

1st Belle II Sustainability Meeting *Discussion*

Comment from survey:

Why is there no talk about concrete measures ? Acceptability would depend on proposed solutions rather than abstract beliefs. We are already in 2024...

13.05.2024

What to do next?

Suggested structure of discussion:

- Travel
 - Computing/Software
 - Detector
 - (Accelerator)
 - Outreach
 - Belle II organization
- ➔ My opinion: taking measures without assessing their impact is green washing

I think it is our duty as citizens and as scientists to use resources responsibly and to consider the impact of our work and our choices on the climate.

Impact Assessment

We should raise awareness about CO2 emissions caused directly by Belle II and how it compares (operation, computing, travel, etc).

I mean it's a difficult discussion. An honest assessment of what the largest power consuming factors are, would be nice to see, where our efforts might have the largest effects. Of course some things like travel and computing can not be reduced to zero, but for upgrades and in future discussions, we should keep an eye on what the environmental impact is and if there are (from performance standpoint) reasonable alternatives, where we can reduce environmental impact. This should also include discussing if we should perform changes to current implementation both in software and hardware (like cooling gases, where leaks can have a large effect).

It would be nice to know the Belle II CO2 footprint and its composition. Is it mostly accelerator operation, air conditioning, travel emissions? Is there a chance to be carbon neutral as is the aim of many companies? Or at least implement measures to reduce it like energy from clean sources? All this can cost extra money on the other hand it makes HEP research more justifiable to the general society. The rapid technology advance in 20th century is responsible for the global warming, it's our task to convince people that the only way out is again science, not returning to the trees.

Travel

The fact that Belle resumed in person participation in B2GM in full scale 3 times a year means that the collaboration does not take it seriously.

Reduce travel, optimize computing

Reducing plane travel, computing resources (and maybe reusing heat from computer clusters for heating buildings) seem like good first steps?

There can be many implementations made in Belle II, whether it's limiting travel or also limiting plastic waste during B2GM, workshops on how to save power consumption etc.

For future B2GM, please strongly recommend participants bring their (reusable) cups/mugs instead of using disposable cups, which is a huge waste.

- One B2GM per year in Europe?
Virtual B2GM (with local hubs)?
- Give preference to longer term stays at KEK for shifts
- Database of Belle II related travel with voluntary entries

Computing/Software

Reduce travel, optimize computing

Reducing plane travel, computing resources (and maybe reusing heat from computer clusters for heating buildings) seem like good first steps?

For Belle 2 the question is to produce GHG free electricity and to optimize the use of this energy: accelerator consumption and computing power.

I really appreciated initiatives like the carbon footprint report that is given to every user on NAF. It helps us understand what is the impact of our every day work.

On NAF you get a weekly report that sends you your estimated CO₂ emissions caused by your computing time. For me personally it really has an effect to try to limit my job submissions actively, while not having this information probably leads me to submit more jobs than really necessary. Would be cool to also get reports like this for the grid/kekcc

- Include CO₂ footprint in yearly computing accounting
- Option to consider site energy mix in job scheduling
- Systematic software optimization

Detector

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- Monitor impact of gas leaks
- Consider footprint of upgrades

Accelerator

For Belle 2 the question is to produce GHG free electricity and to optimize the use of this energy: accelerator consumption and computing power.

Power savings except the accelerator and detector are neglectable. Instead look for clean energy in general, but nuclear energy is already good for fighting climate change. To reduce the effect one could only restrict the project in general, which would restrict research in general. And this is not a good solution.

Since it is obvious that the Belle II experiment has to make large energy consumption as a high energy experiment, I believe that it would be important not only to reduce CO₂ emissions but also to prepare the environment to absorb emitted CO₂ so that the net CO₂ emission is zero in total.

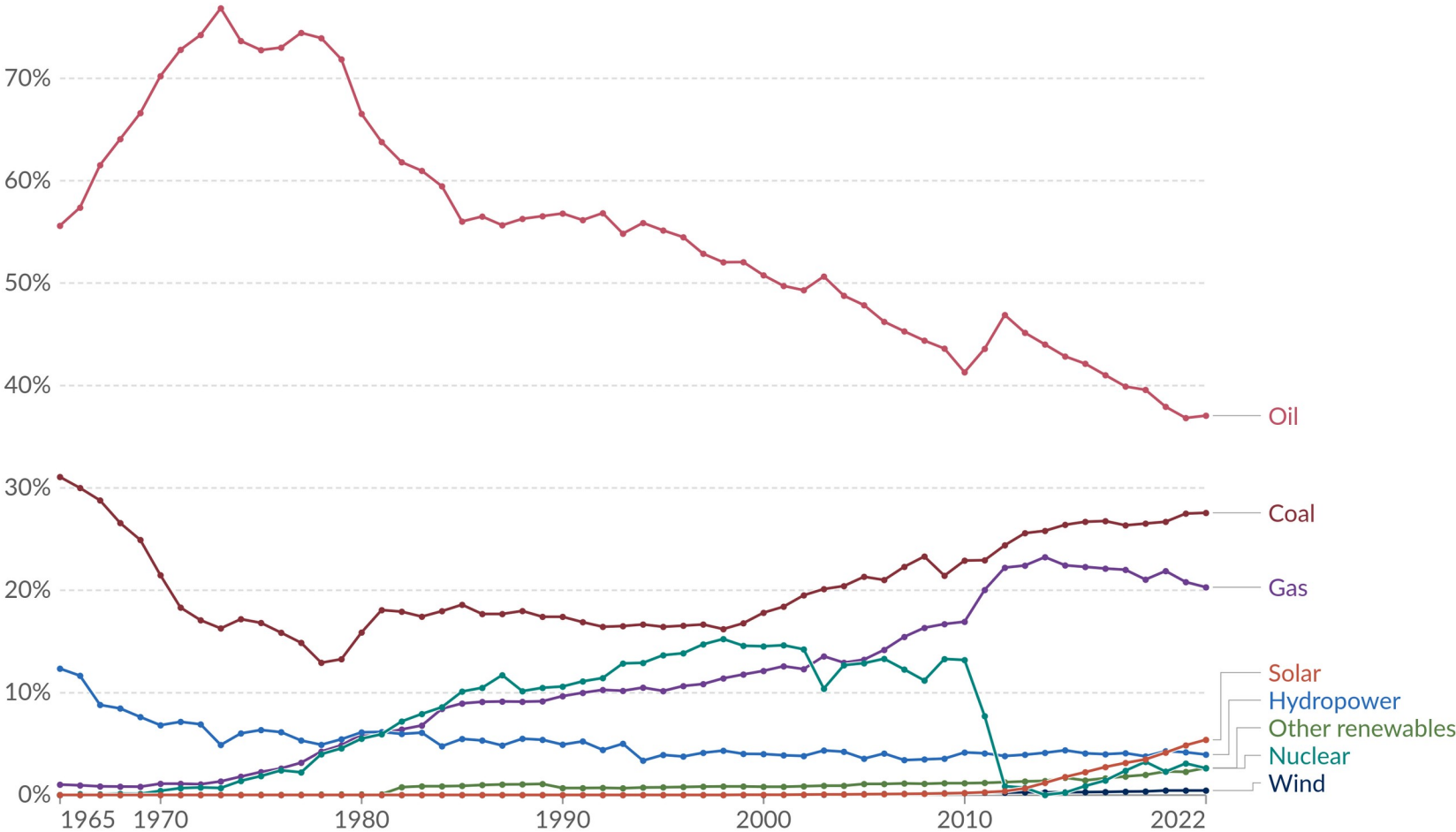
- Potential of using green electricity?
- Reuse of energy/heat?

Energy Mix in Japan



Share of energy consumption by source, Japan

Measured as a percentage of primary energy¹, using the substitution method².



Data source: Energy Institute - Statistical Review of World Energy (2023)

OurWorldInData.org/energy | CC BY

Outreach

I was always very much aware of the of climate change, but have never viewed it as an urgent issue, rather something that we can gradually adapt to over the years. What I didn't understand until very recently, is that how unstable climate system is. Especially how the existence of positive feedback loops (ice-albedo feedback, water vapor feedback, methane release from permafrost, forest fires etc.) can lead to massive destabilisation and nonlinear global temperature increase. These considerations gain attention in physicist community, but I think they are still poorly propagated to general audience. I think scientific collaborations such as Belle II can contribute to changing that.

Eventhough our impact on the CO₂ emission might be small compared to industry we should try to be a good example and a pioneer in this area

Increased awareness, training for new PhD students, and active role in outreach as a social responsibility should be encouraged.

I think the main contribution that Belle II can provide in this regard is to generally increase the societies interest in research and to increase the trust in science in general.

Outreach

I think it is formally a little off-topic, excepting for the facts that we travel a lot and that running the accelerator takes a lot of energy. BUT, all scientists everywhere should do what they can to promote awareness and policy based on science. And we all have our personal responsibilities to contribute (both in our own actions and politically).

Unless enforced by law, the changes made by a few individuals will sadly make no difference. When there is competition, some will self-impose climate change restrictions and other will not. From experience, those without restrictions will do better. Rather than Belle II searching for their own solution, a field-wide approach would be more effective and fair.

Organization

- Mailing list: coll-sustainability@belle2.org
- Regular sustainability meetings?
- Sustainability prize
- Belle II Sustainability Officers (similar as for diversity)
 - Organizational support of sustainability activities within the collaboration
 - Raise awareness and help adopting good practices
 - Liaise with other players in the field
 - Develop a plan for carbon neutrality