

# Session 6

## Electrical system re-commissioning - improving equipment performance

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Efficiency Centre



# TIMEPAC

## Academy

### Session 6

## Electrical system re-commissioning – improving equipment performance

Presenter: Boris Sučić – JSI

23 September 2024

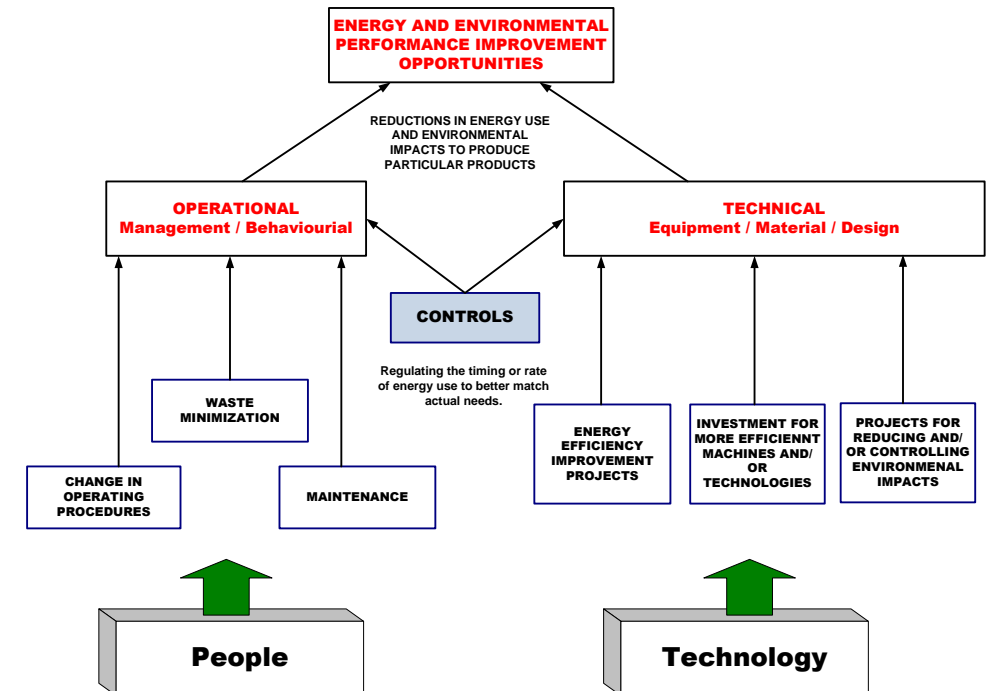
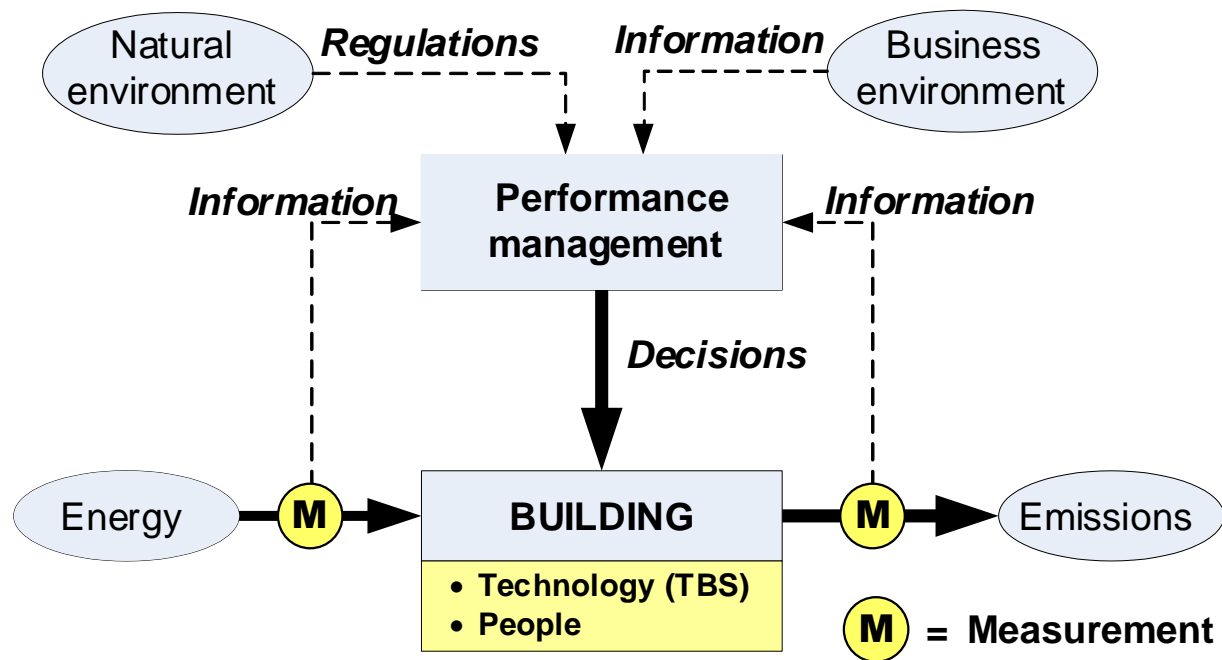


# Energy efficiency – our common challenge

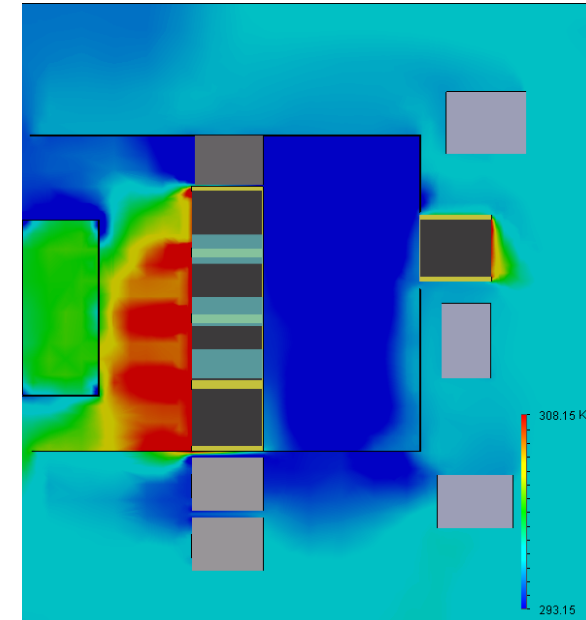
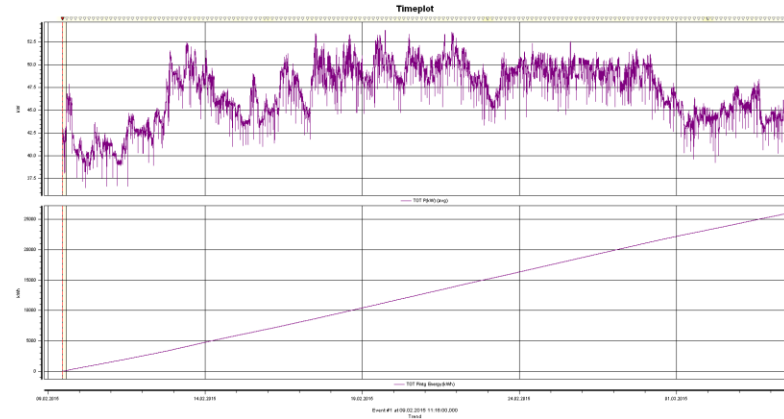
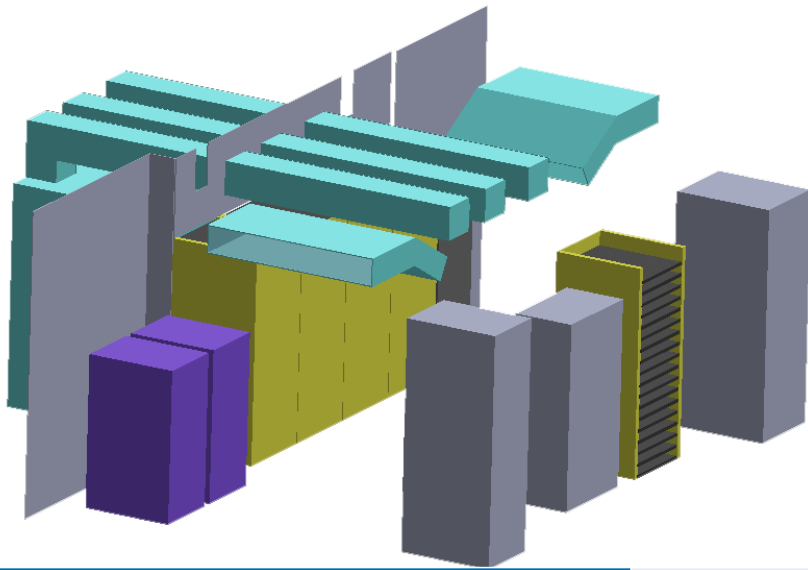
- Energy efficiency - the most powerful and cost-effective tool for achieving the sustainability goals of any company
- **Energy efficiency is not just saving energy !**
- **Reduction of energy consumption in buildings** is a vital element in the long-term transition **towards carbon-neutral society**
- The EU has identified buildings as **being the most promising target for improving energy efficiency** and has quantified a significant energy-saving potential associated with infrastructure and equipment investments
- The challenge - What can we do **to promote greater adoption of new and efficient technologies** in buildings?

# Optimization of the operation of electrical devices and systems

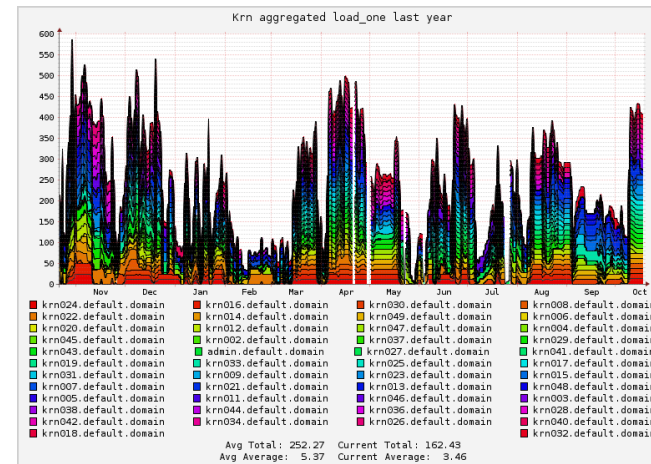
- It sounds simple: **Turn it off when you don't need it!** (golden rule)



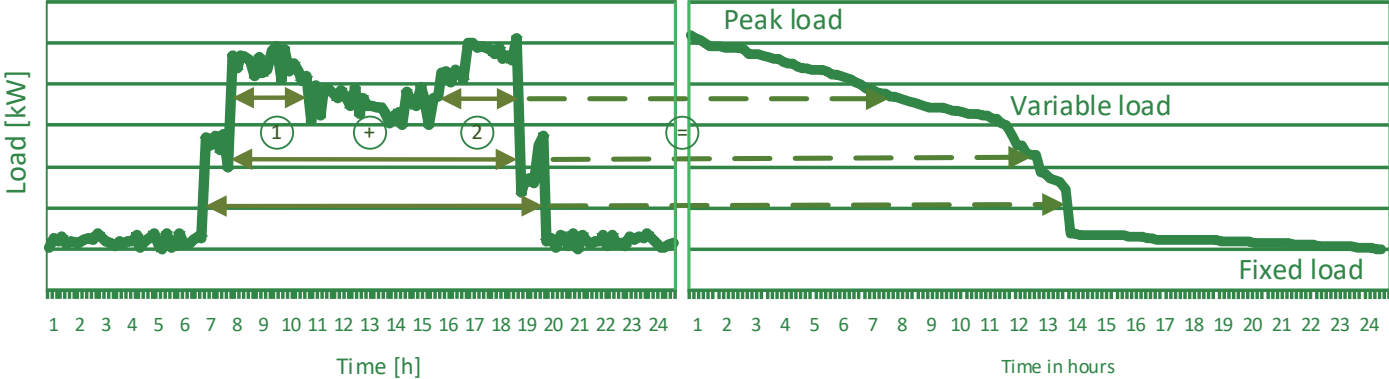
# Case study – Data room, complex performance evaluation and modelling



|  |        |
|--|--------|
| Potential reduction in electricity consumption (MWh/year)                                    | 82,3   |
| Indirect (electricity induced) CO <sub>2</sub> emission reduction (t CO <sub>2</sub> / year) | 42,2   |
| Cost reduction (€ / year)  | 6.200  |
| Payback period (static) (year)   | 2,2    |
| Net present value (€) (economic lifetime 5 years and discount rate 10%)                      | 10.000 |
| Internal Rate of Return (%)  | 36     |

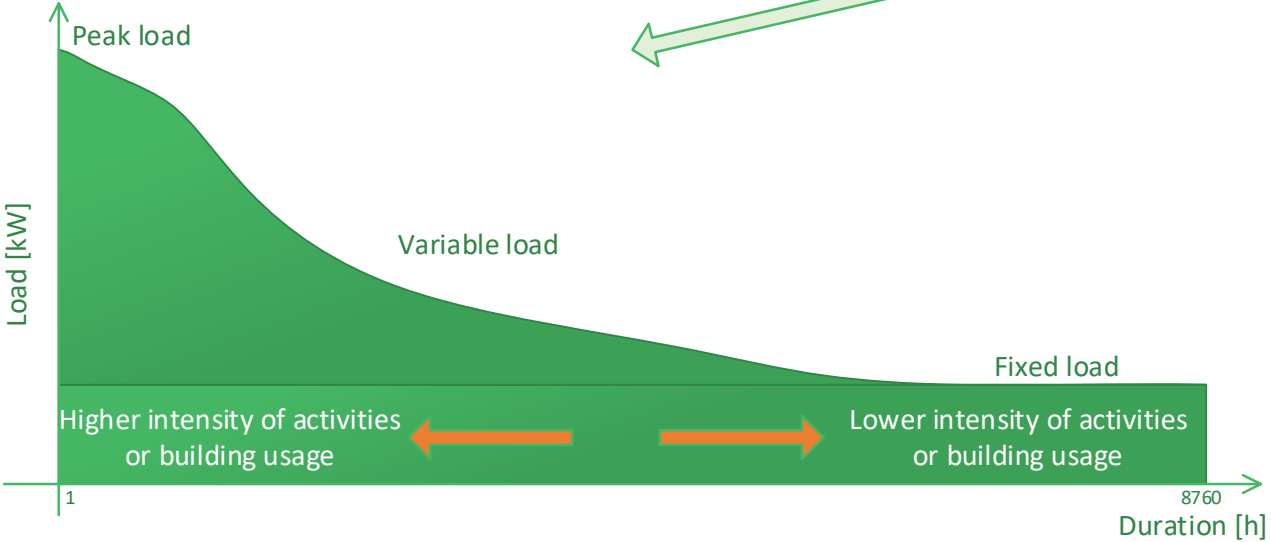


# Optimization (1/4)



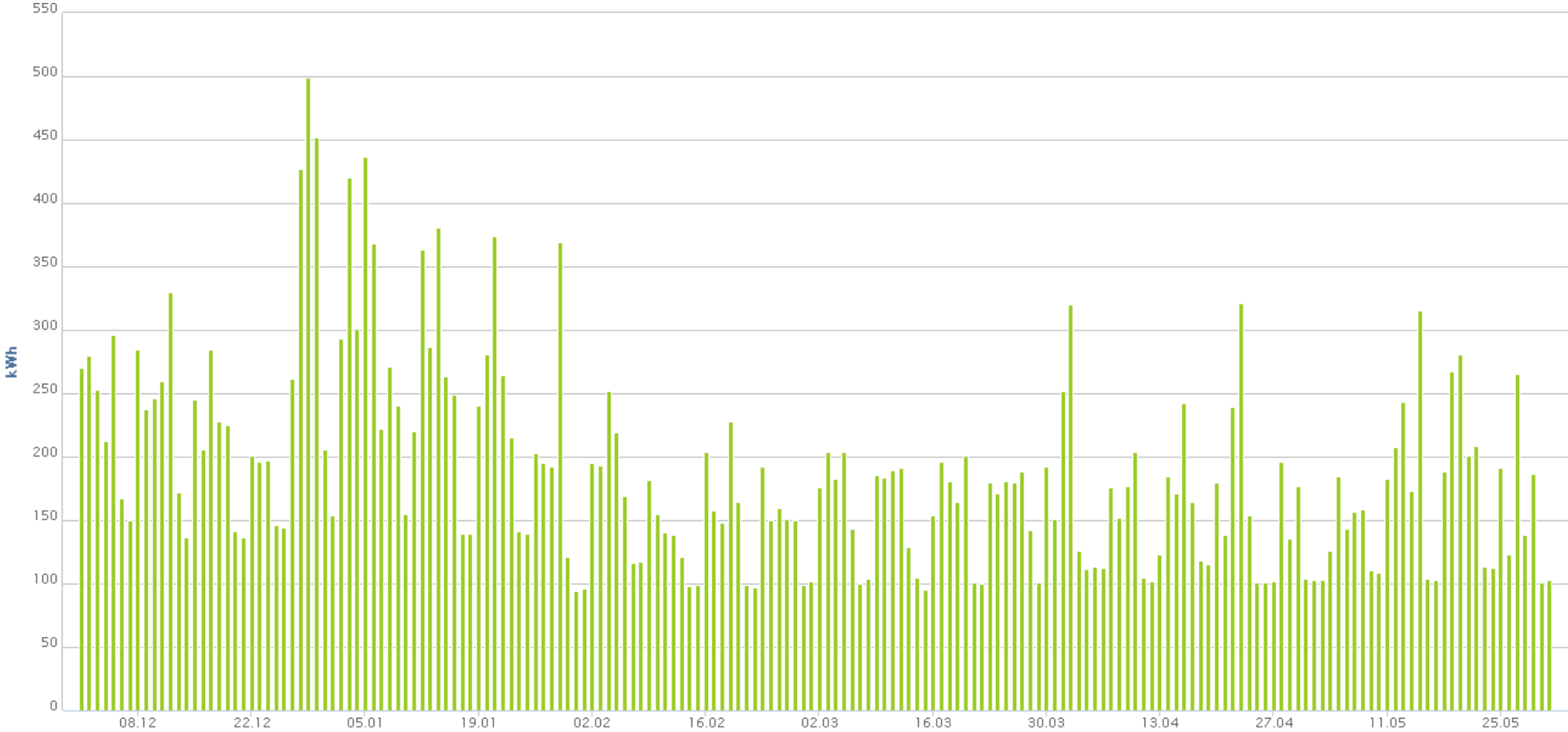
Daily Load Diagram

Daily Load Duration Diagram

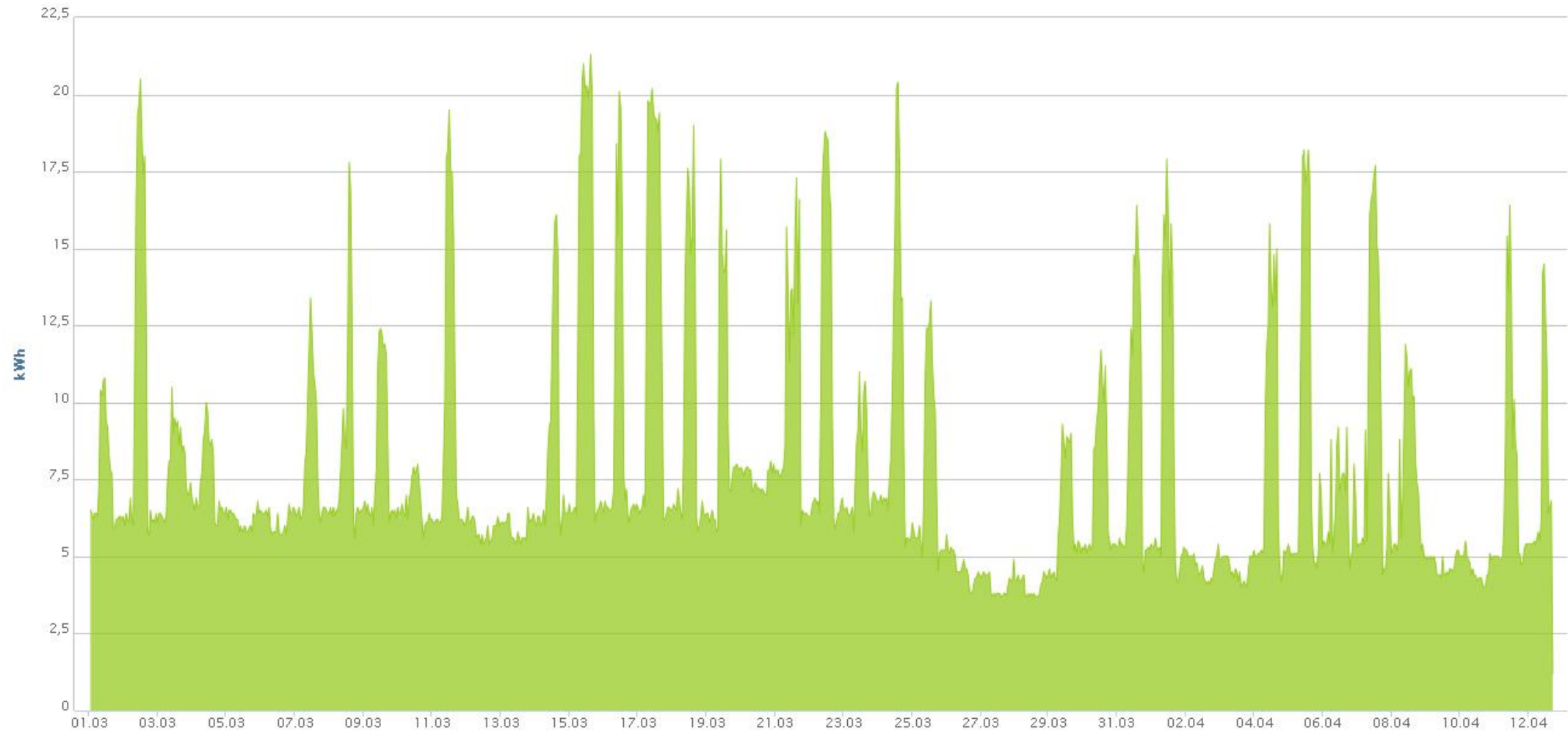


Annual Load Duration Diagram

# Optimization (2/4)

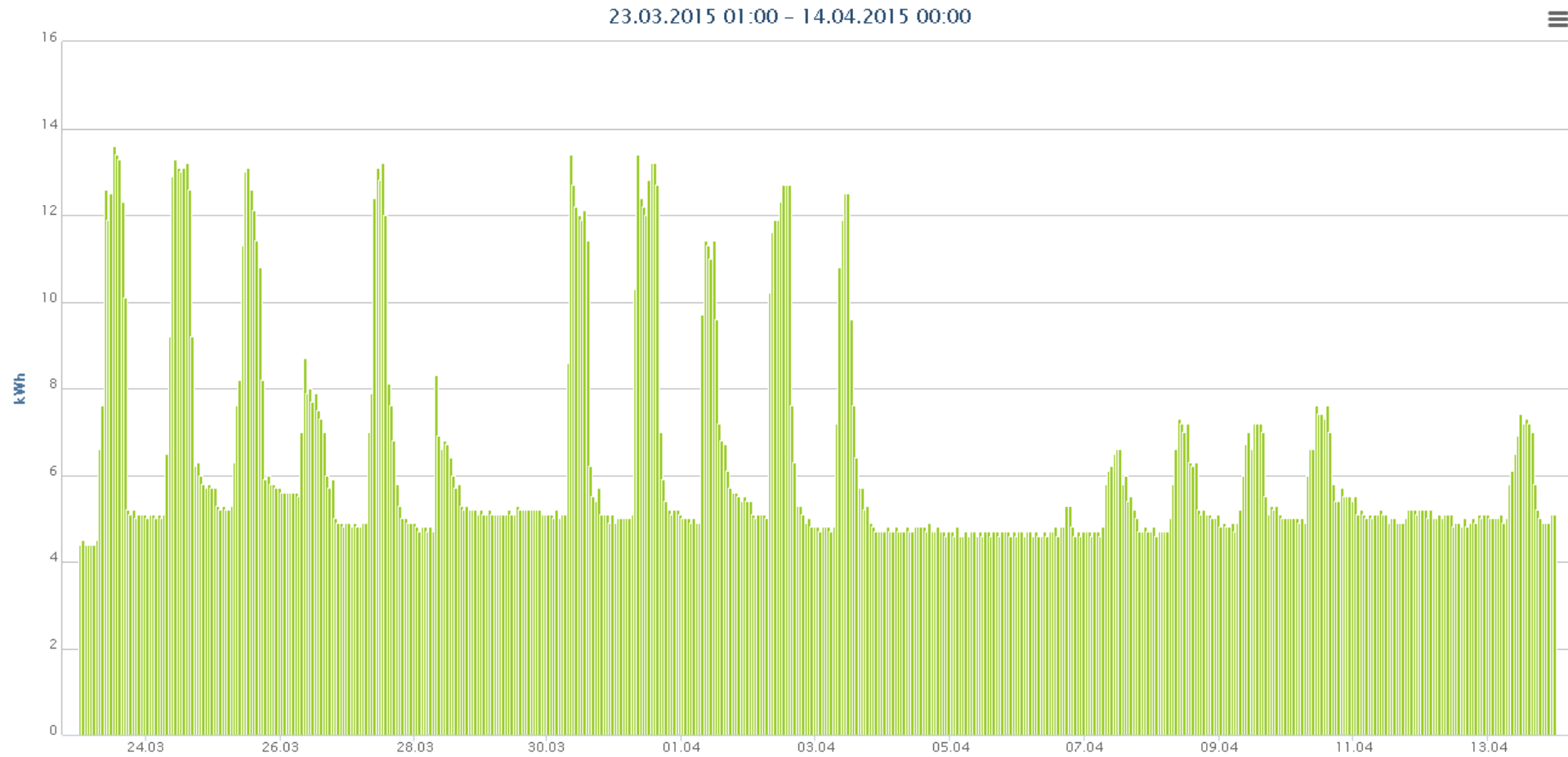


# Optimization (3/4)

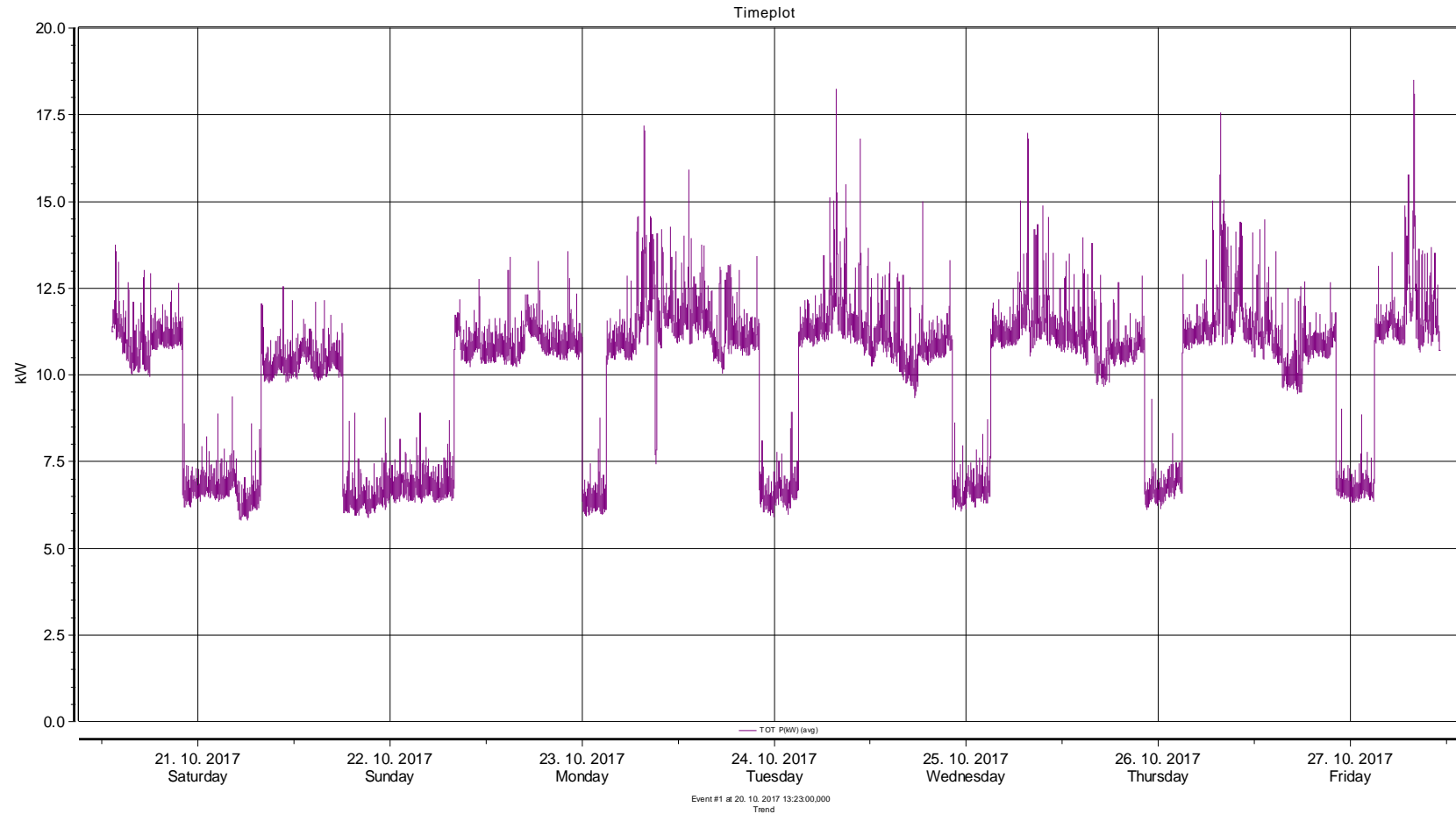




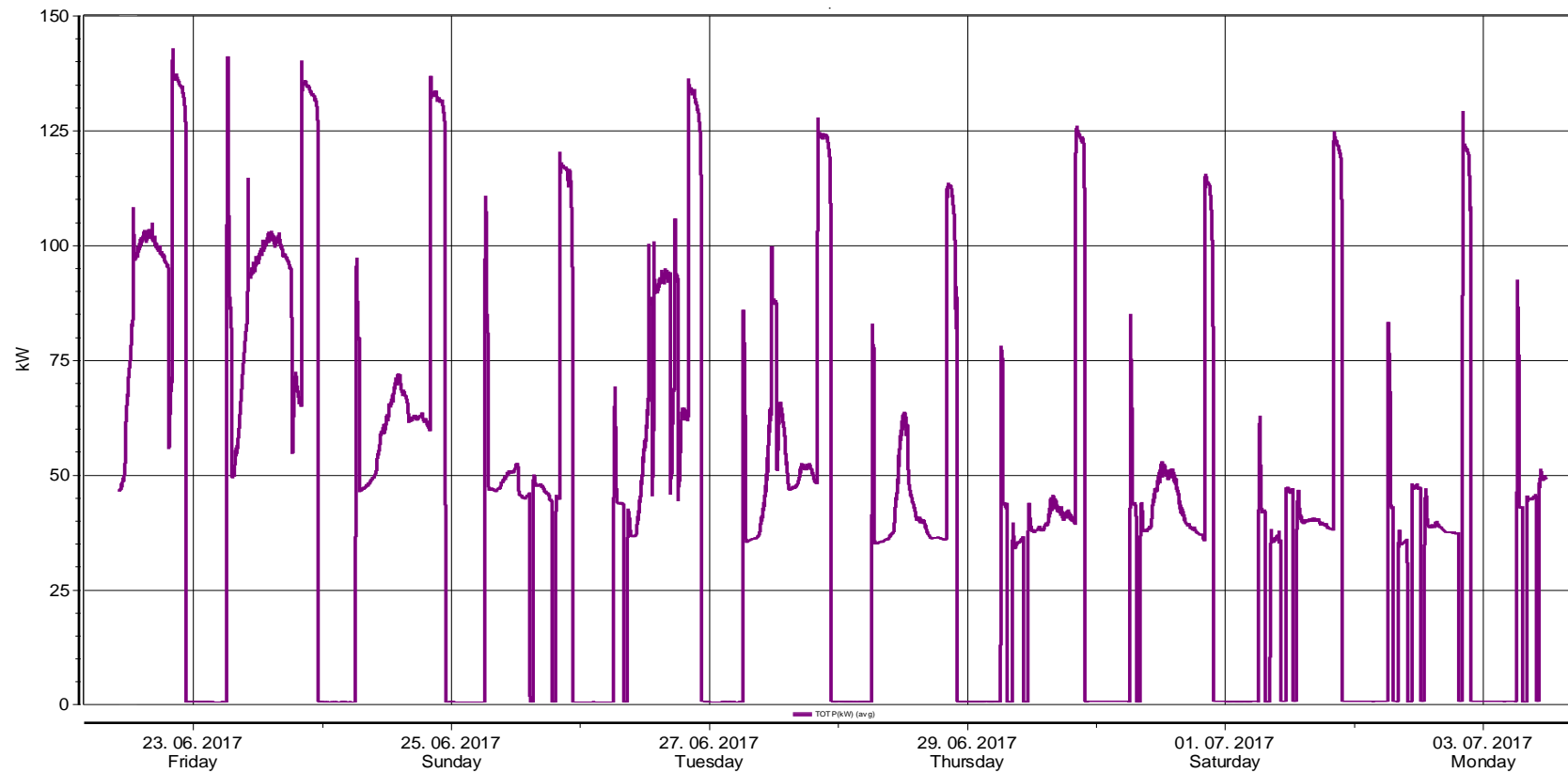
# Practical examples (1/9)



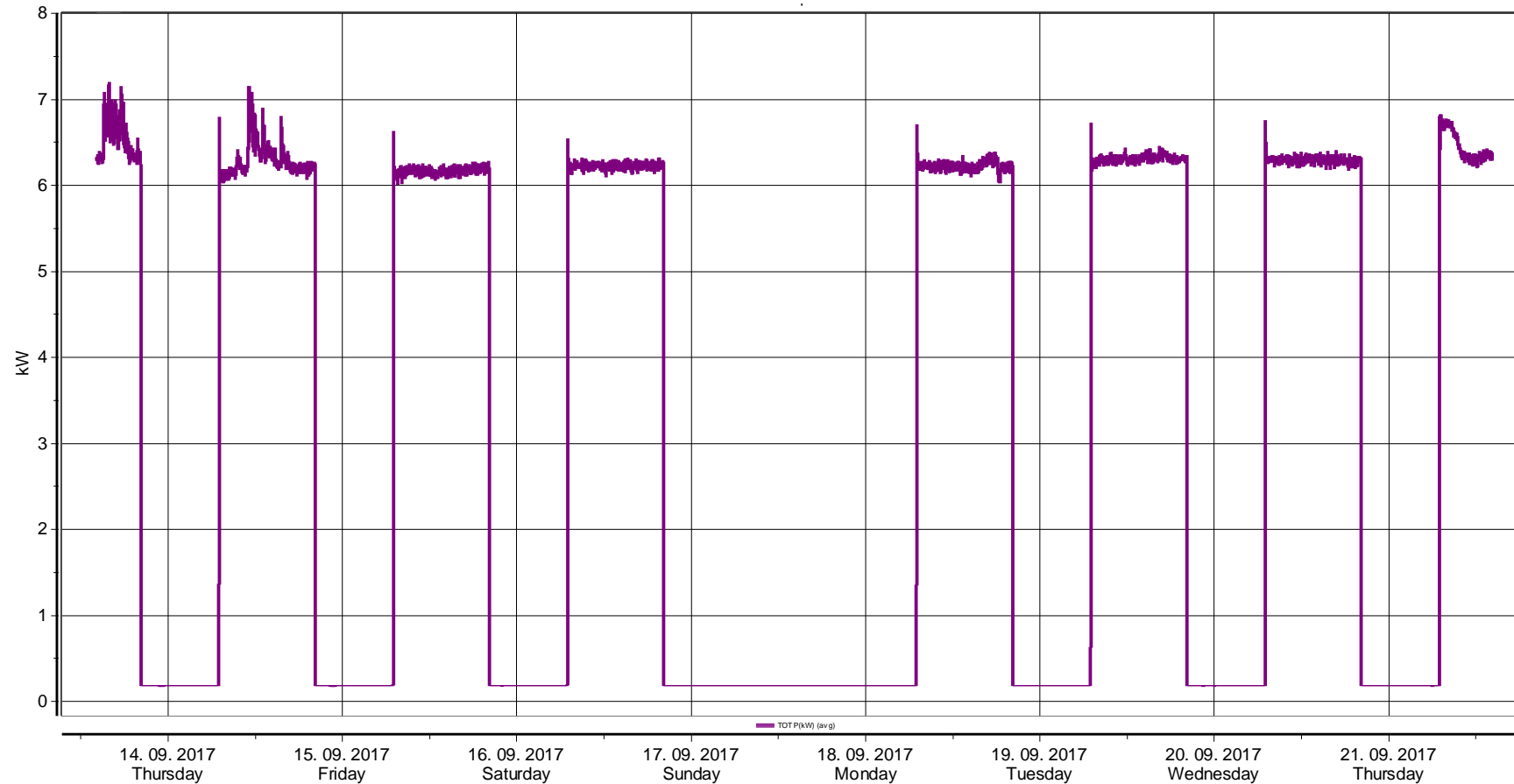
# Practical examples (2/9)



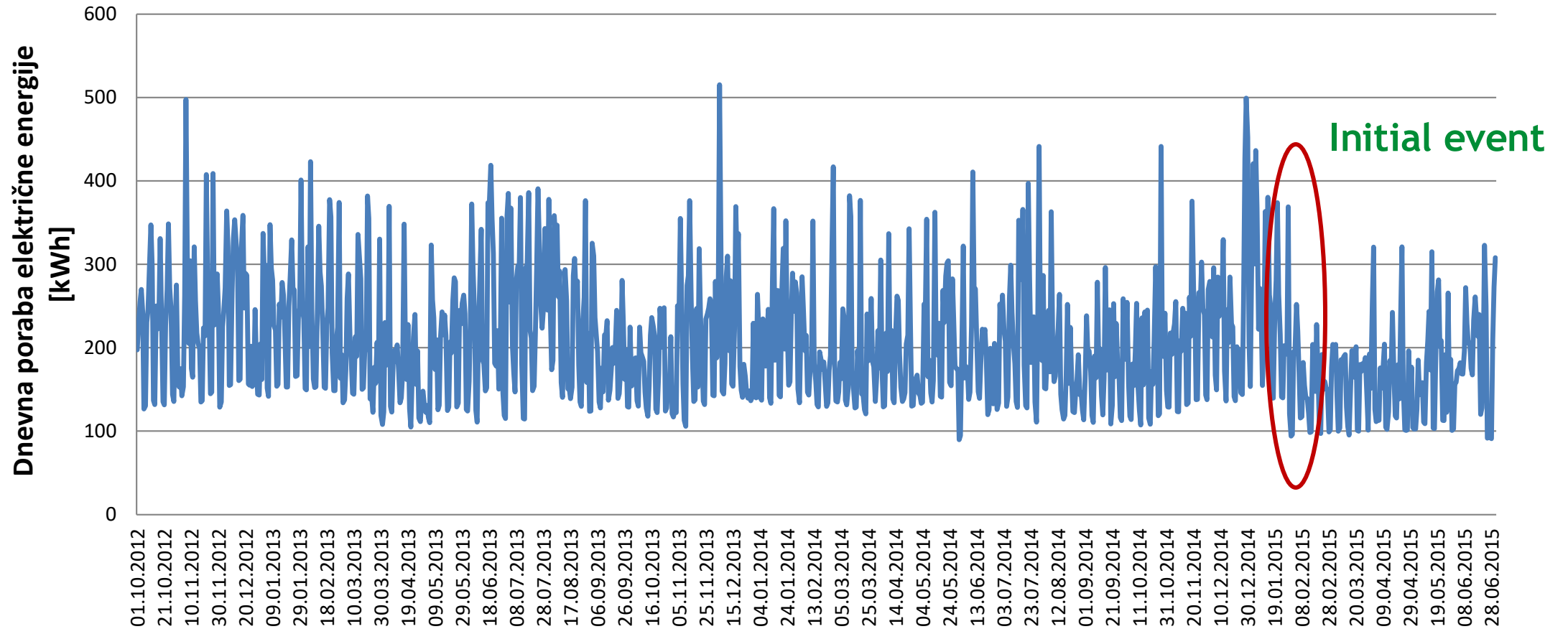
# Practical examples (3/9)



# Practical examples (4/9)

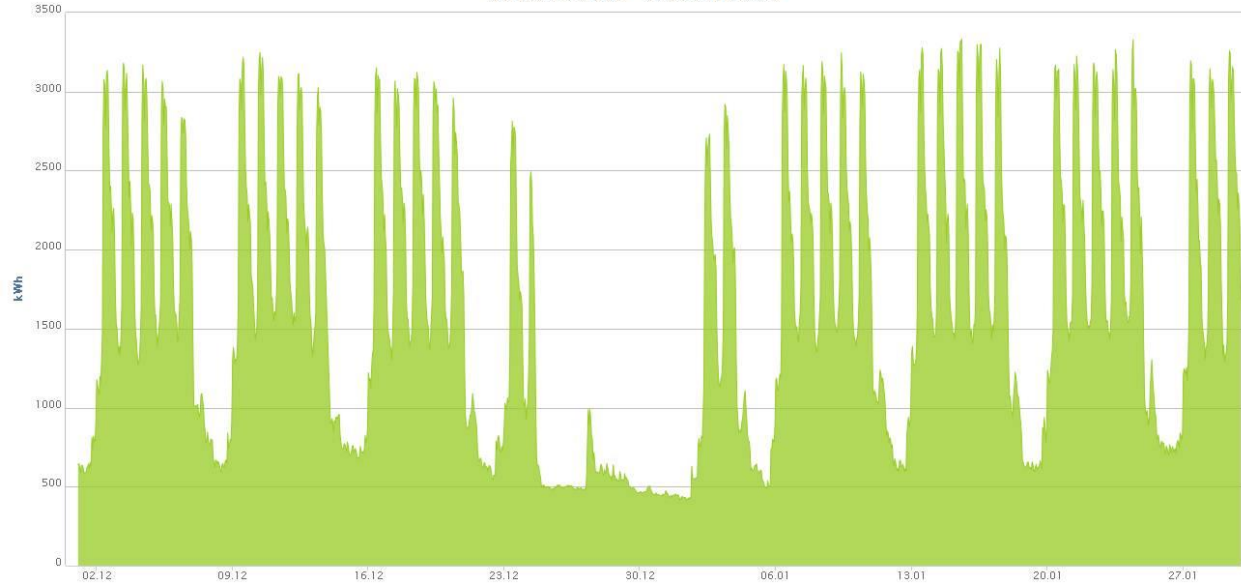


# Practical examples (5/9)

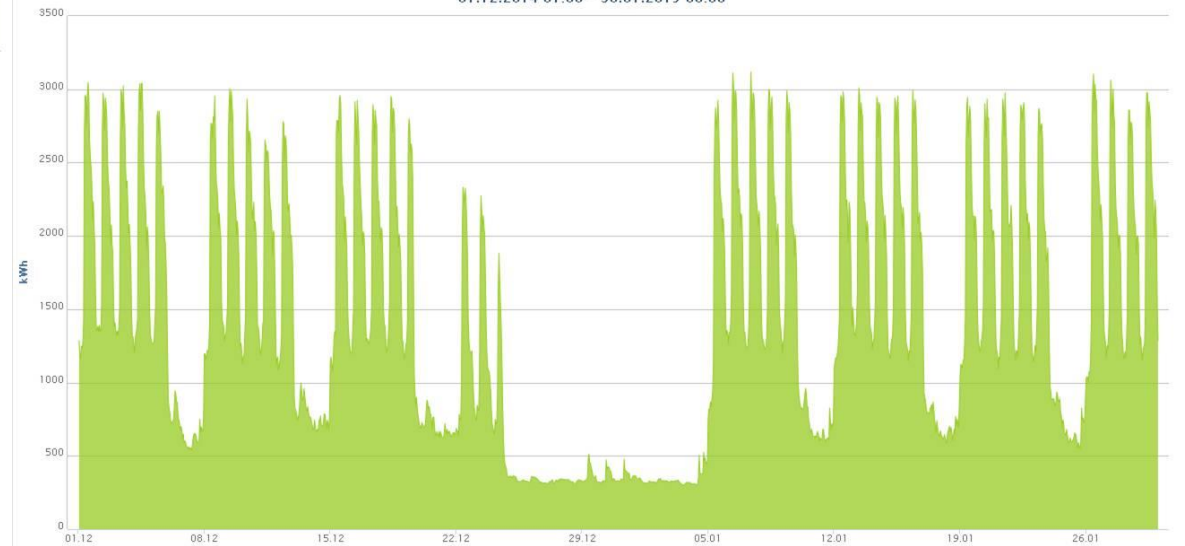


# Practical examples (6/9)

01.12.2013 01:00 - 30.01.2014 00:00



01.12.2014 01:00 - 30.01.2015 00:00

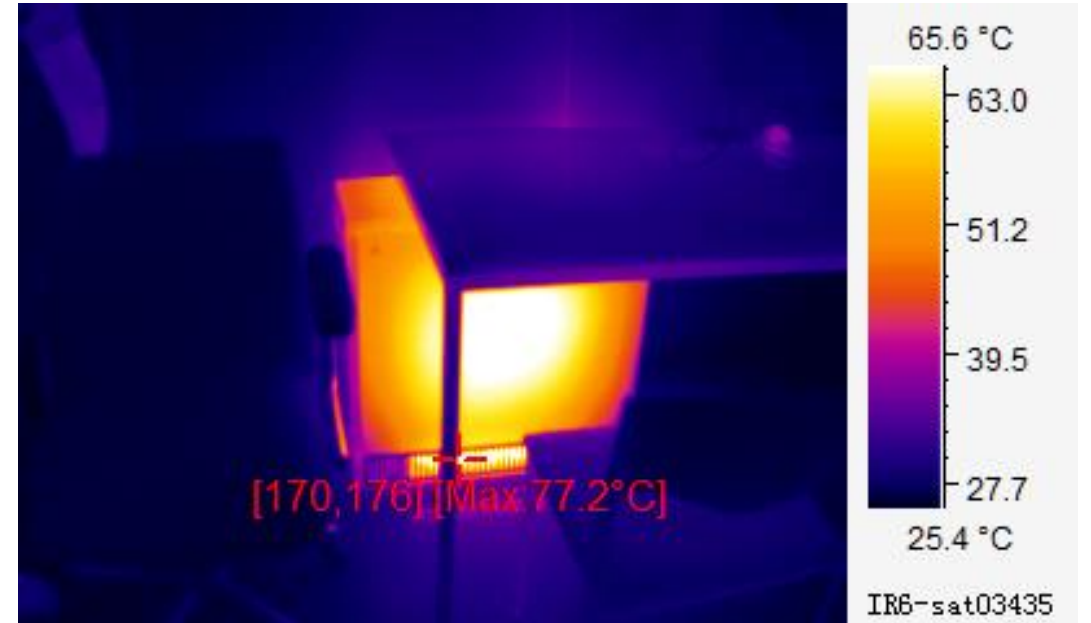




# Practical examples (8/9)

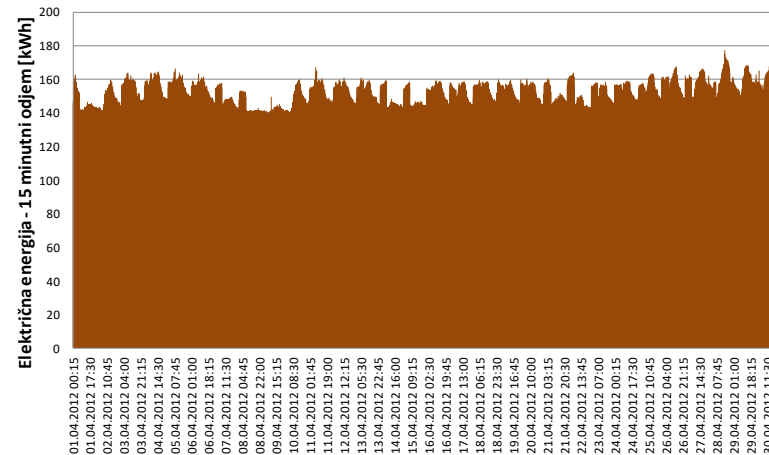
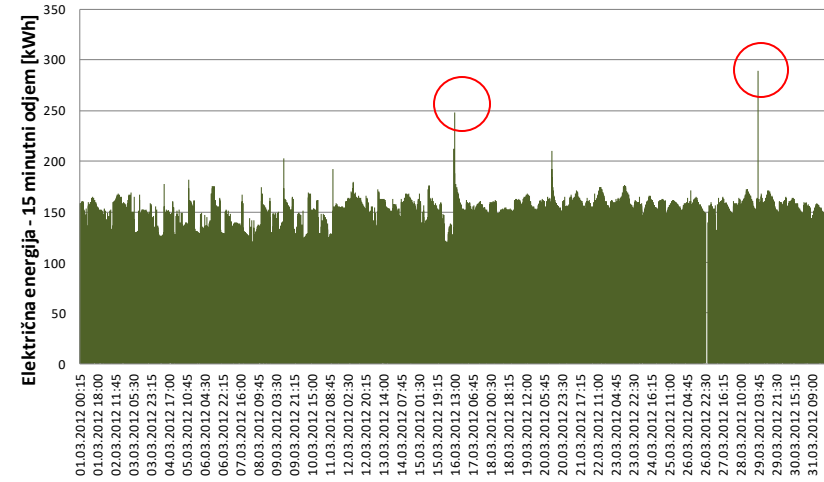
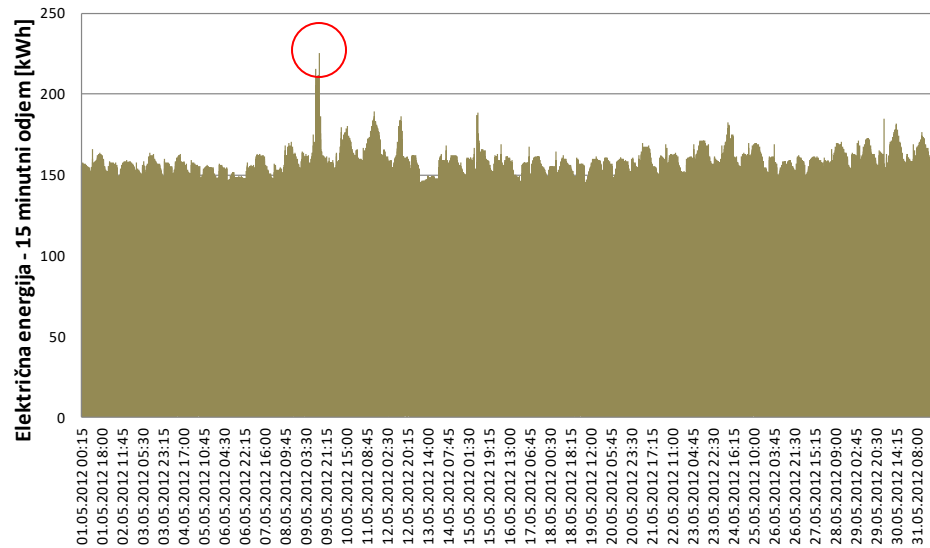
Poraba električne energije - ESC 9. SUK

| Datum      | 01:00 | 02:00 | 03:00 | 04:00 | 05:00 | 06:00 | 07:00 | 08:00 | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 00:00 |      |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|
| 1.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 2.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 3.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 4.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 112%  | 105%  | 107%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100% |
| 5.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 114%  | 100%  | 118%  | 113%  | 108%  | 107%  | 102%  | 102%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100% |
| 6.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 119%  | 114%  | 105%  | 108%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100% |
| 7.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 111%  | 122%  | 100%  | 123%  | 105%  | 110%  | 115%  | 100%  | 111%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100% |
| 8.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 101%  | 102%  | 100%  | 127%  | 111%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 9.5.2015.  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 10.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 11.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 105%  | 105%  | 124%  | 100%  | 110%  | 120%  | 100%  | 110%  | 108%  | 107%  | 101%  | 100%  | 100%  | 100%  | 100%  |      |
| 12.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 118%  | 100%  | 119%  | 100%  | 112%  | 114%  | 100%  | 112%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 13.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 105%  | 100%  | 100%  | 100%  | 110%  | 110%  | 100%  | 109%  | 128%  | 138%  | 136%  |      |
| 14.5.2015. | 140%  | 139%  | 100%  | 144%  | 145%  | 137%  | 100%  | 130%  | 154%  | 142%  | 105%  | 138%  | 137%  | 126%  | 100%  | 100%  | 101%  | 116%  | 106%  | 100%  | 126%  | 118%  | 100%  | 122%  |      |
| 15.5.2015. | 121%  | 100%  | 118%  | 127%  | 100%  | 108%  | 123%  | 110%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 107%  | 108%  | 105%  | 143%  | 136%  | 100%  | 137%  | 136%  |      |
| 16.5.2015. | 111%  | 135%  | 143%  | 137%  | 106%  | 147%  | 143%  | 100%  | 145%  | 145%  | 111%  | 125%  | 146%  | 141%  | 101%  | 139%  | 143%  | 142%  | 100%  | 149%  | 143%  | 100%  | 142%  | 145%  |      |
| 17.5.2015. | 142%  | 100%  | 139%  | 143%  | 130%  | 110%  | 141%  | 145%  | 115%  | 122%  | 144%  | 142%  | 100%  | 139%  | 146%  | 119%  | 118%  | 141%  | 145%  | 100%  | 141%  | 147%  | 141%  | 100%  |      |
| 18.5.2015. | 133%  | 133%  | 138%  | 104%  | 123%  | 135%  | 137%  | 127%  | 145%  | 133%  | 136%  | 124%  | 125%  | 132%  | 130%  | 118%  | 100%  | 121%  | 142%  | 130%  | 102%  | 141%  | 144%  | 112%  |      |
| 19.5.2015. | 124%  | 143%  | 148%  | 116%  | 123%  | 139%  | 146%  | 140%  | 142%  | 135%  | 115%  | 123%  | 119%  | 106%  | 119%  | 106%  | 145%  | 124%  | 116%  | 105%  | 105%  | 120%  | 100%  | 119%  |      |
| 20.5.2015. | 100%  | 120%  | 100%  | 121%  | 100%  | 119%  | 100%  | 104%  | 100%  | 100%  | 110%  | 119%  | 104%  | 115%  | 105%  | 112%  | 144%  | 114%  | 100%  | 100%  | 102%  | 102%  | 103%  | 100%  |      |
| 21.5.2015. | 101%  | 101%  | 102%  | 102%  | 103%  | 100%  | 103%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 105%  | 205%  | 135%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 22.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 102%  | 101%  | 100%  | 100%  | 100%  | 107%  | 100%  | 100%  | 105%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 23.5.2015. | 100%  | 102%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 101%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 24.5.2015. | 100%  | 101%  | 100%  | 100%  | 101%  | 100%  | 100%  | 101%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 101%  | 100%  | 100%  | 102%  | 100%  | 103%  | 100%  |      |
| 25.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 102%  | 100%  | 106%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 26.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 27.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 28.5.2015. | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 102%  | 100%  | 100%  | 100%  |      |
| 29.5.2015. | 101%  | 101%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  | 100%  |      |
| 30.5.2015. | 102%  | 104%  | 100%  | 100%  | 104%  | 103%  | 100%  | 100%  | 101%  | 100%  | 101%  | 100%  | 103%  | 100%  | 100%  | 101%  | 100%  | 100%  | 103%  | 101%  | 100%  | 102%  | 100%  | 103%  |      |
| 31.5.2015. | 101%  | 104%  | 100%  | 100%  | 104%  | 102%  | 100%  | 103%  | 100%  | 100%  | 101%  | 100%  | 102%  | 100%  | 101%  | 102%  | 100%  | 100%  | 104%  | 102%  | 100%  | 103%  | 100%  | 104%  |      |





# Practical examples (9/9)



# Additional indicators

- **Server rooms:** The ratio between the power for IT equipment and total power (**Power Usage Effectiveness (PUE) and Data Centre Efficiency (DCE)**)
- **Peak load duration:** The ratio between the total annual electricity consumption and maximum power ( $t = E_{\text{annual}} / P_{\text{max}}$ )
- **Share of energy costs in total annual costs**
- **Electricity consumption per m<sup>3</sup> of net volume** (allows comparison between different facilities from the same sector)

# Conclusion

- **Copy-paste planning - the most frequent mistake!**
- The energy performance certification is **the first step in the improvement of energy performance** - our entry point and unique opportunity
- Set goals with **clearly defined responsibility for implementing measures** and provide support to overcome obstacles
- Combining activities: **Energy audit + Re-Co + EPC + SRI = sustainable reduction of energy consumption**
- SIST EN ISO 50001:2018 is based on the assumption that **the company will periodically review and evaluate its energy management system**, thereby identifying opportunities for improvements and their implementation

**If you would like more information,  
please visit [www.timepac.eu](http://www.timepac.eu) or contact us at  
[boris.sucic@ijs.si](mailto:boris.sucic@ijs.si)**

Thanks for your attention!