# 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 SCIENCE AT CERN AND OTHER MAJOR FACILITIES

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

By Brian Owens

As energy prices spike as a result of Russia's invasion of Ukraine, possibly causing a global economic downturn and stoking fears of rolling blackouts – especially in Europe – science laboratories are not being spared. The situation

campus, including switching off street lighting at night and delaying the start of building heating by one week.

### Keeping cool

CERN's flagship machine, the 27-kilometre-long Large Hadron Collider, is a major electricity glutton, in large part because of

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

year will be fiercer than usual, say

total number of proton–proton

the LHC will be lower than normal

next, but Mnich does not expect

a huge effect on the science. "O

the whole of run 3, which goes

of 2025, there will probably on

effect," he says.

Energy prices are also rising

in the United Kingdom, although

there would not say how this wi

operations in the short term.

son for Imperial College Lond

although the university, like all

zations, is affected by the rising c

"we are confident in our resilien

to respond to the challenge". The

Technology Facilities Council, wh

eral large sites, including the Di

Source in Didcot, says all of its fa

been working on energy-reduct

a number of years to meet their n

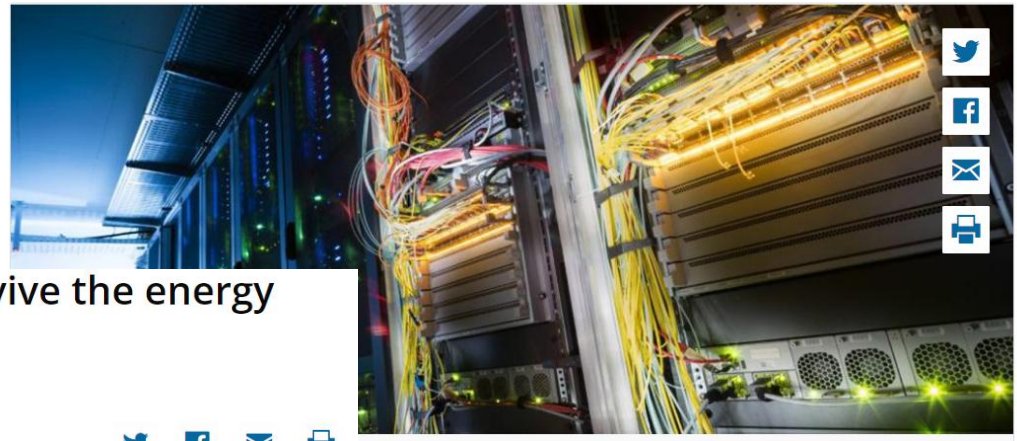
https://www.nature.com/articles/d41586-022-03257-8

## 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/research-infrastructures-are-about-get-vocal-about-energy-crisis

## Short supply: How will R&D survive the energy crisis?

*A public Science | Business webcast (16:00 – 17:00 CET)*


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

# Need from the RIs:

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

<u>Relief current financial stress by:</u>

- 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:

- 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:**

- 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)
- AI to use energy more efficiently

# CERN/ABB

## 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

## 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-fully-powered-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-complex-be-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!