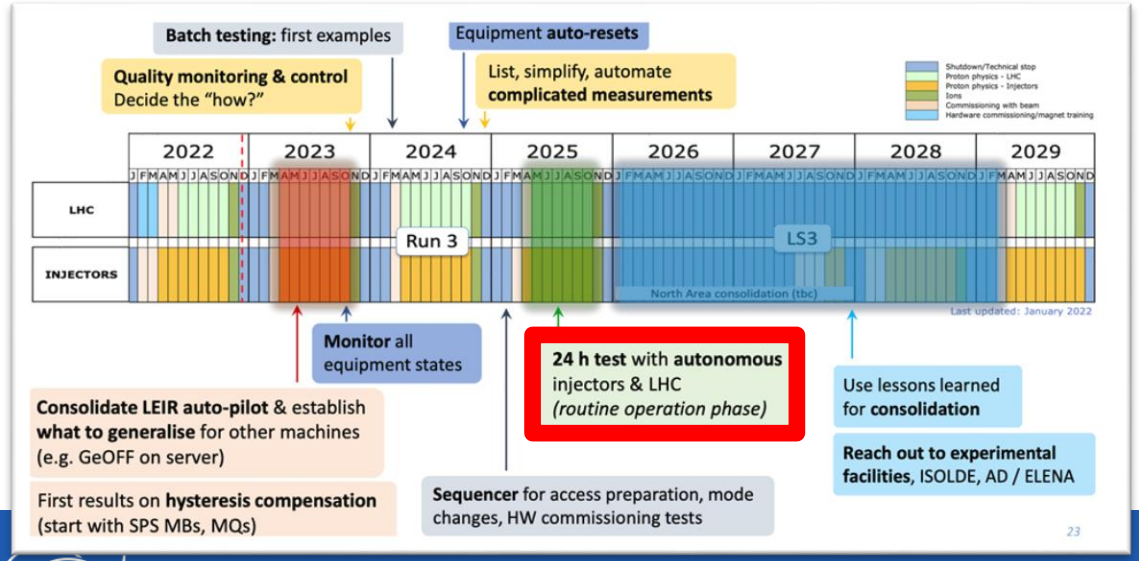
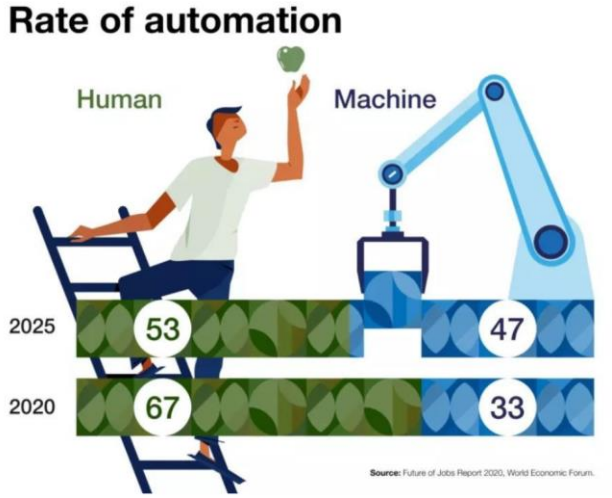
Follow-up from JAPW session 7: Efficiency, reliability & tools across the complex

Many thanks to: Heiko, Nikos, Reyes + Michael, Piotr, Kostas, Ben

Automation is the future

- **Automation is the way to …**
  - … save energy, time (of people and schedules) and money while achieving best performance and beam quality
  - … efficiently commission our accelerators
- **What goal do we want to achieve?**
  - First discussions in the Efficiency Think Tank led to a clear proposal
    - Do we adopt it and **make it our automation roadmap?**



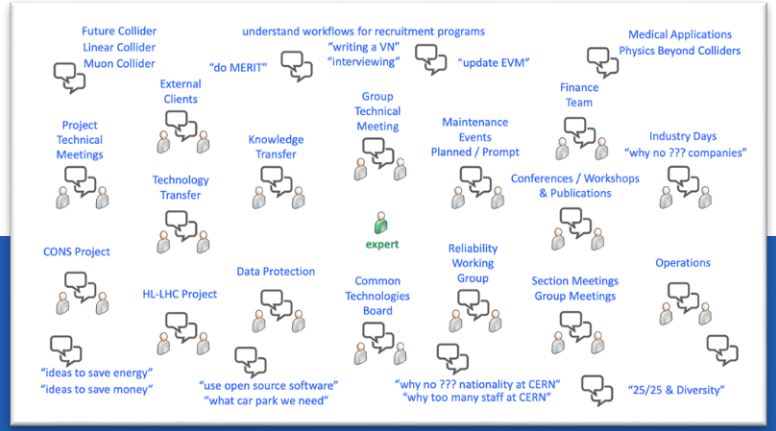


"(…) automation (…) is **not** actually **replacing** the (..) the **individual** to work, it's **replacing** a certain **task** (…) giving that individual the chance to **work on something better**."

"(…) **large organizations** are going to have a **hard time keeping pace**."

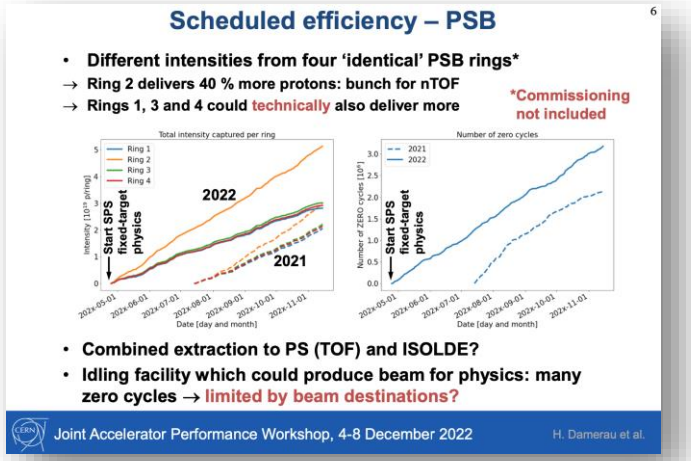
[WEForum]

- **We must address technical and organisational challenges at the same time!**



Integral parts of the automation question…

- **Next generation cycle management, beam requests and scheduling**
  - How to better exploit **deadtime** (zero cycles)?
    - Who wants …
      - 160 MeV – 2 GeV protons
      - low energy ions



  - **Dynamically build requests**
    - avoid dead time in SPS injectors for long flat bottom LHC/HiRadMat cycles while 1 injection only
  - **Sequential/dedicated operation** instead of parallel operation in the SPS: AWAKE,…

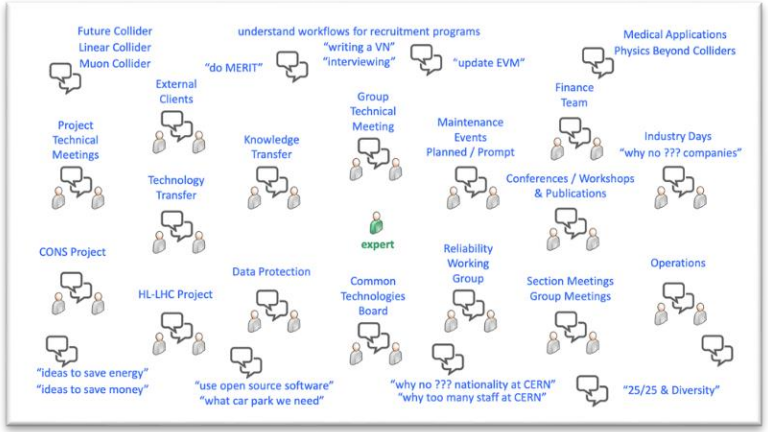
- **Classical automation**
  - Settings consistency, super settings, makerule consistency checks, etc.

Creating awareness and energy saving alternatives

- **Improve our energy (and equipment life) consumption monitoring**
  - Will also help to identify “missing consumers”
- **New rules during design:**
  - Establish policies, e.g. DC vs. pulses vs. permanent magnets
  - “sleep mode” for new equipment
  - avoid reusing old magnets and operating them in saturation
- **SPS is the lowest hanging fruit**
  - **NACONS**:
    - reconsider DC magnets
    - automation for reducing power consumptions of transfer lines when not needed
  - Sort out **hysteresis control**
  - **Interleave low energy** NA operation with **high energy** operation?
    - how to distribute downtime?

Organizational challenges

- **Vision: “why are we doing this?”, “where are we going?”**
  - Aligning strategies and profit from synergies: groups/departments versus projects/task forces



...“business as usual” is ending...

Vision → Resources → Constraints → Shield

- **Settings Management Working Group**
  - Who establishes priorities, goals and allocates manpower? Reporting?
  - Where are other non-settings management software topics addressed?
- **Reduce/remove meetings during commissioning phases**

New directions

- **Beam + System Performance Tracking**
  - → preventive maintenance with automatic prognostics: reduce number of piquet interventions?
  - Online performance monitoring is the new black (UCAP & Co … auto-pilots)

- **Scheduling**
  - Planning to consider beam quality requirements at end of commissioning
    - More/fewer parallel and dedicated MDs in blocks/weekly?
    - **Commissioning to recover top performance** vs. **providing what is required for physics setup**
  - Incorporate experiments' plannings into schedules, communicate super cycle configurations, etc.
    - ASM?

- **Digital Twins**
  - Data driven models of as-built machines/systems for efficient operation

#softwareAutomation #onlySolution