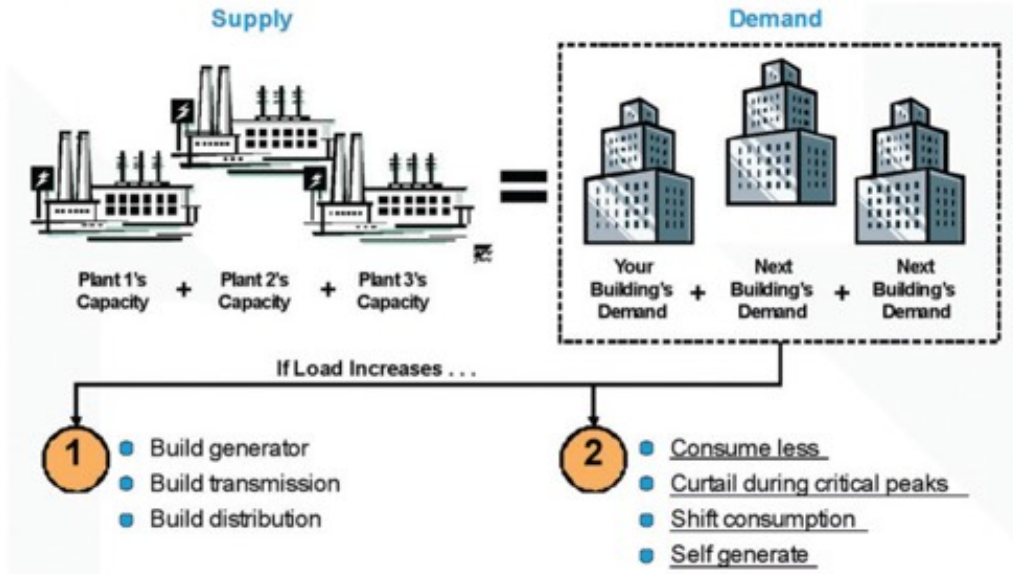**Vattenfall's total electricity production in 2016: 119.0 TWh**

Finland
0.4
Hydro power
0.4

Sweden

80.0
Biomass, waste
0.3
Wind power
1.0
Nuclear power
46.9
Hydro power
31.8

UK
2.0
Wind power
2.0

Denmark
1.0
Wind power
1.0

Netherlands
15.2
Wind power
0.4
Fossil-based power
14.7
Hydro power
0.1

Germany
20.6
Biomass, waste
0.5
Wind power
1.5
Fossil-based power
16.1
Hydro power
2.5

Hydro power   Fossil-based power   Biomass, peat, waste
Nuclear power   Wind power
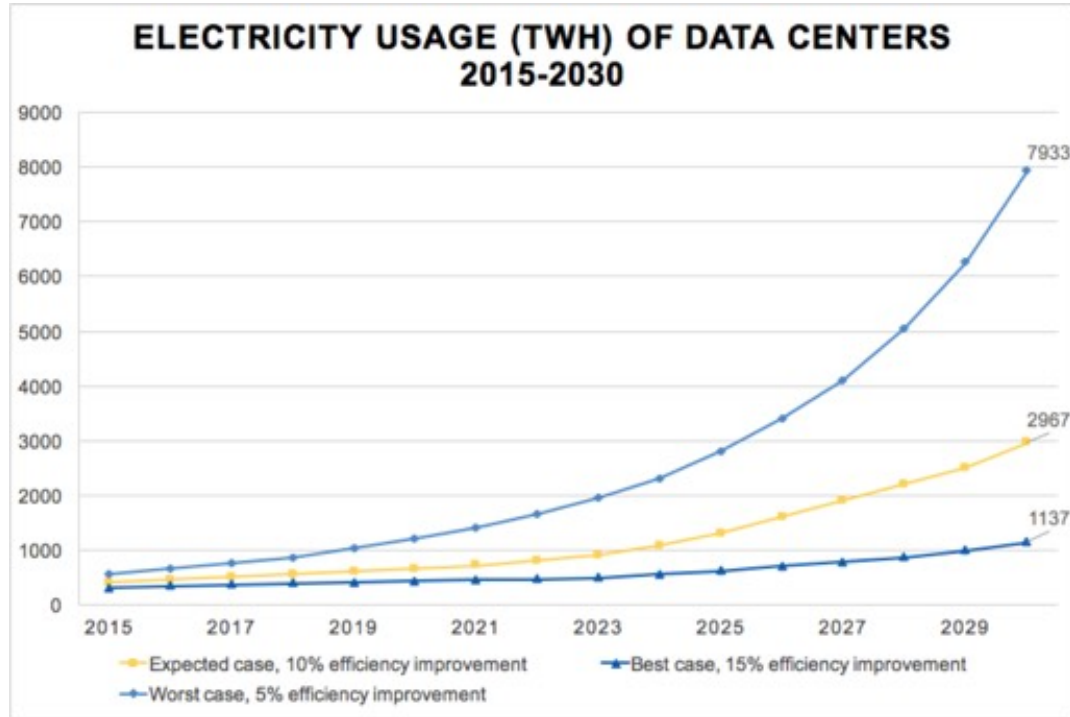
VATTENFALL

78

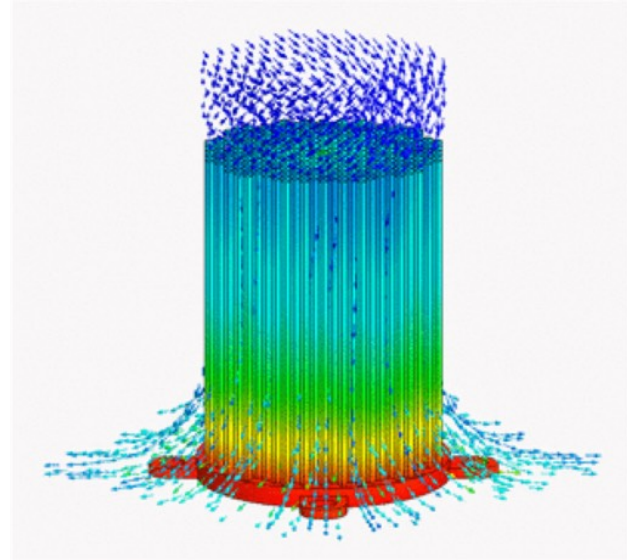# Fossil free within one generation

Energy system is transforming

Flexibility is a key enabler to ensure transition to renewables

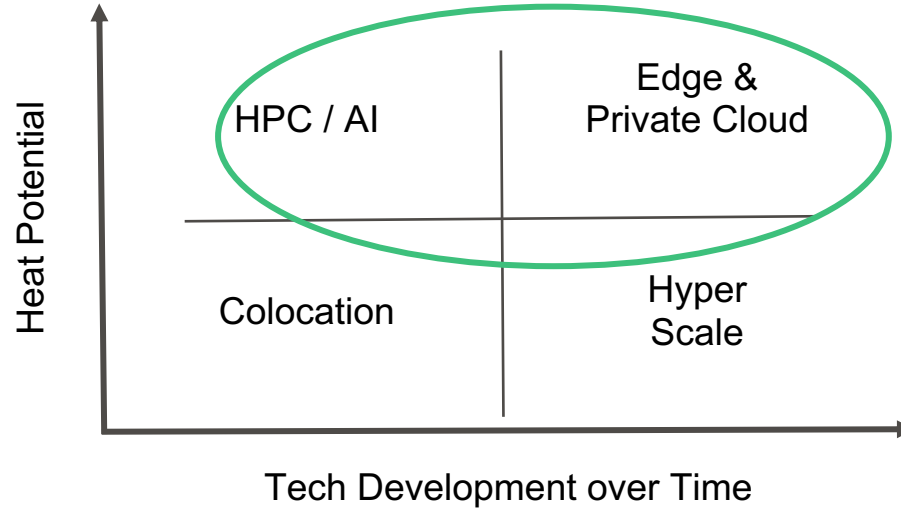# Data centers are large user of power

ELECTRICITY USAGE (TWH) OF DATA CENTERS 2015-2030

Expected case, 10% efficiency improvement — Best case, 15% efficiency improvement — Worst case, 5% efficiency improvement

Silicon chips generate a lot of heat (~100% of input power)

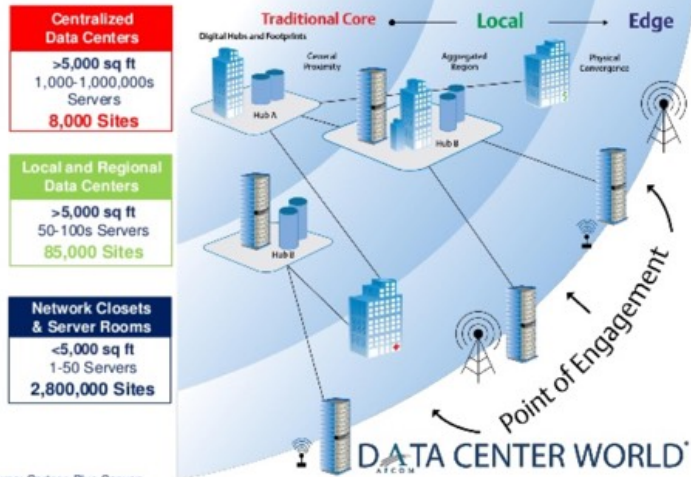# Two key areas are driving change to the data center world

HPC is cost-sensitive & flexible computing load

Private Cloud & Edge is driving decentralization

5 Edge – Compute / Storage 'Last Mile'

Centralized Data Centers	Local and Regional Data Centers	Network Closets & Server Rooms
>5,000 sq ft 1,000-1,000,000s Servers 8,000 Sites	>5,000 sq ft 50-100s Servers 85,000 Sites	<5,000 sq ft 1-50 Servers 2,800,000 Sites

Source: Gartner, Blue Canyon

Red Hat OpenShift & OpenStack enable us to make it happen

Thank you! Questions?