

Motivation

- Power grid operators have to maintain a balance between supply and demand. An imbalance causes a frequency shift from the set point of 50 Hz. While small deviations are normal, larger deviations cause emergency routines like load shedding.
- Proof-of-Work cryptocurrencies consume high loads of electric power from the grid. We investigate whether the power consumption of Bitcoin and Ethereum in Europe might destabilize the Synchronous Grid of Continental Europe spanning over 24 countries in Europe and Northern Africa.

Threat Model

An (occasional or malicious) incident leads to the outage of miners eventually causing totalled fluctuations on power consumptions.

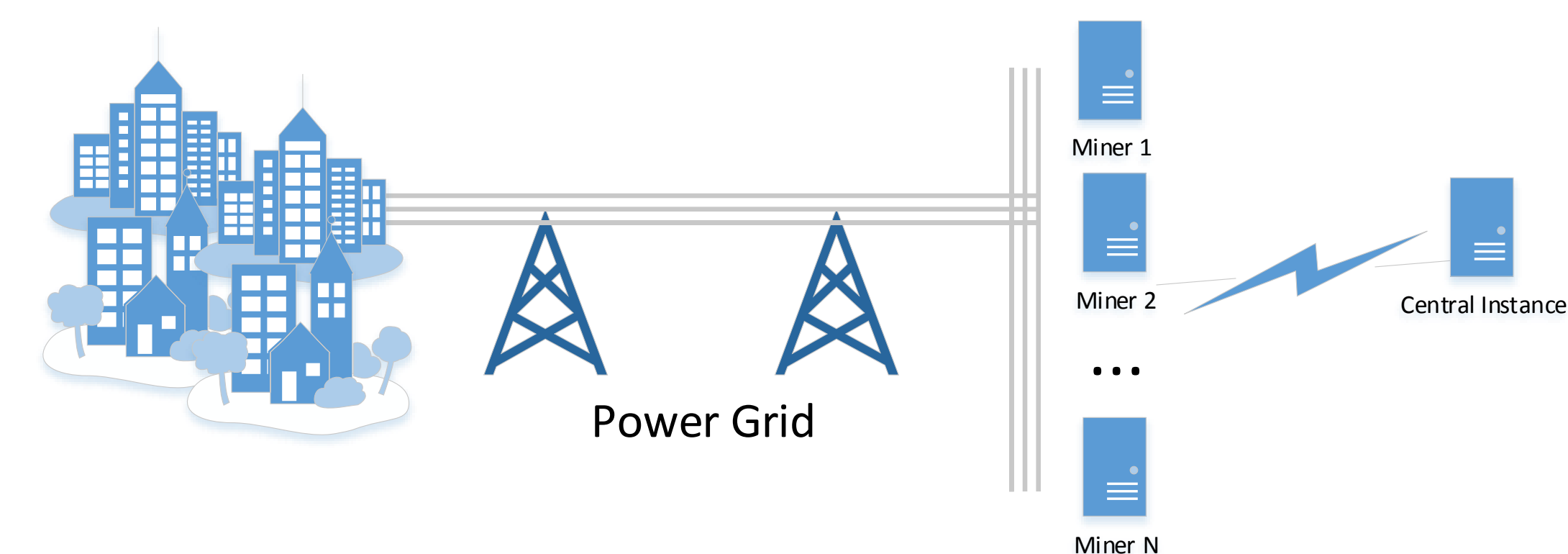
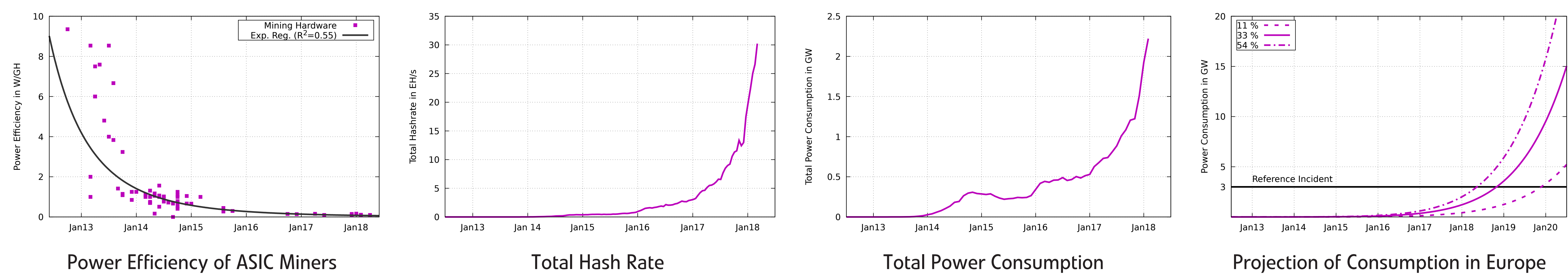
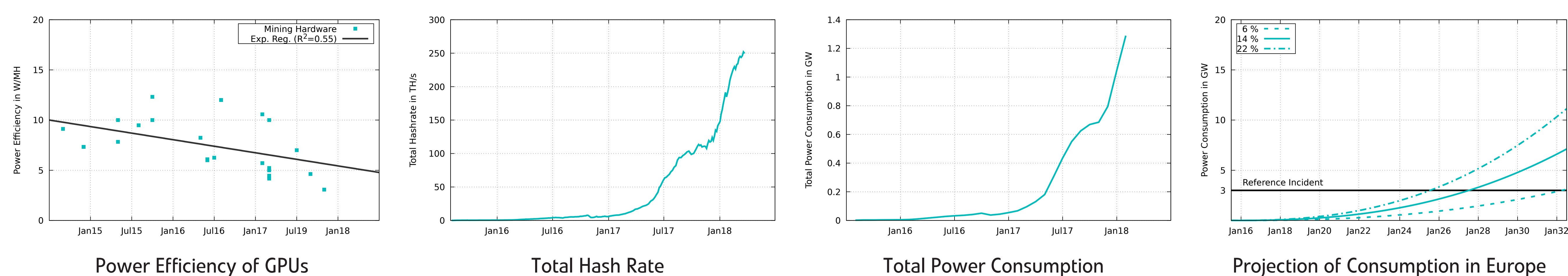


Figure 1: Threat Model

Results: Bitcoin



Results: Ethereum



Methodology

- Assessment of available power consumption models
- Collection of data sheets for mining hardware
- Regression analysis of mining hardware's power efficiency
- Estimation of hash rate from public blockchains
- Projection of total power consumption based on a mining mix
- Attribution of power consumption to geographic areas
- Comparison with reference values of respective power grids

Conclusion

- In Europe, Bitcoin and Ethereum draw power in the order of magnitude of a nuclear power plants.
- An incident leading to an outage of miners is able to destabilize the European power grid and might eventually lead to blackouts.
- In comparison to previous works focusing on botnets, such an incident decreases the grid's electric load – a situation which is more difficult to handle by grid operators.