DECARBONISING INDUSTRY AND THE ICT SECTOR

ENERGY AND CO2 SAVING POTENTIALS IN THE SHORT AND LONGER TERM

SUSTAINABLE ENERGY WEEK

EUROPEAN ALLIANCE TO SAVE ENERGY

eiif

Umwelt Bundesamt

Fraunhofer ISI

#DecarbIndustry
#EUSEW2020

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PRACTICAL INFORMATION

- A Q&A is foreseen after the panel discussion
- Please anticipate your questions in writing using the Q&A tool
- The webinar is recorded and will be made available, together with the slides, on the organizers' websites

DECARBONISING INDUSTRY & THE ICT SECTOR

PETER HOEDEMAKER
President
European Industrial Insulation Foundation

Welcome

DECARBONISING INDUSTRY & THE ICT SECTOR

ANDREAS GUERTLER
Director

European Industrial Insulation Foundation

EiiF Presentation

Decarbonising industry - Energy and CO_2 saving potentials in the short term
Saving 6% of industrial CO_2 emissions in Europe through industrial insulation

WE POWER SUSTAINABILITY

About EiiF

The **European Industrial Insulation Foundation (EiiF)** is a European non-profit foundation registered in Switzerland in 2009.

The 60+ EiiF members have insulation operations across the world, employ over 70.000 people worldwide and have an aggregated annual turnover of about 14 billion EUR.

ARTICLE 2 - PURPOSE OF THE FOUNDATION

The Foundation engages itself, exclusively and irrevocably, on a non-profit basis for the **deployment of sustainable insulation systems in industrial plants and in the industrial environment with the aim of saving energy, reducing CO_2 emissions** […].

The primary task of the Foundation is **to initiate the implementation of concrete projects**.

www.eiif.org

EiiF Supports the Green Deal

EiiF's GREEN DEAL GOAL

Reduce EU's CO_2 emissions by setting standards making insulation in EU 27 industry mandatory with energy performance requirements similar to existing building codes and by promoting insulation inspections.

	POWER PLANT	BUILDING Code (walls) *before 2010*	BUILDING Code (walls) *2016*
TEMPERATURE	250°C	18°C - 22°C	18°C - 22°C
HEAT LOSS	150 W/m² *AGI Q101*	< 10 W/m² *EU average*	< 4 W/m² *EU average*
INSULATION THICKNESS	100 mm	0 - 50 mm	100 - 250 mm

Comparing Building and Industry insulation requirements illustrates the lack of ambition to insulate industry equipment with well performing energy efficient insulation solutions.

The VDI 4610 Energy Classes

The VDI 4610 Energy Classes are defined by calculating the heat losses in relation to the Ecological Optimum (EO):

A = … EO → +20 %

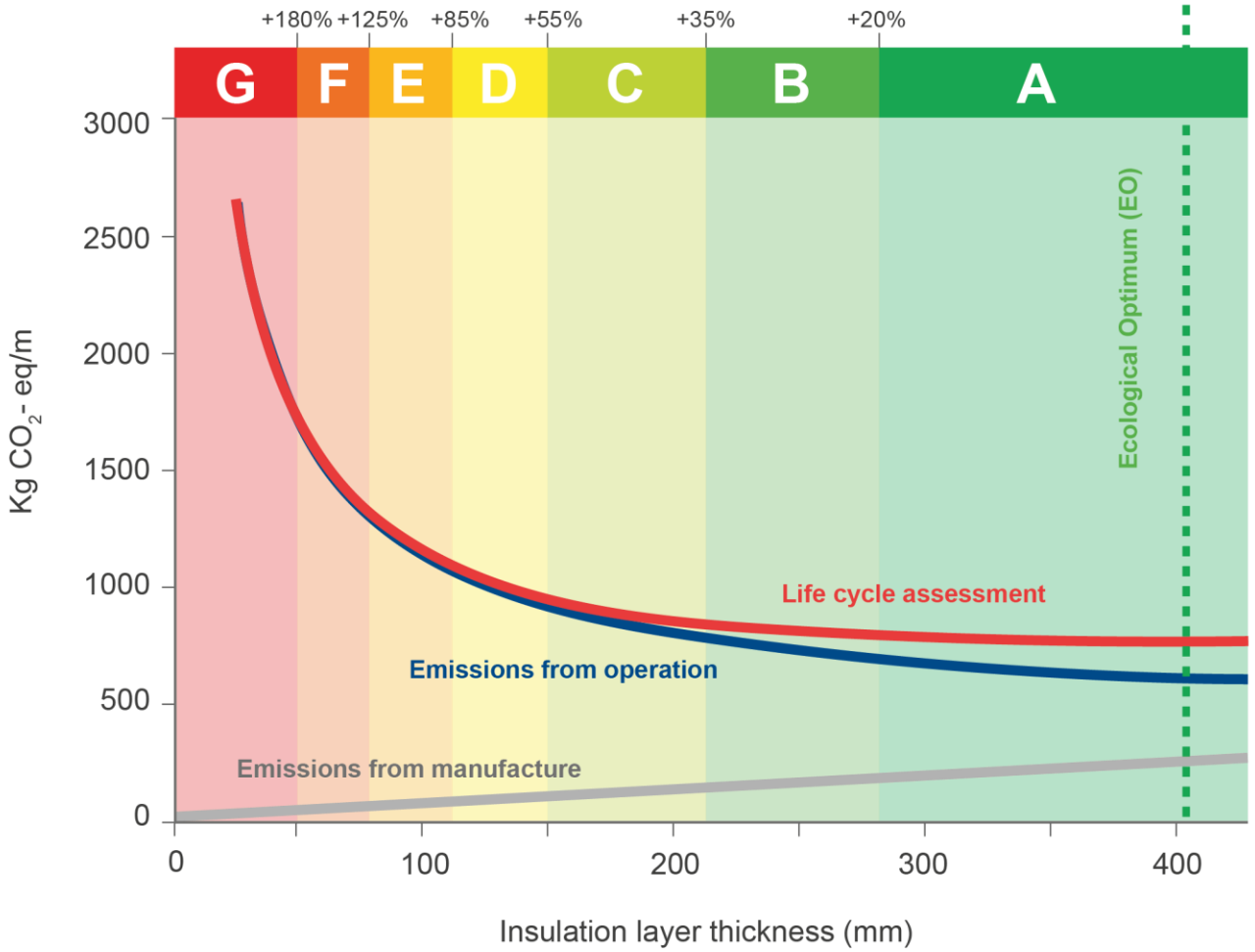
B = EO +21% → +35%

C = EO +36% → +55%

D = EO +56% → +85%

…

G = EO +181% →...



The Quality Level of Insulation in Europe

			Wall at 200°C according to VDI 4610/1 *Energy efficiency of industrial installations —Thermal insulation*						
			Class G	**Class F**	**Class E**	**Class D**	**Class C**	**Class B**	**Class A**
INSULATION THICKNESS			<135 mm	135 mm	174 mm	222 mm	281 mm	345 mm	422 mm
HEAT FLOW RATE			>83 W/m²	83 W/m²	64 W/m²	50 W/m²	40 W/m²	32 W/m²	26 W/m²
SAFETY	EUROPE	*Surface temperature 55°C (123 W/m2)*							
COUNTRY BEST PRACTICE	SWEDEN	*Level medium (45 W/m2)*							
	GERMANY	*Industry average (56 W/m2)*							
	FRANCE	*DTU 45.2-2018 (67 W/m2)*							
	NETHERLANDS	*Energy invest. allowance 2019 (71 W/m2)*							
	SPAIN	*PNE 92330-2017 (90 W/m2)*							

The widely applied insulation design in **EU** is often only based on the **safety requirement** to keep surface temperatures **below 55 °C**.

If this **safety solution** is used the **Energy Class** reached is:	in **Europe**	**G** (EO +181%...)
If **best practice** is applied the best **Energy Class** reached is:	in **Germany**	**E** (EO +86% → +125%)
	in **Sweden** (best in class)	**D** (EO +56% → +85%)

The Quality Level of Insulation in Europe

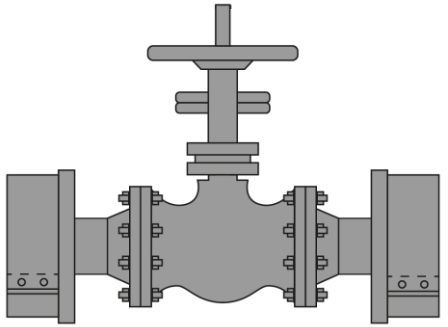
THE SHARE OF INDUSTRIAL EQUIPMENT WITHOUT INSULATION OR WITH DAMAGED INSULATION

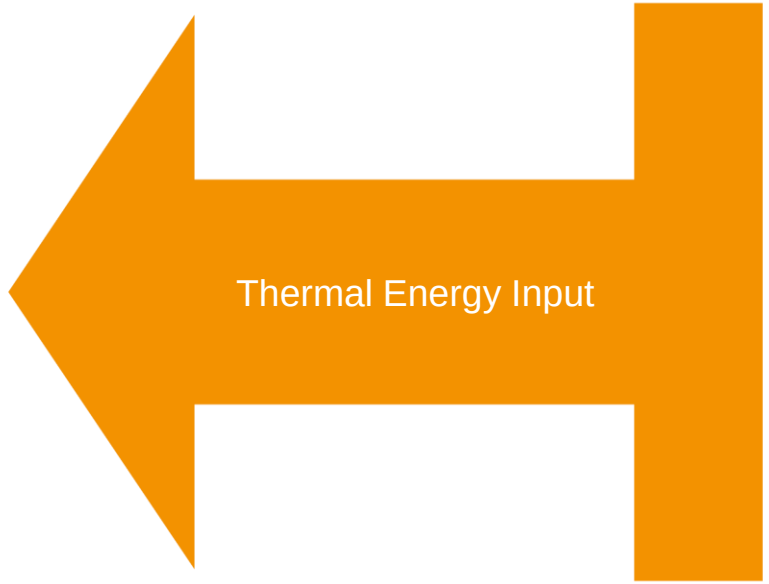
LOW-TEMPERATURE	MIDDLE-TEMPERATURE	HIGH-TEMPERATURE
(<100 °C)	(100 – 300 °C)	(>300 °C)
10%	**6%**	**2%**

Consequently insulating uninsulated equipment and repairing damaged insulation offers a large CO_2 and energy saving potential with very short simple payback periods (often below one year).

ONE **UNINSULATED** INDUSTRIAL VALVE

Size: NPS 6 / DN 150
Temperature: 150 °C
Operational time: 8.760 hours/year



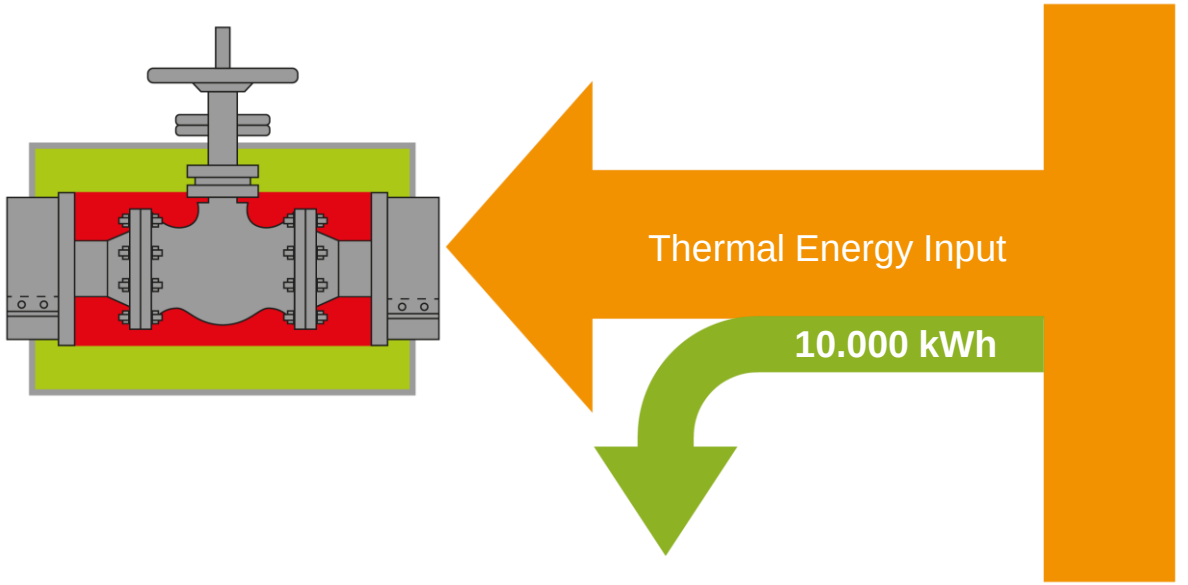


Energy loss per year: 10.600 kWh

The Power of Industrial Insulation

ONE **INSULATED** INDUSTRIAL VALVE

Size: NPS 6 / DN 150
Temperature: 150 °C
Operational time: 8.760 hours/year

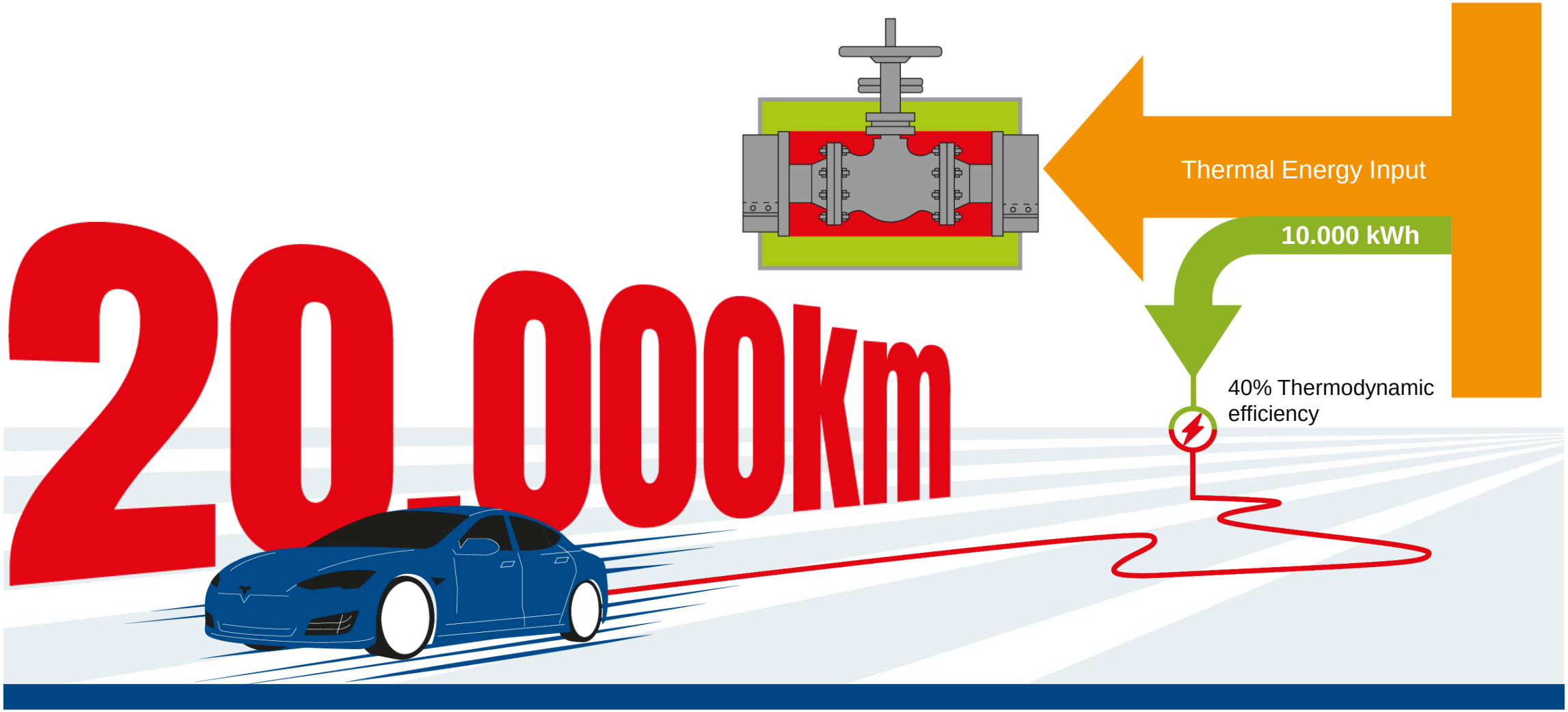


Energy savings per year: 10.000 kWh

Energy loss per year: 600 kWh

The Power of Industrial Insulation

The insulation contribution to build a low carbon EU industry



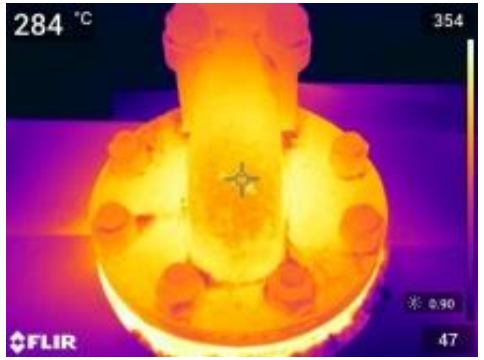
The Power of Industrial Insulation

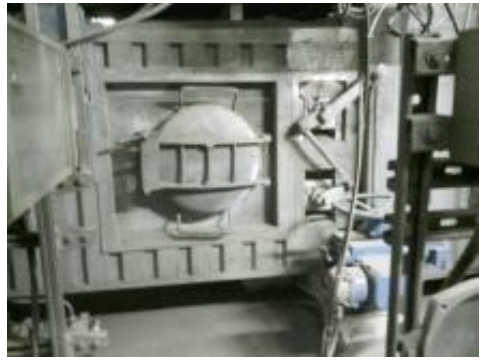
The insulation contribution to build a low carbon EU industry

	DN	Temperature (in °C)		Losses (in W)	Operational Time (in hours)	Annual Losses (in kWh)	Energy Savings (in kWh)
Valve uninsulated	150	150		**1.211**	8.760	**10.608**	-
Valve insulated	150	150		65	8.760	569	**10.039**
					Thermodynamic Efficiency		*40%*
					Electric Energy (in kWh)		**4.016**

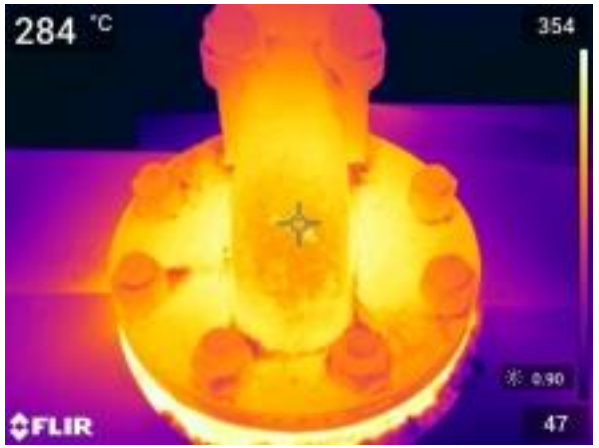
TESLA Model	Consumption (in kWh/100km)	Mileage (in kilometres)
S 60	18,1	**22.186**
S 70	18,5	**21.706**
S 75	18,5	**21.706**
S 90 D	18,9	**21.246**
S P90D	20	**20.078**
S 100D	18,9	**21.246**
S P100D	20	**20.078**

The Typical TIPCHECK Findings

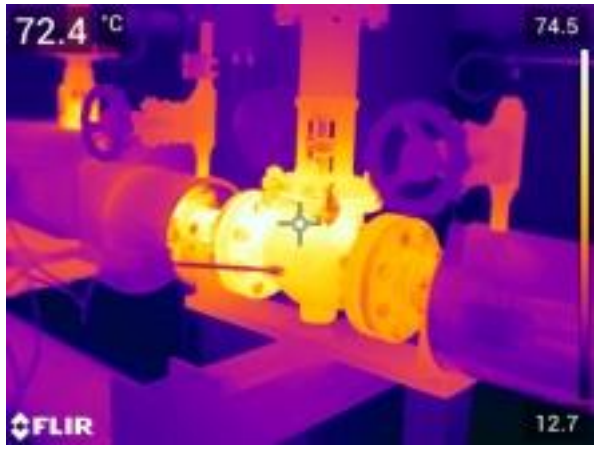


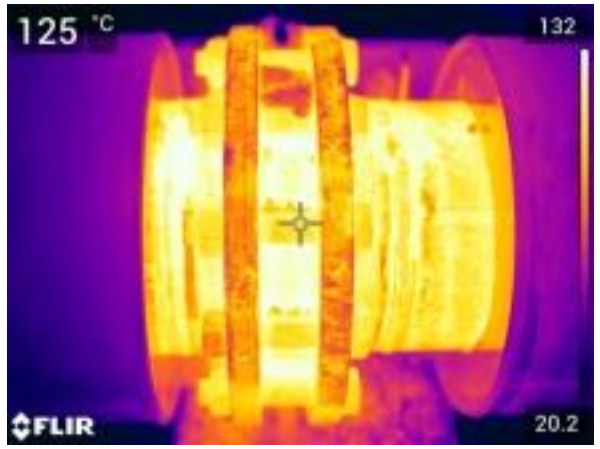


50 – 150 uninsulated equipment like flanges, valves, heat exchangers, parts of pipes, vessels, manholes and more are typically identified **as hot spots** during a **TIPCHECK** or **TBI Inspection**.


284 °C
354
0.90
FLIR
47

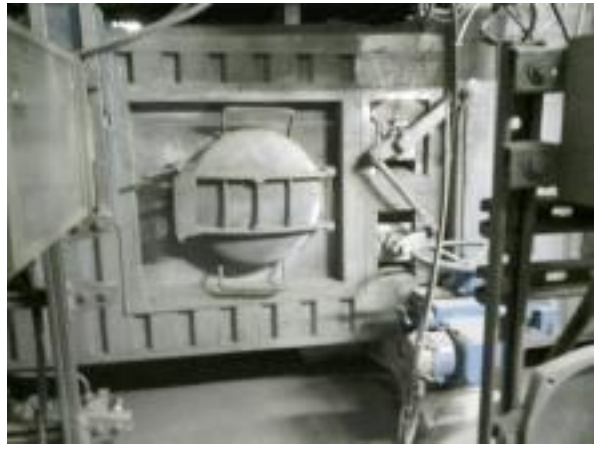

215 °C
240
FLIR
42


72.4 °C
74.5
FLIR
12.7


125 °C
132
FLIR
20.2


>160 °C
160
FLIR
38.9


137 °C
160
FLIR
37.9



TIPCHECK Experience – Uninsulated Components

THE NUMBER OF VALVES AND FLANGES IN INDUSTRIAL PLANTS

The number of single components such as valves and flanges which are typically uninsulated and losing heat **is large**.

The potential to reduce CO_2 emissions and save energy by insulating these components **is significant and cost effective**.

The payback time **of 2 years** or less for insulating uninsulated equipment **is short**.

Refinery C1 data

Component	Service	Count	Total Emissions (EPA August 1995) (lb/hr)	Average Emission Factor (lb/hr/comp)	1980 Refinery (lb/hr/comp)
Valve	HL	28,265	0.8782	3.11E-05	5.07E-04
Fitting	HL	100,482	1.8313	1.82E-05	5.51E-04
Flange	HL	23,370	1.1716	5.01E-05	5.51E-04
Pump	HL	787	0.4364	5.54E-04	4.63E-02
Other	HL	12,077	1.3669	1.13E-04	--
PRD	HL	871	0.0984	1.13E-04	--
	Total =	165,852			

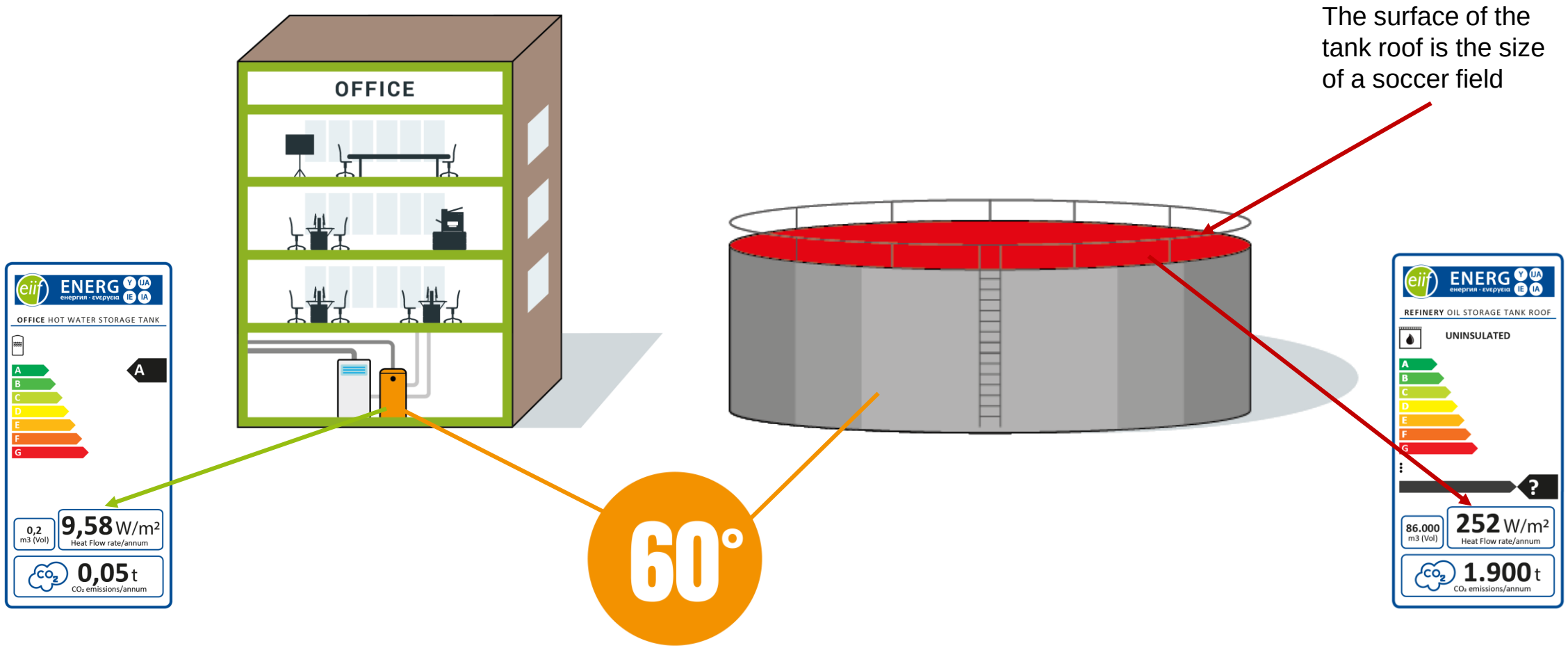
Refinery C2 data

Component	Service	Count	Total Emissions (EPA August 1995) (lb/hr)	Average Emission Factor (lb/hr/comp)	1980 Refinery (lb/hr/comp)
Valve	HL	5,468	0.8456	1.55E-04	5.07E-04
Fitting	HL	14,268	0.2626	1.84E-05	5.51E-04
Flange	HL	1,536	0.2192	1.43E-04	5.51E-04
Pump	HL	72	0.1070	1.49E-03	4.63E-02
PRD	HL	66	0.0006	8.71E-06	--
	Total =	21,410			

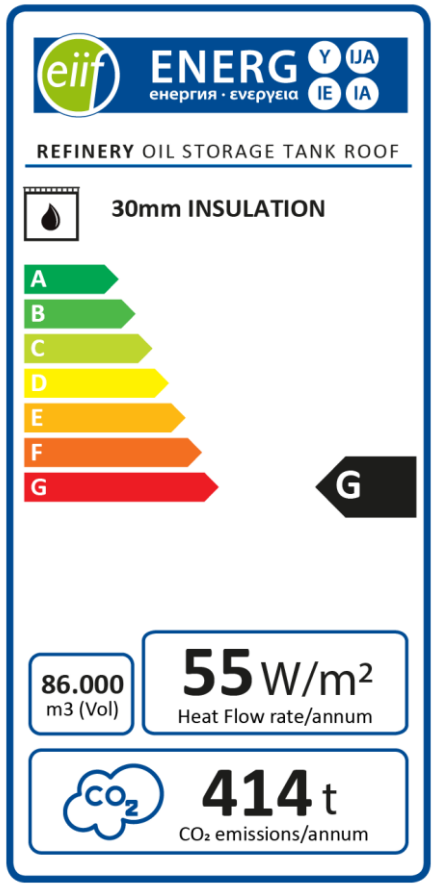
Table 2-2. Average Emission Factors for Components in Heavy Liquid Service
(7 Qtrs. of Refinery C1 Data, 6 Qtrs. of Refinery C2 data, and 2 Qtrs. of Refineries C3 & C4 data)

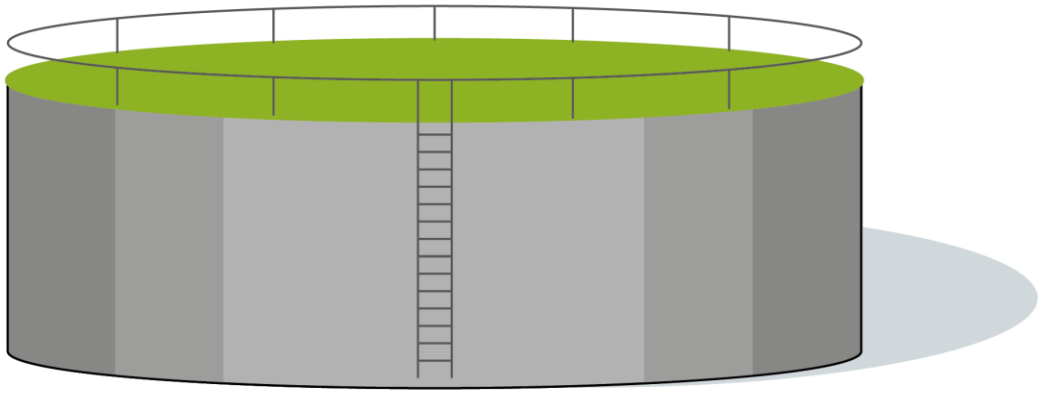
Source: https://www.api.org/~/media/Files/EHS/Clean_Air/API%20Publication%20337%20-%20HL%20Fugitives.pdf

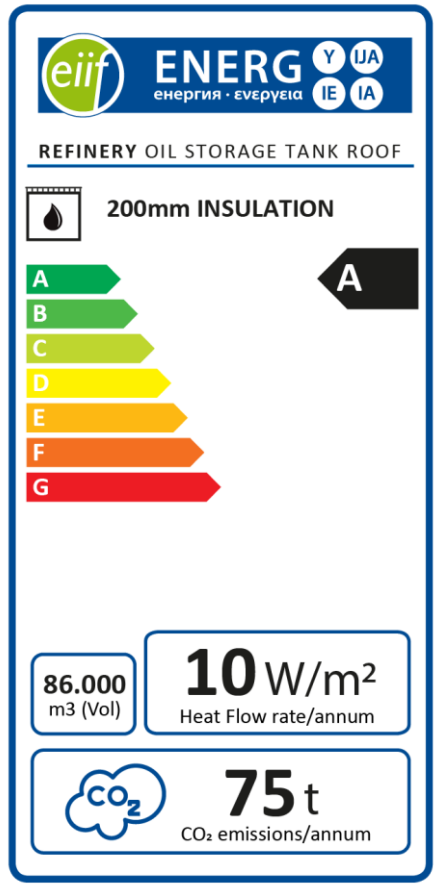
Comparing Building and Industry



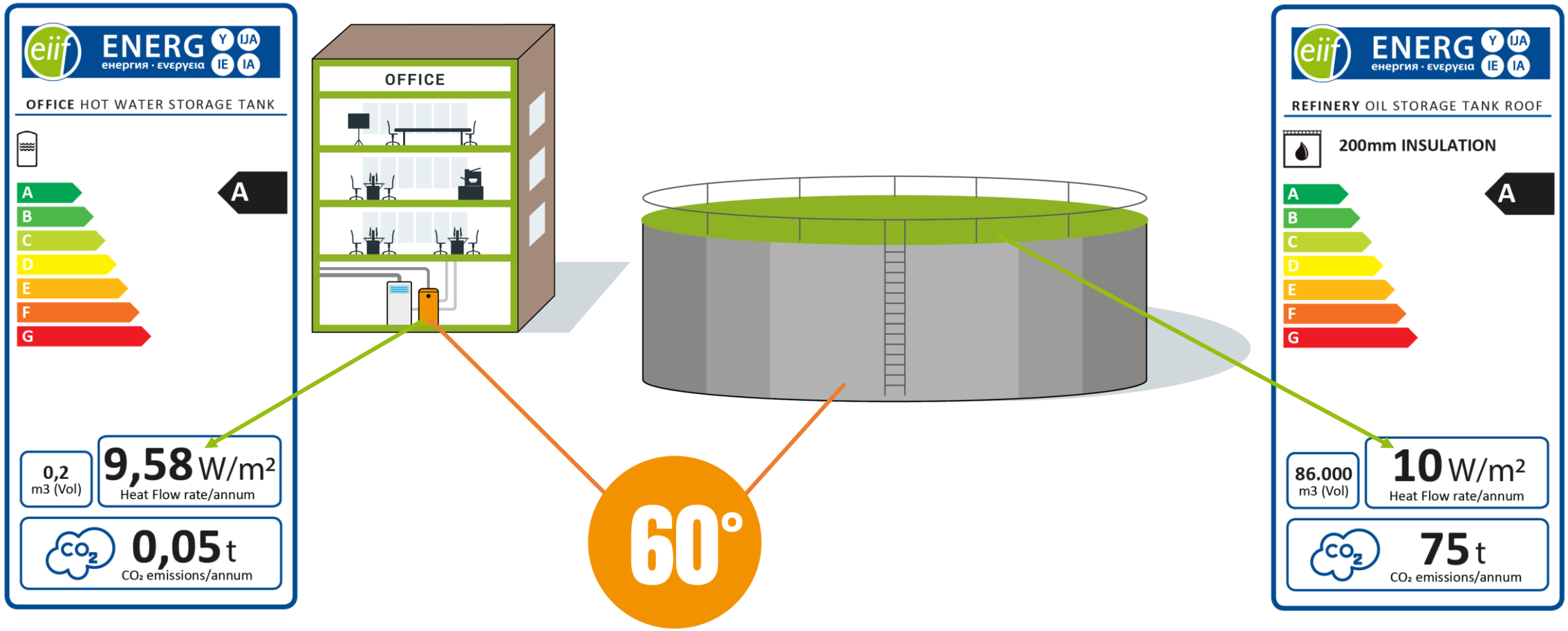
VDI 4610 Energy Classes for Industrial Insulation







Industry = Building



REFINERY – OIL STORAGE TANK ROOF

Insulation (30mm standard material – energy class G: Investment ~400.000 EUR)

on the new roof saves annually:

- ✓ ***Money:*** ***~230.000 EUR***
- ✓ ***Energy:*** ***~7.600 MWh***
- ✓ ***CO_2:*** ***~2.000 t***

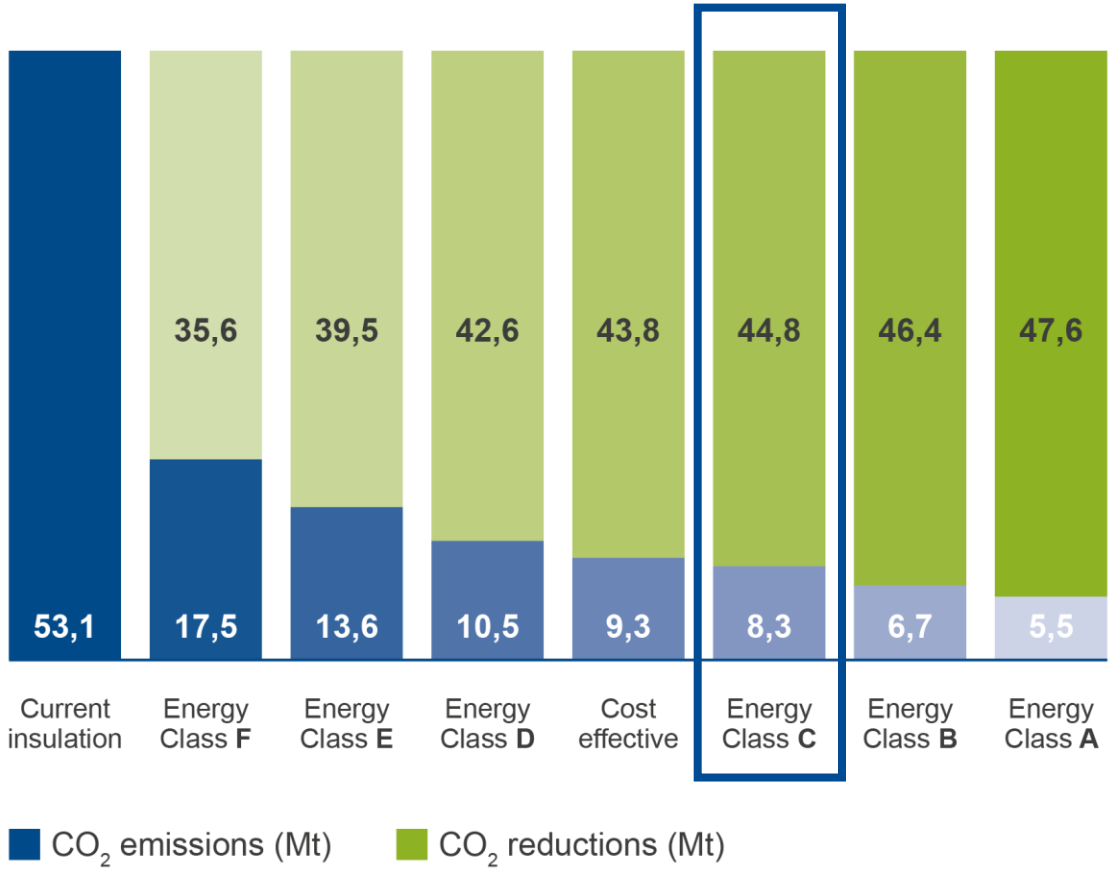
EiiF CO_2 Study 2020

CO_2 REDUCTION POTENTIAL OF INDUSTRIAL INSULATION IN EU 27

EiiF investigated the CO_2 reduction potential of industrial insulation in EU27 based on the VDI 4610 Energy Classes.

Reducing consequently the share of industrial equipment without insulation or with damaged insulation and by improving all insulation systems to **Energy Class C** could deliver annual reductions of:

44,8 Mt of CO_2



EiiF CO_2 Study 2020

According to the latest figures (2018) from the European Environment Agency (EEA) on the annual CO_2 eq. emissions in Europe, industrial insulation could reduce*

- 6% of annual EU industry emissions** (588 Mt)
- 1% of annual EU emissions (3.764 Mt)

**Upgrading to VDI Energy Class C*
***Industry without Power generation*

6%
of EU industry emissions

1%
of EU emissions

36,4Mt
CO_2 emissions

44,8Mt
CO_2 emissions

European Environment Agency

THE MULTIPLE BENEFITS OF INDUSTRIAL INSULATION

GLOBAL CLIMATE

- 45 Mt less CO_2 emissions every year

EUROPEAN UNION

- A short term contribution towards net zero in 2050 (*Green Deal*)
- The chance to create and save jobs in Europe (*Green Recovery*)

EUROPEAN INDUSTRY

- Smart investments: short payback times (*2 years or even less*)
- Reduced production costs (*reduced energy & CO_2 certificate costs*)
- Safer, better working conditions

Contact

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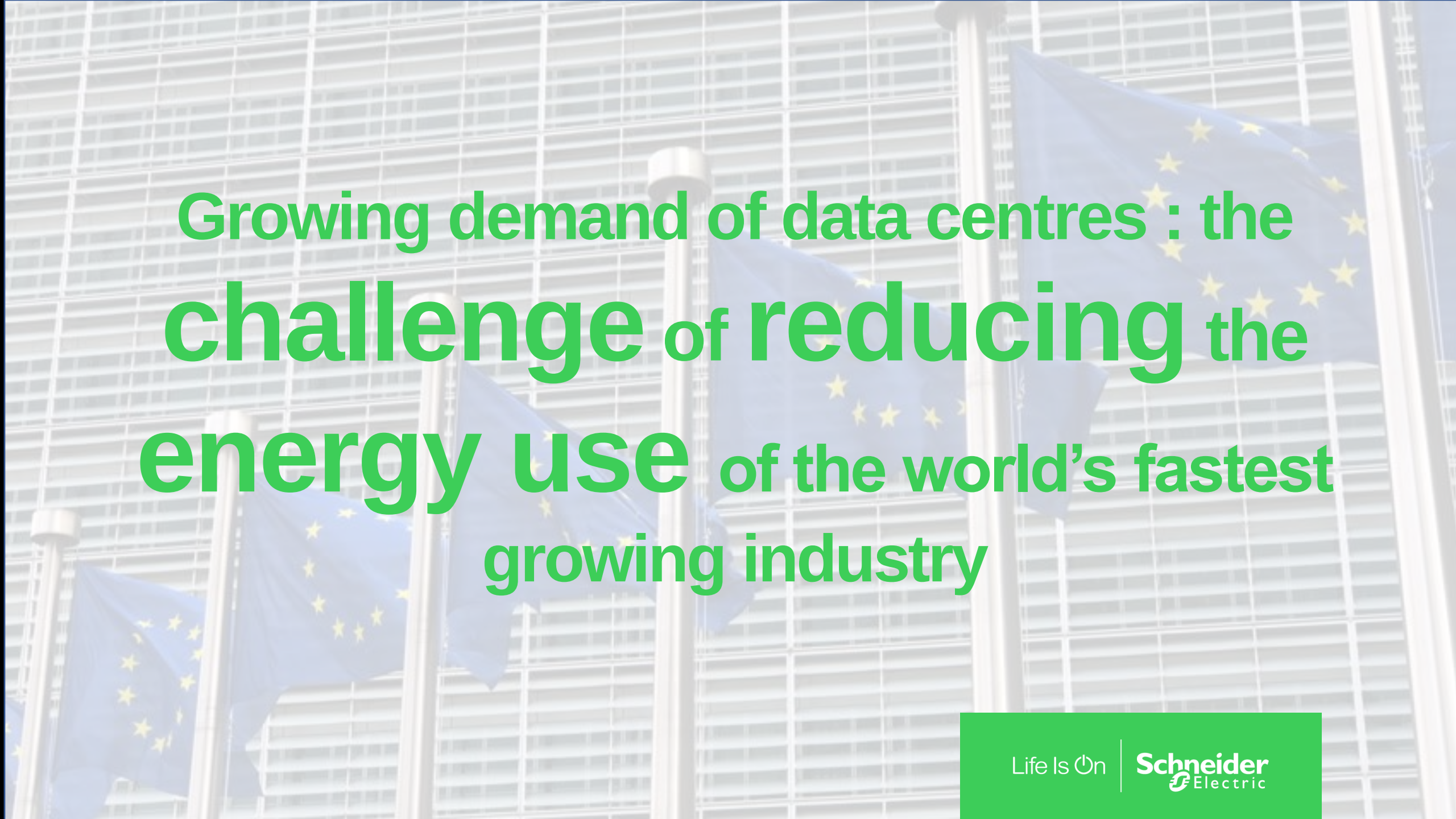
DECARBONISING INDUSTRY & THE ICT SECTOR

GAEL SOUCHET

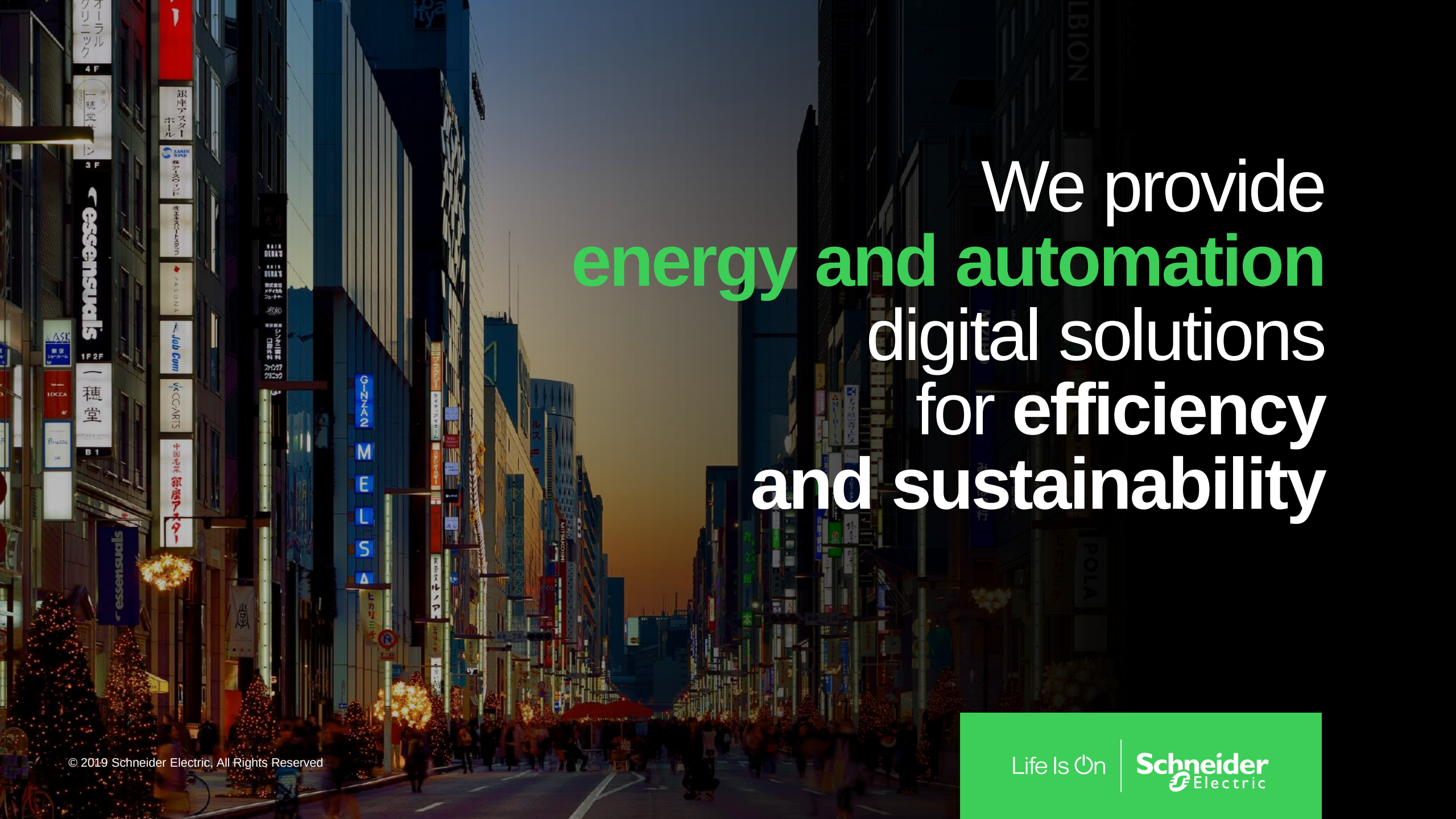
Senior Product Manager New Energy Storage

Schneider Electric



Growing demand of data centres : the challenge of reducing the energy use of the world's fastest growing industry

Life Is On | Schneider Electric



We provide **energy and automation** digital solutions for **efficiency and sustainability**

Life Is On Schneider Electric

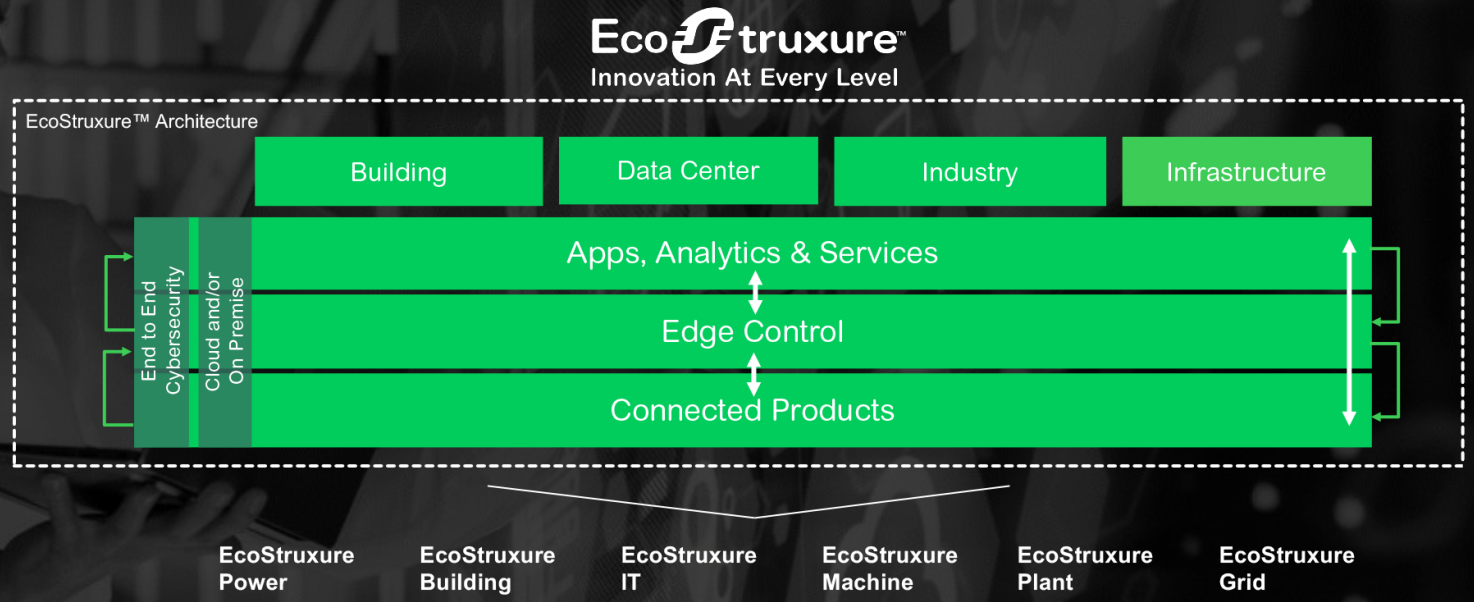
Digital brings tremendous opportunities to improve efficiency

More IT as part of OT

24%

of efficiency comes from digital

(OECD/IEA, 2017)



 |

Life Is On | Schneider Electric

Telefonica, Spain

Ensuring a more sustainable and stable data centre

Customer Challenge

- High reliability
- Low carbon emissions
- Implementing a single system of measurement
- Highly energy efficient

The Solution

- LV Electric Box
- Building Lighting
- UPS
- Control & Supervision of HVAC

Customer Benefits

- Real time monitoring of installation components
- Early detection and quick resolution of downtime
- Reduced energy usage

The Results: Life is On with...

PUE between 1.3 & 1.4

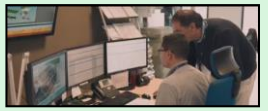
"We chose Schneider Electric as a partner given their reliability and experience, well-established service and system monitoring tools. Our goal is to have zero shutdowns".

Fran Muna,
Responsible of Critical Infrastructure,
Telefonica Data Centre

Largest data centre in Europe and **3rd** largest in the world

EcoStruxure™ Innovation At Every Level for Data Center

Apps, analytics, and services



Remote monitoring services

Edge control

Connected products

LV Electric Box
Building Lighting
UPS

Life Is On Schneider Electric

We are also committed to improve sustainability of the digital world

To meet the needs of the digital world and the decarbonization challenge, we have to change the way we deploy and manage IT in the data center, cloud, and at the edge.

Life Is On Schneider Electric

How the EU could ensure stronger convergence between sustainability and digital

Promote digital tools to improve sustainability

- Building Management Systems (BMS), Building Information Modelling (BIM), IIoT Platforms

Optimise decarbonized & green data centers

- Better deployment of the EU CoC for data centers (“Power Usage Effectiveness (PUE) targets based on size/age of data centre)
- Enhance interaction with other EU regulations (micro-grid development, green public procurement, use of renewable, use of waste heat, etc.) and promote innovation

A policy framework for digitizing European industry in a sustainable manner

- A EU governance for industry 4.0 with decarbonization at core
- Instigate green strategic value chains (=focus on SMART BUILDINGS)
- Promote education & skills for green jobs

DECARBONISING INDUSTRY & THE ICT SECTOR

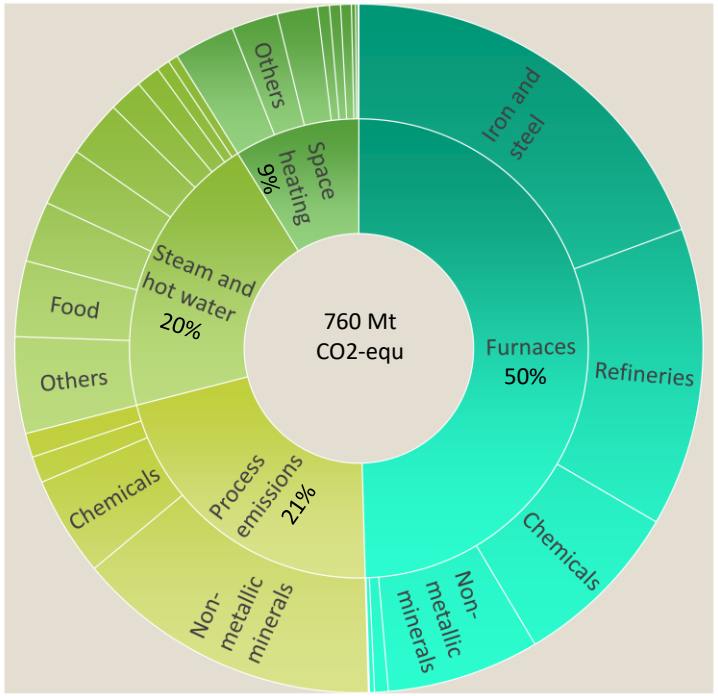
ANDREA HERBST
Senior Researcher

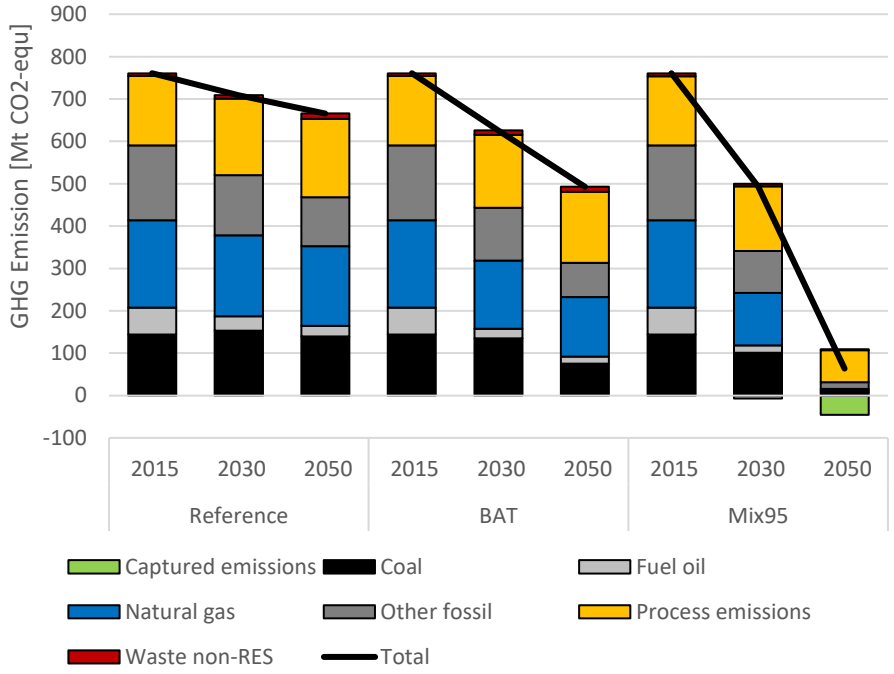
Fraunhofer ISI

OPTIONS FOR ACHIEVING A CLOSE-TO CLIMATE-NEUTRAL EU INDUSTRY AND THEIR IMPLICATIONS

Dr. Andrea Herbst, Dr. Tobias Fleiter, Matthias Rehfeldt

EUSEW 2020, Webinar, 08.07.2020





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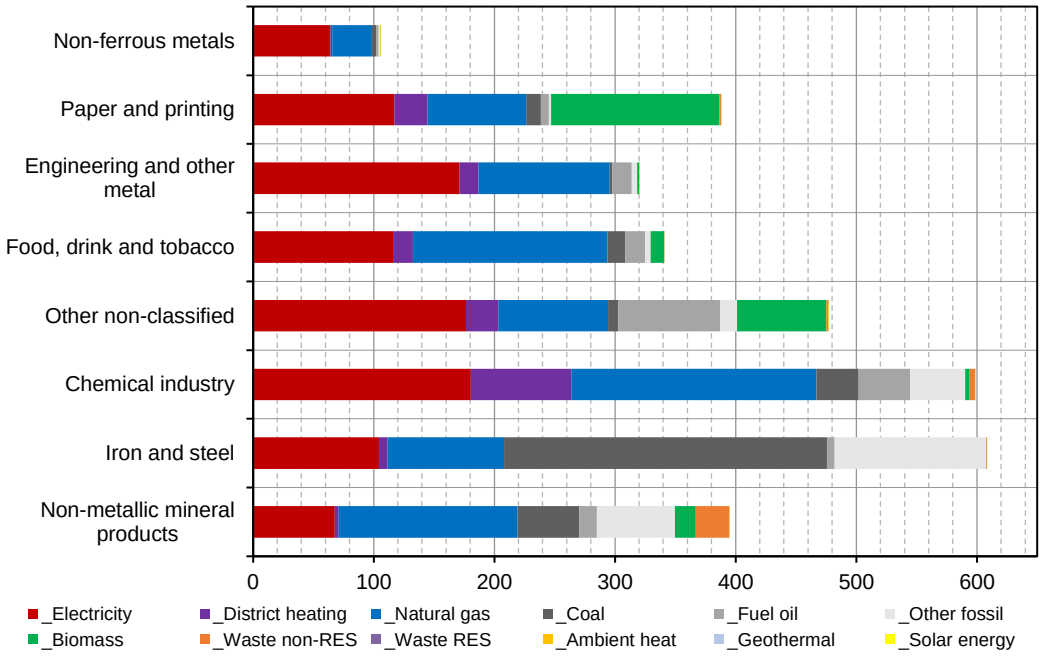
INDUSTRY ACCOUNTS FOR 25% OF EU FINAL ENERGY CONSUMPTION

- Dominant energy carriers: **gas, electricity, coal and oil**
- Current **policy** is **not on the right track to decarbonisation** and deep emission reductions require significant changes in the sector

EU28 INDUSTRIAL FINAL ENERGY DEMAND (2015)



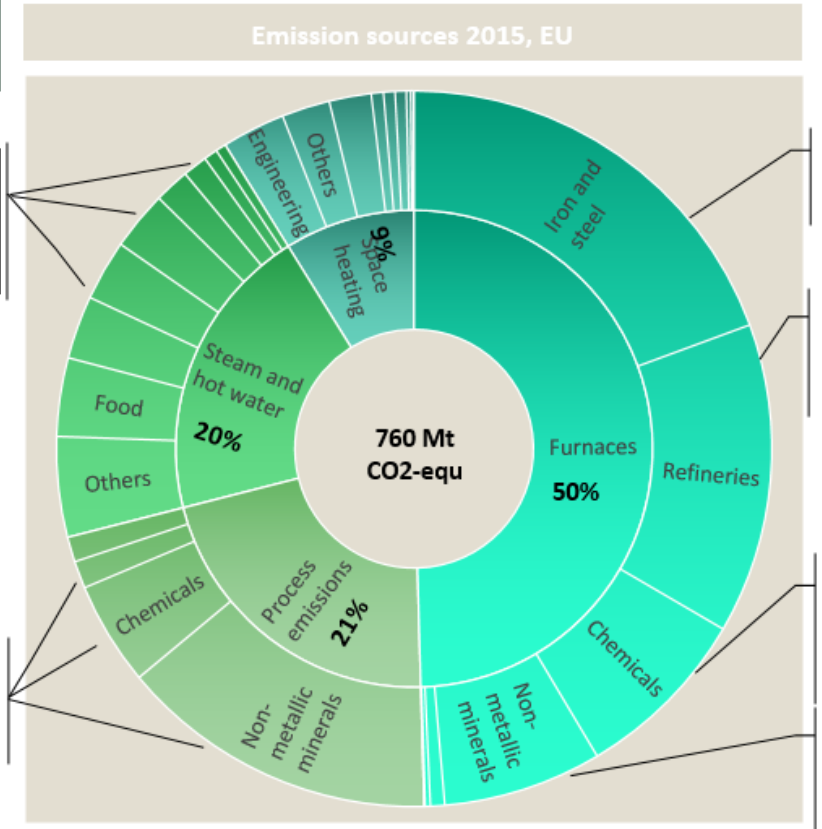
Source: FORECAST

TODAYS AVAILABLE TECHNOLOGIES ARE NOT SUFFICIENT FOR DECARBONISATION

Decarbonisation challenges

Strong reliance on natural gas, mostly high temperature

Process emissions chemically linked to production



Decarbonisation challenges

Coke technically required in blast

Strong reliance on refinery gas

Strong reliance on natural gas (also as feedstock)

High temperature limits use of renewables

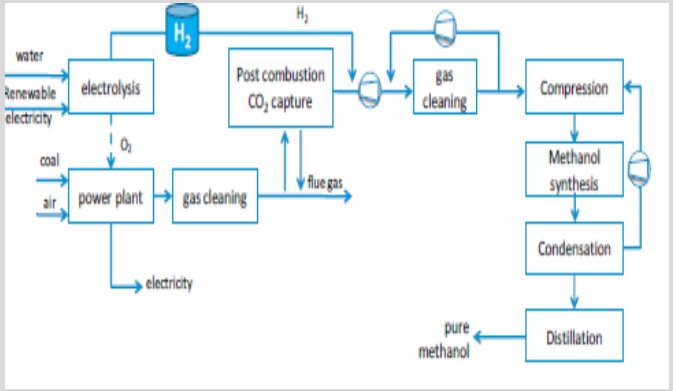
- Deep decarbonisation not possible via BAT energy efficiency and traditional fuel switch
- Innovative low-carbon technologies are needed

BREAK-THROUGH INNOVATIONS WITH DIFFERENT LEVELS OF MATURITY ARE UNDER DEVELOPMENT

Siderwinn (ArcelorMittal)
Fully electric steelmaking via electrolysis

Hybrit (SSA
H2 direct reduction
with EA

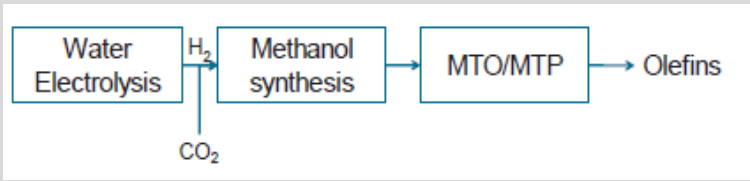
H2 Methanol
RES H2 from water electrolysis plus hydrogenation of CO2 as carbon source



Grass paper (Creapaper)
Grass based fibres replacing wood fibres

Source: http://www.graspapier.de/

H2 Methanol to Olefins
Ethylene and propylene production from RES H2 methanol



Source: http://www.g

Source: Towards the EU ETS Innovation fund workshops (online available), Dechema 2017

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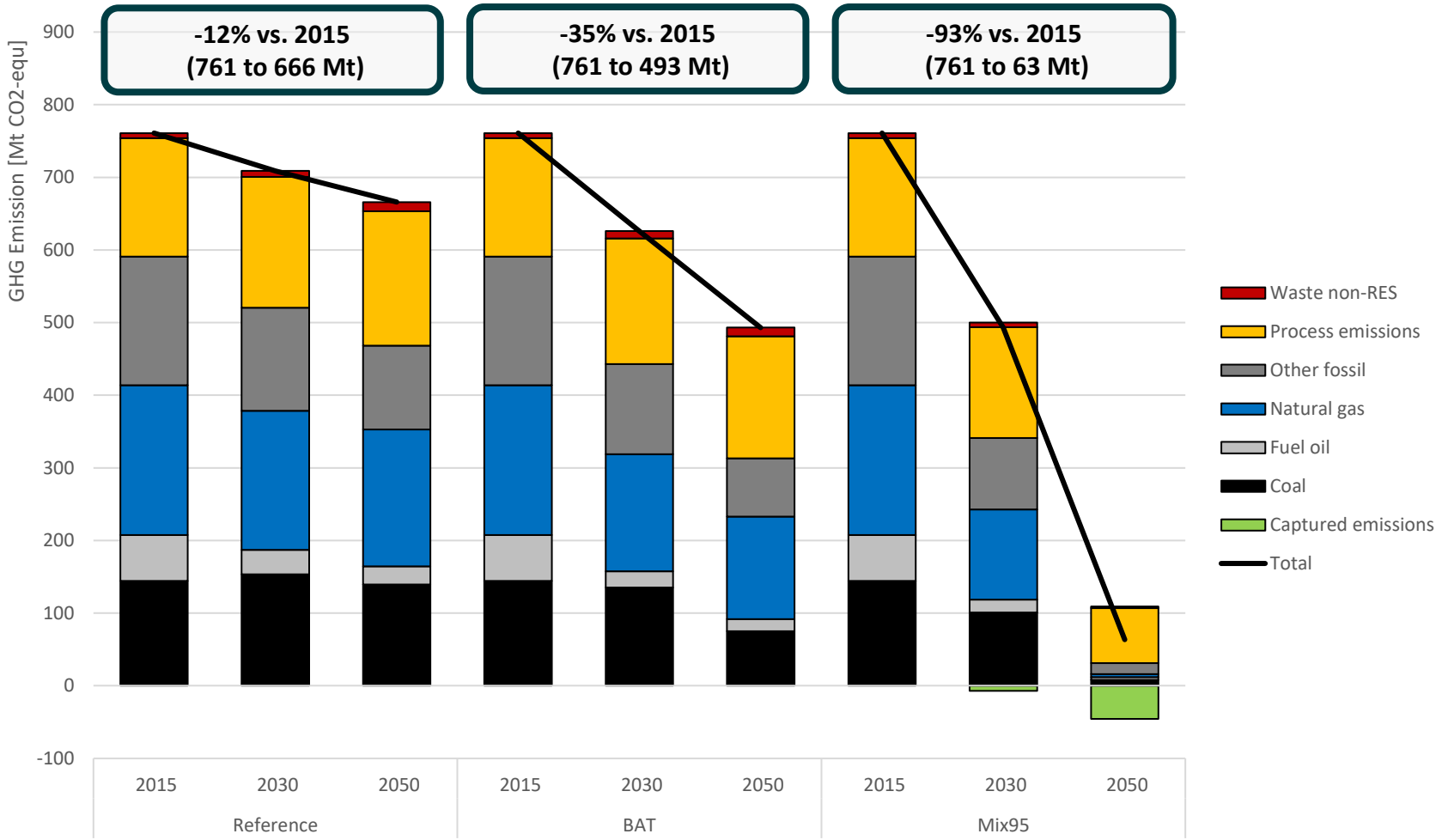
PATHWAY CHARACTERIZATION BY MITIGATION OPTION

Clusters of mitigation options	REFERENCE	BAT	MIX95
Incremental efficiency improvement	Energy efficiency progress according to current policy framework and historical trends.	Complete diffusion of **today's best available technologies** with regard to energy efficiency where technically applicable	Faster diffusion of **incremental process improvements** (BAT & INNOV ≥TRL 5).
Fundamental processes improvement **energy efficiency, process emissions**	-	-	**Radical process improvements** (INNOV ≥TRL 5)
Fuel switching to RES towards decarbonized electricity and/or hydrogen	Fuel switching driven by energy prices and assumed CO_2-price increase	Fuel switching driven by energy prices and assumed CO2-price increase	Stronger fuel switching to **power-to-heat and power-to-gas** technologies. **Radical changes** in industrial process technologies drive fuel switch (e.g. switch to **hydrogen**).
Carbon capture and storage (CCS)	-	-	CCS only for remaining **process emissions**
Recycling and re-use	Slow increase in recycling rates based on historical trends.	Fast development of recycling	Stronger switch **to secondary production.**
Material efficiency and substitution	Based on historic trends.	Based on historic trends. Decrease in **clinker factor.**	Decrease in **clinker factor**. Increase in **material efficiency & substitution**.

VERY HIGH LEVEL OF AMBITION ENABLES A HIGH REDUCTION IN CO_2 EMISSIONS [EU28]



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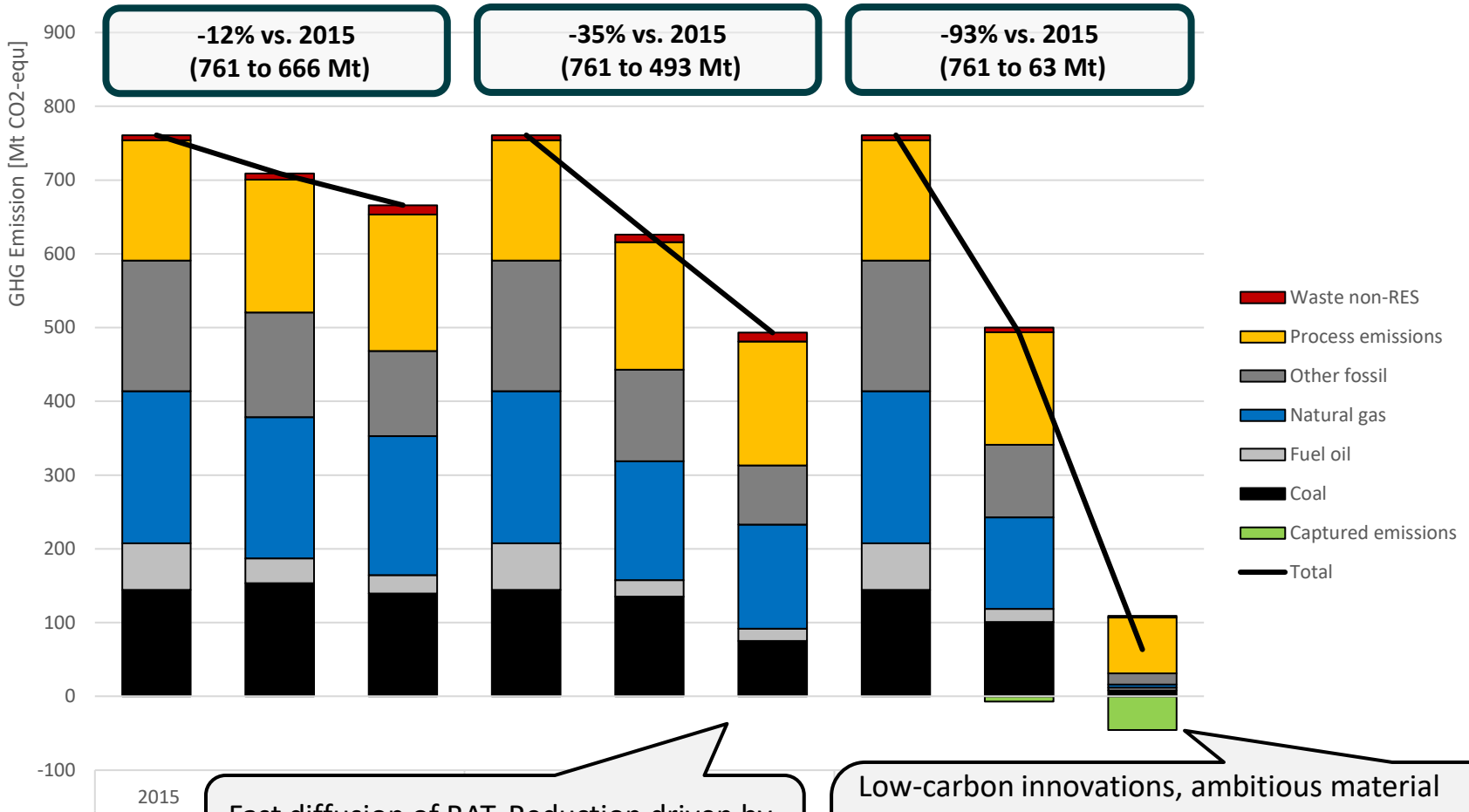
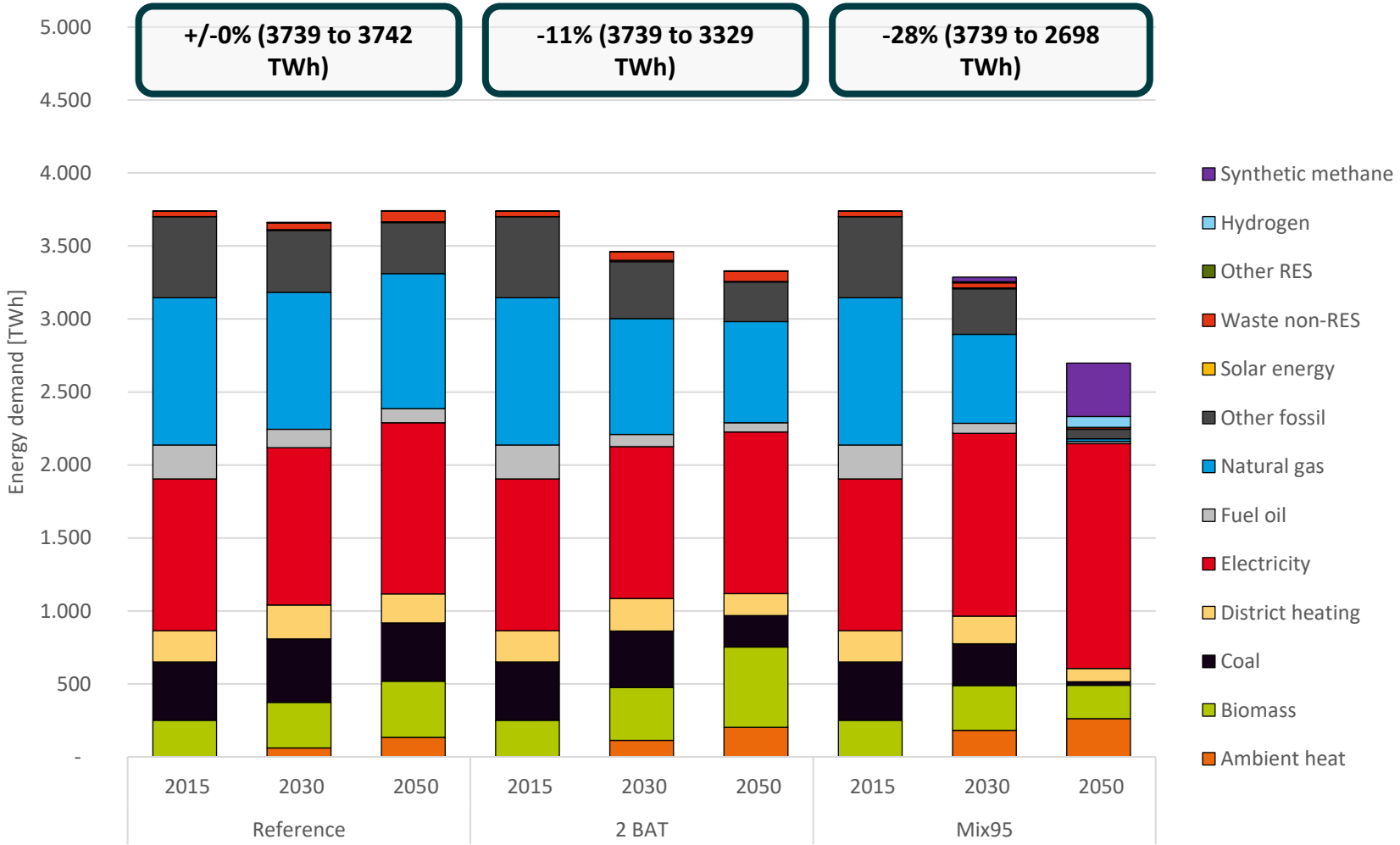
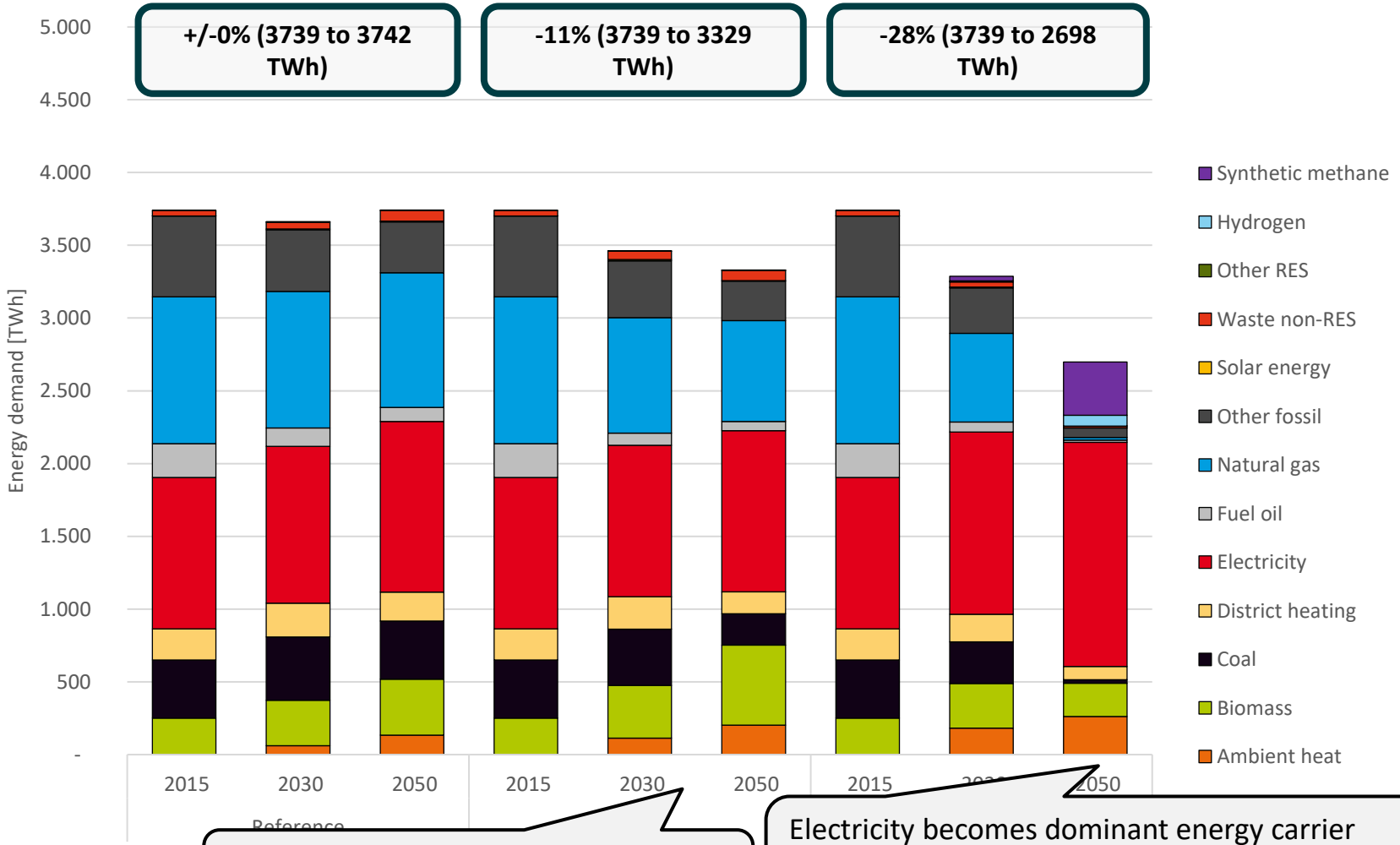
VERY HIGH LEVEL OF AMBITION ENABLES A HIGH REDUCTION IN CO_2 EMISSIONS [EU28]



REDUCTION IN FINAL ENERGY DEMAND LESS PRONOUNCED THAN EMISSIONS [EU28]



Reduction in final energy demand less pronounced than emissions [EU28]

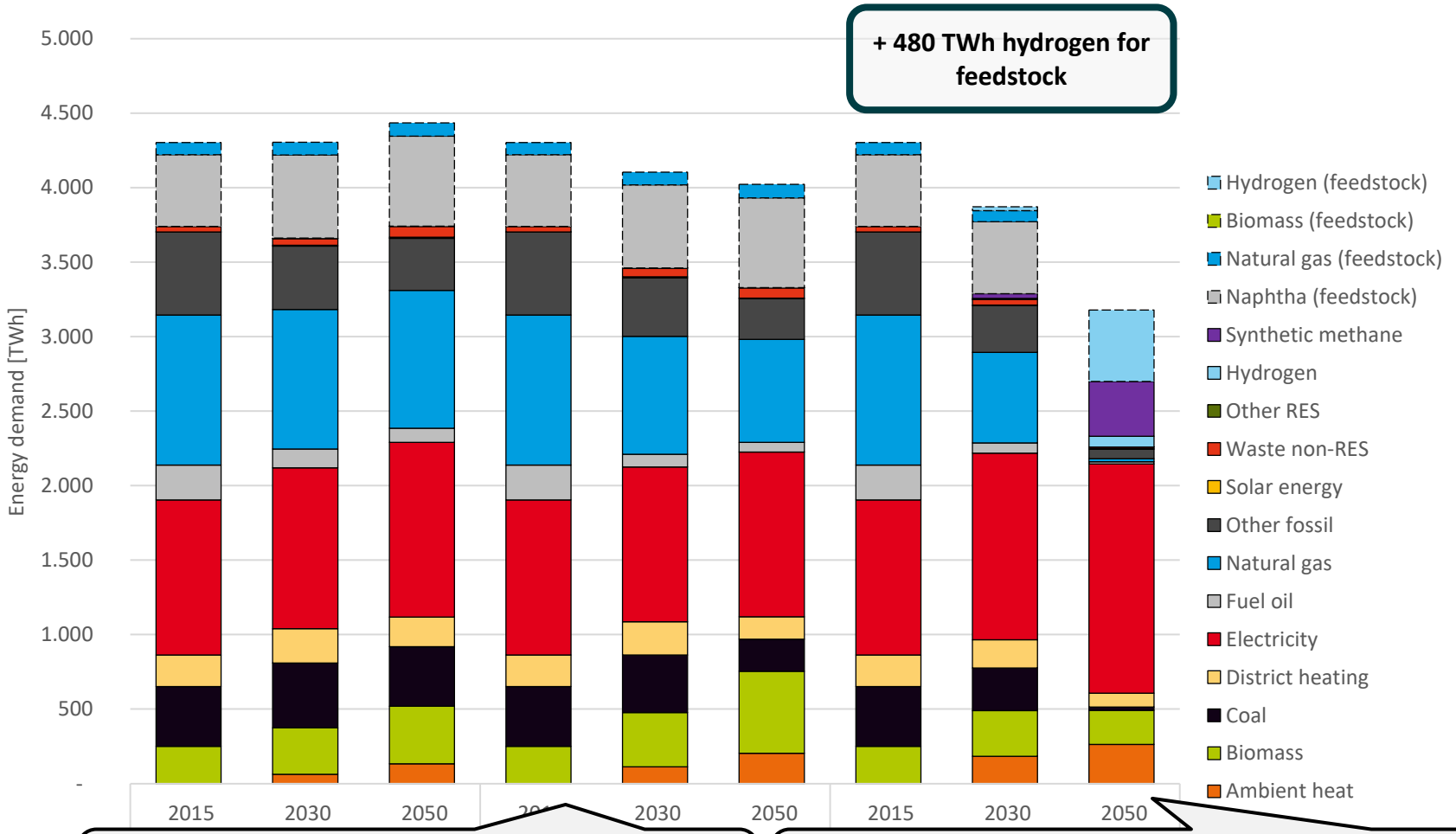


Energy efficiency overcompensating economic growth

Electricity becomes dominant energy carrier (new uses for process heat)
Fossil fuels are (nearly) completely phased out

RES H2 FEEDSTOCK DEMAND CHANGES

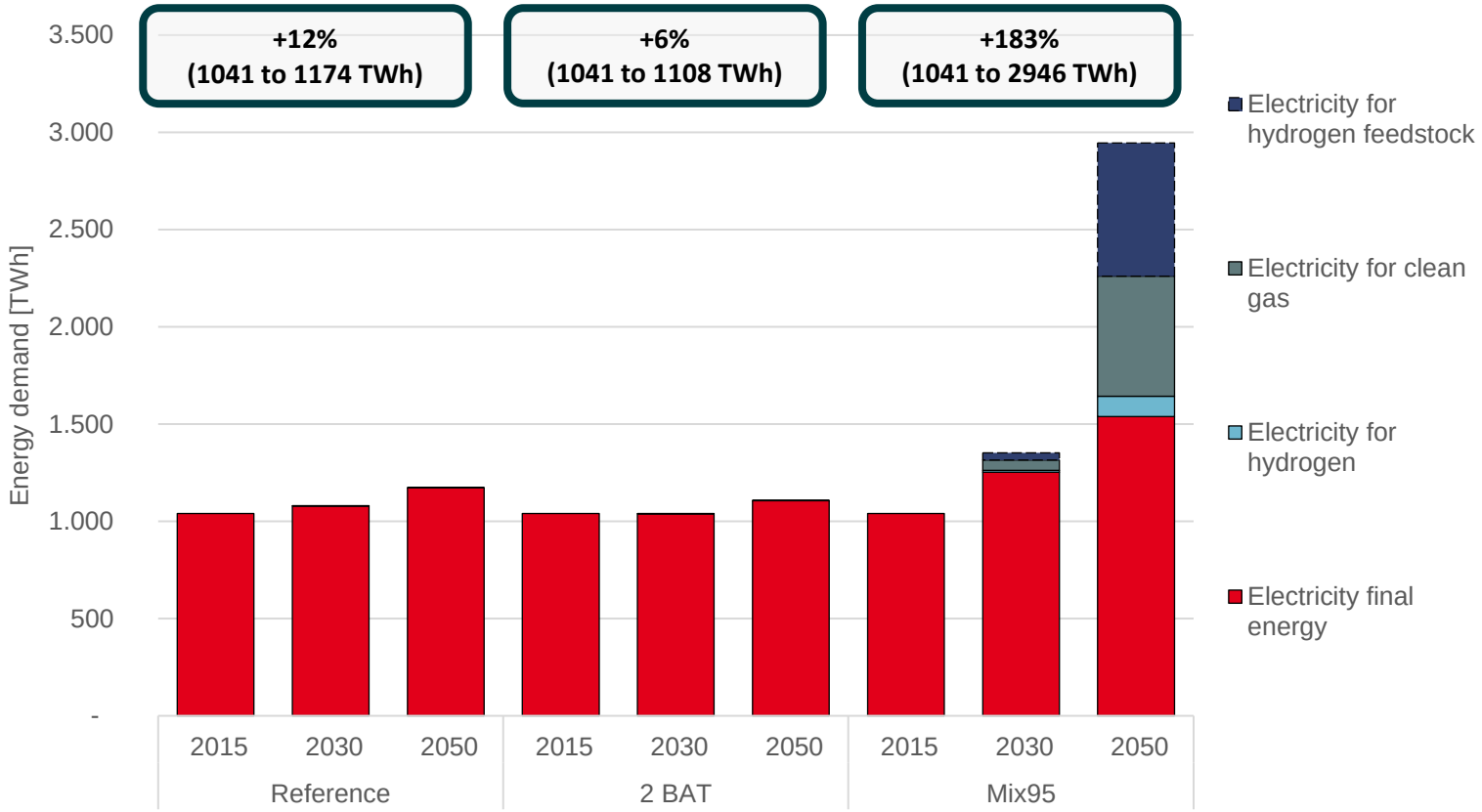
ENERGY BALANCE BOUNDARIES [EU28]



Feedstock for chemicals still based on fossil fuels

Feedstocks are dominated by RES H2: ammonia, methanol and methanol-based ethylene

LARGE VOLUMES OF RENEWABLE ELECTRICITY WILL BE NEEDED [EU28]



SUMMARY: INNOVATIONS FACILITATE DECARBONISATION OF EU INDUSTRY

1 Introduction

- Available technologies not sufficient for decarbonisation of EU industry

2 Innovations

- Many low-carbon process innovations are under development
- They differ strongly in maturity and distance to market

3 Pathways

- >80% decarbonisation is possible – even without CCS, but requires:
  - Process innovations,
  - CO2-free secondary energy carriers,
  - Innovations in material efficiency and circular economy

4 Policy

- Support for RES and energy efficiency
- Extending the ETS with a minimum price path to provide long-term certainty
- Public RD funding for low-carbon innovations
- Targeted public procurement to support low-carbon products
- CO2 tax to provide incentives for companies outside the ETS
- Policies to boost material efficiency & circular economy as well as energy efficiency

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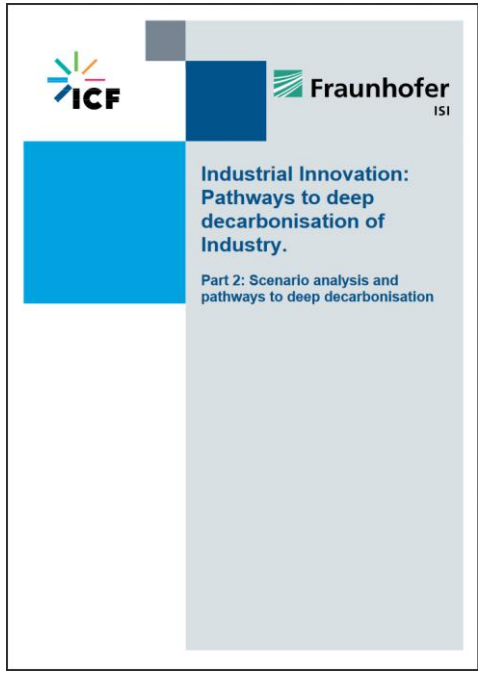
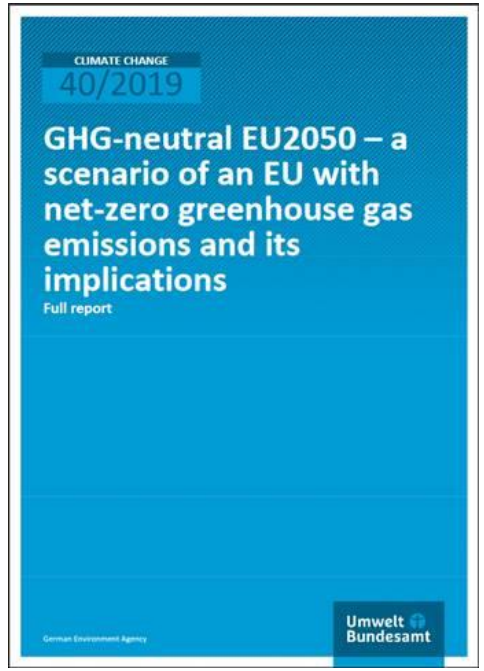
MANY THANKS FOR YOUR ATTENTION!

More scenarios and details:

https://www.umweltbundesamt.de/en/publikationen/ghg-neutral-eu2050

https://ec.europa.eu/clima/sites/clima/files/strategies/2050/docs/industrial_innovation_part_2_en.pdf





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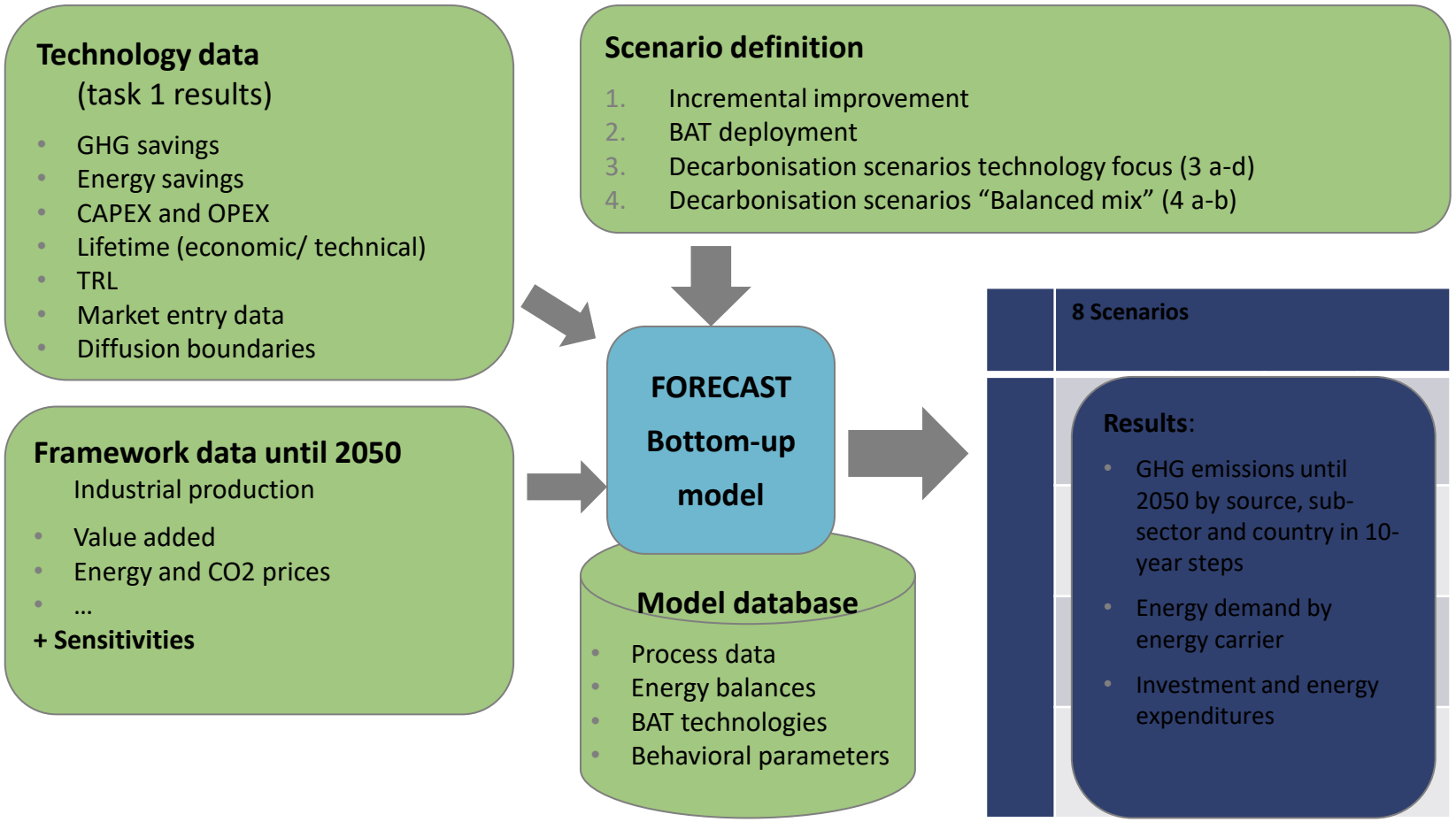
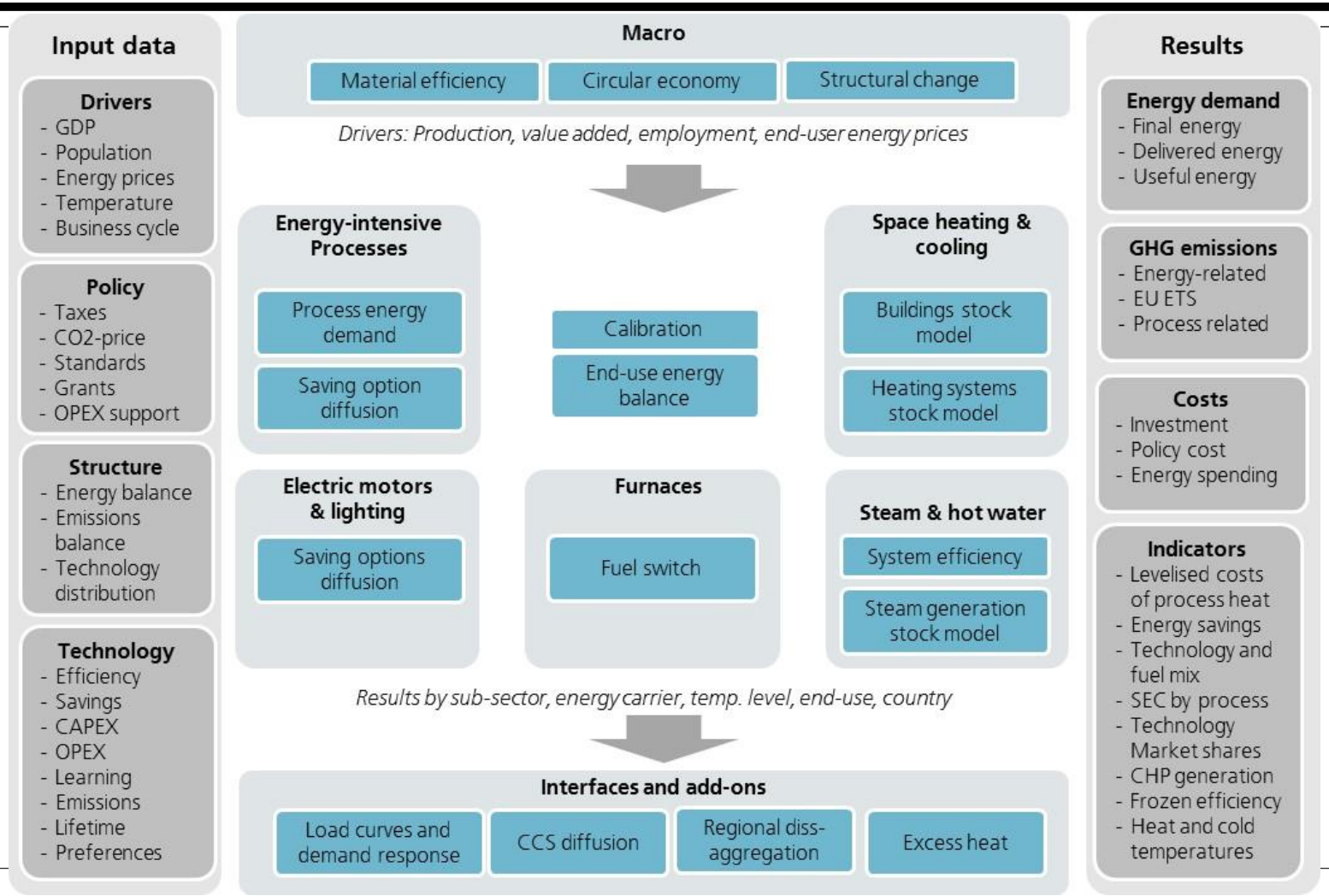
The methodology combines multiple data sources



FORECAST:

BOTTOM-UP SIMULATION MODEL

FORECAST
FORecasting Energy Consumption Analysis and Simulation Tool



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MAIN MESSAGES

- *EiiF: Short term decarbonisation potential in industry can quickly be tapped if regulators set mandatory standards for energy efficient equipment. Why are we hesitating?*

- *Schneider Electric: The EU needs a policy framework for digitising the European industry in a sustainable manner, ensuring a stronger convergence between sustainability and digital.*

- *Fraunhofer ISI: Transforming the industrial sector to reach CO2-neutrality by 2050 requires innovative low-carbon production technologies, a comprehensive circular economy and CO2-free energy carriers as well as changes in the political and regulatory framework.*

PANEL DISCUSSION

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SUSTAINABLE ENERGY WEEK

EUROPEAN ALLIANCE TO SAVE ENERGY

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DECARBONISING INDUSTRY &
THE ICT SECTOR

Q&A WITH PARTICIPANTS

DECARBONISING INDUSTRY & THE ICT SECTOR

PETER HOEDEMAKER
President
European Industrial Insulation Foundation

Conclusions

DECARBONISING INDUSTRY &
THE ICT SECTOR

THANK YOU!