



# Design Integration with ESS

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# Overview

- STFC & ISIS Neutron and Muon Source
- ESS/ISIS Integration options
- Advantages
- Disadvantages
- The decision
- How is it working in practice
- Summary



# STFC

- Science and Technology Facilities Council
- Publicly funded, non-profit making organisation
- Operates or hosts experimental facilities in the UK and internationally
- ISIS pulsed neutron and muon source is based at Rutherford Appleton Laboratory, Oxfordshire



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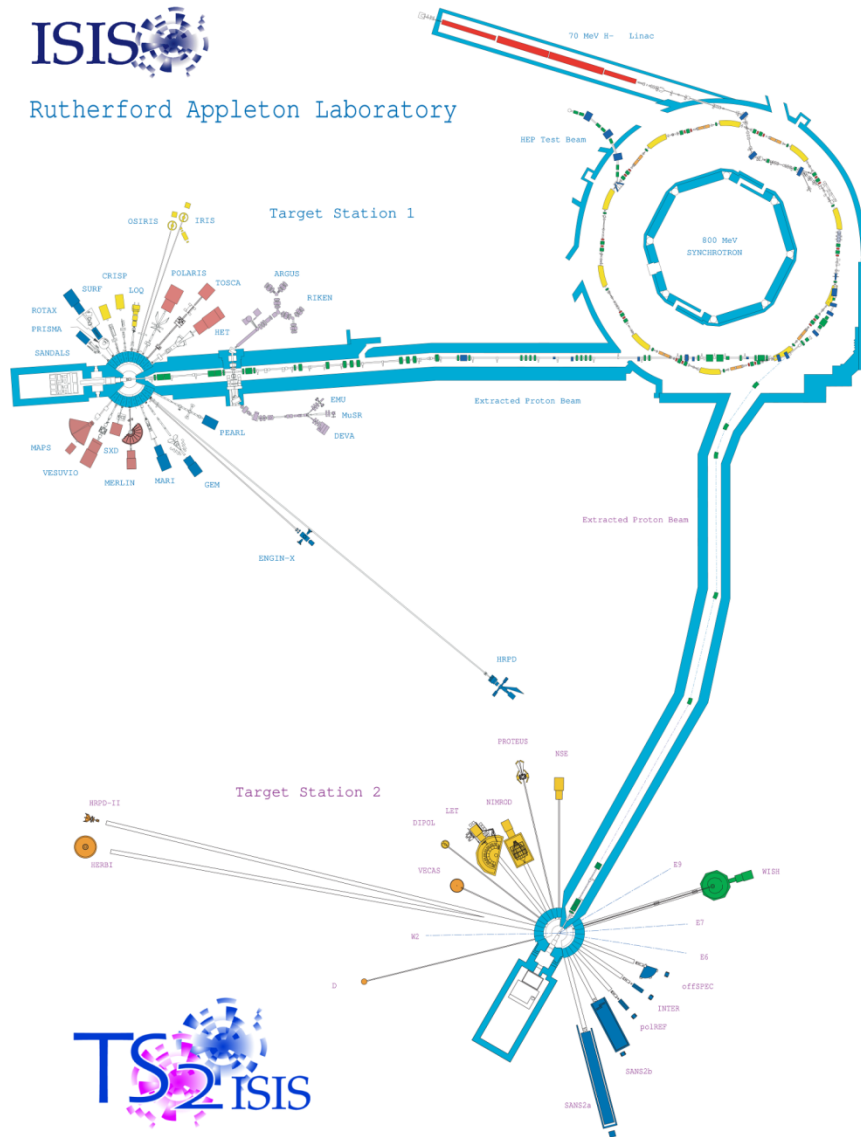
# Rutherford Appleton Laboratory



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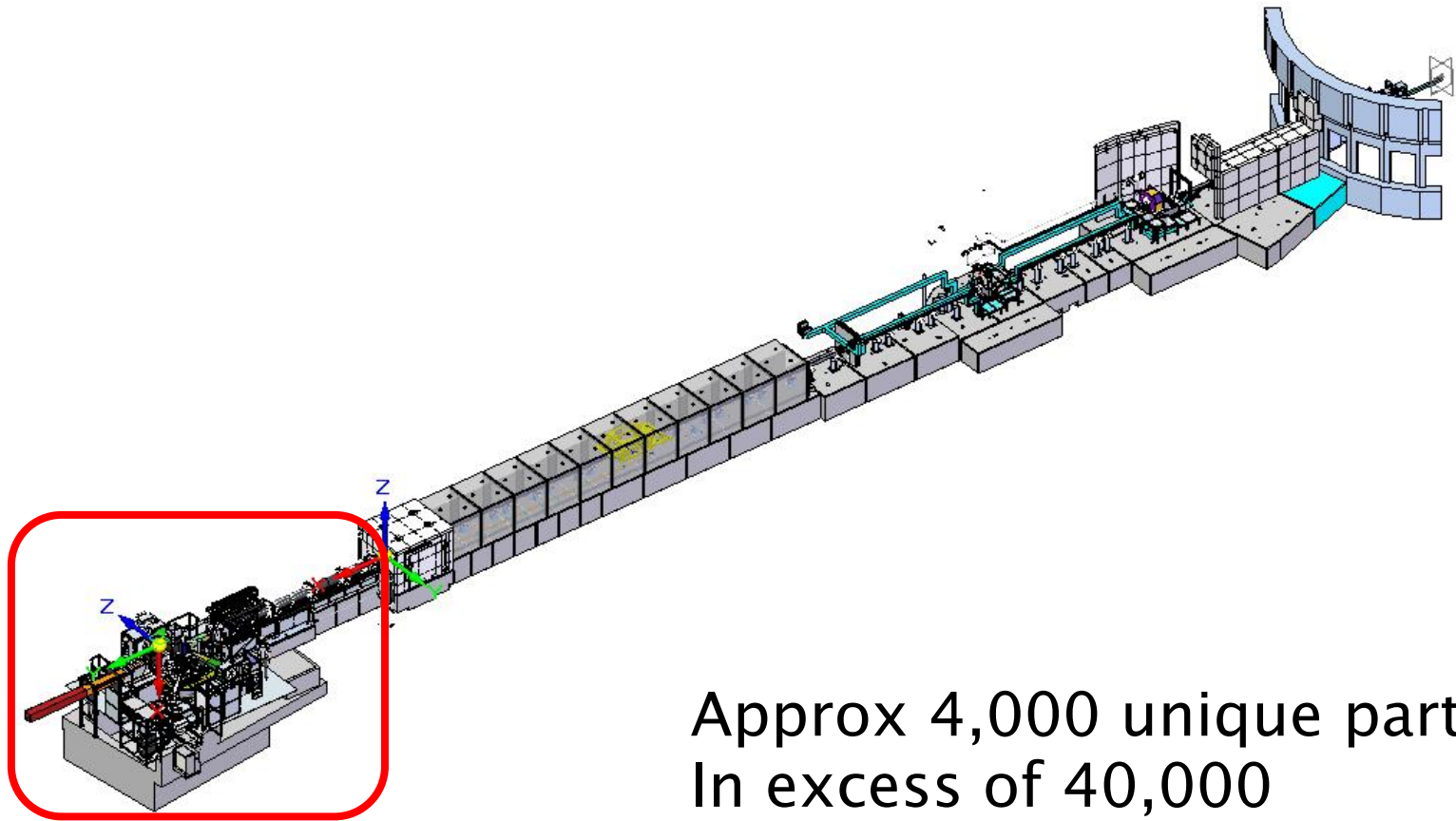


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# ISIS Design Division

- The Design Division has around 70 Engineers
  - Maintenance & refurbishment
  - Upgrades
  - New Instruments
- Two separate CAD/PLM systems
  - Solid Edge & Teamcenter                      Mechanical Design
  - AutoCAD & Meridian                      Electrical and Plant Design
- Two full time CAE support engineers
  - Also support two other separate engineering groups
- Simple, straightforward procedures
  - e.g. two stage release process

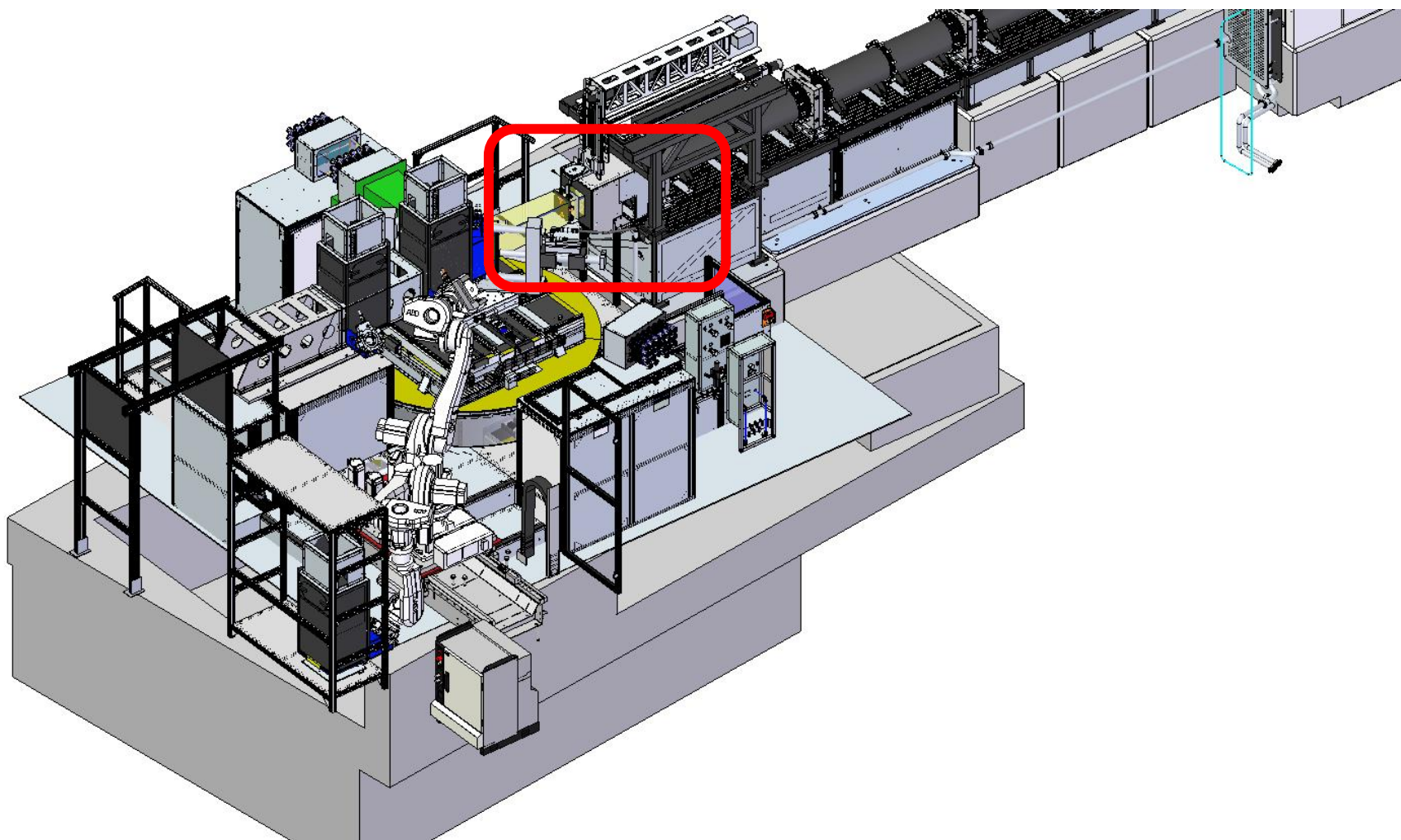




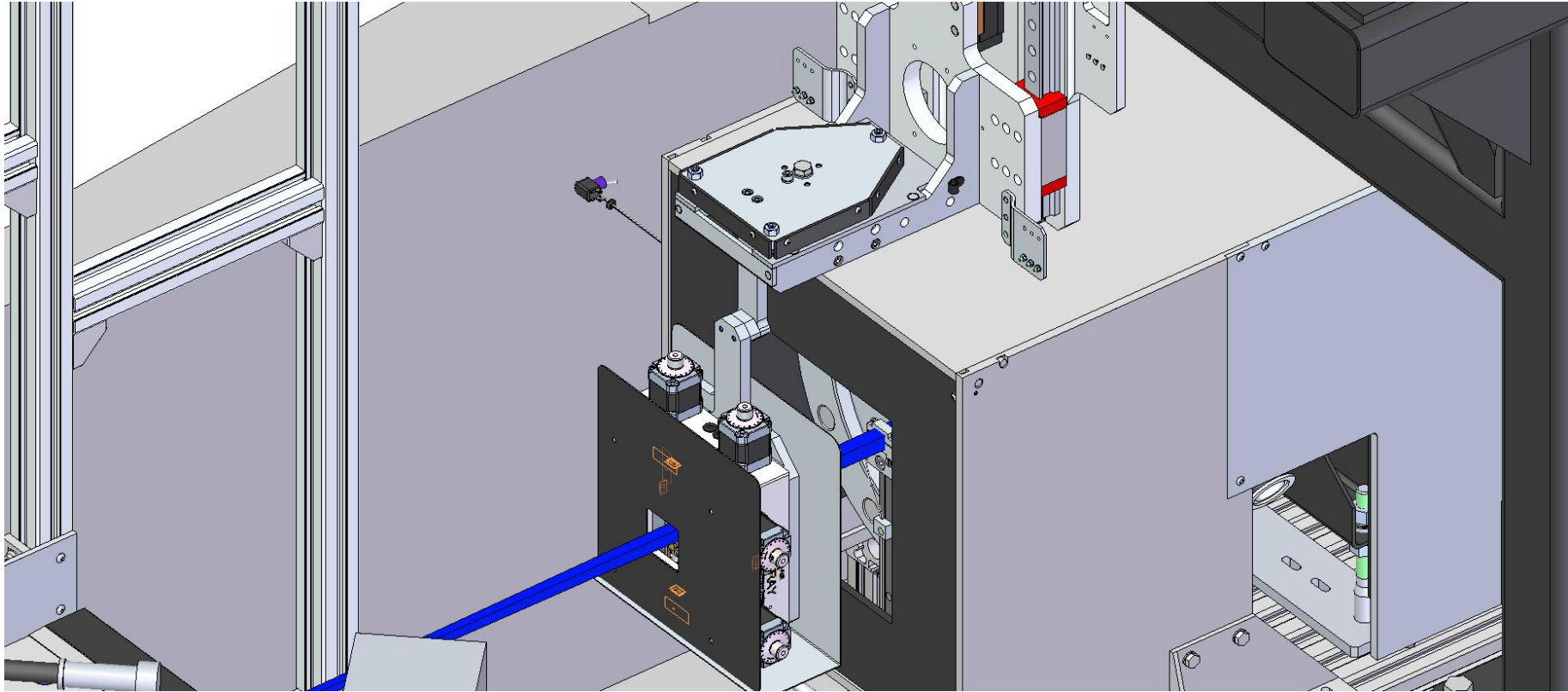
Approx 4,000 unique parts  
In excess of 40,000  
occurrences



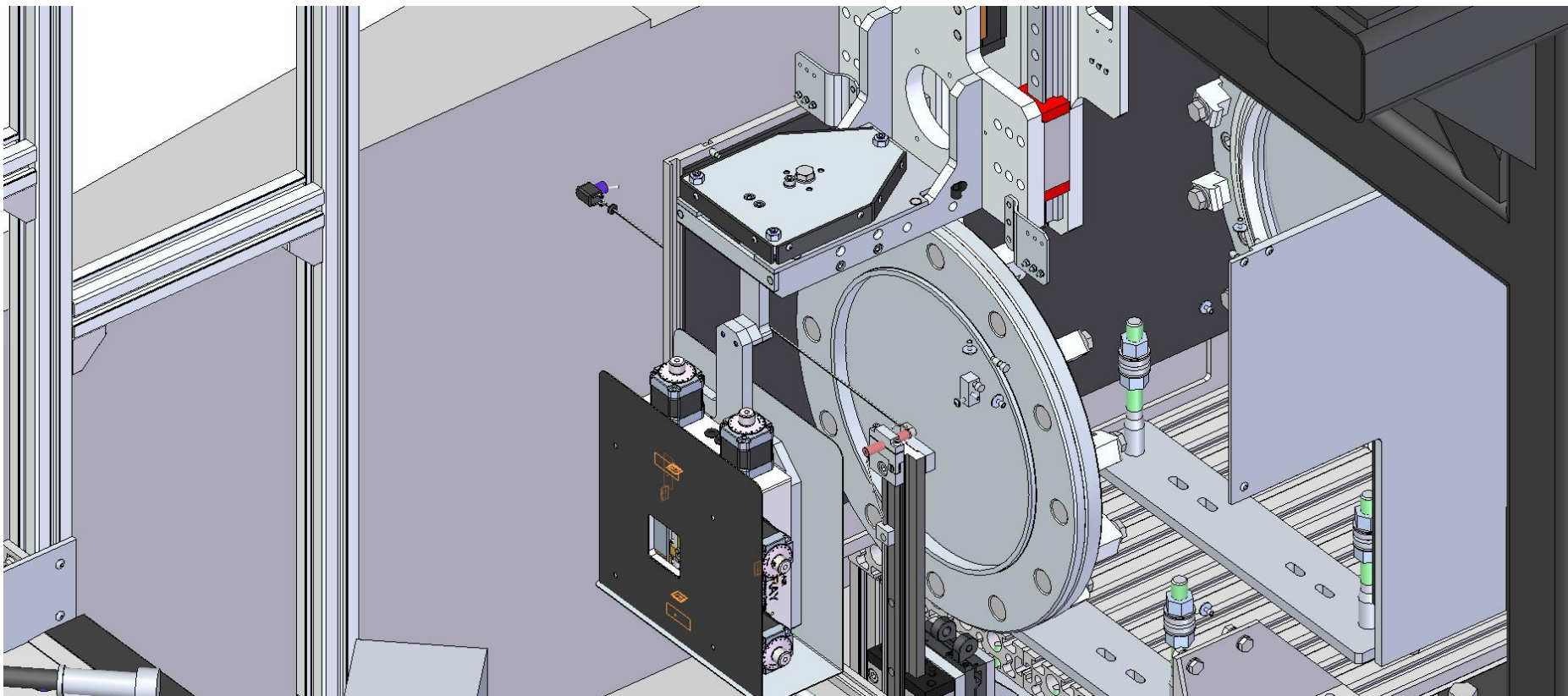








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# ISIS workpackage

- ISIS are working on the design of two instruments
  - Loki
  - Freia
- Delivery
  - Loki Mid 2022
  - Freia Mid 2023



# Initial factors

- Distance
  - Working on designs while separated by hundreds of miles and a time zone will cause issues
- Communication
  - Physically separate design teams need effective communication channels
- Design
  - The design was not finalised and subject to change
- Culture
  - ESS – new and developing organisation
  - ISIS – mature
  - Language



# Design Integration Options

Two Options:

1. Work in our existing CAD system. Export design into CHES/CATIA
2. Create new designs in CHES/CATIA



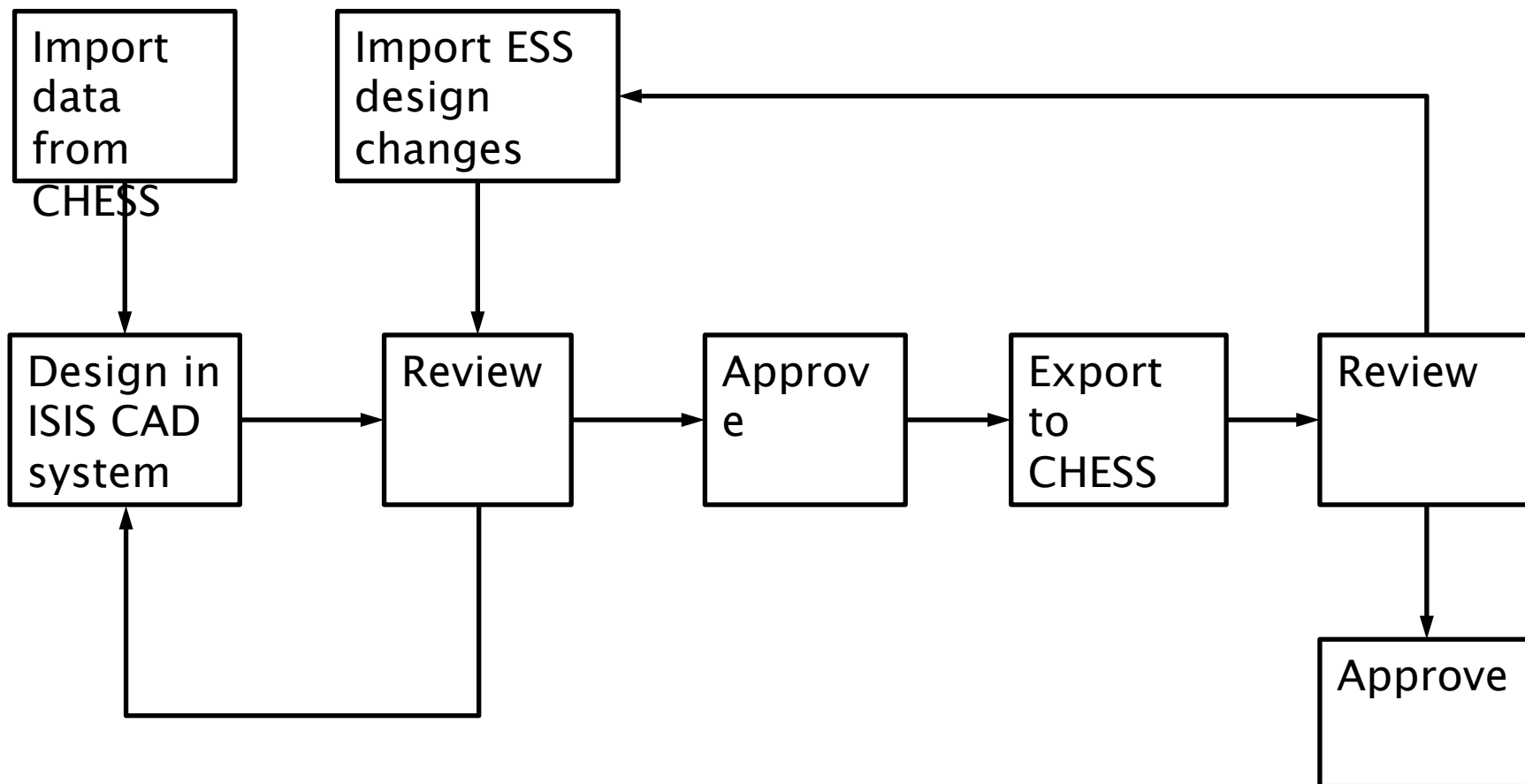
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# Working in Separate CAD Systems

- + Easy for STFC/ISIS
- + No training requirements
- + Large pool of experienced engineers ready to start
- Requires large volumes of data to be transferred on a regular basis
- Interface between designs not finalised so design changes must be communicated effectively
- Translation/Transfer of data is a potential source of errors
- Working with out-of-date exported data can produce errors
- Drawings are not linked to models



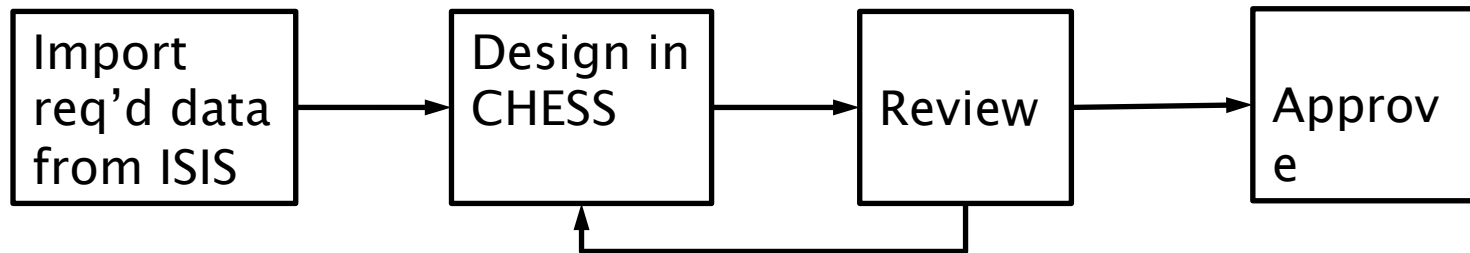
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# Working in CHESS/Catia

- + Engineers are all working with up-to-date, live data
- + All designers are more closely integrated
- + Communication is easier when all designers are using the same data
- Catia and CHESS require a high level of training to be undertaken for STFC
- Therefore there are fewer engineers available
- Processes and procedures for designer partners must be in place and workable



# What did we decide?

STFC decided to undertake design work in CATIA/CHESS.

We believe that working concurrently in the same CAD PLM system will reduce errors and improve the quality of the project.

For ESS having accurate models and drawings will be extremely useful in the operational phase.





So that is the theory

How does it work in reality?



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# In Practice

- Everyone is working with live data
  - Design changes are available immediately
- Designs are integrated from the beginning
  - Equipment interfaces are defined early
  - Rapid clash detection
  - Cooperation in areas with restricted space
- Communication is improved.
  - Discussion of design problems



# In Practice

- Potential errors and time delays from translation and transfer of data are removed
  - Poor translations can have a significant impact
- Provision of an integration engineer is vital
  - Dedicated engineer is invaluable
  - Without them it would be almost impossible to deliver this project and we would not have committed to designing in Catia/CHESS
  - Provides continuity into the operational phase



# In Practice

- Working at a distance
  - Physically separate environments adds difficulties
  - Communication channels must be effective
  - We are reliant on a fast, reliable internet connection
- We are reliant on ESS for a lot of software support
  - Distance can again cause issues
  - No option to sit and talk through problems
  - Upgrades cannot be planned around existing work



# In Practice

- Standard parts and materials
  - A library of standard parts is not available
  - Procedure to add standard parts
  - Materials
- Design Software
  - Catia is extremely capable but complex
  - User Interface is very different
  - All this gives a steep learning curve



# In Practice

- Procedures and processes must be robust, pragmatic and workable. Simple is good. They must be available and communicated to all partners.

## Examples:

- Product structure
  - Is there a definitive up-to-date structure
  - How is this identified
- Re-use of parts
  - How are parts identified so they can be re-used e.g. Motors
- Sub-systems e.g. sample stack
  - How do we deal with this
  - Are drawings req'd





# In Practice

- Electrical & Plant equipment design
  - How is it integrated into mechanical designs
- Design change management
  - Process for implementing changes
  - How far up the structure does the change “ripple”
- Design review/approval process
  - Who is involved, are they appropriate
  - Is authority delegated to partners, ISIS have an existing design review process
  - Must an ESS engineer sign off every drawing
  - Make it as simple as possible – 1000s of drawings per instrument



# Summary

- Working in CHES/Catia provides a better long term solution
  - Data required for longer term, operational phase
- Communication is key
  - Distance
  - Partners rather than employees
- Integration engineer is vital
- Processes/procedures must be sensible, workable and communicated effectively
  - Keep them as simple as possible



# Thank You



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