

# Impacts of Increasing Electricity Prices: CMS Perspective

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# Impacts of Reductions in Computing Resources

The loss of a computing site, whether unexpected or not, represents a continuing risk for all experiments:

- Especially impactful for a Tier-1, which plays a particular role in the CMS computing model.
  - Hold the working copy of the RAW data for CMS
  - Re-reconstruction takes place, e.g. during the year-end shutdowns
  - Hold the archival tape copies of simulated data sets
- We have lost (temporarily or permanently) Tier-1 sites before, due to fire or flood, e.g.
- Loss of a large Tier-2 site, while significant, does not have a similar impact to central activities: mostly affects physics analysis and Monte Carlo production, but not detector data re-reconstruction.

**Impacts of the loss of a Tier-1 site: Delays in re-reconstruction, and therewith physics analysis, and puts stress on remaining Tier-1 sites**

# Pledged and Beyond-Pledge Resources

However, we need to make a clear distinction between pledged and beyond-pledge resources:

- Beyond-pledge resources are by their very nature opportunistic.
- The success of the CMS physics program does not depend on them.
- However, we are very grateful to the sites and for such resources and strive to maximize our efficient use of them when they are available.
- Opportunistic capacity allows us to perform activities beyond the baseline, such as tests for new and expensive Monte Carlo Generators, optional studies of systematic effects, and an overall speeding up of the arrival of Monte Carlo samples in general.

**The baseline physics program of CMS  
 may be impacted by reductions in  
 pledged computing resources.**

# Impacts of Reductions in Computing Resources

The loss of Tier-1 storage is particularly impactful:

- CMS has a flexible computing model incorporating remote reading of data through XRootD
  - As long as storage is online, data can be read from processing resources elsewhere (with certain limitations), or copied via Rucio to another site if there is enough disk space,
  - at the cost of additional operational load and perhaps a loss of efficiency.
- Reductions in pledged processing capacity (CPU) is less impactful and delay the program of CMS rather than stopping it.
- Tier-2 sites do not hold on disk any unique unreproducible data in the CMS computing model.
  - Impacts may be delays in analysis and simulation but not reprocessing.

**As former and present site responsables, we find the weekly or even daily turning on and off of compute or storage to be an unrealistic option.**