Anna Carlmark, enhetschef



Energy crisis impact on Research & Innovation

Dr. Anna Carlmark Malkoch, Swedish Research Council

Director Infrastructure support unit

Research Infrastructures under pressure

- Delays after the pandemic
- Geopolitical situation
- Inflation rate contra model of indexation
- Energy prices
- Energy shortage/instability in market



MAX IV strategy 2023-2030 - MAX IV (lu.se)



Many research infrastructures signal large increases in costs and requests increased budgets for coming years, i.e. increase of membership fees on international research infrastructures

Several papers and discussions on this topic



Cryogenics account for more than half of the LHC's electricity consumption.

ENERGY CRISIS SQUEEZES FR MA JOR FAC

Large Hadron Collider to end 2022 data-taking season two weeks early to save on electricity.

By Brian Owens

s energy prices spike as a result of Russia's invasion of Ukraine, possibly causing a global economic downturn and stoking fears of rolling blackouts CERN's flagship machine, the 27-kiloespecially in Europe - science lab-

campus, including switching off street lighting at night and delaying the start of building heating by one week. to respond to the challenge". The Technology Facilities Council, wh **Keeping cool** eral large sites, including the Dia

Source in Didcot, says all of its fai metre-long Large Hadron Collider, is a major been working on energy-reducti oratories are not being spared. The situation electricity glutton, in large part because of a number of years to meet their n

https://www.nature.com/articles/d41586-022-03257-8

research and computing at CERN. The reduction in operations will lower that significantly next year, although not by the full 20%, because the accelerator magnets still need to be kept cool while the facility is offline.

The move will help to save money amid rising energy prices, but Mnich says cost was not the main driver of the decision. Natural gas is the primary source of electricity and heating in the winter in much of Europe, and CERN wants to reduce its use of the limited supplies, leaving more for people to heat their homes. "This is something we do not primarily to save money, but as a sign of social responsibility," he says.

The longer shutdowns will affect the scientists who rely on CERN's other accelerators for their experiments. Those that were scheduled for the last two weeks of this year's run will have to be postponed until next ;

competition for the reduced be: Short supply: How will R&D survive the energy year will be fiercer than usual, say

total number of proton-proton theLHC will be lower than normal Crisis? next, but Mnich does not expect a huge effect on the science. "Or

Energy prices are also rising s in the United Kingdom, although

the whole of run 3, which goest A public Science | Business webcast (16:00 – 17:00 CET) of 2025, there will probably onl effect," he says.

> Short supply: How will R&D survive the energy crisis? SB Science|Business

Research infrastructures are about to get vocal about the energy crisis

25 Oct 2022 | News

The rising cost of energy spells scaling back and temporary shut downs for vital research infrastructures, which are now looking for help from governments to pay their bills. 'We are going to make ourselves heard,' they say

By Goda Naujokaitytė





https://sciencebusiness.net/news/re search-infrastructures-are-aboutget-vocal-about-energy-crisis

Vetenskapsrådet crisis

https://sciencebusiness.net/events/short -supply-how-will-rd-survive-energy-

Florin Zubascu Executive Editor, Science/Business

SCIENCE BUSINESS

there would not say how this wil operations in the short term. A son for Imperial College Londo although the university, like all I zations, is affected by the rising co "we are confident in our resilience

Need from the RIs:

- Long term planning
- Limitations in the cost for energy
- Guaranteed capacity
- Sustainable, affordable and predictable energy supply

Relief current financial stress by:

- Seeking extra government funding
- Energy price gap for RIs



https://sciencebusiness.net/news/research-infrastructures-are-about-get-vocal-about-energy-crisis

Different situations för different governments/funding agencies

- Currencies
- Inflation rate
- Legislation
- Governmental support, subsidies (covering inflation, electricity costs etc.)
- Most likely limited ability to meet needed increase of budgets in the short term, to fully cover increase in cost.



RIs – different approaches to the increase in costs

Need for RIs to develop contigency plans and to activate these

Savings:

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- Decrease staff
- Postpone or cancel investments and upgrades
- Cancel conferences, events, education- and mobility programs

Decrease operations:

- Postpone or cancel projects
- Run at lower power settings
- Less run-time
- Temporary shut-downs

Energy situation:

- Power Purchase Agreements (energy price fixed for 15-20 years)
- Energy saving projects

Consequences to research and innovation

Concerns:

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- Increased competition to access to RIs
- Fewer experiments to be run
- Affect mainly younger researchers in early carreers
- Quality of experiments run
- Re-growth of competence
- Capital destruction (crucial investments cannot be done)

Possibilities:

- Push for innovation and technical development
- Collaboration between RIs across fields
- Energy efficiency
- Sustainability

RIs have an important role to play in solving the problem!

- High-tech facilities with high technical competence amongst the staff
- Development of sustainable sources for energy
- Recycle of heat (heat generated by machine can be used to warm office buildings/cities for example)
- Exchange of parts/materials (cryo modules switched to new superconducting cooling devices, for example)
- Al to use energy more efficiently



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CERN/ABB

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ABB Ability[™] digital solutions to help CERN boost energy efficiency of critical cooling systems

Press release | Zurich, Switerland | 2022-06-14

https://new.abb.com/news/detail/92029/abb-ability-digital-solutions-to-help-cern-boost-energy-efficiency-of-critical-cooling-systems

Non-profit project between ABB and CERN

- Partnership will use data insights and expertise to reduce the energy consumption of CERN's cooling and ventilation system by up to 15 percent
- ABB and CERN will create digital twins to support online diagnostics and maximize the system's efficient and reliable operation
- The partnership will enable collecting digital performance data from hundreds of industrial electric motors and applications. Analysis by ABB's experts will identify precisely where and how much energy can be saved by adjusting schedules and loads or upgrading to high-efficiency motors and variable speed drives (VSDs).
- Learnings and best practices will be shared publicly so that other large-scale cooling and ventilation projects can find new ways to increase energy efficiency

https://new.abb.com/news/detail/92029/abb-ability-digital-solutions-to-help-cern-boost-energy-efficiency-of-critical-cooling-systems

SESAME – synchrotron in Jordan



Home

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SESAME becomes the world's first large accelerator complex to be fully powered by renewable energy

26 February, 2019

https://www.sesame.org.jo/news/sesame-becomes-worlds-first-large-accelerator-complex-be-fullypowered-renewable-energy

Solar power plant of SESAME

- Constructed 30 km from SESAME
- A total power capacity of 6.48 MW, which will amply satisfy SESAME's needs for several years
- The world's first carbon neutral accelerator laboratory
- This makes SESAME economically, as well as environmentally sustainable



https://www.sesame.org.jo/news/sesame-becomes-worlds-first-large-accelerator-complexbe-fully-powered-renewable-energy

National and international strategies needed!

- Development of national and international strategies för energy autonomy
- Coordination neccessary
- ESRFI
- Regulated tarif for research infrastructures?
- Funding agencies to align in Europe?



Future:

- Location of RIs: place where they are most energy sufficient
- Creation of own electricity (wind mills, solar panels)
- Recycling of energy: generated energy to be transferred back to the grid or used in other parts of the operation
- Working together and learn from each other!

