

ENERGY EFFICIENCY AT VIENNA INTERNATIONAL AIRPORT

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Environmental and Sustainability Management

Agenda



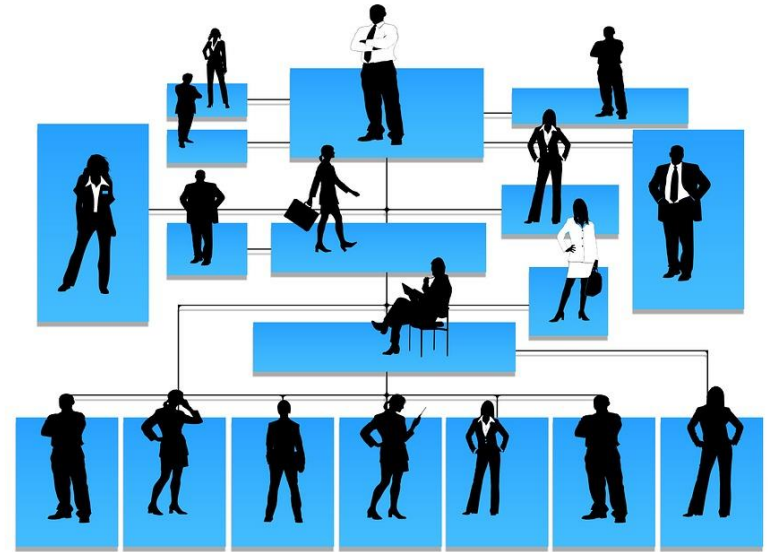
- Environmental Management EMAS
- Importance of Energy Savings
- Best Practises



EMAS-System: organisational structure



- The responsibility for the successful implementation of an environmental management system (EMS) lies with the Management Board and with the executives in accordance with the line organisation of Flughafen Wien AG
- An appointed Environmental Manager conducts the operational management of EMAS
- Appointed topic authors for specific environmental themes and aspects (Environmental Team) support the work of the Environmental Manager





EMAS-System: Documentation

Goal: Systematic and company-wide documentation of environmental protection measures ensures that risks and environmental impact are minimised going forward.

Clear in-depth and up-to-date description of individual processes leads to improvement of environmental performance in environmental standards and procedure instructions

Publications:

EMS-Manual

comprehensive manual gives a general overview of the EMS of FWAG

EMS-Procedure instructions

regulate EMS-procedures and processes

Environment-Procedure instructions

regulate relevant processes and responsibilities of each individual environmental topic

EMS: Content and environmental aspects



Environmental aspects

(Vienna International Airport site and 19 Austrian subsidiaries of FWAG)

Input

- Electricity
- Heating
- Cooling
- Materials/ Substances
- Fuel
- Water



Output

- Noise
- Airborne emissions
- Waste
- Waste water



VIE – a major consumer of energy

	Internal consumption	Total consumption on site	Maximum connected load
Electricity	93 GWh	141 GWh	32 MW
Heating	53 GWh	115 GWh	53 MW
Cooling	29 GWh	43 GWh	23 MW
Water	380.000 m ³	664.000 m ³	Well system (3 wells)
CO₂	29.000 tonnes	58.000 tonnes	



Carbon footprint Vienna International Airport



Carbon footprint Vienna International Airport



Sphere of influence described in three scopes

Scope 1

... in the course of the business operations of the company from sources that the company itself owns and/or operates, e.g. vehicles, combustion plants



Scope 2

... as part of the generation by third parties of the energy consumed by the company, e.g. electricity, district heating and cooling



Scope 3

... in the supply chain or in the course of using the products or services sold by the company, arrival and departure of passengers and employees, transportation of goods, use of the airport by airlines



LTO = Landing-and-Take-off-Cycle
APU = Auxiliary Power Unit,
TWP = Engine tests

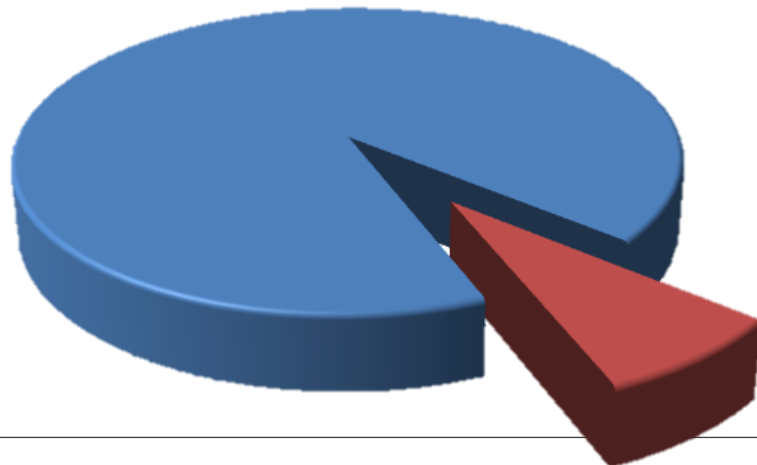


Carbon footprint Vienna International Airport

The Flughafen Wien Group can influence Scope 1 emissions directly, Scope 2 emissions only partially and Scope 3 emissions not at all

Emissions per scopes at the Vienna Airport site (in tonnes)

	2015	2016	2017
SCOPE 1	11,461	11,796	8,455
SCOPE 2	46,714	46,710	45,732
SCOPE 3	258,050	262,743	322,735
Total	316,225	321,249	376,922



-----> 92% or 347,138 tonnes not directly influenceable by the airport operator

-----> 8.0% or 29,784 tonnes directly influenceable by the airport operator



Energy efficiency targets of FWAG

For the continuous improvement of the company's environmental performance, Flughafen Wien AG has set itself environmental targets with regard to individual environmental aspects.

Environmental aspect	Unit	Initial 2012 value	target value 2022	2012 – 2022 targeted efficiency increase	Value as of 2017
Electrical energy Flughafen Wien Group	kWh/TU ¹	4.42	3.49	21 %	3.52
Heat consumption Flughafen Wien Group	kWh/TU ¹	2.42	2.01	17 %	2.01
Cooling consumption Flughafen Wien Group	kWh/TU ¹	1.72	1.24	28 %	1.09
Fuel consumption Flughafen Wien Group	kWh/TU ¹	1.41	1.17	17 %	1.20
Greenhouse gas CO ₂ Flughafen Wien Group	kWh/TU ¹	1.95	1.36	30 %	1.12

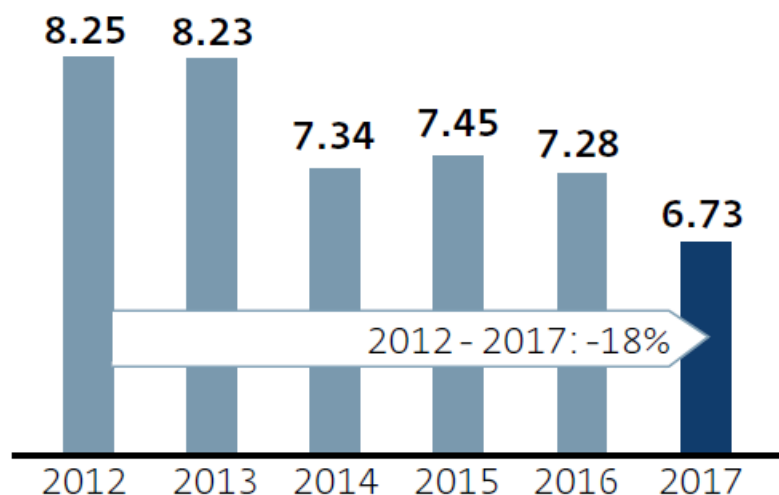
¹⁰ 1) One traffic unit (TU) is equivalent to one passenger or 100 kg of air cargo or airmail



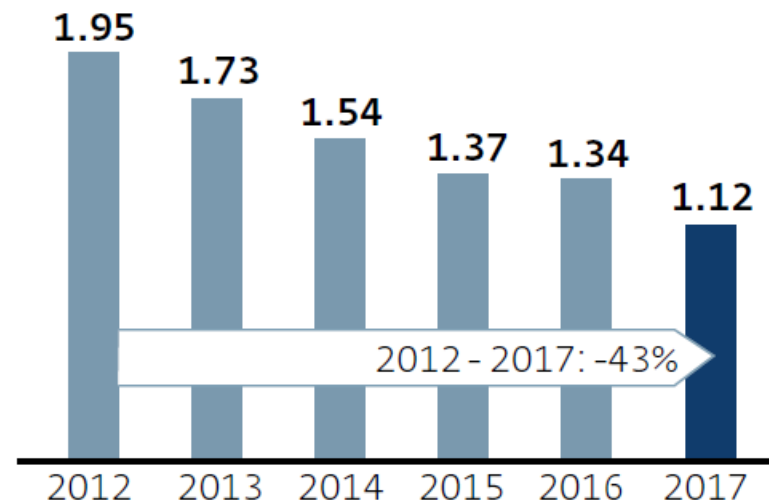
Key performance indicators



Total energy requirements in kWh/TU



CO₂ Emissions in kg/TU



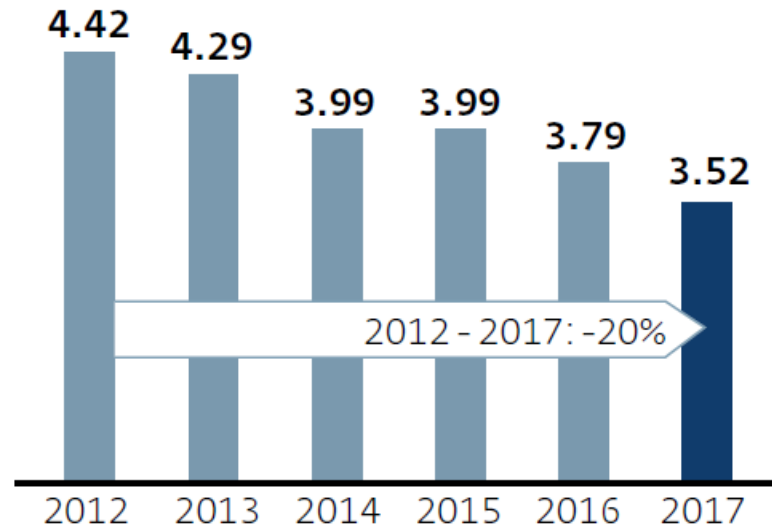
Water consumption

	Unit	2015	2016	2017
Water consumption FWAG	l/TU	17.3	18.4	16.8
	m ³	427,931	468,169	445,698
Waste water	l/TU	16.2	14.8	14.0
	m ³	401,152	376,799	371,511

Key performance indicators



Electricity consumption FAWG in kWh/TU



Heat consumption FWAG	kWh/TU	2.33	2.29	2.01
Heat consumption FWAG	MWh	57,734	58,315	53,304
Cooling consumption FWAG	kWh/TU	1.31	1.25	1.09
Cooling consumption FWAG	MWh	32,557	31,856	28,846

Key performance indicators



Waste

	Unit	2015	2016	2017
Total waste	kg/TU	0.15	0.15	0.17
	tonnes	3,650	3,887	4,457
Total hazardous waste	kg/TU	0.01	0.01	0.01
	tonnes	145	147	151
Industrial waste	kg/TU	0.09	0.10	0.11
	tonnes	2,240	2,597	2,981
Paper and cardboard	kg/TU	0.01	0.02	0.02
	tonnes	360	398	414

Fuel consumption FWAG	kWh/TU	1.13	1.20	1.20
Fuel consumption FWAG	MWh	28,041	30,447	31,733

The importance of energy saving

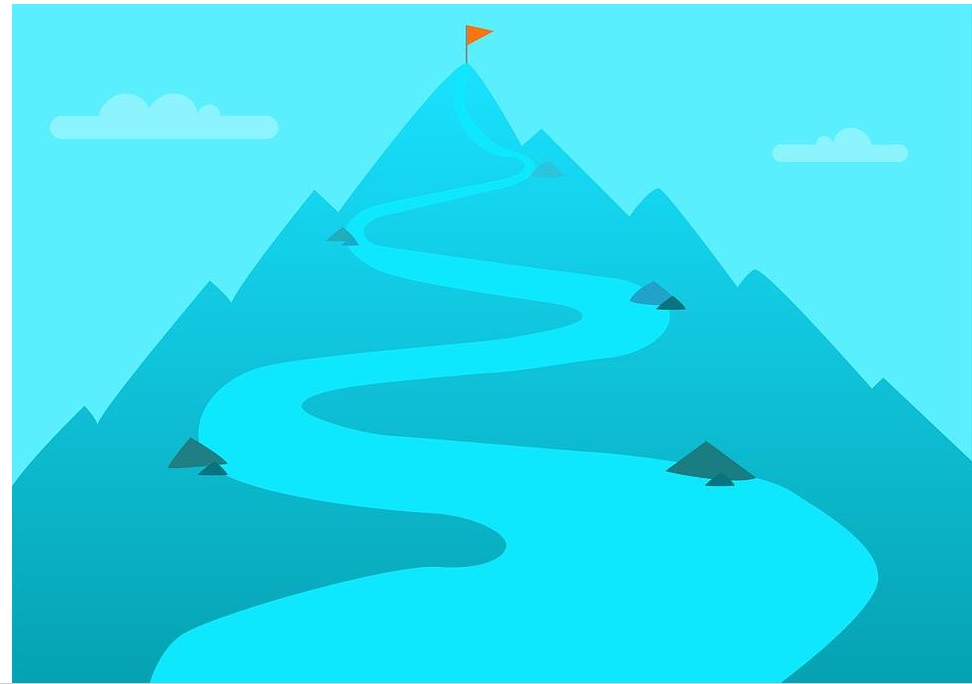
- Financial savings (reduction in operating cost)
- Considerate handling of available resources
- Avoidance of huge investments into technical infrastructure
(Savings in investment cost)
- Enhancing competitiveness
- Official requirements for the 3rd runway
- Energy demand for future projects which are already included in the development plan 2025
- achievement of the EU stated climate targets (particularly substantial CO₂ reduction) despite continuing growth



What we have done so far....



- EMAS – an environmental management system – implemented
- Own department for energy management was implemented in 2015
- more than 200 optimisations in the central building control system
- Recirculation dampers
- Conversion to LED
- Heat recovery
- Optimisation of operating hours
- Free Cooling (the optimization of cooling plants through the use of natural ambient cold)



Office Park 4 – Energy-efficient and sustainable



VIENNA AIRPORT  Vienna International Airport
OFFICE PARK 4.

Office Park 4 – Energy-efficient and sustainable



Goals

- Modern office and working environment (25.000 m²)
- Communicative hub
- Essential element in developing the Airport City
- New urban center
- Designed dynamic venue
- Multifunctional
- Energy-efficient and sustainable



Success factors

- Providing redundant high-performance- IT
- Attractive open space design
- Communication zones in the building and outside
- Retail, Kindergarten and gastronomy on location
- Event and presentation area
- Outstanding connection to public transport and the Airport City



Office Park 4 – Energy-efficient and sustainable



- Focus on energy efficiency already at the point of conceptualisation
- Requirements for the general planners : high competence in the field of energy efficiency, sustainable planning and building simulation
- Cooperation between general planners and the Technical University Vienna (TU) – research and development support – results in optimization
- Office Park 4: Low energy standard with passive house characteristics
- DGNB pre-certificate in platinum already received from the Austrian Association for a Sustainable Real Estate Industry (ÖGNI)
- Geothermal Energy – bored piles equipped with absorber lines and brine/water heat pump in the planning
- Building simulations by a computer-assisted “virtual city”, which can simulate and estimate the effects of measures and management decisions on the consumption of energy, cooling or heat.
- Highly insulating facade
- Intelligent control of the night ventilation system
- Highly efficient ventilation system
- Efficient electrical systems (i.e. LED lighting)



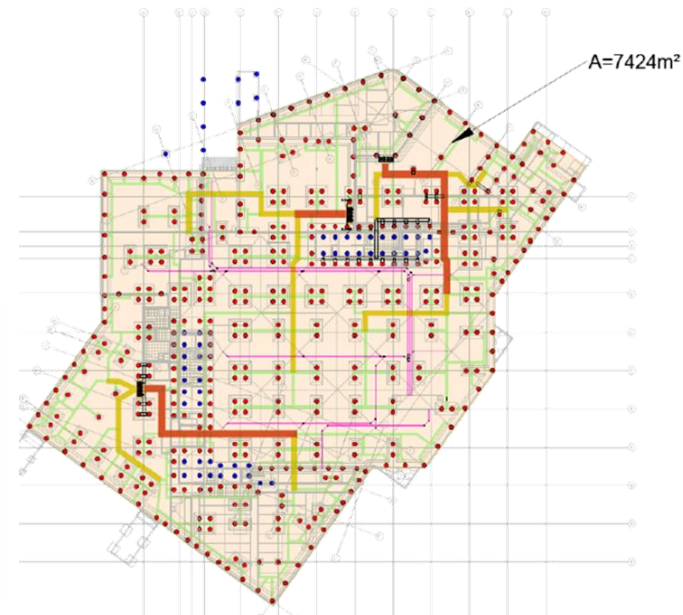
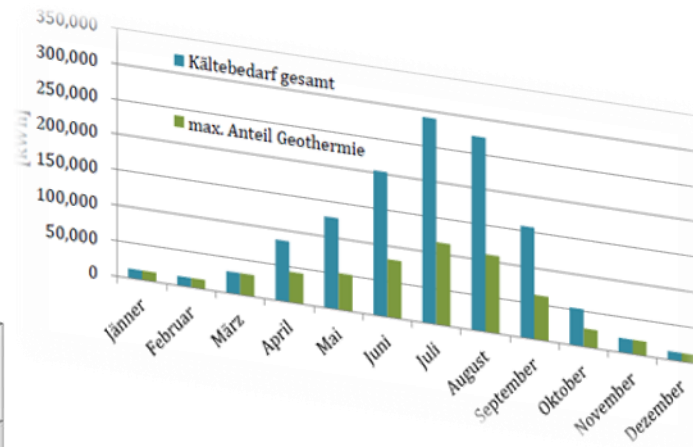
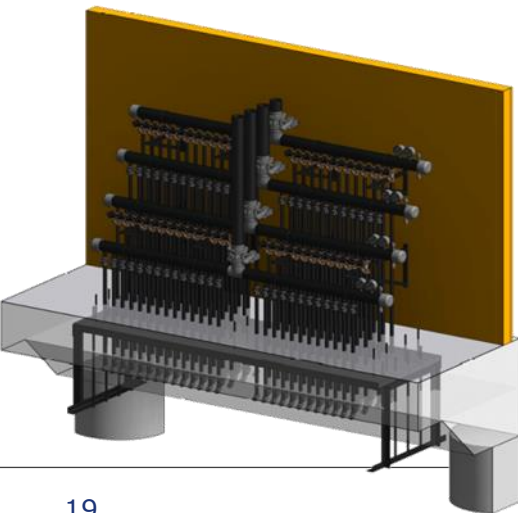
Office Park 4 – Geothermal energy

Geothermal Energy

441 bored piles equipped with absorber lines,
10-18m long, about a metre in diameter, reinforced concrete, with brine water piping;

The system covers

- ➔ 94% Heating energy consumption
 - ➔ 45% cooling energy consumption
- in the period of one year

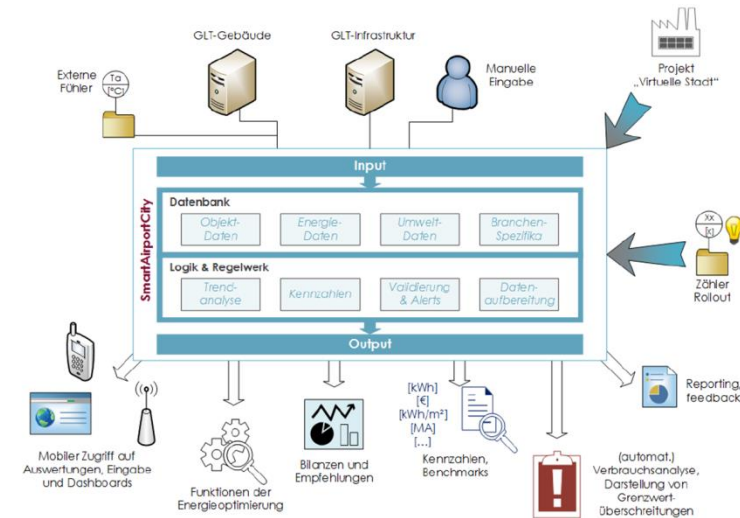


Smart Airport City



Goals and tasks

- ✈ Energy-efficient building operation
 - by automated trending, analysis and response to environmental inputs
- ✈ Reduction of load and energy use
 - Improving infrastructure use
 - Exploiting cross-location synergies



➔ Research and Development Project (R&D Project)

➔ Project period: till end of March 2020

Consortium: 



denkstatt 

•msg

denkstatt
sustainable thinking

Funding agency: Forschungsförderungsgesellschaft

Vienna International Airport: Virtual City



Virtual City and virtual buildings

In 2017, Flughafen Wien AG, together with the University of Technology initiated a research and development project to visualise the consumption of electrical energy and the supply of individual buildings with cooling and heat.

This project is developing a prototype of a computer-assisted “virtual city”, which can simulate and estimate the effects of measures and management decisions on the consumption of energy, cooling or heat. First scenarios for Office Park 4, Pier East, Terminal 2 and enlargement of terminals to the south

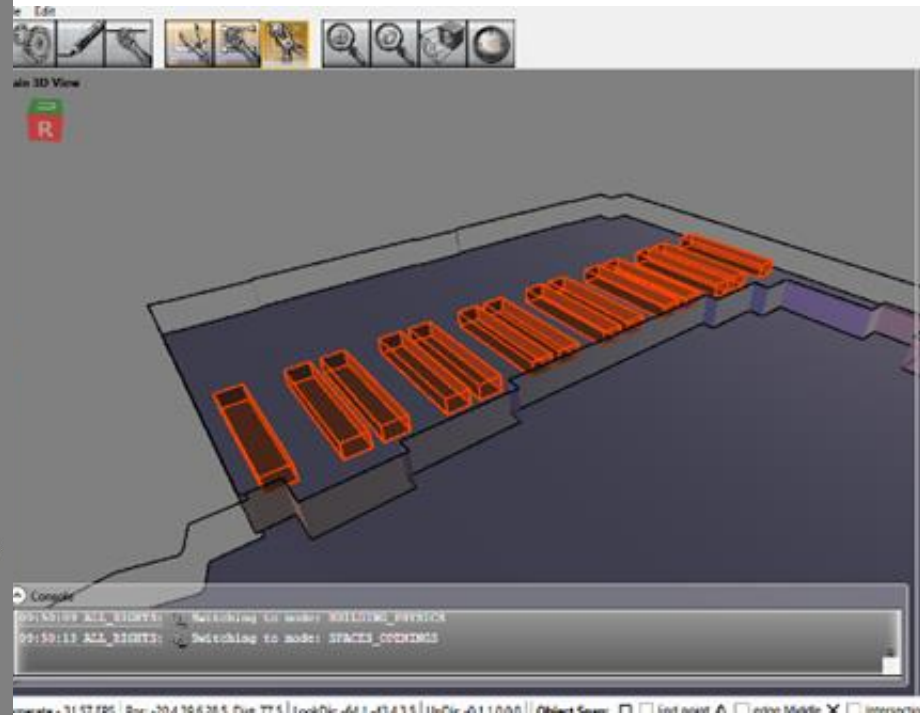
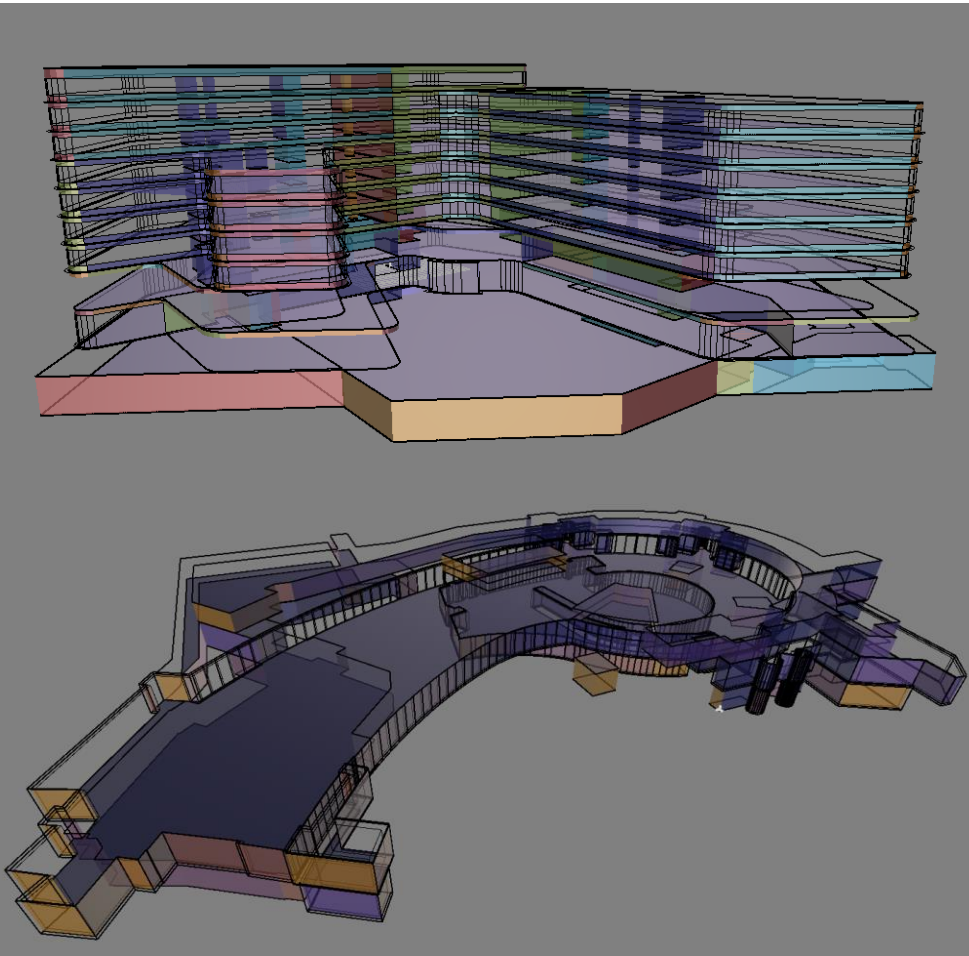
- Research and Development Project (R&D Project)
- Project period: 8 years



Vienna International Airport: Virtual City



The “Virtual City” grants a holistic view at the Vienna Airport System

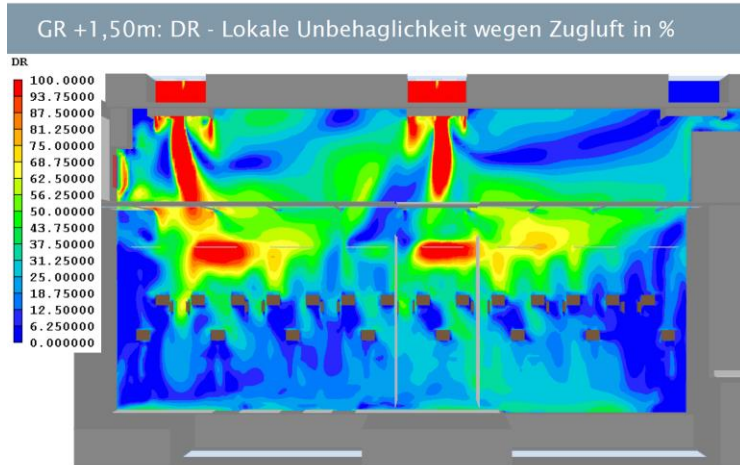


Vienna International Airport: Virtual City



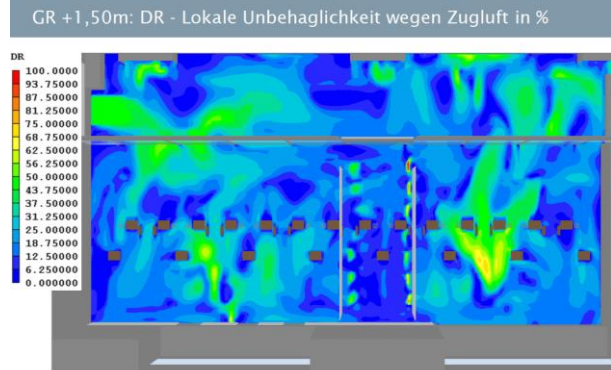
Detailed analysis of indoor air flow

SIKO Winter

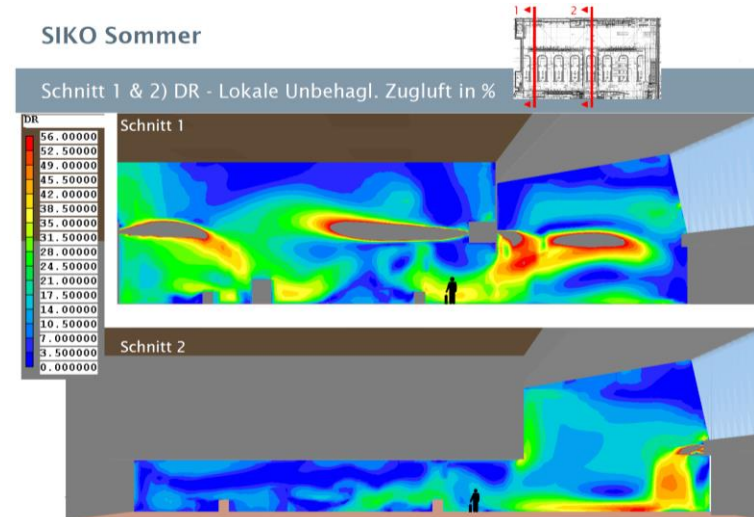


24.04.2018

SIKO Sommer



SIKO Sommer



Example: Security check area

E-Mobility



CO₂-neutral E-Port

- ➔ Mobile and stationary power storage units will enhance efficiency and sustainability of Vienna Airport
- ➔ Research Project
- ➔ Project period: 4 years
- ➔ Funding agency: Forschungsförderungsgesellschaft

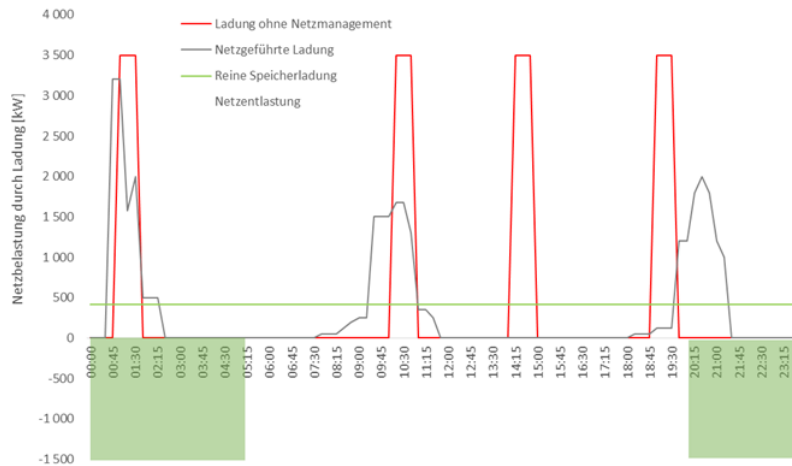


E-Mobility



Annual savings potential

- **1.5 GWh** less energy demand
- **1,400 t** less carbon emissions
- **375,000** litre diesel
- **365,000 €** cost for diesel



Consequences of E-Mobility

- **More electric energy** 2.2 GWh (up to 14 GWh for the complete conversion)
- **Project „Virtual City“** E-Mobility is a very important component – therefore must be taken into foresighted consideration
- **Charging strategy** in conjunction with power grid and operation
- **Mobile and stationary power storage units** have to be implemented for the purpose of grid stabilisation and to participate in the control energy market

Photovoltaic systems (PV) at Vienna Airport



3 photovoltaic systems at the site

- ➔ Technical Data (in total)
 - ➔ Installed capacity: 1,300 kWp
 - ➔ Electricity: up to 1,500.000 kWh/year
 - ➔ Installed area: 8.000 m²
 - ➔ Reduction CO₂: up to 900 tonnes/year
 - ➔ 20% of the electricity needs covered



Photovoltaic systems (PV) at Vienna Airport

Photovoltaic systems - 2018

- Roof treatment plant
- Installed capacity: 715 kWp
- Electricity: up to 750.000 kWh/year
- Reduction CO₂: up to 450 tonnes/year

Photovoltaic systems 2019 (under examination)

- Multi-storey car parks
- Office Park 4
- Hangar 6



Everyone can contribute.....



- Lowering shutters to avoid that rooms get even more heated by the solar radiation
- Switch off the lights
- Proper clothing in Winter and in Summer
- Develop higher tolerance towards temperature
- Switch off your computer, screen and printer
- In Winter quick ventilation is better than continuously tilted windows
- Use the stairs instead of using the elevator



Conclusion:



- ✈ Identify your main energy users
- ✈ Crop „low hanging fruits“ first
(minor investments => quick results)
- ✈ Use „Best Practice“
 - benchmark yourself with other airports
- ✈ Avoid to extend your conventional energy infrastructure
 - Go for Solar Energy!
 - Go for Geothermal Energy!
- ✈ Try to get financial subsidies for projects with high environmental protection effect and a long payback period (ROI)
- ✈ Make your efforts public
 - „We care about energy efficiency/ environment....“



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THANK YOU FOR YOUR ATTENTION!

