

# BEFORE STARTING

## HOUSEKEEPING

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- Turn on your system's sound to hear the streaming presentation
- **Questions?** Submit them into the question box!
- The webinar on Twitter @ICTFOOTPRINTeu





# ICTFOOTPRINT EU

European Framework Initiative for Energy & Environmental Efficiency in the ICT Sector

**Webinar:** Decreasing ICT energy consumption – the power of data centres and people's will

In partnership with:

Wednesday, 18<sup>th</sup> July 2018





# Speakers

**Maikel Bouricius**  
Marketing Manager  
Asperitas



**Daniel Frohnmaier**  
Project Manager  
START2ACT & Geonardo  
Environmental Technologies



**Rita Meneses - Moderator**  
Marketing Analyst & Researcher, Project Manager  
Trust-IT Services



# The ICTFOOTPRINT.eu initiative, in a nutshell

## Mission

Become “THE” consolidated effort that, at European level, raises awareness on metrics, methodologies & best practices in measuring the energy and environmental efficiency of the ICT-sector, to facilitate their broad deployment & uptake.

## Partners



## Stakeholders



ICT Intensive SME



Standard Development Organisations



Cities & Public Administration



ICT Suppliers

Helping you choose your Low Carbon & Energy Efficiency in ICT



# ICTFOOTPRINT.eu Results so far



**+4.000 Community Members**



**24 ICT Sustainable Suppliers** from 8 different countries



**13 Advisory Group members** from 7 different countries



**5 languages helpdesk** (ENG, FR, DE, IT, ES)



**1 Paper published** in Scientific Event proceedings



**2 user-friendly Self-Assessment Tool** ([SAT-O](#) & [SAT-S](#))



**44 Success Stories** on Green ICT



**Map of ICT Standards** with 20 factsheets



**9 webinars** with 25 different speakers & +420 registrations



**Active Presence** in 16 ICT & energy-aware events, plus visibility in 5 events

***Consolidated community of +4.000 through an effective marketplace, dynamic Map of ICT Standards and communication & dissemination actions***

# Main Outputs for our stakeholders



**ictfootprint.eu**



## Marketplace

**Buyer:** Find sustainable ICT suppliers & publish ICT sustainable needs.  
**Seller:** publish ICT sustainable services or procurements & search for clients.



## Webinars

Know more on sustainable ICT: get practical guides from a highly qualified experts in the Sustainable ICT sector and learn how to apply them in your organisation.



## Help Desk In 5 languages

Get support about how to decrease your carbon footprint & implement ICT energy efficiency standards with Online Assistance (EN, FR, ES, DE, IT).



## Success Stories

Best practices in Sustainable ICT. Search how players like you got energy savings & carbon footprint reduction. Or even showcase your success story!



## SAT-S & SAT-O

Measure your own carbon footprint and start learning how to become sustainable thanks to ICT standards & methodologies.



## Map of ICT Methodologies

20 downloadable fact-sheets of ICT methodologies & standards, understand & measure your ICT goods, services organisations & cities' carbon footprint.

# Join us and get energy savings by choosing low carbon ICT

# A Low Carbon ICT engaged community



Social Media followers, Newsletter subscribers,  
Webinars registrations, Marketplace sellers &  
buyers, Journalists, Synergies

★ + 4.900 members ★  
**ICTFOOTPRINT.eu COMMUNITY**

## ICTFOOTPRINT.eu Community 1.900 members



**SMEs 53%**



**Large Enterprises 12%**



**Public Administration 5%**



**NPO 24%**



**SDO 0,6%**



**Media 2,20%**



**Academia & Research Centre 3,3%**

## Amongst the connections that count (multipliers/influencers)



## 8 webinars with reputable speakers



## 21 sustainable ICT sellers



# Get to action! How Policy can support Green IT?

## Why?

- **Sensibilise people** to on policy actions that support the development of green ICT in Europe
- **Learn how** ecodesign principles can be applied in ICT sector
- **Develop** your organisation's Green ICT assessment during the hands-on session with **ICTFOOTPRINT.eu SAT-O**

## Who?

Public Authorities, ICT companies, NGO on sustainability and ICT



**Key priorities, insights & further conclusions to be included in “Policy Action Plan & ICTFOOTPRINT.eu Sustainability Roadmap” Report for the European Commission**

**REGISTER ON <https://ictfootprint.eu/user/register> TO GET THE REPORT AS SOON AS IS AVAILABLE**



# How sustainable is your ICT company?



<https://ictfootprint.eu/en/services/self-assessment-tool-organisations>



**SAT-O (for Organisations)** – Free & simple tool to calculate the overall carbon footprint of your organisation

- ✔ Digital services provided & used by the organisation
- ✔ Structural impact of the building and personnel's
- ✔ Your own personalised report, with a light reading style, that shows the approximate climate change and primary energy footprint of your ICT-intensive organisation assessed over one year



Assess the ICT carbon footprint of your organisation, for sustainable ICT decisions

**TRY “SAT-O” TOOL & MAKE INFORMED DECISIONS ON HOW TO MAKE YOUR ICT SUSTAINABLE & ENERGY EFFICIENT**



European Framework Initiative for Energy & Environmental Efficiency in the ICT Sector

## Energy Producing datacenters with Immersed Computing®

Name Maikel Bouricius

18-07-2018



# THE NEW SUSTAINABILITY FOR DATACENTERS

**“DATACENTRES ARE BIG  
ELECTRICAL HEATERS WITH LIMITS  
AND WE COOL THEM.  
WHY NOT MAKE THEM MORE  
EFFECTIVE HEATERS?”**

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# THE GLOBAL CHALLENGE

## ENERGY FOOTPRINT OF INFORMATION FACILITIES

Datacentres, Server rooms, Network hubs etc.

Estimated **4%** Global Electricity Production (25 PWh)

4% = **1 PWh**

**10000000000000000 Wh ( $10^{15}$ )**

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# THE LOCAL REALITY

## THE CHALLENGE

***"Is Singapore's audacious vision of a green, high-rise data center even possible?"***

***"Apple's Ireland data center could use more energy than the city of Dublin."***

***"The world's cryptocurrency mining uses more electricity than Iceland."***

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# THE URGENCY

## THE CHALLENGES

INCREASE IN INFORMATION FOOTPRINT  
DEMAND FOR HIGH DENSITY CLOUD  
CONSOLIDATION OF POWER DEMAND  
OVERLOADING OF OUTDATED POWER GRID  
GLOBAL NETWORK LOAD

**CREATING EXERGY**

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# IMMERSED COMPUTING®

## IMMERSED COMPUTING® HAS BEEN DEVELOPED FOR



Sustainability



Flexibility



Efficiency

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# SUSTAINABILITY IS NOT A COMPROMISE

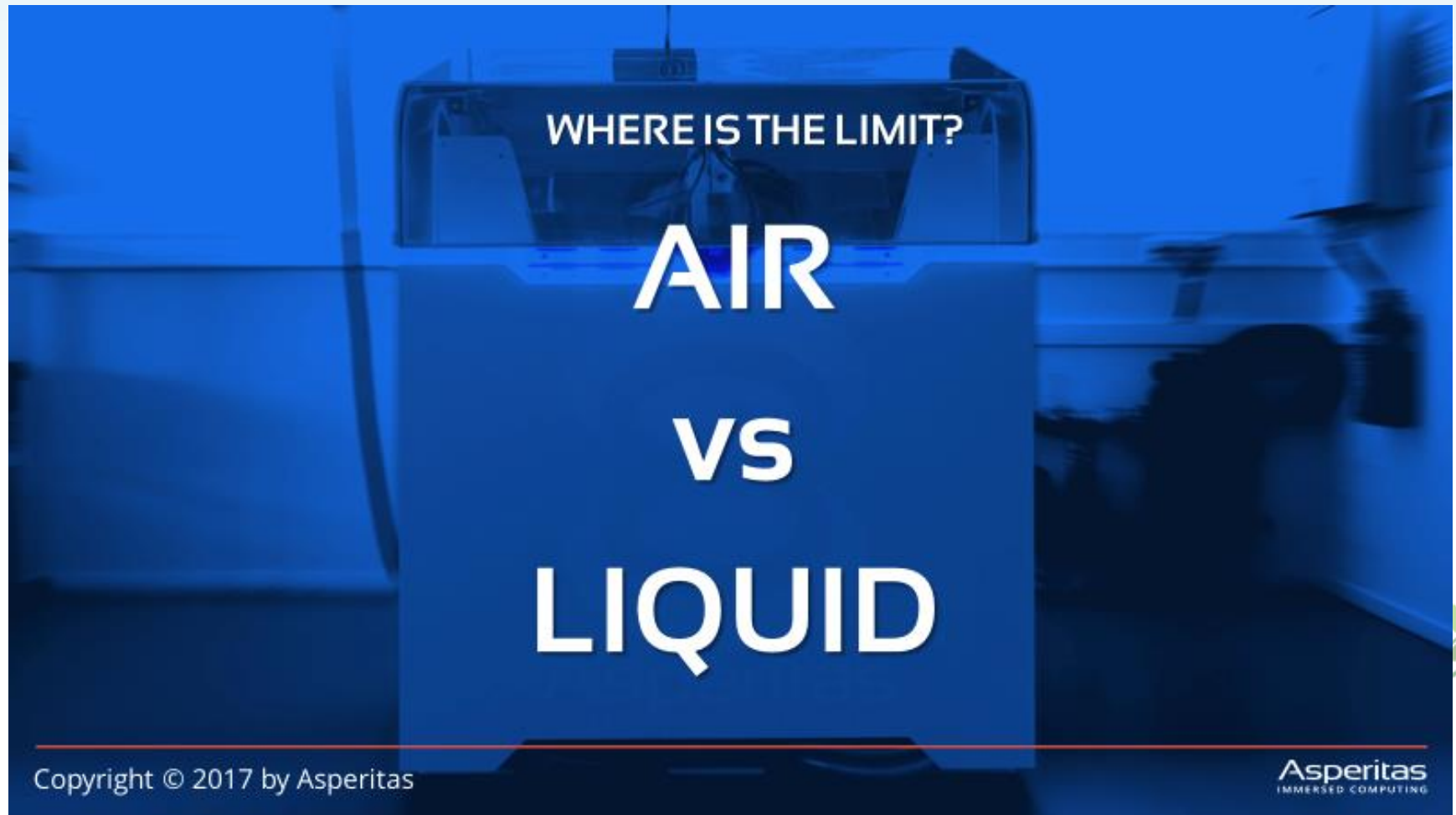


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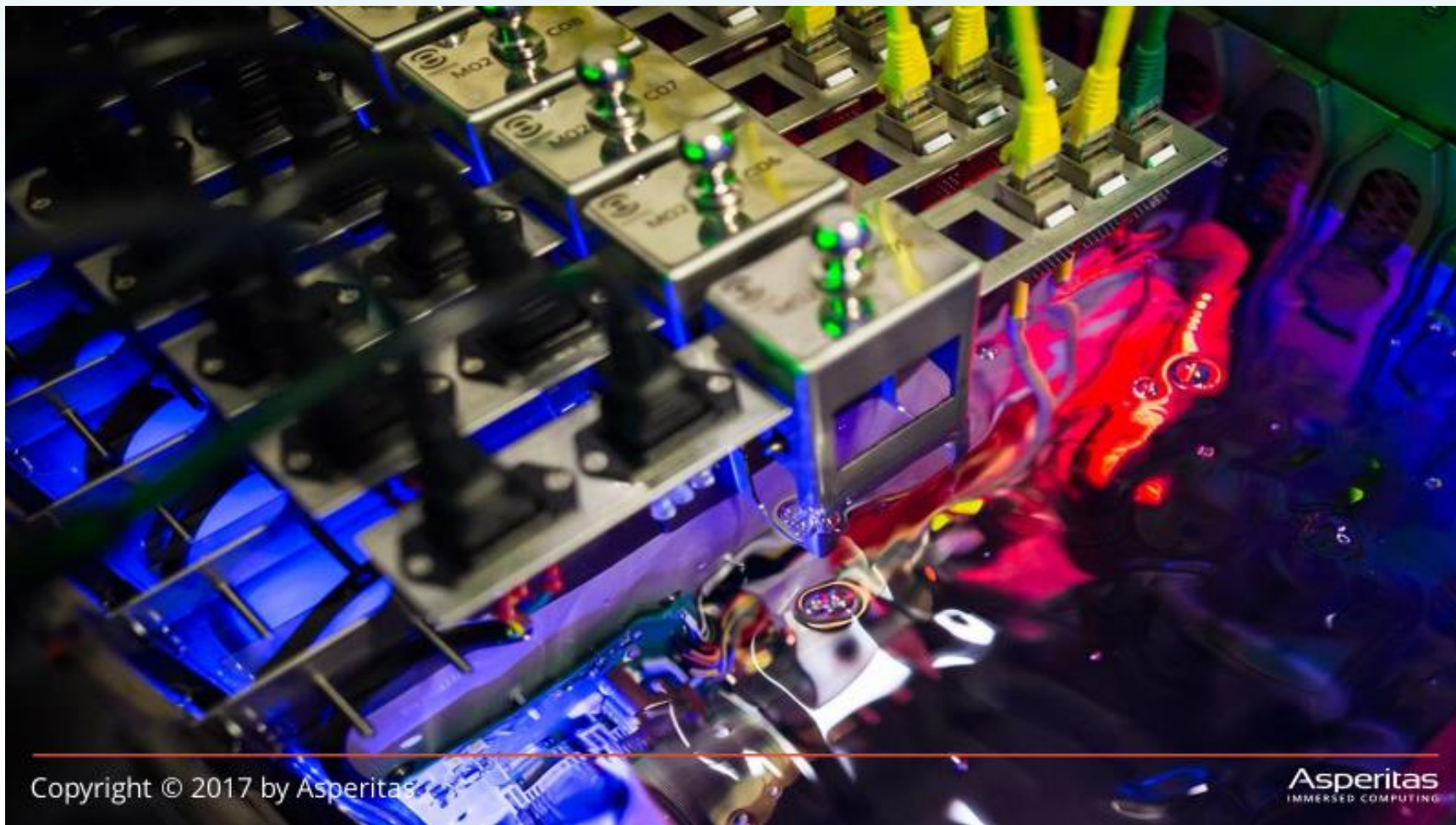
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# LET'S DO IT DIFFERENTLY



# LET'S DO IT DIFFERENTLY



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# IT'S SCIENCE

83333 L/s AIR VS WATER

1 MJ/s

Water required for  $\Delta T$  of 5 °C

$4187 \text{ J/kg}^\circ\text{C} * 1 \text{ kg/L} = 4187 \text{ J/L/s per } 1^\circ\text{C}$

5°C with 1 MJ/s: **48 L/s**

Liquid can travel

**200 TIMES THE DISTANCE**

with same thermal losses

**IMMERSED COMPUTING® DATACENTRE:**

**6 L/s by temperature chaining**

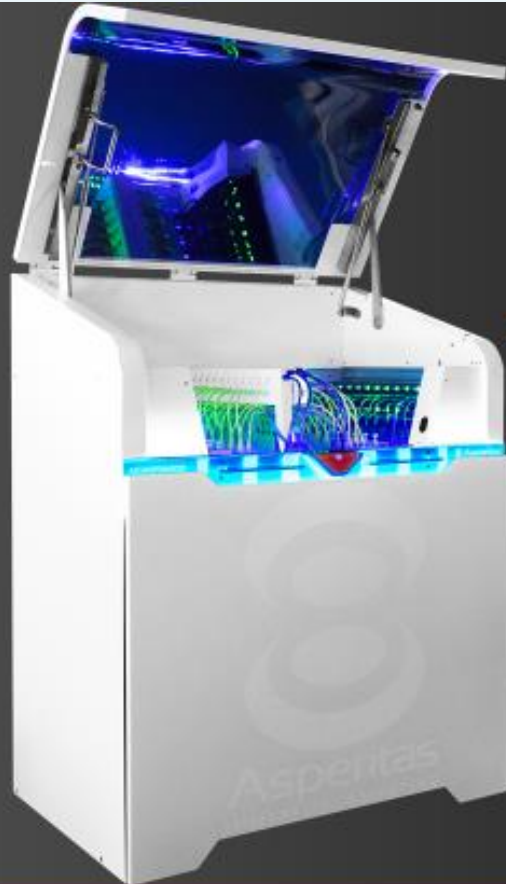
**CAN BE AN ENERGY PRODUCER...**

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# DATACENTRE IN A BOX



## IMMERSED COMPUTING®: AIC24

- 100% Removal of heat from the IT
- Highest IT efficiency by eliminated fans
- No airflow required
- Level of intelligence
  - Management control and insight
  - Automatic optimisation of the water circuit
- Optimised for high density cloud/HPC nodes
  - Varying servers
  - Flexible IT hardware
- Feed: 18-40°C / 55°C Extreme / max  $\Delta T$  10°C

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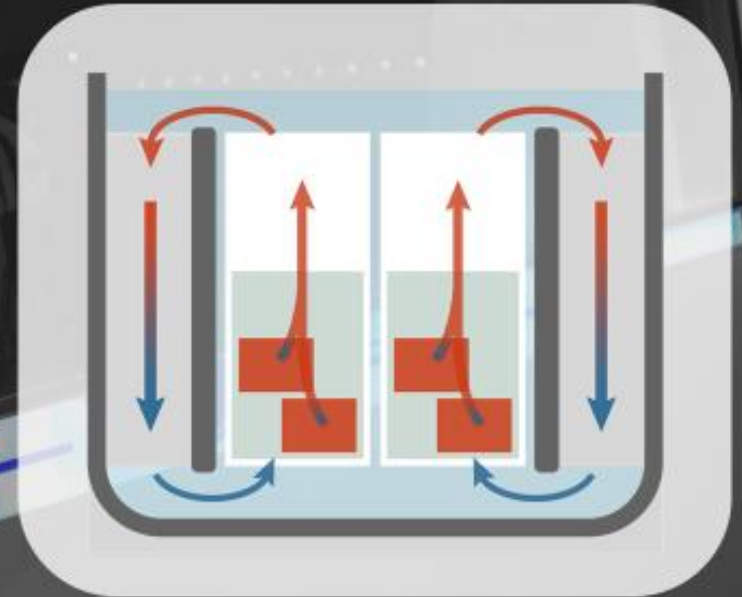
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# NATURAL CONVECTION

## ENCLOSED IMMERSION TECHNOLOGY

- Self Sustained
  - Driven by gravity, Thermal expansion
  - Self regulating
- Reliable
  - No moving parts
  - No oxygen
  - High heat capacity, less thermal shock
- Efficient
  - IT energy reduction
  - No chiller requirements



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# OUR APPROACH

## FOCUS ON CONTAINMENT

- Liquid containment
  - Double hull
  - Capillary effect
- Usability
  - Serviceable cabling
  - Integrated power and network
- Optimised for liquid
  - Optimised chassis
  - Minimised IT
- Serviceability
  - Way of work
  - Liquid tooling and Service trolley

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# DATACENTRE IN A BOX

## IMMERSED COMPUTING<sup>®</sup>

- Plug and Play
  - Power (2x 22 kW)
  - Water cooled (2x 0,3 L/s)
  - Data connectivity
- Self contained
  - Integrated managed PDU's
  - Integrated switching
  - 48 high capacity nodes
- Modular
  - Stackable
  - Shared water infrastructure

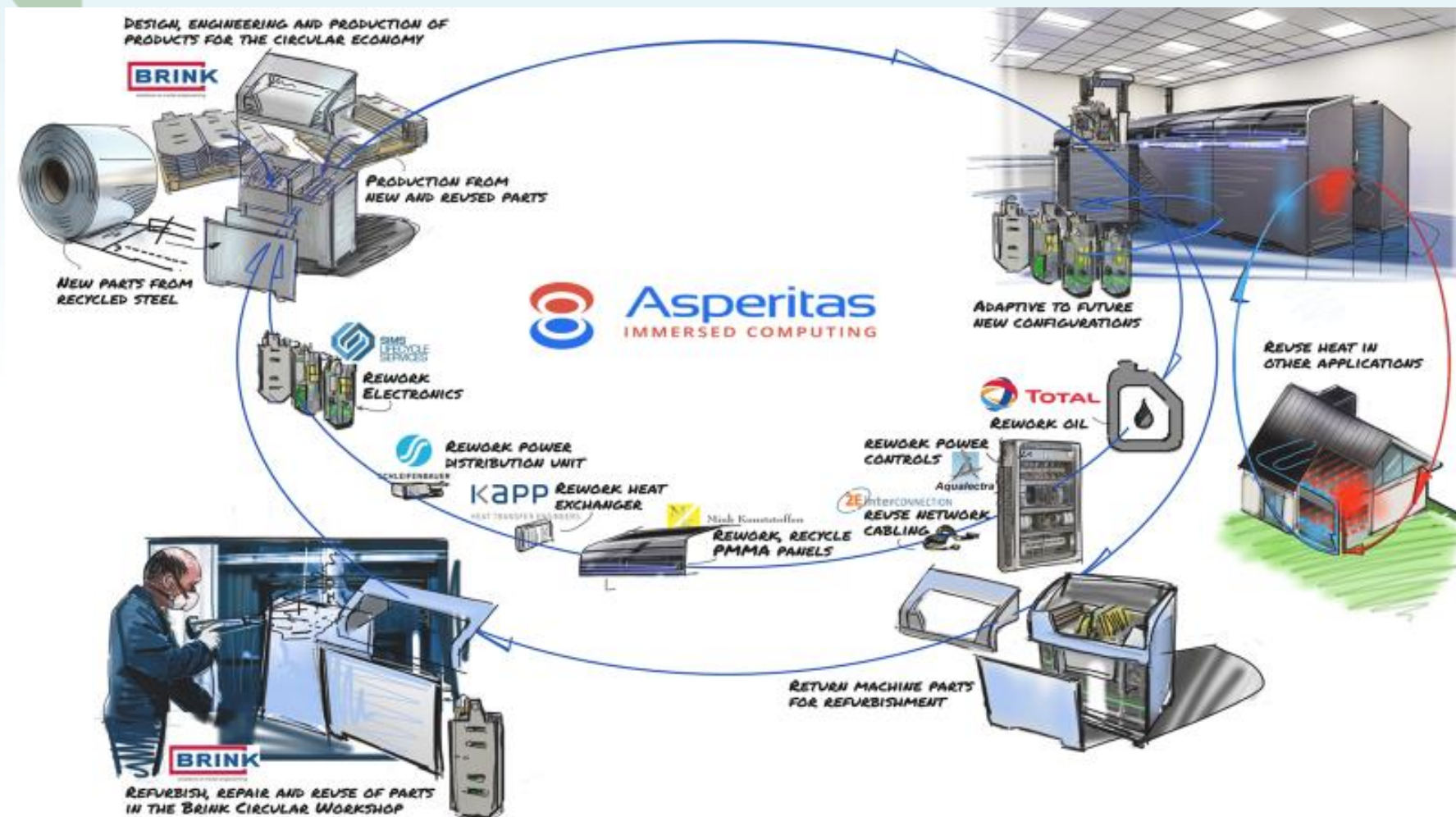
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# CIRCULARITY

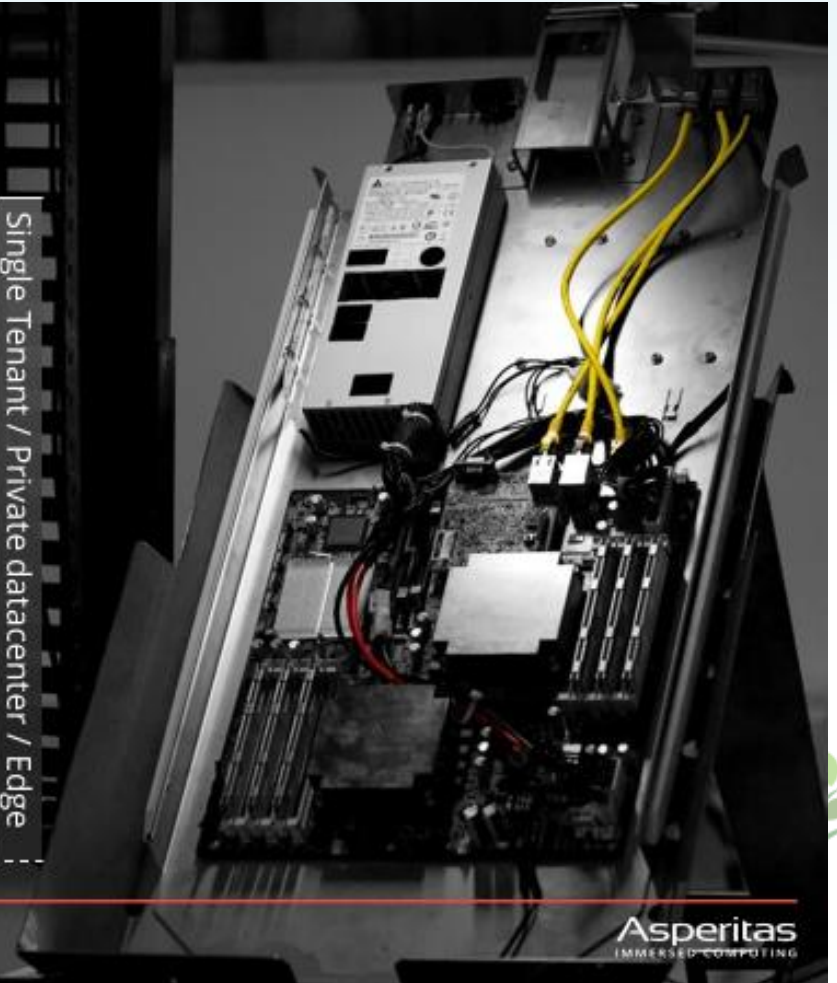




# THE IMPACT

## LIQUID VALUE CHAIN

- Software efficiency
  - Reduced OS and CPU licenses
- IT Hardware
  - Less IT, more IT power
- Datacentre Operations
  - Reduced cooling, reduced IT failures
- Datacentre Facilities
  - Minimised cooling and UPS sizing
- Datacentre Build
  - Reduced floorspace, no raised floors



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# OUR APPROACH

## DATA CENTRE DESIGN

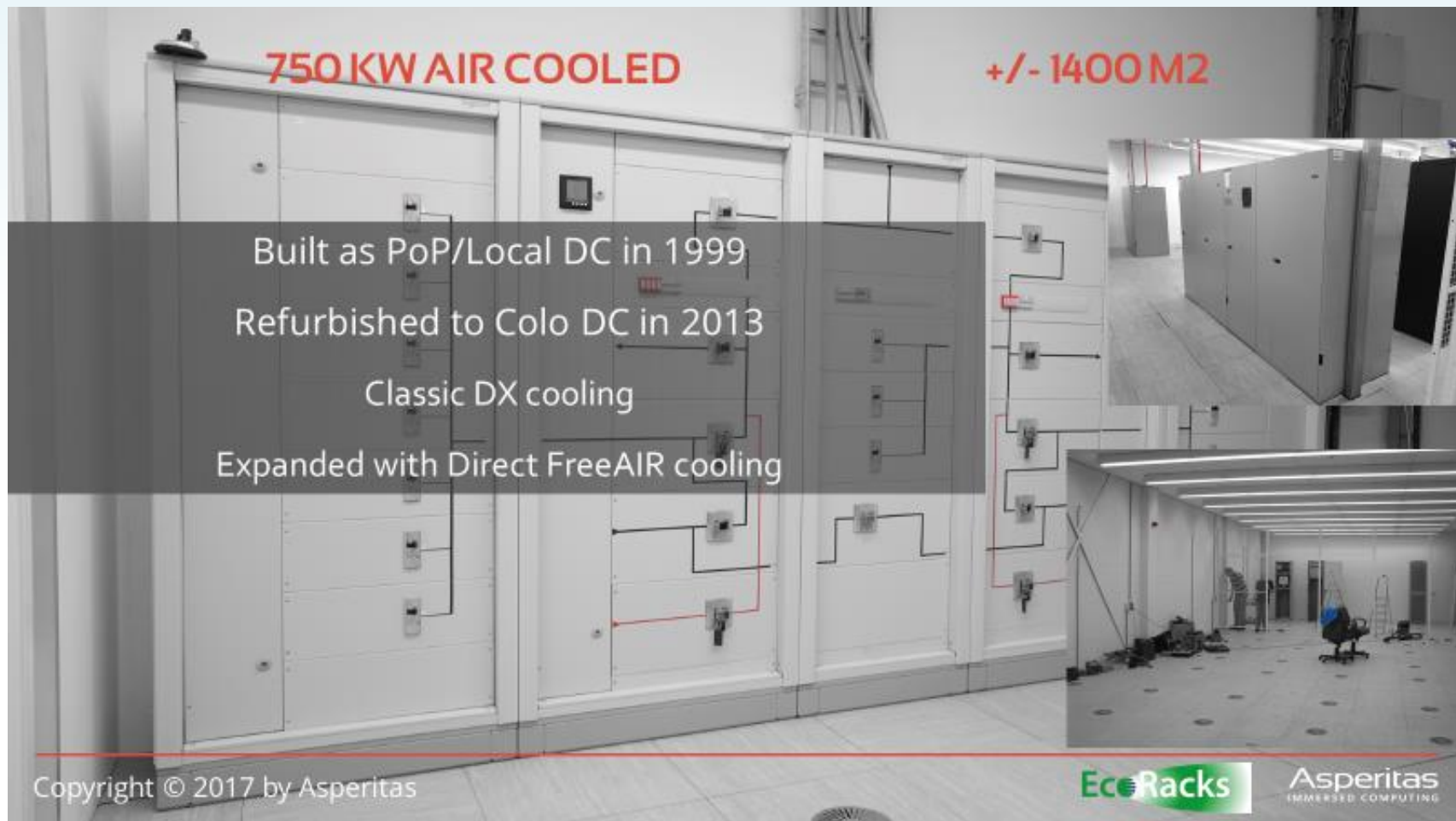
### DESIGNED FOR AIR

- Cooling options:
  - 100% Chillers
  - 100% Free air/adiabatic + **100%** Chillers (off)
  - **High volume, low  $\Delta T$**  (5-20 °C)
- Fluid handling
  - Spacious high capacity air ducting
  - Air filtration / water storage quality mmt
  - Hot/Cold aisle separation
- Information density (avg) **1,5 kW/m<sup>2</sup>**
- Concrete floor + **Raised floors**
- Power
  - UPS (IT only): 100%
  - Gensets (facility): 100%

### DESIGNED FOR LIQUID

- Cooling options:
  - **External cold water** supply by re-user
  - 100% Free air/adiabatic
  - **Low volume, high  $\Delta T$**  (20+°C)
- Fluid handling
  - Normal capacity water circuit
  - Closed/open circuit, no storage quality mmt
  - Minimal “fresh-air” ventilation
- Information density (mixed) **12+ kW/m<sup>2</sup>**
- Bare concrete floor
- Power (compared to air)
  - UPS (IT only): **85%**
  - Gensets: **50%**

# A CASE



750 KW AIR COOLED

+/- 1400 M2

Built as PoP/Local DC in 1999  
Refurbished to Colo DC in 2013  
Classic DX cooling  
Expanded with Direct FreeAIR cooling

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EcoRacks

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# A CASE

## ADDED 300 KW IMMERSED COMPUTING®

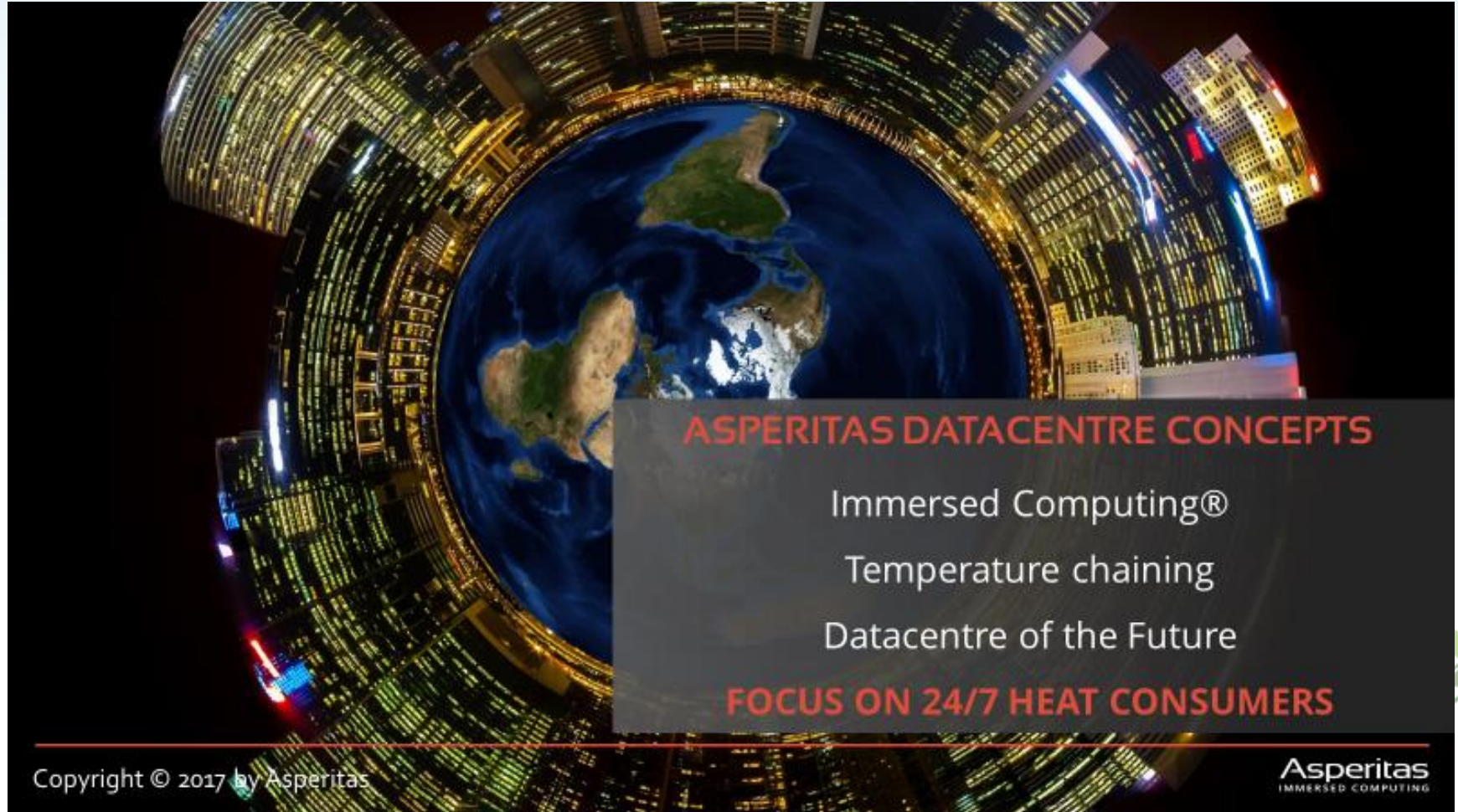
+/- 35M2

- Customer 1
  - Hosting
  - High availability requirements
  - +/- 16 kW/module
- Customer 2
  - GPU based cloud cluster
  - Low availability requirements
  - +/- 32 kW/module

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# THE OPPORTUNITY



# THE NEW SUSTAINABILITY

## INCREASING $\Delta T$ WITH TEMPERATURE CHAINING

- Serial implementation of the infrastructure



### CREATE HIGH $\Delta T$

3-stage cooling for low water volume

Down to 35 °C, free-air

Between 35-28 °C, adiabatic

Below 28 °C, chiller

USABLE HEAT

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# ENERGY PRODUCING DATACENTERS

## ENERGY PRODUCING DATACENTRES

- Multiple datacentre projects
  - 2-100 MW facilities
  - Heating city blocks
- Primary cooling by heat reuse
- No cooling energy
- Reusable heat
  - Challenge for 70°C
  - Current experimental 65°C
  - Current Implementations 50°C



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# ENERGY PRODUCING DATACENTERS

## DISTRIBUTED MICRO EDGE NODES

### EDGE ENERGY REUSE

Spas, swimming pools (100% reuse)  
Hospitals, hotels with hot water loops (100% reuse)  
Urban fish/vegetable farms with aquaponics (100% reuse)  
District heating (100% reuse)  
Aquifers for heat storage (75% reuse)  
Water mains (29% reuse)  
Canals, lakes and sewage (exergy destruction)

- 10-100 kW
- Edge of network, within urban areas
  - IoT capture and processing
  - Data caching (Netflix, Youtube, etc.)
  - Localised cloud services (SaaS, Paas, IaaS)
- Minimised facilities
  - External cooling input
  - 24/7 energy rejection for reuse
  - Geo redundant
  - Tesla Powerpack for controlled failover
  - District data hub

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# THE NEW SUSTAINABILITY

**DATACENTER & URBANFARM**

THE ULTIMATE SUSTAINABLE SMART CITY SOLUTION

GREEN COMPUTING + URBANFARMING = CIRCULAR

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*Thank you for your attention*

***Contact: MAIKEL BOURICIUS, MARKETING  
MANAGER, LEAD ASPERITAS ENERGY  
INNOVATION***

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# ICTFOOTPRINT EU

European Framework Initiative for Energy & Environmental Efficiency in the ICT Sector

**Engaging businesses in sustainable energy –  
the human factor**

**Daniel Frohnmaier, Geonardo Environmental  
Technologies Ltd., START2ACT**

**18/07/2018**

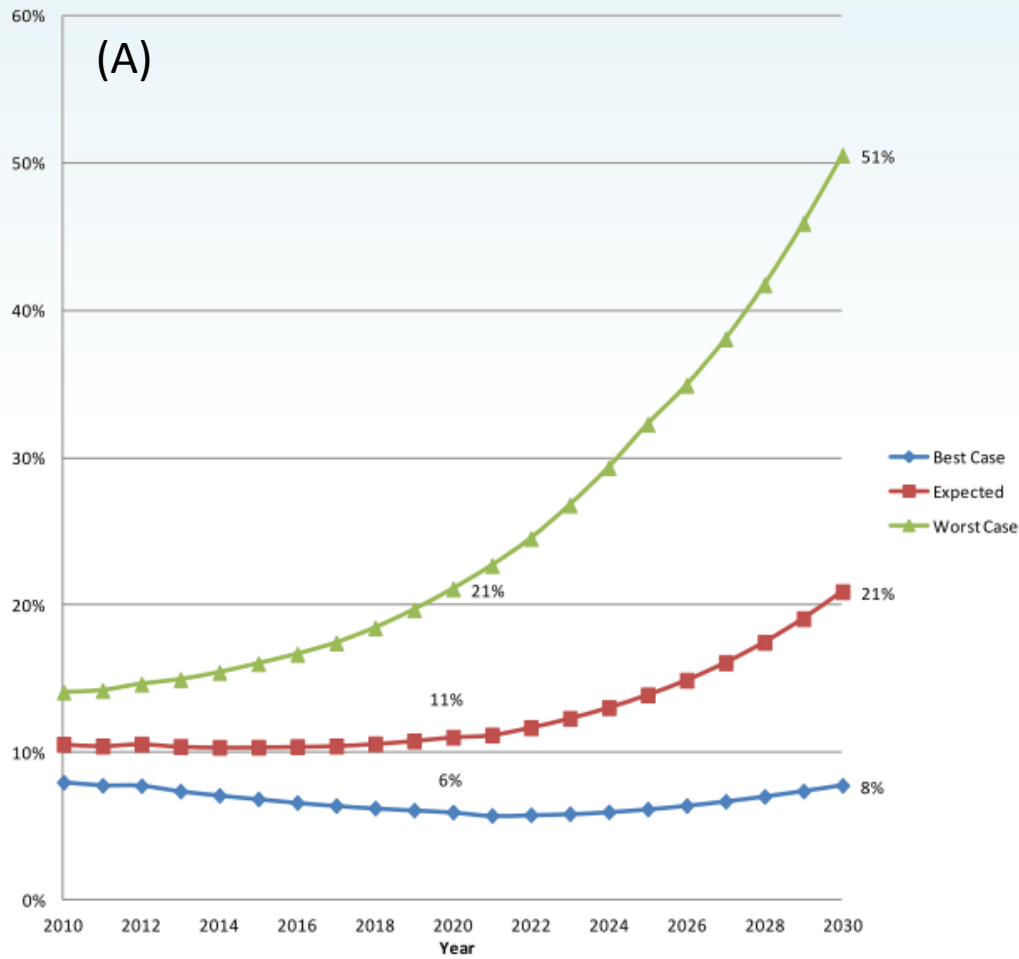
# Agenda

- Background, the role of people in energy efficiency
- START2ACT project purpose and methods
- Activities for businesses to decrease energy consumption
- START2ACT activities
- Conclusion





# Background



(A) Projection of global electricity usage by ICT 2010-2030<sup>1</sup>.

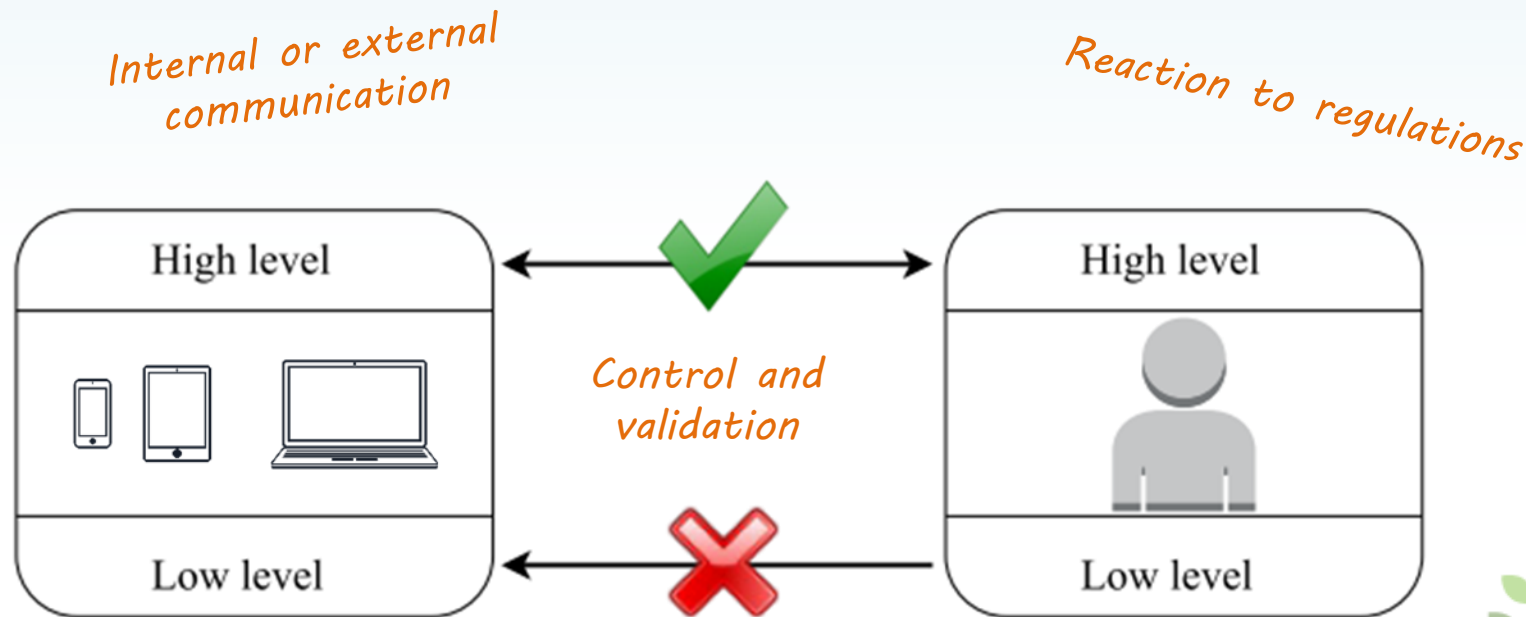
Selling numbers of all ICT devices (except PC and set top boxes) are predicted to grow significantly.

The ICT 'technology' challenge: achieve more transparency between system stack levels to design for more energy efficient operation<sup>2</sup>.



# Background

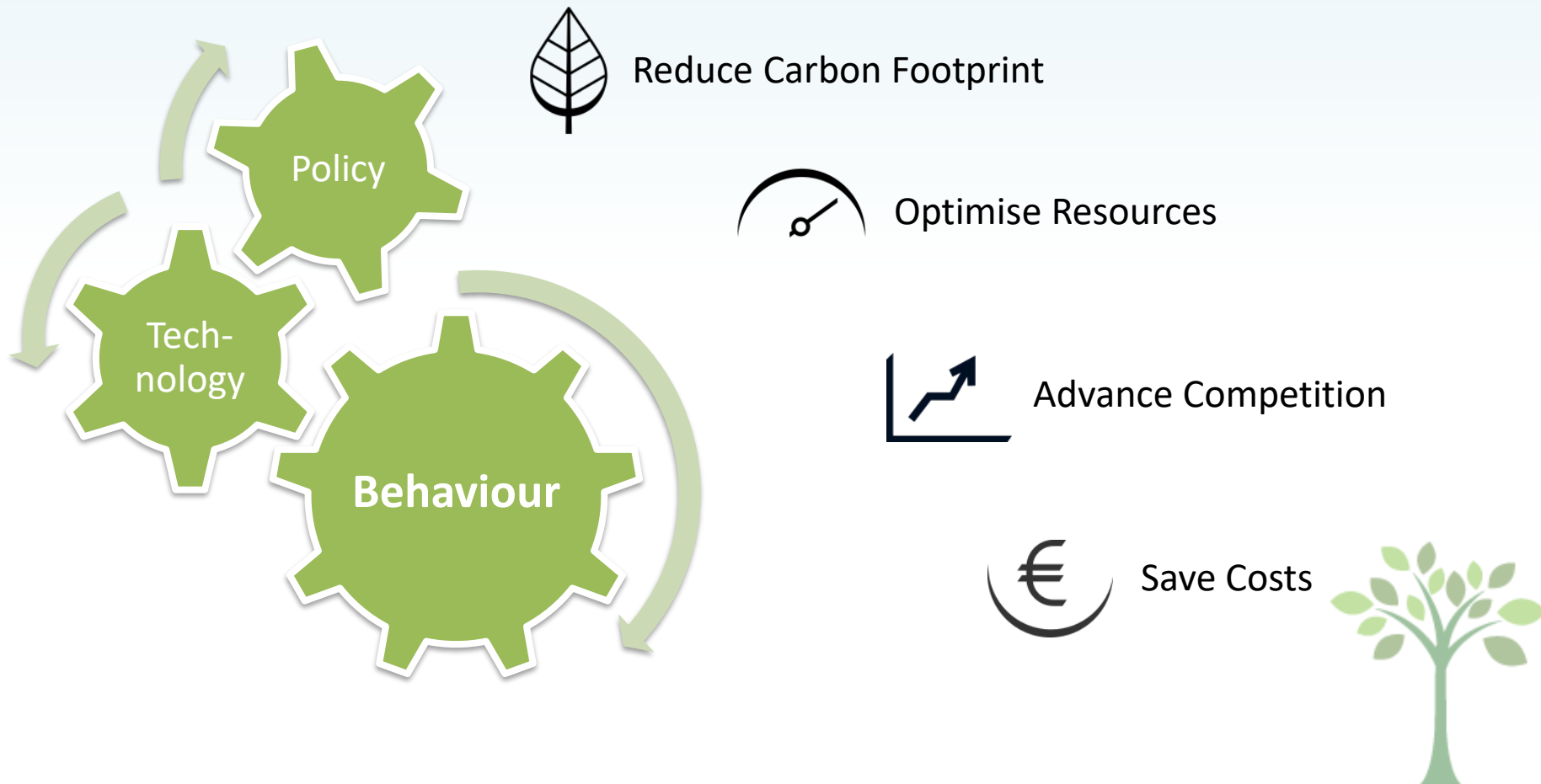
People must be an integral part of the ICT system.



*“A machine is only as efficient as its operator”*



# Drivers and benefits of Environmental Efficiency – the company perspective





# START2ACT – our Mission

Increase Energy  
Efficiency



**20%** savings,  
possible through  
behavior change. <sup>3, 4</sup>

on ICT and office  
equipment



**14%** of global  
emissions by 2040  
from ICT <sup>1</sup>.  
Fastest Growing  
energy user in the  
business world <sup>5</sup>.

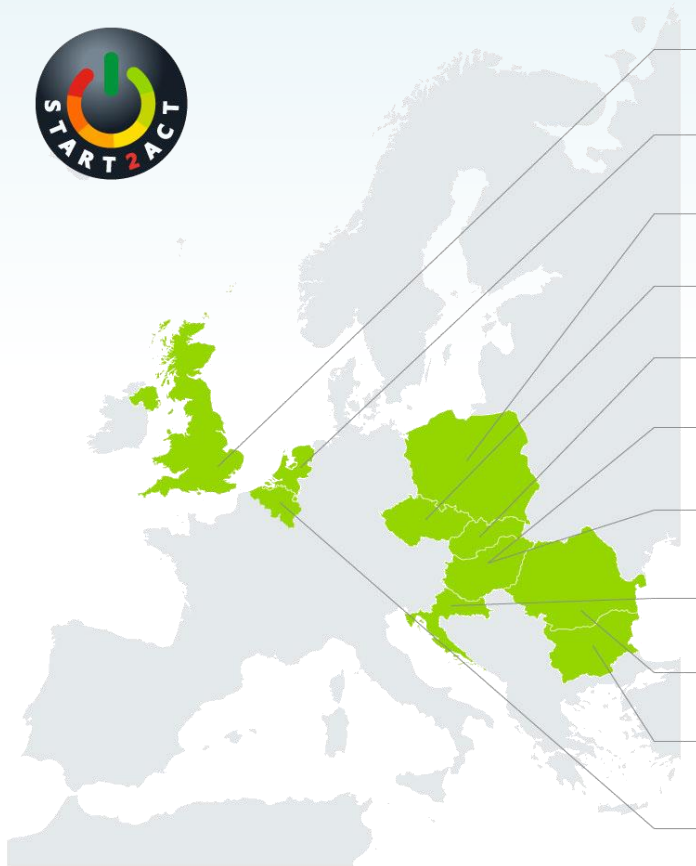
in young SMEs  
and Startups



**2/3** of SMEs  
operating in the  
EU are lacking  
simple rules or  
devices for  
saving energy <sup>6</sup>.



# our methods



The Carbon Trust



Stichting CentERdata



Krajowa Agencja Poszanowania Energii S.A.



ENVIROS, s.r.o.



Slovak Innovation and Energy Agency



Europa Media Non-profit Ltd.



Geonardo Environmental Technologies Ltd.



Energy Institute Hrvoje Požar



Centre for Promotion of Clean and Efficient Energy in Romania



Sofia Energy Agency



startups.be

Support package to young SMEs and startups

On-site consultancy and mentoring

Online tools & resources



# START2ACT Monitoring



Monitoring surveys before and after the mentoring/training sessions filled in by the participants from young SMEs and startups.

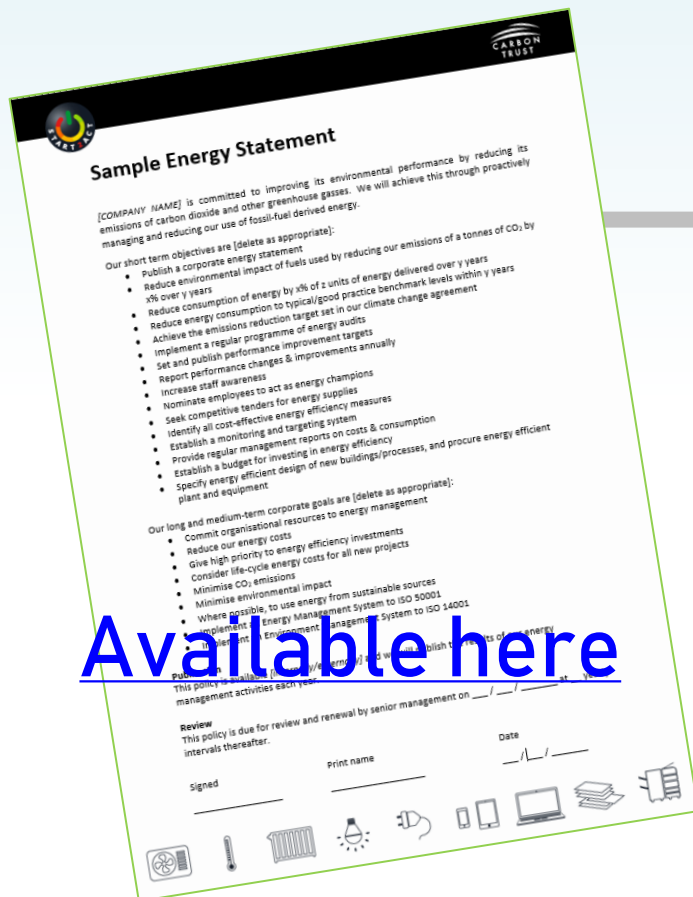
Analysed by partner CentERdata (NL) → improvement of the activities, relevant scientific findings.









# Activity: Stimulating norms (I)

## Declare corporate commitment to Energy/Environmental Efficiency



Available here

**Content:** Objectives & goals.  
Quantitative targets,    
corporate agreements,   
support for/from employees 

**Form:** Available internally or externally,  
publish regular results.  
Review and approval by senior  
management.



# Activity: Stimulating norms (II)

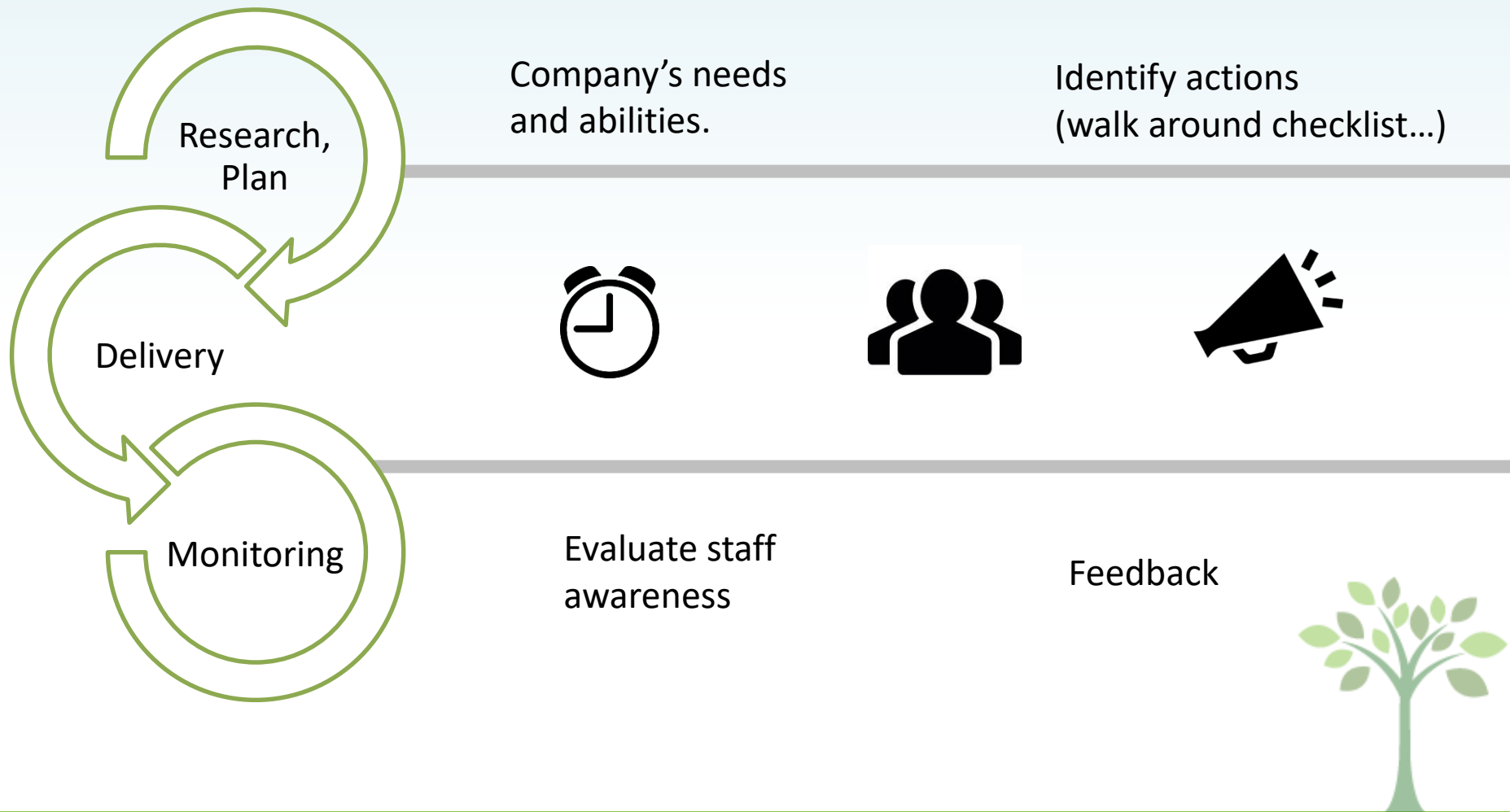
Results from the START2ACT monitoring survey ( $N_{\text{startups}} = 167$ ,  $N_{\text{SMEs}} = 96$ )

Rating (1 = strongly disagree; 5 = strongly agree)

Personal attitudes towards energy efficiency	Rating SME	Rating Startups
I consider it important to help my company to conserve energy.	4.33	4.06
It is the company norm to switch off office equipment (e.g. PCs, lights) when not in use.	3.84	3.89

Company attitudes towards energy efficiency	Rating SME
Energy saving is <b>not</b> a priority in my company.	2.13
By saving energy, me and my colleagues can contribute to lowering the energy bill of the company.	4.06

# Activity: Involve Employees (I)





# Activity: Involve Employees (II)

Results from the START2ACT monitoring survey ( $N_{\text{startups}} = 167$ ,  $N_{\text{SMEs}} = 96$ )

Rating (1 = strongly disagree; 5 = strongly agree)

Personal attitudes and current behaviour.	Rating SME	Rating Startup
I encourage my colleagues (work) / friends (home) to behave in an environmentally friendly way.	3.9	3.7
I consider it important to help my company to conserve energy.	4.33	4.06
By saving energy, me and my colleagues can contribute to lowering the energy bill of the company.	4.06	-



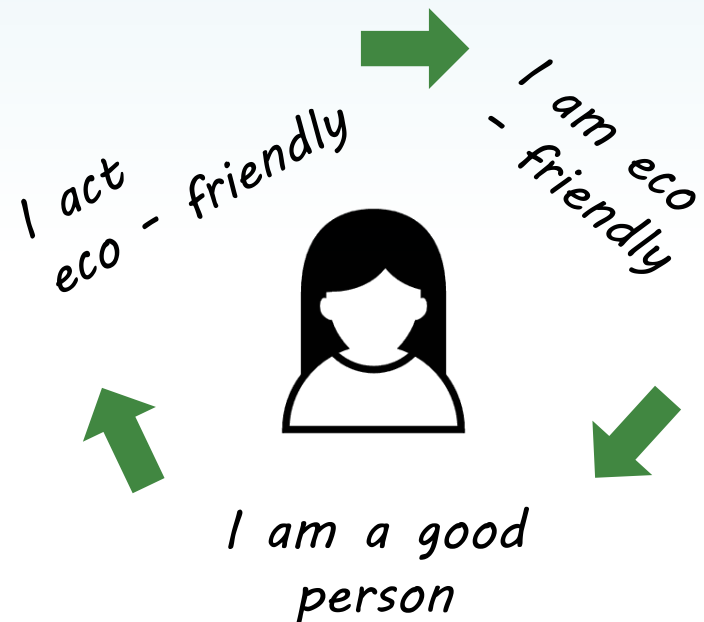
# Activity: Involve Employees (III)

## Scientific evidence

Economic reasons  
may weigh less



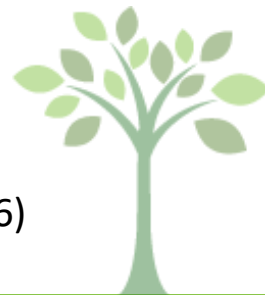
Environmental, social  
and justice reasons  
may weigh more



<sup>7</sup> Bolderdijk, Steg, Geller, Lehman and Postmes (2012)

<sup>9</sup> Venhoeven, Bolderdijk, Steg (2016)

<sup>8</sup> Umpfenbach (2014)



# START2ACT On-site



## Training to young SMEs

**Focus:** Low and no cost energy saving measures

### VISIT 1

- ◆ Understand your company's energy use
- ◆ Implement energy saving quick wins

### VISIT 2

- ◆ Conduct opportunities assessment
- ◆ Implement low-cost and policy opportunities

### VISIT 3

- ◆ Receive implementation support
- ◆ Consider larger opportunities



## Mentoring of Startups

**Format:** partnering with incubators and accelerators to deliver mentoring.

**Focus:** Greening products and services; Promoting green credentials, sustainable procurement policies, choose energy efficient premises.



## Business Breakfasts for young SMEs





# START2ACT Online



**START2ACT** @START2ACT · Jul 10  
 Are you ready for the next #elearning chapter on #energysaving? 💡  
 This week, join our #energysaving heroes and learn why effective metering and monitoring is a key part of energy management!  
 More info here ➡ [goo.gl/78FxQb](https://goo.gl/78FxQb)

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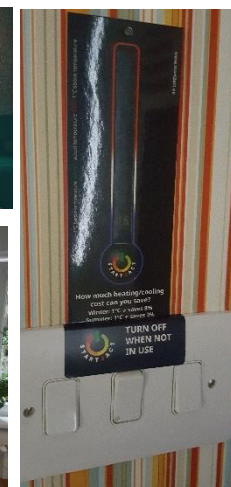
TRACK YOUR ENERGY USE: METERING AND MONITORING



Despite the energy saving actions of Peter's employees, the energy bill has not been reduced as much as he expected.  
 How frequently should he analyse the collected data to identify energy wastage hot spots?

Monthly Weekly Daily

H2020EfficientEnergy, LowUP EU project, GAIA Project and 3 others



# START2ACT Online



## START2ACT FORUM



Discuss with the community or ASK THE EXPERT for personalised advise.

Enter the Forum

## Knowledge base



I work at an SME



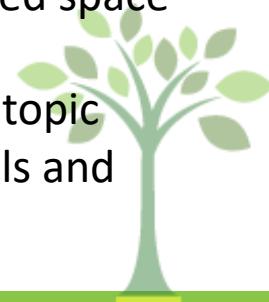
I work at a Startup

Please make your choice above and access the repository of START2ACT where all knowledge is stored.

You can tap into the pool of advices, documents, solutions, tools, products on energy efficiency in the office environment as well as at home.

Decision tree: SME → Manager/Employee  
Startup → own space/rented space

Different decisions result in relevant topic pages – detailed advice, external tools and references.



# Conclusion

- Technology is not enough, people need to invest efforts & act.
- The efficient use of our resources pays off.
- Introducing corporate norms → frame for all environmental/social efforts in a business; powerful tool on the competitive market.
- Include all people in a business, win-win





# References

- 1. Anders Andrae and Tomas Edler (2015): On Global Electricity Usage of Communication Technology: Trends to 2030
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- 8. Katharina Umpfenbach (2014), Influences on consumer behavior. Policy implications beyond nudging European commission by EcoLogic
- 9. Leonie A. Venhoeven , Jan Willem Bolderdijk and Linda Steg (2016): Why Acting Environmentally-Friendly Feels Good: Exploring the Role of Self-Image



# *Thank you for your attention*

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Project website: <http://start2act.eu/>



# THANK YOU!

## STAY TUNED FOR REGULAR UPDATES

the future is *sustainable!*

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- Contact us by email: [contact@ictfootprint.eu](mailto:contact@ictfootprint.eu)
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