The Liquid Cooling Company

liquidcooling.eu

ok we are not good at slides

1. Google it: „datacenter liquid cooling”

2. Now check: „Edge datacenters”

3. Go through our website www.dcx.eu.

Acknowledge that data explosion forces rapid datacenters transformation. We are cutting edge of new disruptive technology. Make sure you will benefit from it

WHAT IS THAT LIQUID COOLING ANYWAY?

- Required by Datacenters, Cloud, HPC, Cryptomining.
- Saving **over 50%** of energy, replacing power hungry HVAC, solving biggest challenge of datacenters – power & cooling. **5-7 x bigger density** of any infrastructure, saving space with large CAPEX/ OPEX savings.
- 3 competitors worldwide: Asetek / Coolit / GRC and immersion cooling startups. Advantage over competition: product advantage (open system, complete safety, better parameters, usability, flexibility), experience, go to market strategy
- **Market:** around 4500 large datacenters worldwide, hundreds of big data and supercomputer instalations, thousands large scale crypto mining and millions of other datacenters.

3M Says we need to change the way we cool it/telco infrastructure. We totally agree.

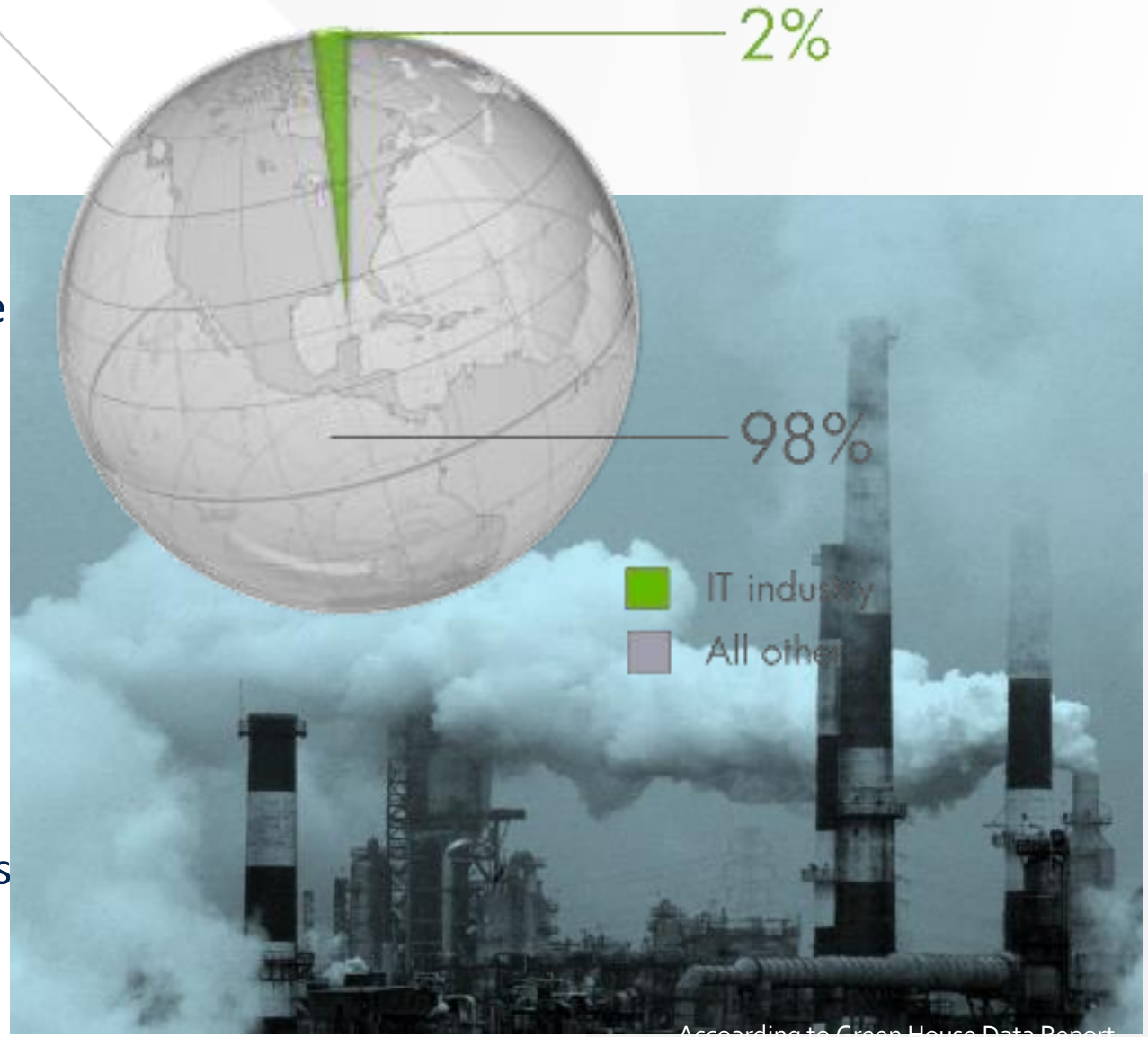
Look it up:

- 20 sec. trailer: https://youtu.be/45R4K-NC4q8
- 8m https://youtu.be/vqKWMfB_lJ0

Scale of energy consumption and costs

at Data Processing Centers in the world

- Datacenters account for **2,5% of planets entire energy consumption. Blockchain industry over 1% of global consumption. We can save at least 1,5%.**
- In reality **67% of this energy comes from fossil fuels**
- 30 billion watts of electricy or **30 nuclear plants** must be used to power datacenters
- 486.2 (TWh) terawatt hours in 2016
- The amount of energy consumed by Data Centers worldwide grows by 63% Y to Y and is projected to grow threefold in the next decade.
- In 2016, the energy consumption in the World Data Centers was much higher than the total energy consumption of UK
- Governments and social pressure on CO2 and greenhous gases emission, carbon footprint awareness requires effort in energy saving



Scale of energy consumption and costs

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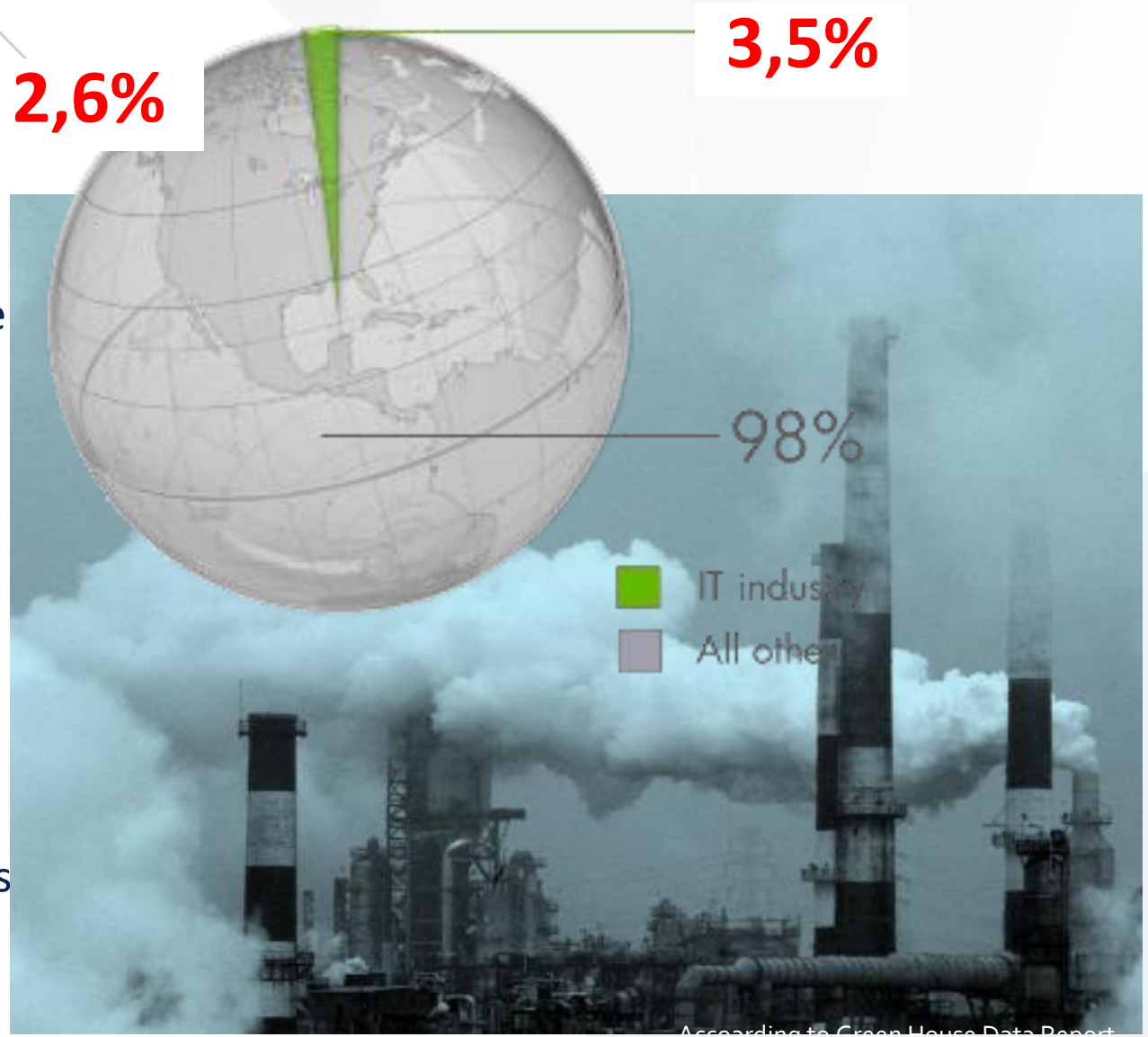
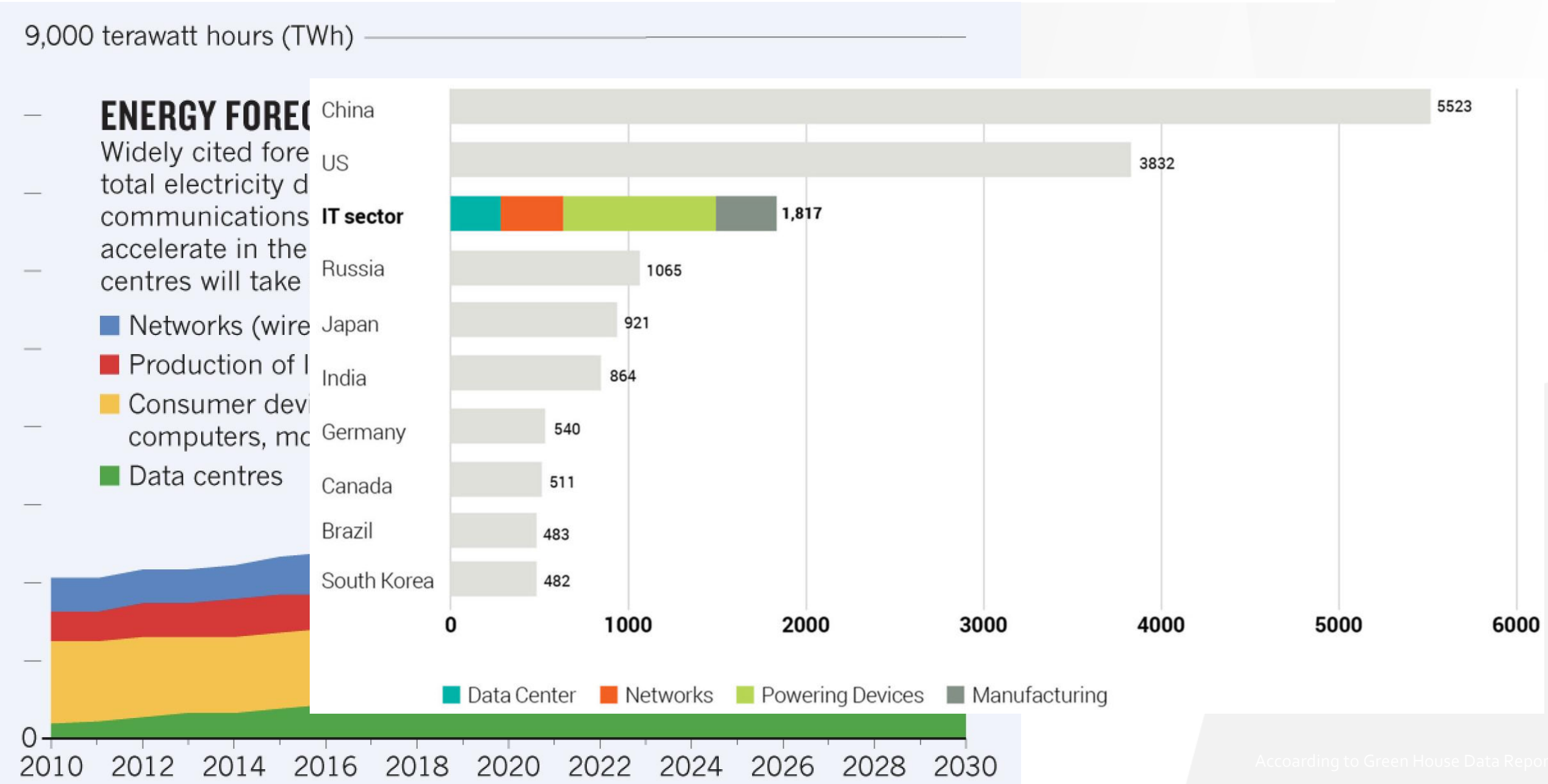
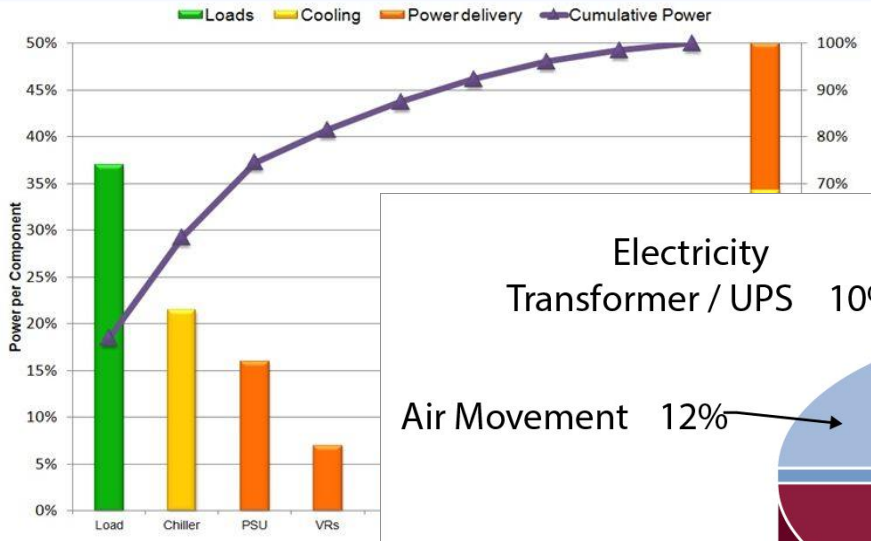


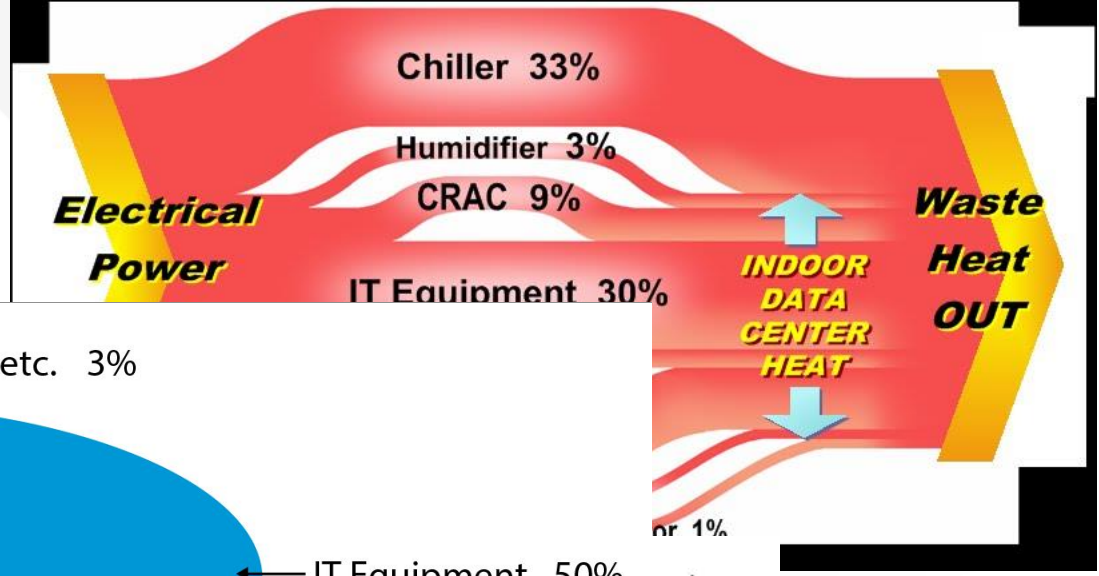
Scale of energy consumption and costs

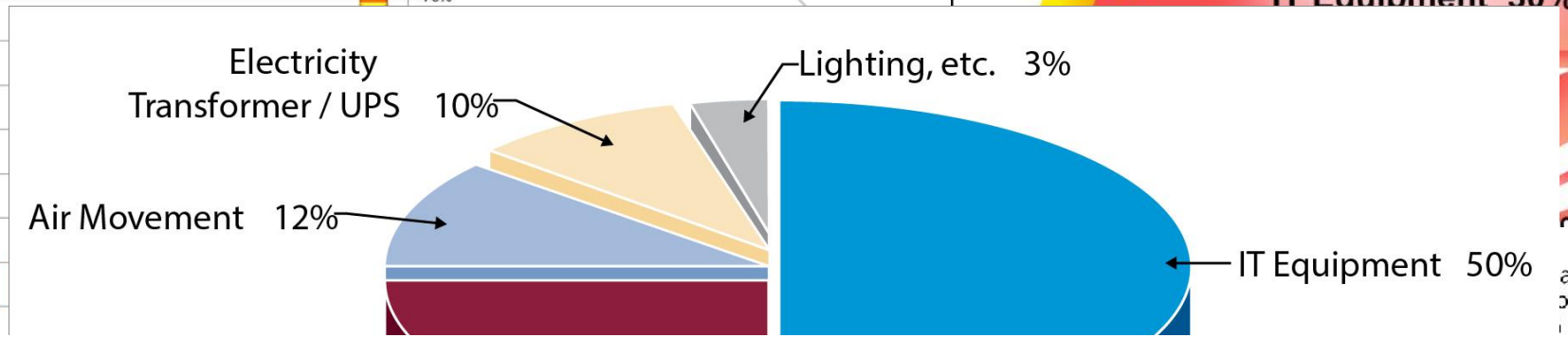


Accoarding to Green House Data Report

Energy Efficiency of Data Centers







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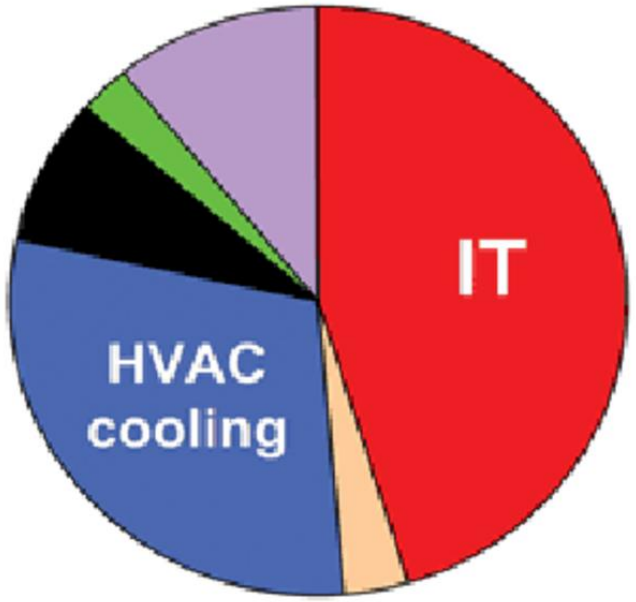
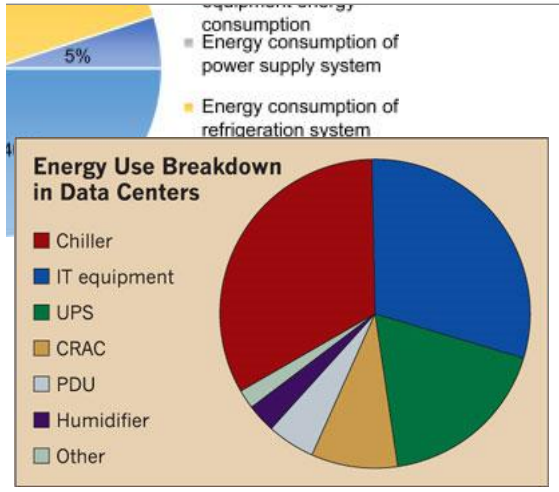
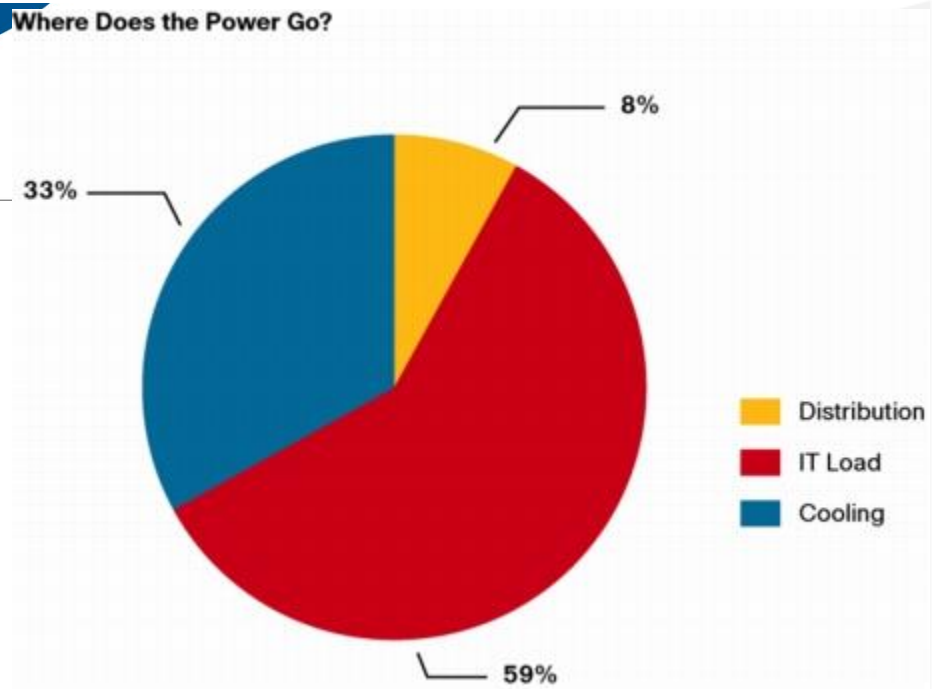
Air conditioning makes 40-50% of datacenter energy use



Servers
DC Equipment
Total HVAC
UPS Losses
Lighting
Other

ies Inc., New York





High Performance Computing requires liquid cooling

6.4.4 Optimisation of the energy spend by the facility by controlling the coolant temperature down to the device level and taking the infrastructure energy cost into account

We expect innovative architectures to appear with new levels of memory hierarchy, the 2.5D and 3D processor and memory integration, optical networks on or close to the chip package. ***This will bring in the new challenges in cooling.*** ***This milestone should establish a procedure to control the cooling to minimize heat dissipation at the device level. For example, it may establish practical way to use the 2-phase liquid cooling for a single device, physical nodes and beyond.*** *The goal of this research is practical demonstration of improved heat extraction from complex chip packages coupled with techniques to regulate the temperature of the coolant to optimize the overall power and energy efficiency from single device to the whole installation with many of these devices. The minimization should include the infrastructure cost, such as the cost of refrigeration (if used) and the pumping cost. The expected result is practical demonstration of working installation with management software that can optimize the temperature to cool individual chips while minimizing the overall energy cost*
Related milestone: M-ENR-HR-4

6.4.9 Highly efficient HPC installation

This computer installation should demonstrate PUE~1.05 (i.e. 5% infrastructure load) and TUE~1.1 (i.e. <5% power conversion losses) which would mark a significant improvement in the power/voltage conversion efficiency. ***This must be entirely liquid cooled facility.*** *This should take into account the possibilities to optimize the overall efficiency by reducing the coolant temperature to limit the leakage current. This milestone should account for the software to manage the facility for the energy and power capping strategies. Optimization of the energy spent to transfer data between the compute nodes (interconnect bandwidth), optimization of the storage access and LAN usage optimization is part of the approach towards this milestone. Expected results are measurements and reports related to energy efficiency and TCO. Related milestone: M-ENR-MS-9*

Sept. 2018 - EU forces huge energy cuts in datacenters from march 2020

2.1. Idle state power

From 1 March 2020, the idle state power (P_{idle}) of servers, with the exception of resilient servers, HPC servers and servers with integrated APA, shall not exceed the value calculated using the following equation:

$P_{idle} = P_{base} + P_{add_i}$

where P_{base} is the basic idle state power allowance in Table 4, and Padd_i is the idle state power allowance for additional components, as determined per Table 5. For blade servers, P_{idle} is calculated as the total measured power divided by the number of installed blade servers in the tested blade chassis. For multi-node servers, P_{idle} is calculated as the total measured power divided by the number of installed nodes in the tested enclosure.

Table 4 Base idle state power allowances

Product type	Base idle state power allowance, P_{base} (W)
1-socket servers	25
2-socket servers	38
Blade or multi-node servers	40

ANNEX II
Ecodesign requirements

1. Specific ecodesign requirements for servers and online data storage produc

1.1. PSU efficiency and power factor requirements

1.1.1. From 1 March 2020, for servers and online data storage products, with the exc of direct current servers and of direct current data storage products, the interna efficiency at 10%, 20%, 50% and 100% rated load level and the power factor a rated load level shall not be less than the values reported in Table 1.

Table 1 Minimum PSU efficiency and power factor requirements from 1 March 2020

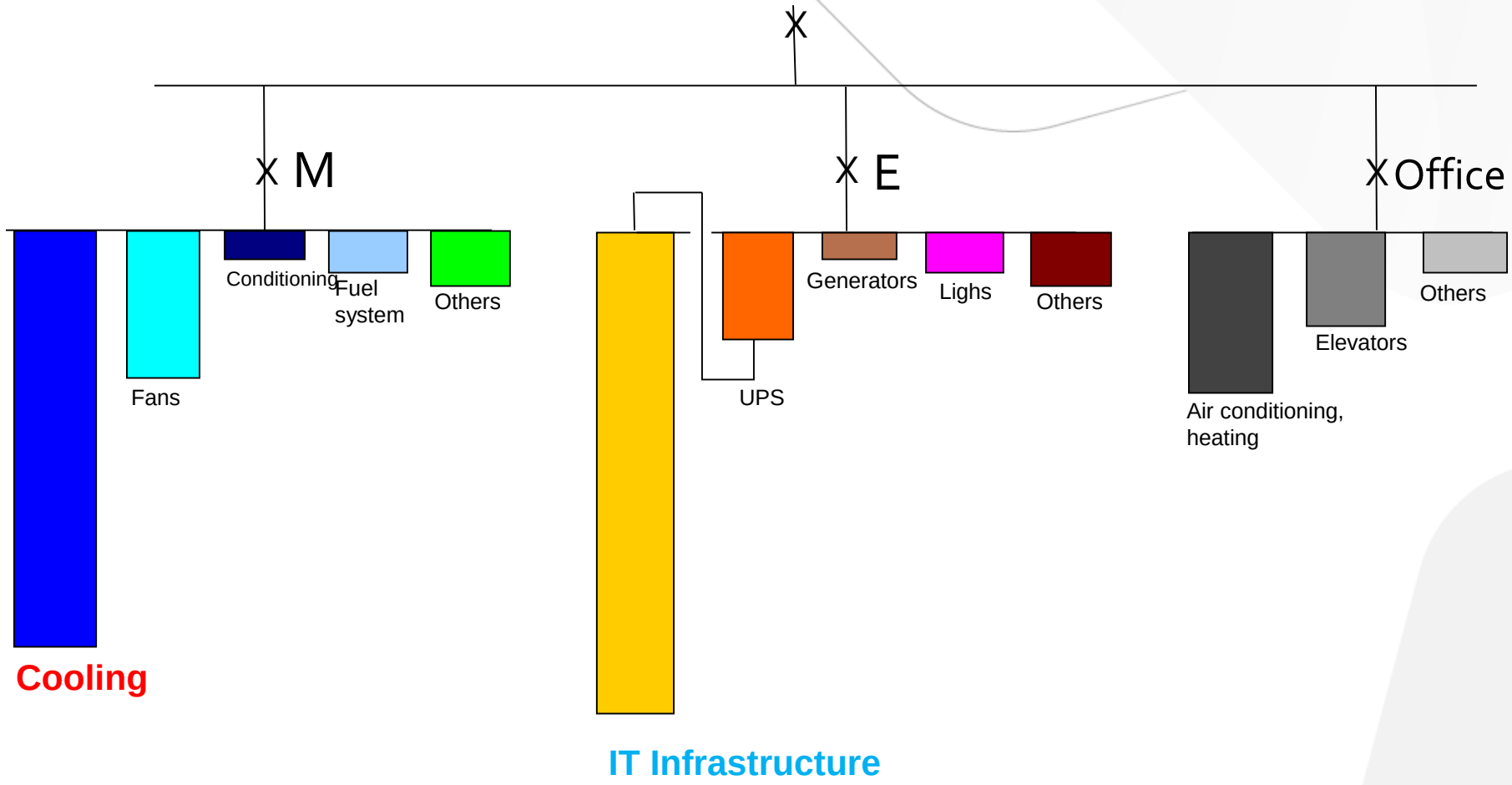
A major milestone in driving energy efficiency in data centres was achieved yesterday in Brussels

Published on September 18, 2018

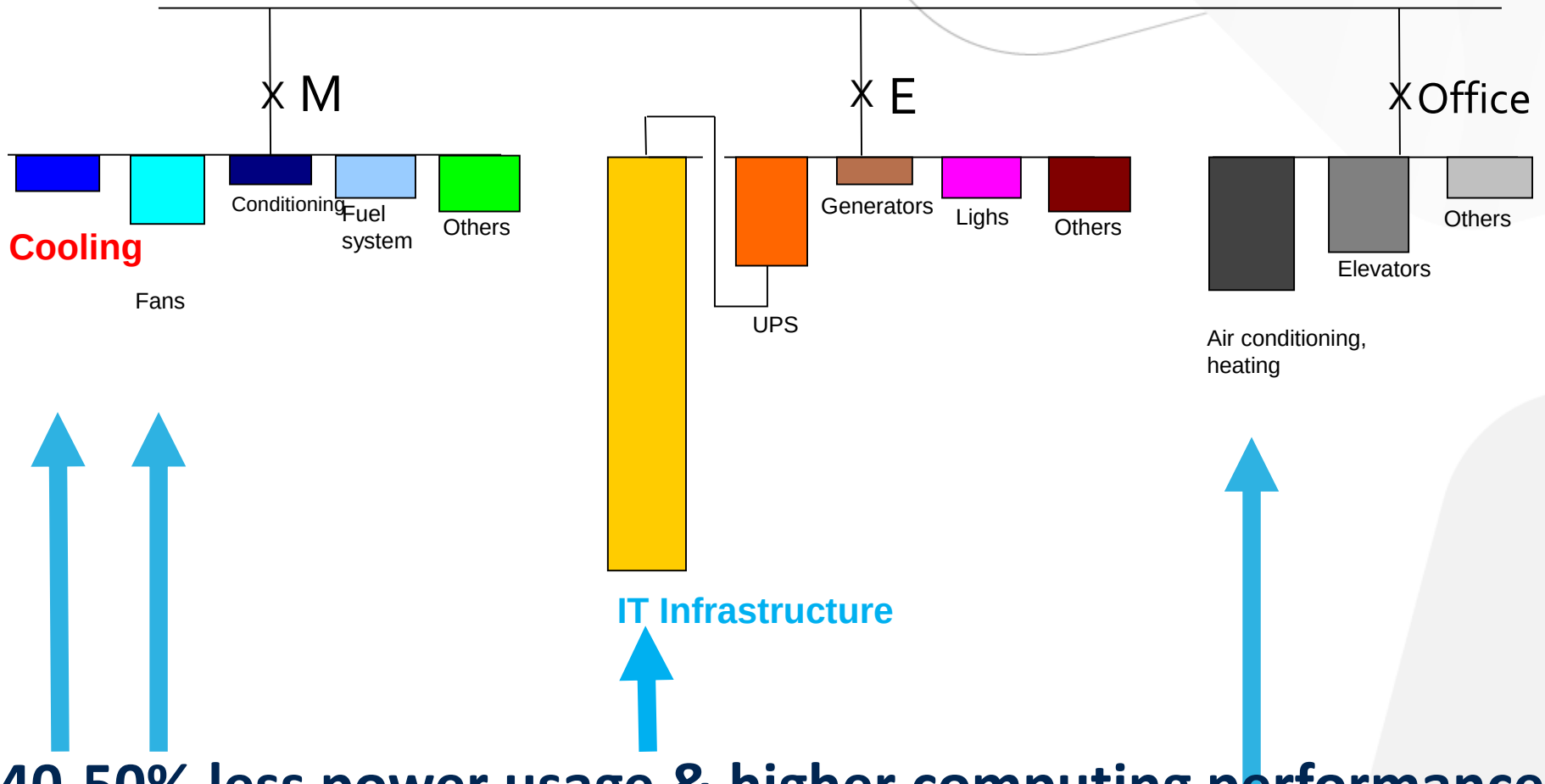
Liquid cooling is the only solution that allows compliance without hardware replacement

Typical ICT infrastructure energy use

Current standard air cooled datacenter:



What we do: the liquid cooling effect



40-50% less power usage & higher computing performance

Complete portfolio

Yes, we are the only company worldwide with complete portfolio of liquid cooling systems

liquidcooling

Next Gen Direct Chip (DLC) System

Next Gen Immersion Liquid Cooling system

Next Gen Immersion Edge Datacenter

The Market

- **HPC / Big Data** - Liquid cooling is required in all HPC infrastructures in EU. **4,3% CAGR**, between 2018 i growth from 28 mld $ to 43,9 mld $
- **Data centers** - 4500 ISP/Cloud/Collocation large datacenters & 8 milion of enterprise datacenters **19,62% CAGR**, in 2018r. 43 mld $. SOM - 1%
- **Cryptomining** - expected to grow from USD 411.5 Million in 2017 to USD 7,683.7 Million by 2022,

KRZYSZTOF KONDRATOWICZ
CEO / OPERATIONS/ INVESTORS / FUNDING

MACIEJ SZADKOWSKI
CTO / PRODUCT DEV / SALES

JAN LISOWSKI
PROJECT MANAGER / EU FUNDING

SEBASTIAN PEZAŁA
PRESALES ENGINEER
HPC & TECHNICAL COMPUTING SYSTEMS

ARKADIUSZ RYBAKOWSKI
VP PRODUCT MANAGEMENT / SALES

FILIP MATEJAK
ENGINEERING - DLC SYSTEMS

BARTOSZ ZBOROWSKI
ENGINEERING TEAM LEAD - ILC SYSTEMS

CORE TEAM

- Krzysztof – 5Y Black Pearls / Investors market experience. Investors relationships, finance.
- Maciej – 18Y Compaq/HP - product development, datacenters, hpc, liquid cooling, tech scope.
- Jan – 6Y H2020 EU Contact Point / EU funding, project management.

TECH TEAM / REMOTE

- Sebastian – 15Y presales engineer / it and hpc
- Arek – 18Y at INTEL and integrators, dlc applications, product management
- Filip – 8Y at CubichInch / DLC components development
- Bartosz – 7Y IOD engineering / ILC systems dev.

SALES / MARKETING TEAM / REMOTE

- Maciej – double role for sales management
- Kuba – 3Y emerging tech marketing & PR

THE TEAM: VERY LOW BURNRATE / REMOTE READY TO JOIN / MUST EXPAND TO SPEED UP TRACTION - →

A) 1HC SALES / 1HC PR-MARKETING / 1HC ENGINEERING

B) Q1 2019 : DELIVERY / ENGINEERING / SUPPORT / LOGISTICS - 3 HC

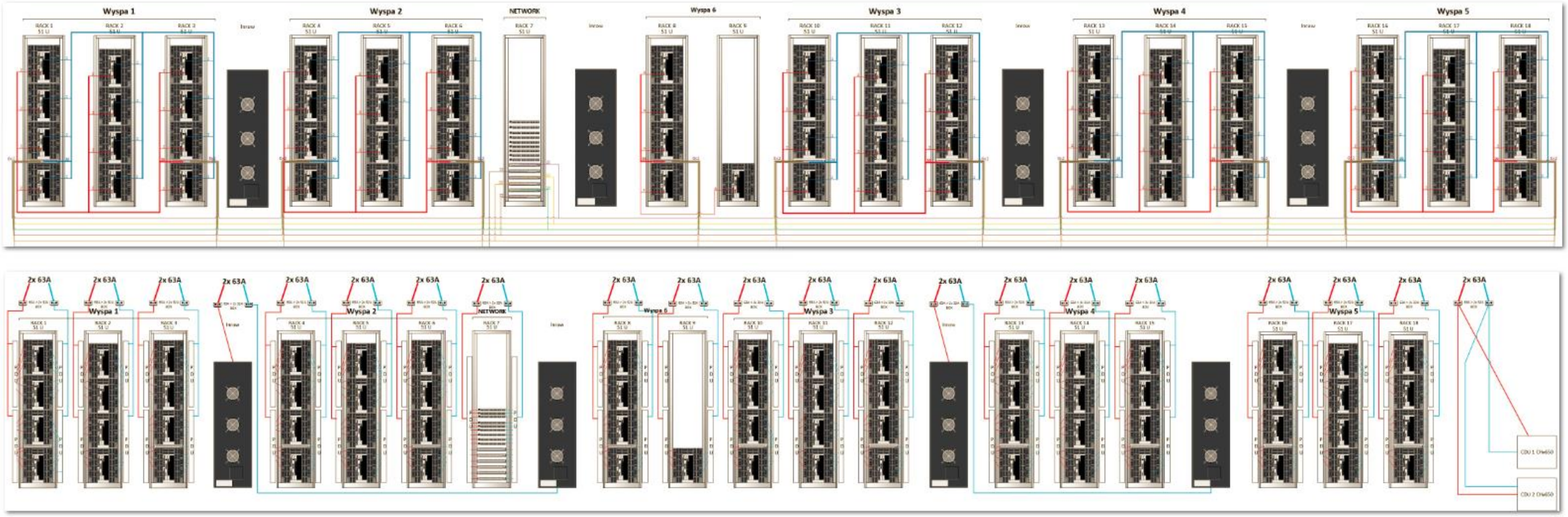
Experience: we already delivered numbers:

2016 – 1.4 Petaflop HPC cluster with custom direct liquid cooling

HPC cluster - **1370 servers** - All hot components **Directly Liquid Cooled**

Efficiency: **1402 TFLOPS** - Cost: **34 mln** (half the cost of similar cluster in Poland)

Memory modules: **8672** – CPU cores: **28 896**



Supercomputer
EAGLE

PNSC – POZNAN NETWORKING & SUPERCOMPUTING CENTER

Experience: We do awesome things – like cooling it systems with 48*C hot liquid.

PUE 1,02 ~ 1,03
Number 1 in Poland in terms of energy efficiency

1370 SERVERS - 1,4 PFLOPS COMPUTING POWER
Second supercomputing cluster in Poland in terms of size
80th place on HPC TOP500 fastest clusters worldwide

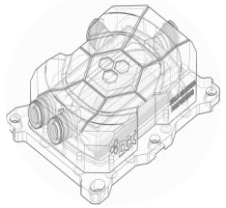
120 TB of memory in 9 831 modules

DIRECT LIQUID COOLING TECHNOLOGY
With dedicated components for processor, memory, vrm cooling

7,9 MLN EUR

Cluster allows to pick up 85% of heat generated by the servers, and we reuse that to heat office building
Compared to air cooling, DLC saves 3,26 kWh of power consumption for PSNC each year!

Timeline Q1-Q4 FY18



March 2018

SECURING IP

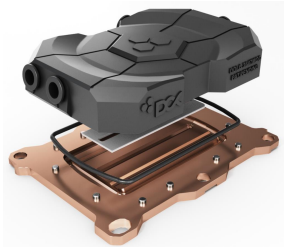
DLC/ILC PATENT APPLICATIONS SUBMITTED

Must secure IP before anouncement of new products features.

Applications for:

- **NextGen DLC modules**
- **NextGen DLC system for PCs**
- **ILC system Architecture**

Important to announce new set of products 2 months before worldwide recognized HPC industry event SuperComputing ’17 to gather awareness of customers and industry analysts



August 2018

NEW PRODUCT

NEXT GEN DDLC ANNOUNCED

Important to announce new set of products 2 months before worldwide recognized HPC industry event SuperComputing ’18 to gather awareness of customers and industry analysts, disrupt competitive offerings

October 2018

EU FUNDING - 200k Eur

EU IP Grant secured

DECEMBER 2018

NEW PRODUCT

ILC SYSTEM ANNOUNCED

September 2018

EU FUNDING - 100k Eur

EU Innovation grant secured

December 2018

SEED PHASE

SECURING SEED FUNDING

Timeline Q1 / Q4 FY19

March 2019

EU FUNDING - 200k Eur

EU H2020 SME Instrument expected

JANUARY 2019

NEW PRODUCT

AUGMENTED REALITY - UNIFIED MONITORING

Competitors are failing at monitoring and user interface. No mobile app, no monitoring tool, just cooling components and exchanger from third party supplier. Users expect convenient way to monitor their system and provide required informations / statistics.

Announcement: ibms web monitoring system, mobile app & comprehensive monitoring sensors suite

Intensive sales efforts & projects with customers in EU.

We should have x open projects and few references on DLC systems.

Closing talks about phase A if EU funding extends

Q3 2019

NEED FUNDING FOR SALES EFFORT AND HPC DEV IN EU

SECURING PHASE A FINANCING FOR DLC / HPC SYSTEMS DEV & SALES EFFORTS

Q4 2019

REPRESENTATION AND SALES

LOCAL REPS AND OFFICES IN EU / SALES PROJECTS

To sell customers must have direct local contact, be able to touch and fell the solution. Required also for product awareness and commercial customers. For public sector we need support from local partner or advisor to successfully bid in local large tenders.

Local Ctry Managers / Offices in Germany, UK, Netherlands, France to secure partnerships and projects with customers

Timeline Q3-Q4 FY19

Q4 2019

NEW PRODUCT

ROBOTIC EDGE DATACENTER

HPC is expanding rapidly however there is group of old established vendors with lack of innovation and focus. We can start fast with Open HPC system innovative power / cooling & architecture, based on ILC / DLC, and follow up to microprocessor technologies.

Delivery: Open convergent exascale HPC architecture with innovative power/cooling and software stack + convenient monitoring

Q4 2019

NEW PRODUCT

FOCUS ON SALES AND DELIVERY, PARTNERSHIPS AND MARKET EXPANSION

Intensive sales efforts & projects with customers in EU.

Partnerships with important integrators as vendor. Agreements with software suppliers. Strong funnel of sales projects in poc & delivery phase.

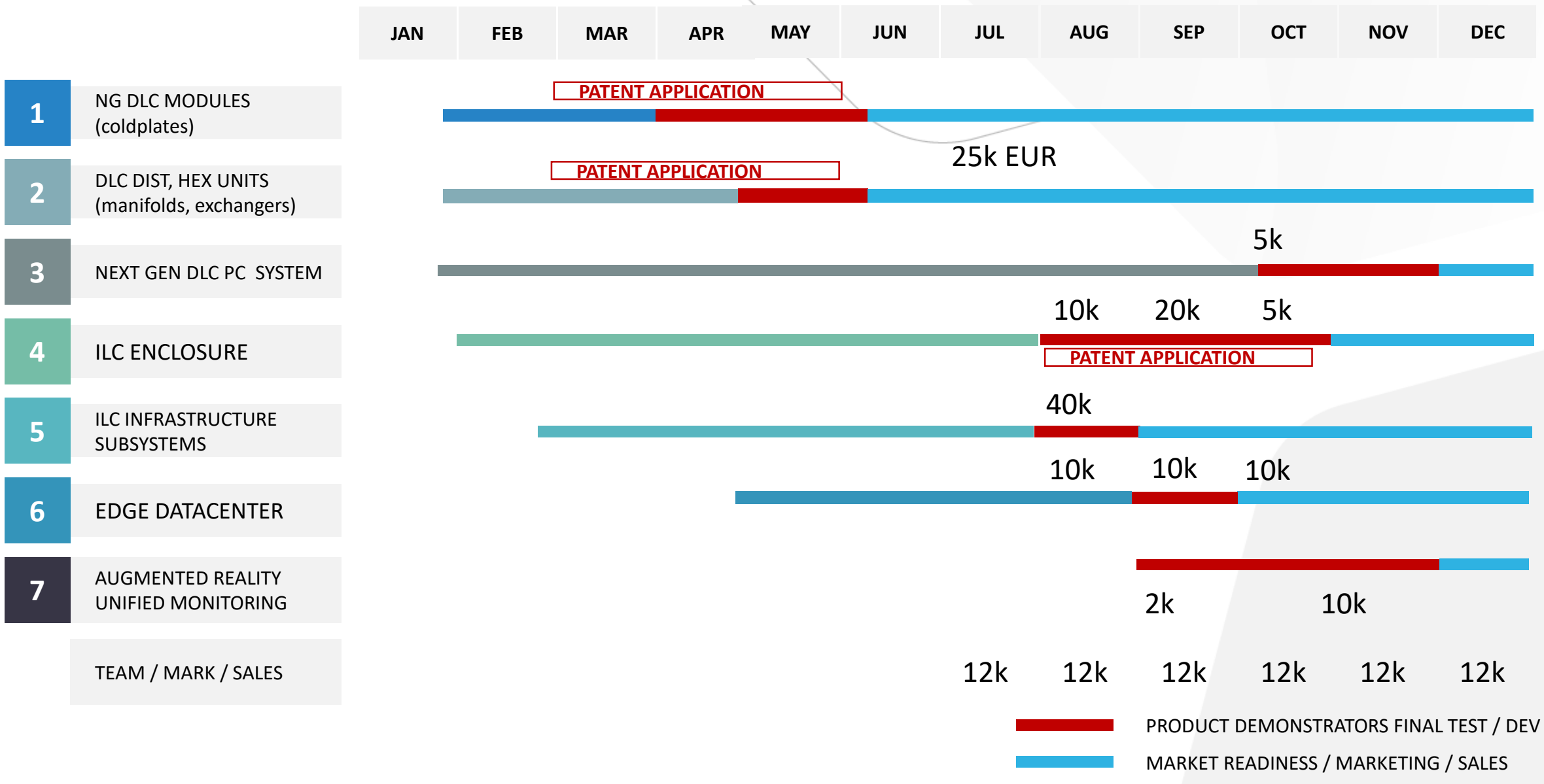
Q4 2020

NEW PRODUCT

SC20 HPC SYSTEM ARCHITECTURE ANOUNCEMENT

To disrupt competitive offerings and participate in HPC projects in EU abs Worldwide, we need to announce before SC ‘19 complete HPC System with open and convergent architecture and software stack utilizing previously created ILC / DLC systems & monitoring suite.

Product development schedule + investments batches*



Product competitive assessment

SAFETY GUARANTEED!

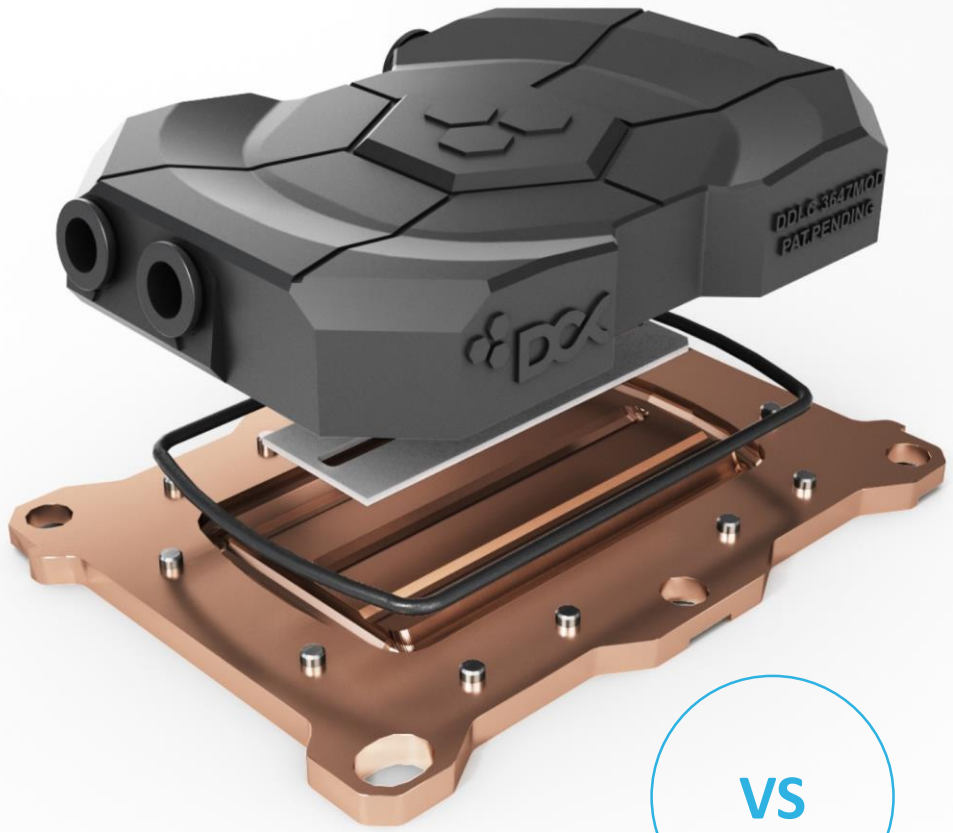
Negative pressure system combined with engineered fluid guarantees safety. Others must make a lot of effort to avoid leaks.

OPEN SYSTEM !

With PTL connectors on each module + set of proprietary tubing, users can finally configure DLC system as any other accessory without any customisation.

6-7 TIMES MORE EFFICIENT

Dual-Phase operation allows improved efficiency with less material and effort – smaller tubing, smaller pumps, smaller flow but better results



VS

USING WATER / GLYCOL

- Leaks have disastrous impact on equipment
- Collant is subject to corrosion, fungus, bacteria

WE DELIVERED THEIR LARGEST INSTALLATION

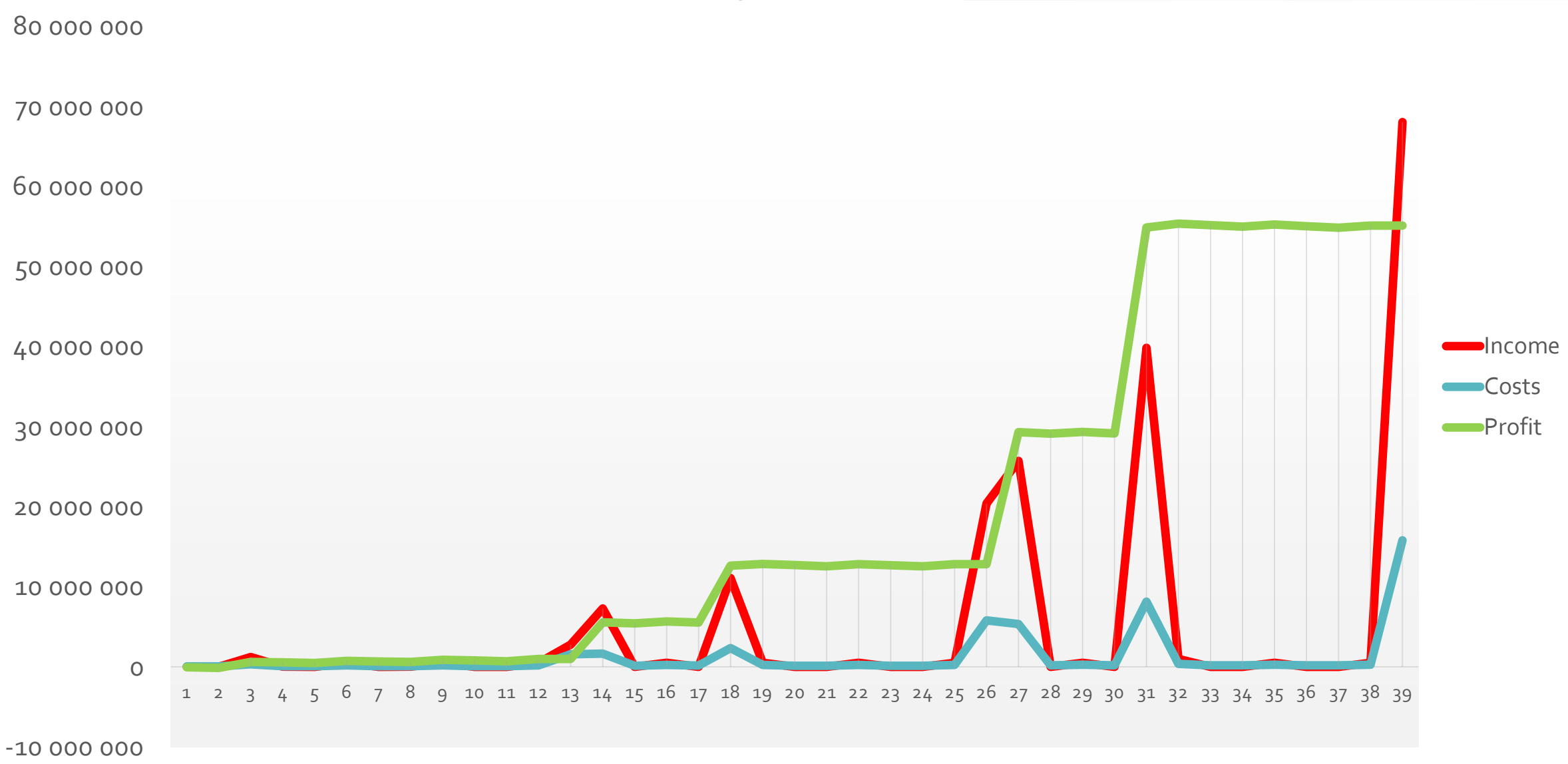
We know from experience what is wrong and will always win in front of customer showing all the problems with water cooling

COSTLY AND CLUMSY REQUIRES CUSTOMISATION

Comes from computer modding industry. Large tubing, large flow, active pumps, complicated delivery and installation,

Investment Proposal

Financial outcome



3 years forecast

	2018	2019	2020
Income	600 500	4 732 980	15 777 893
Profit	243 000	2 760 776	9 829 146
Cash at the end of period	52 112	2 807 560	9 875 935
NPV	646 611	1 805 624	9 867 330
IRR	-25%	574%	701%

Breakeven Point (Financial) = 697 632 EUR

All amounts expressed in EUR nett.

What we need & what we propose in detail

1. We are in market start phase. Ready & tested / simulated designs. Going to market now, need sales / marketing headcount and to start first production batches.

2. We need funding for first production batch, ip protection, sales activities, product dev. All products subject to further resale – approx. 305k eur.
   - 20-25k for DLC products ,
   - 30k for ILC system
   - 30-35k for contenerised solutions.
   - 40-45k for auxilary components (drycoolers/ freecoolers/monitoring)
   - 20k – additional patent applications
   - 150k team and worldwide sales activities (travel, fairs / meetings) for 1Y

3. We have already private investor proposals. However we look for marketing message: 1-1.5m eur funding agreement from recognised fund. In reality we need only one, maximum 2 co-investors with 500k eur per 5% share, up to 10% max. We need decision within December 2018. After end of December we will use private funding untill EU funding kicks in.

4. We will get EU funding for sure, (H2020, HPC, liquid cooling requirement, sustainability, energy efficiency, 3 strong scientific partners – ITME/ Technical University in Warsaw & Lublin) that will provide steady cashflow and for next R&D, IP protection and sales activities. We also expect up to 300k eur reve this year.

1 PAGE BRIEF

- EXPERIENCED TEAM - 4 core / 4 outsourced
- DISRUPTIVE TECH. OF LIQUID COOLING
- EXPERIENCED TEAM – 8m eur project in the past and 18m turnover
- 4 Patent applications – 2 submitted / 2 in process
- 2 EU GRANTS APPROVED (innovation 100k eu & IP protection 200k eur grants)
  3 EU applications in process.
- PRODUCT ADVANTAGES OVER COMPETITION
- IN LINE WITH EU TARGETS: Energy efficiency , sustainability, greenit, reusability
- APPLICABLE INDUSTRIES: High Performance Computing & Big Data, IT / Datacenters, Blockchain / Electromobility / Aerospace
- LOOKING FOR 1M EU INVESTMENT IN BATCHES FOR PRODUCT / SALES DEV.

More info?

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m.szadkowski@dcx.eu – Product & Sales
j.lisowski@dcx.eu – EU projects & cooperation

BE PART OF THIS (before others do)