Lighting networks providing new data insights for smart buildings

REHVA EXPERT TALK IN LIGHT AND BUILDINGS

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Outline

Lighting Control – Why/How/What

Past DATA

Live DATA

Predictions

New senses with new opportunities

Why Lighting Control?

To Improve Wellbeing

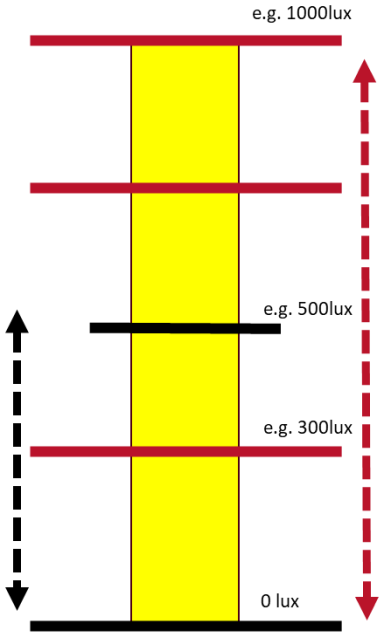
To Increase Flexibility

To Save Energy

Table 33 —Offices

Ref. no.	Type of task/activity area	$\bar{E}_m$ lx		U_o	R_a	R_{UGL}	$\bar{E}_{mz}$ lx	$\bar{E}_{m,wall}$ lx	$\bar{E}_{m,ceiling}$ lx	Specific requirements
		required[a]	modified[b]				$U_o \geq 0,10$			
33.1	Filing, copying, etc.	300	500	0,40	80	19	100	100	75	
33.2	Writing, typing, reading, data processing	500	1 000	0,60	80	19	150	150	100	DSE-work, see 5.9 room brightness, see 6.7 and Annex B Lighting should be controllable, see 6.2.4. For smaller cellular offices the wall requirement applies to the front wall. For other walls a lower requirement of minimum 75 lx could be accepted.
33.3	Technical drawing	750	1 500	0,70	80	16	150	150	100	DSE-work, see 5.9 room brightness, see 6.7
33.4	CAD work stations	500	1 000	0,60	80	19	150	150	100	DSE-work, see 5.9.
33.5.1	Conference and meeting rooms	500	1 000	0,60	80	19	150	150	100	Lighting should be controllable, see 6.2.4.
33.5.2	Conference table	500	1 000	0,60	80	19	150	150	100	Lighting should be controllable, see 6.2.4.
33.6	Reception desk	300	750	0,60	80	22	100	100	75	If reception desk includes regular work station tasks these should be lit accordingly.
33.7	Archiving	200	300	0,40	80	25	75	75	50	

[a] required: minimum value



Basic lighting control –

- **“Occupancy” detection** – automated on/off
- **Daylight harvesting** – Controlling artificial lighting depending on natural light availability.
- **Scene setting** – changing lighting scene depending on needs

EN Norm Approach is

Context modifiers for increase of maintained illuminance;

- errors are costly to rectify
- accuracy, higher productivity or increased concentration is of great importance;
- task details are of unusually small size or low contrast
- the task is undertaken for an unusually long time;
- the task area or activity area has a low daylight provission
- the visual capacity of the worker is below normal

Decreasing illuminance by one step may be considered when conditions

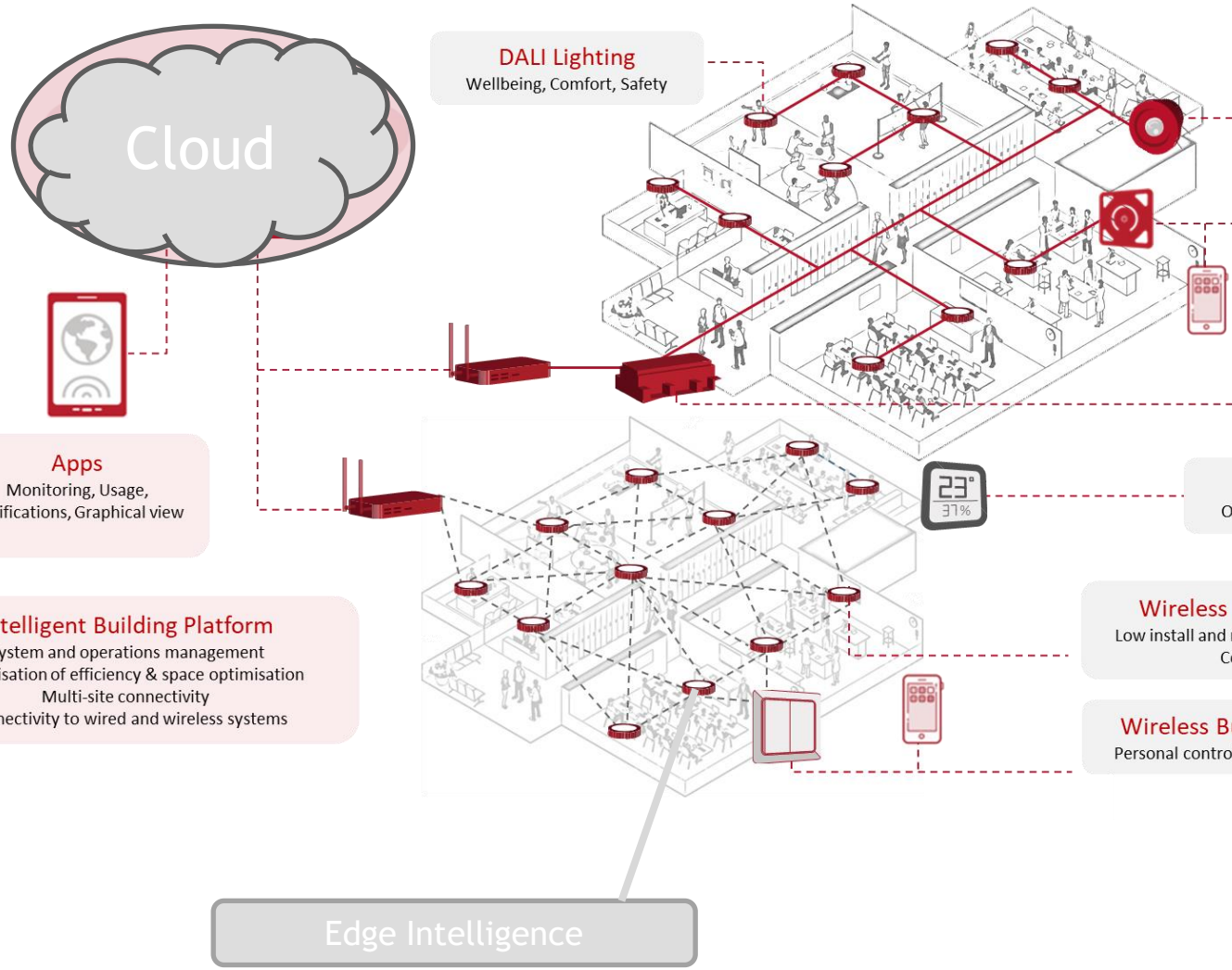
- task details are of an unusually large size or high contrast
- The task is undertaken for an unusually short time.

Lighting Networks

Cloud AI & lighting

Lighting data use beyond lighting

Lighting control
- Wellbeing
- Flexibility
- Energy saving



Lighting-related Sensors

Typically, lighting-related sensors (Occupancy/movement & LIGHT) are used to:

- Turn on the lights without noticeable delay
- Turn off the lights after people have left the space
- Keep lights at the required level

Why use lighting sensors for something else?

Less sensors mean

- **Less COSTS**
  - Initial investments
  - Design, installation, operation, maintenance
- **Smaller carbon footprint**
  - Less embodied carbon
  - Less energy consumption
- Better aesthetics – less sensor acne

Luminaire-based Sensors

Area Sensors

Occupancy detection technologies

PIR &

- Camera
- Thermal camera
- Radar
- Lidar
- Acoustic
- …
- ….

Lighting-related DATA supports smart buildings

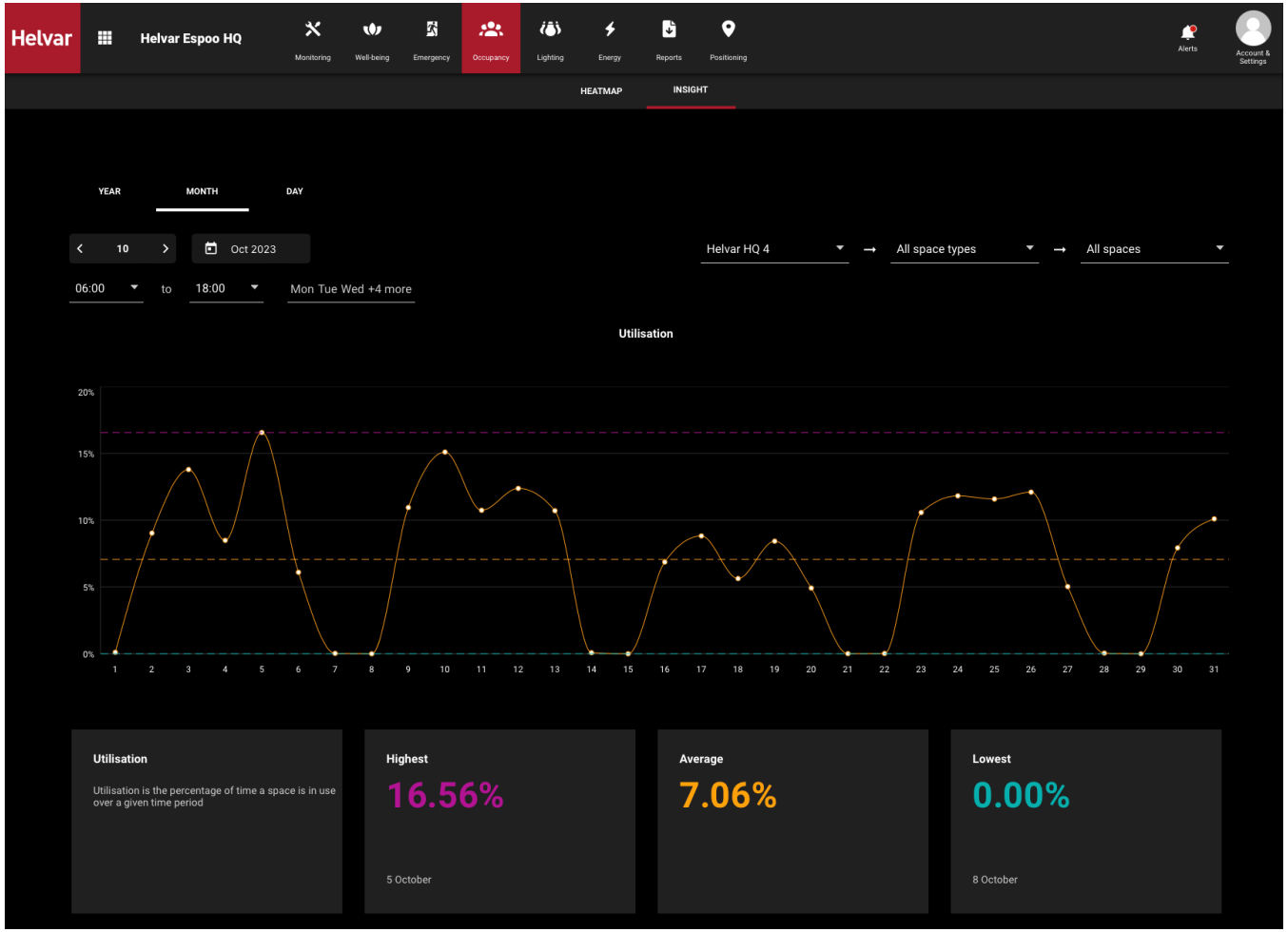
PAST DATA	LIVE DATA	PREDICTIONS
Reports	Direct inputs	Leading inputs
Recommendations	Alerts	Warnings

- ✓ Lighting can work better – using less energy / giving better support for people's wellbeing
- ✓ Other building systems can benefit from the same data, and better support wellbeing & smarter use of energy

Past Data (Occupancy at the building)

Reports & Recommendations

- **Understanding Building usage**
- **Differences / abnormalities**
- **Reporting periods?**
- **Finding Trends**
  - Adjusting timings
  - Adjusting levels
- **“Manual changes”**



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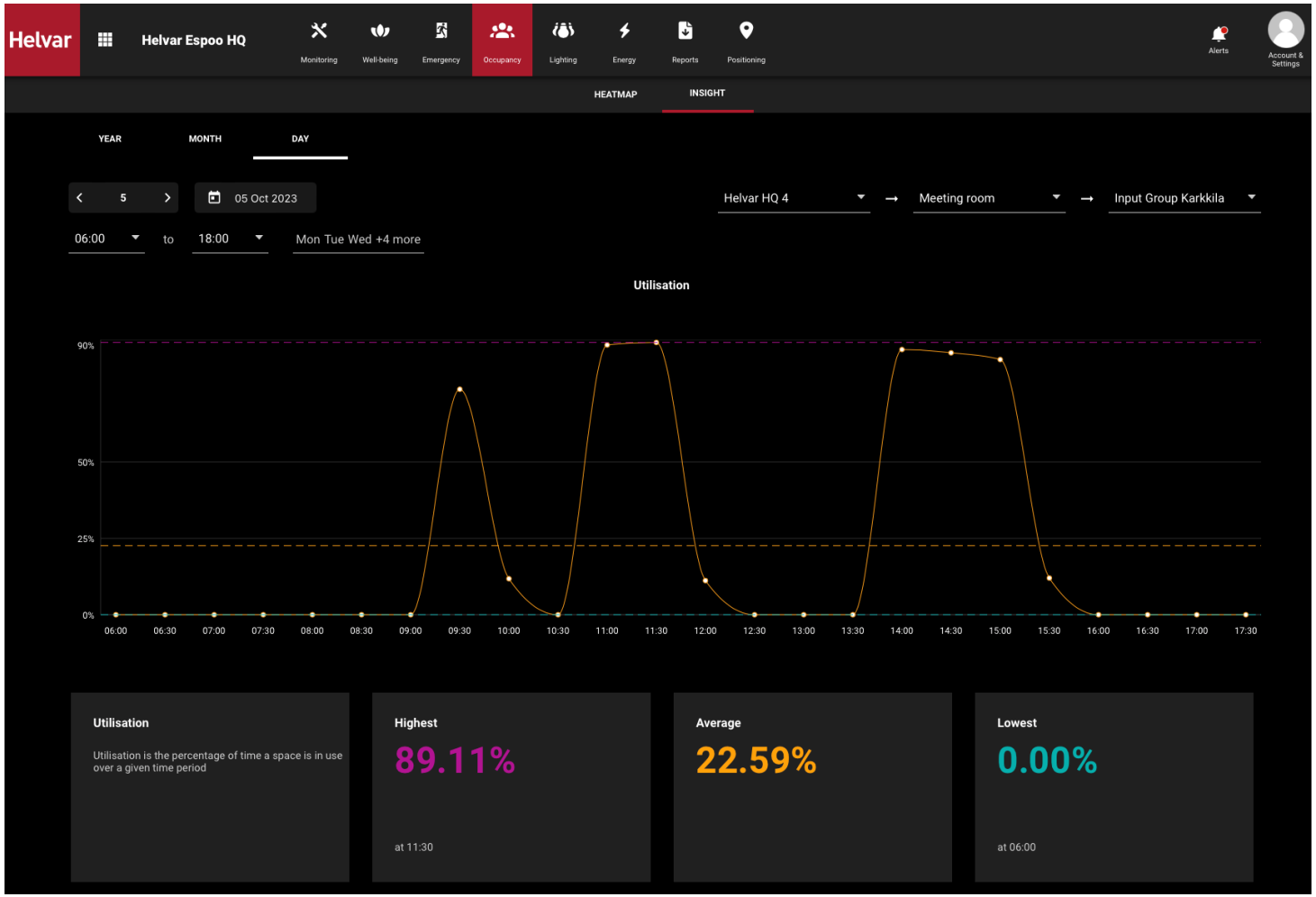
Past Data (Occupancy at the space))

Reports & Recommendations

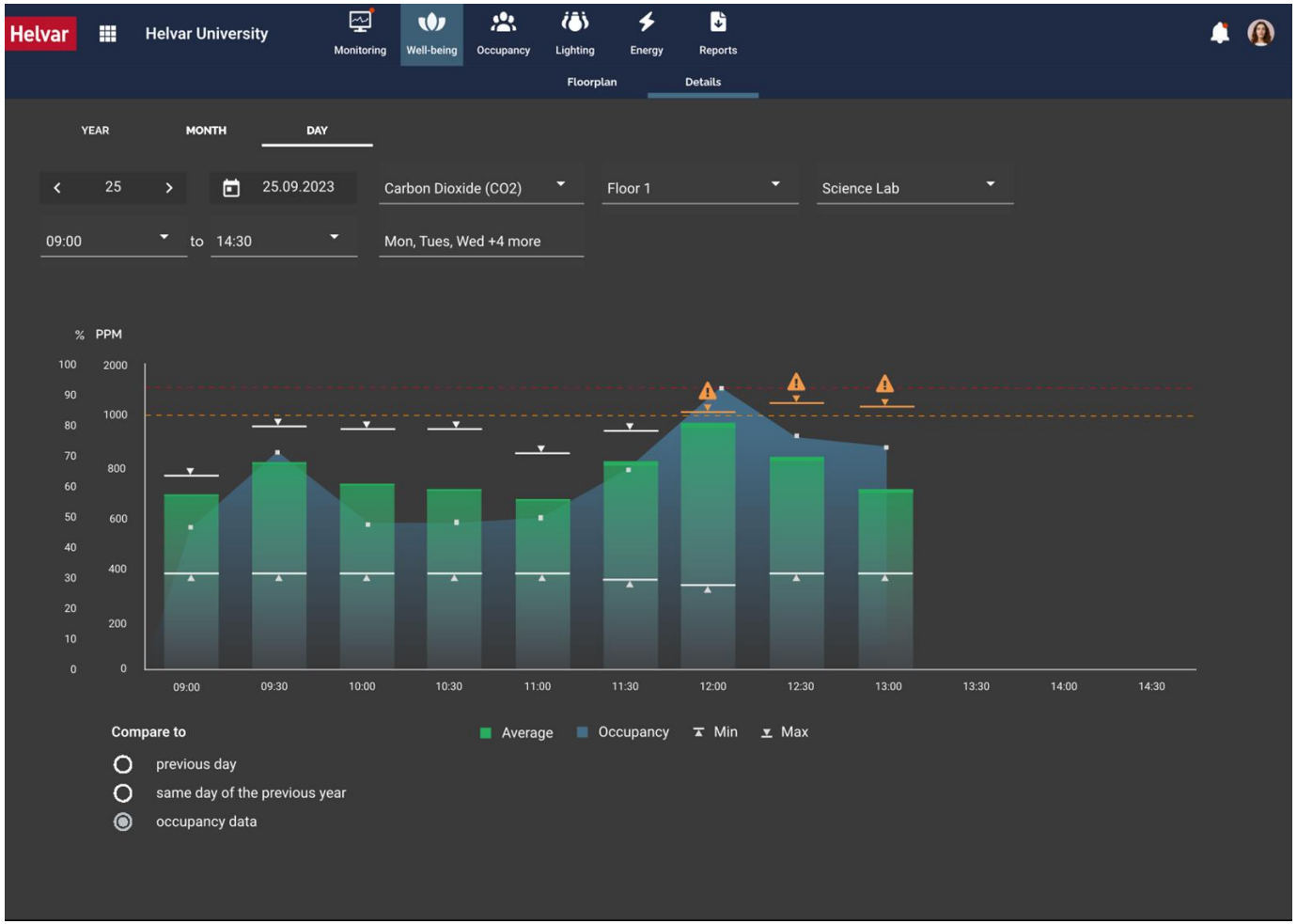
- **Understanding Space usage**
- **Differences / abnormalities**
- **Reporting periods?**
- **Finding Trends**
  - Adjusting timings
  - Adjusting levels
- **“Manual changes”**



Past Data (Adding more sensors)

Reports & Recommendations

- **Understanding Indoor conditions**
- **Differences / abnormalities**
- **Reporting periods?**
- **Finding Trends**
  - Adjusting timings
  - Adjusting levels
- **“Manual changes”**



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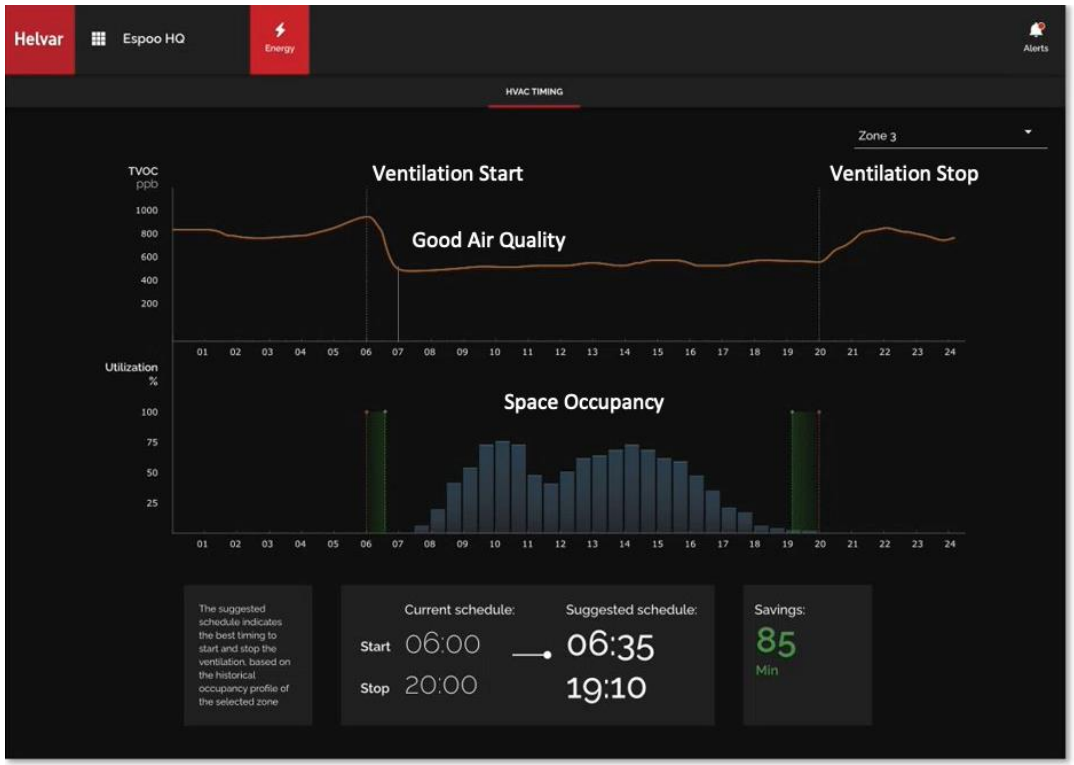
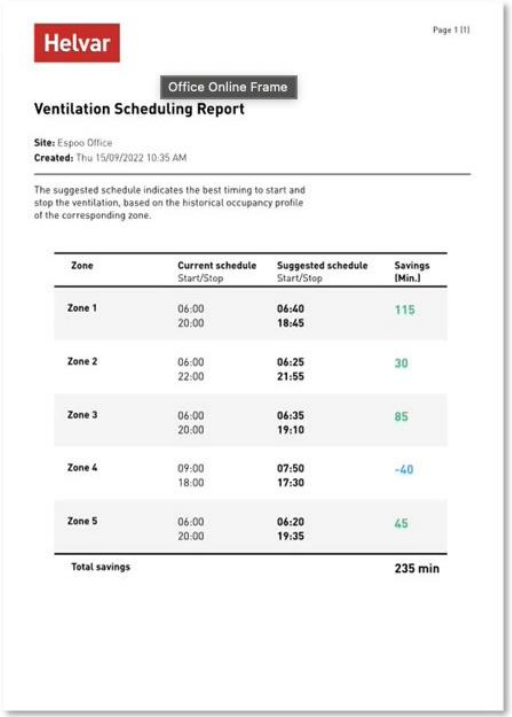
Past Data (Adding more sensors)

Reports & Recommendations

- **Understanding <u>Space usage and Indoor conditions</u>**
- **Differences / abnormalities**
- **Reporting periods?**
- **Finding Trends**
  - Adjusting timings
  - Adjusting levels
- **“Manual changes”**





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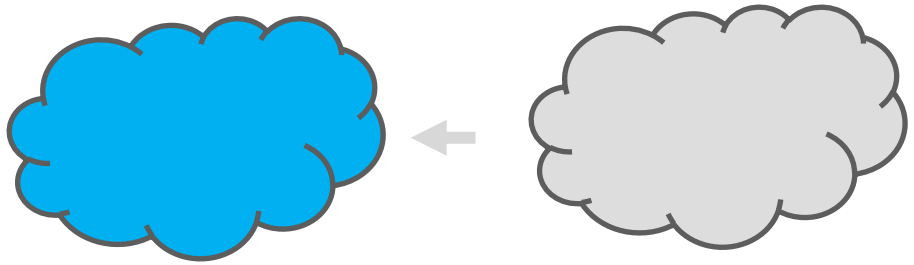
Live Data

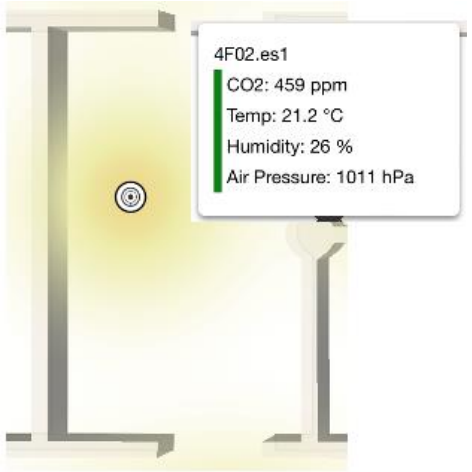
Cloud, Building or Space?



Direct inputs & Alerts

LIVE data can give inputs like:

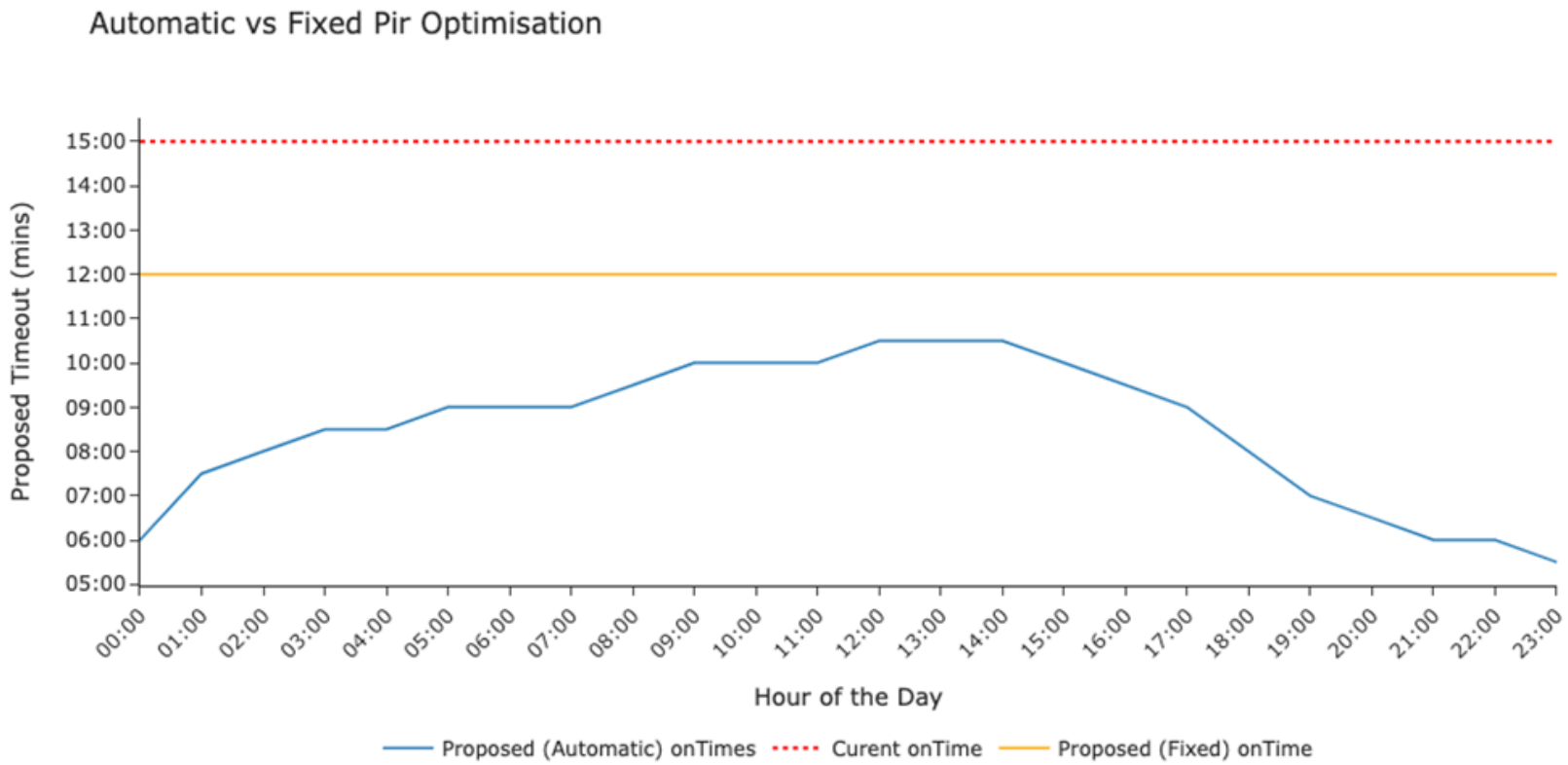
- If space is occupied, keep or turn ‘something on’ at a ‘certain level’, send info to….
- If space has been occupied X minutes…
- If space is unoccupied, act…
- If bigger area is occupied/unoccupied…
- If “value” is higher than, act…



Predictions

Leading inputs & Warnings

- **Lighting example**
  - PIR optimization
- **HVAC example**
  - Using same predictions as an input for HVAC
  - Adding new data, and data from other sources
- **Warning / indicating that omething is going to happen..**
  - “Value” is going to be over “X” after “Y” minutes



New Senses will increase opportunities

Adding new senses (like sensing additional environmental parameters at same sensor mechanics) to lighting-related sensors means:

- ✓ Lighting can work **even** better – use less energy and give better support for people's wellbeing
  - ✓ As an example using sound to improve occupancy detection
- ✓ Other building-related systems can benefit **more** from the same data, and better support wellbeing & smart energy usage

PAST DATA	LIVE DATA	PREDICTIONS
Reports	Direct inputs	Leading inputs
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Key takeaways

1 Lighting requires sensors and **'light speed'** sensor networks, which are already in buildings.

2 Lighting-based sensor data can give insights for other smart building systems in a very **cost-efficient** & **sustainable** way.

3 **PAST data, LIVE data and PREDICTIONS** have their own unique use cases, which experts of each individual building technology area know best and can develop further.