ENEA Fusion Components Failure Rate Database, status and evolution

IAEA 2nd Tech Meeting on Long-Pulse Operation of Fusion Devices

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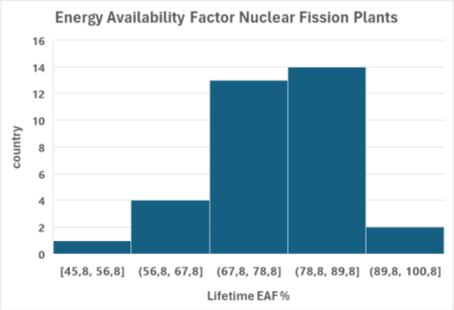
Context: importance of plant availability for energy production market

Nuclear fusion is expected to be available as energy technology source of energy in the near future.
Besides scientific and technological challenges to obtain burning plasma and tritium self-sufficiency, a key aspect for the success of such technology in the energy market will be plant availability.

Nuclear Fission Lifetime stats up to 2023 :



- Energy Availability Factor Average: 78.2%
- Average Unplanned Capability Loss Factor: 5.9%

Source: IAEA PRIS database

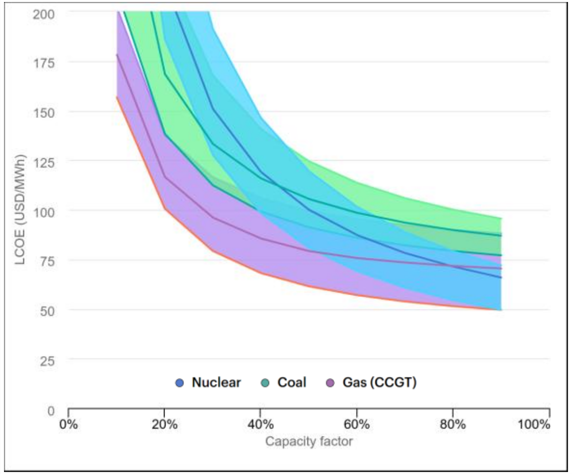
Nuclear Fusion:

- Characterized by high CaPex costs and planned maintenance time
- Levelized Cost Of Electricity ≈ **(rF/A)$^{0.6}$**
  - with **r** discount rate, **F** the learning factor, **A** plant availability
- DEMO EU Plant:
  - Operational Availability Target 30%
  - Mean Inherent Availab. Target 48%
- Fusion Power Plant Availability in market penetration analyses: Assume A = 80% rising -> 85% after learning factor.

https://doi.org/10.1016/j.fusengdes.2005.06.160
https://doi.org/10.1016/j.esr.2016.11.002
https://doi.org/10.1016/j.fusengdes.2020.111937

Comparative with energy gen. Tech

Tech.	Coal NatGas Bio	Nuclear Fission /Fusion (assum.)	Hydro	Wind	Solar
AF %	75-95	80	50	20-40	10-20

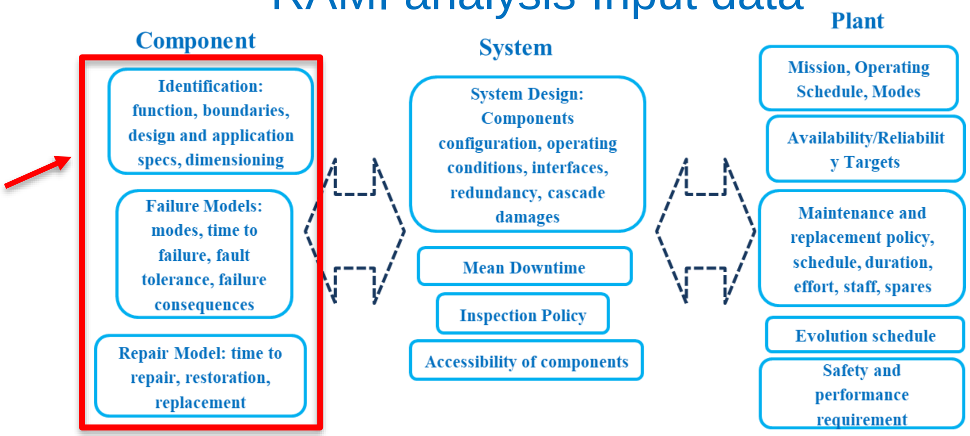


IEA (2020), Sensitivity of LCOE of baseload plants to capacity factor, IEA, Paris

Motivation for fusion reliability data collection/selection

- **Reliability/Availability shall be considered since design early phases**
- Fusion is characterized by pulsed operation, high scheduled maintenance time which reduce Op.Av.:
  - **MANDATORY to minimize unscheduled downtime**
- Nuclear fusion plants will exploit many fusion specific components with relatively low technology readiness level, or in some cases exploit components with mature technology from fission plants but within different and poorly explored operating domain window (e.g., in terms of loads, operation regimes, etc.).
- An important source of uncertainty in reliability assessment then resides in the failure and repair model definition for fusion plant components.
- To limit such uncertainty, **Fusion Components Failure Rate Database** was developed to collect failure and repair screening data suitable for fusion systems reliability analyses.

RAMI analysis Input data



Component / System / Plant levels input data mutually impacting each other

Overview FCFRDB & IEA context

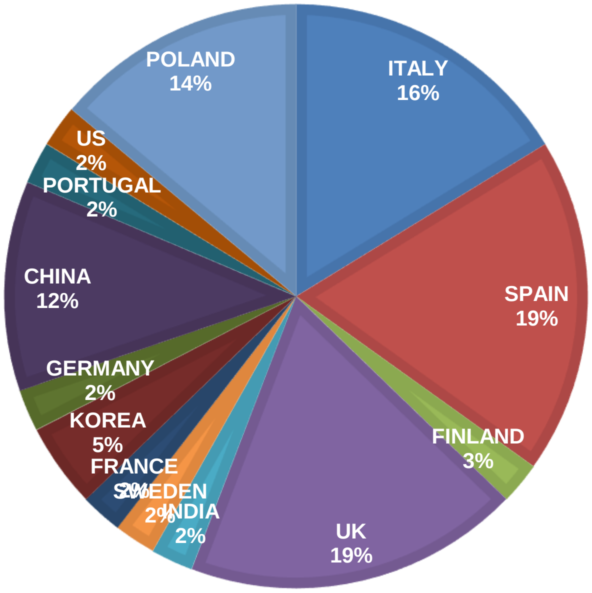
Framework: International Energy Agency Agreement on the Environmental, Safety and Economic Aspects of Fusion Power (IEA ESEFP) – Task 5.

FCFRDB WEB-ACCESSIBLE DATABASE

ENEA FCFRDB - Fusion Component Failure Rate DB

http://fus-se.frascati.enea.it:8080/Enea/login

- Users: Fusion Community Users willing to work on RAMI analysis or research on failure operational statistics for not commercial purposes.
- Currently about 60 active users from 22 institutes across 13 countries

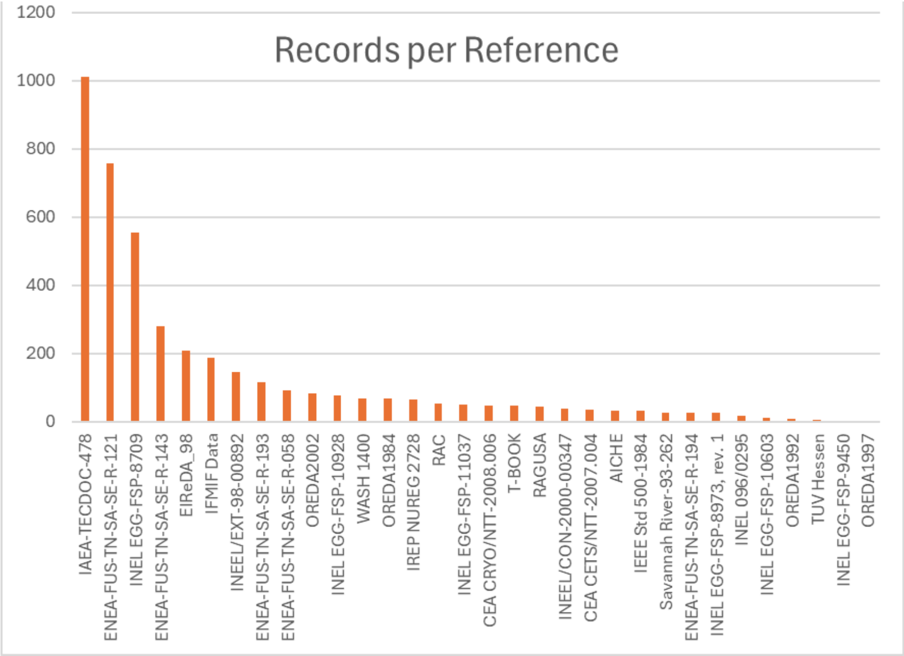


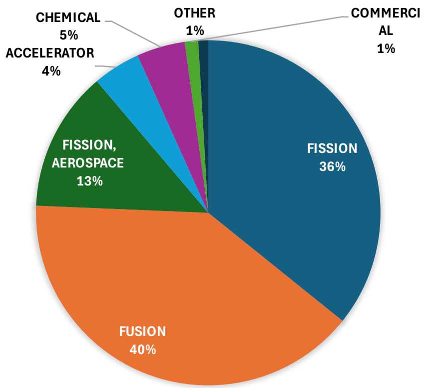
FCFRDB USERS

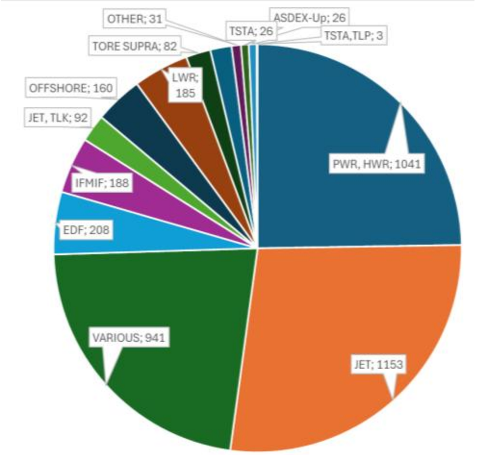
FCFRDB Records at glance: hystorical record sources

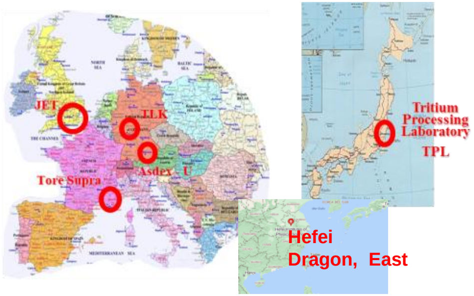
>4k records

62% records selected for fusion from literature screening
38% records estimated from failure data in facilities



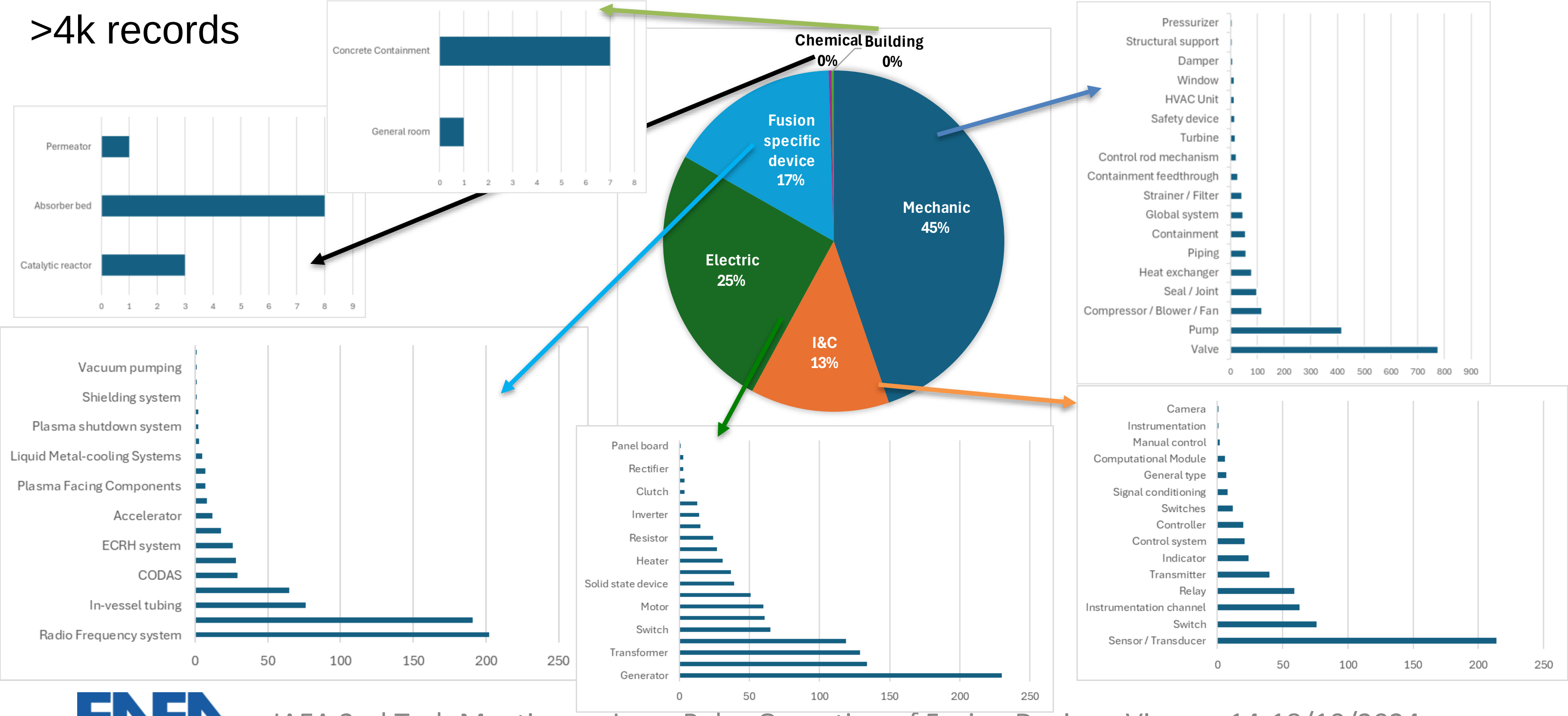






FCFRDB Records at glance: components record types

>4k records



Overview FCFRDB: Record Composition

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Show Component

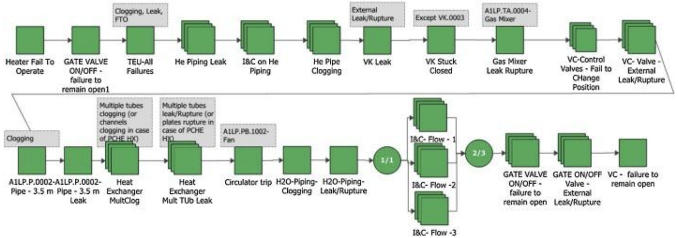
Family Name: Chemical	**Type:** Absorber bed	**Sub-class1:** Molecular sieve bed
Sub-class2:	**Sub-class3:**	**Sub-class4:**
Function:	**Short Description:** Molecular Sieve Beds	**Failure Mode:** All failure modes
Cause:	**Operation Mode:**	**Comp. Bounderies:** Two beds of 36.4 kg per bed of Linde type 13X molecular sieve, and two beds of 54.4 kg per bed of Linde type 4A molecular sieve
Design Characteristics:	**Appl. Characteristics:** Tritium Waste Treatment system components at TSTA	**Note:** Table A-2 - The Reference gives only upper bound, then mean failure rate have been estimated with the formula LambdaUB*LN(0.4)/LN(0.1) because, with no faults observed, the following approximation can be done: Mean=-LN(0.4)/D and UB=-LN(0.1)/D, where D is the number of operations
Failure Rate/Prob. - Mean: 5.05E-02 Error Factor: N/A Upper Bound 95%: 1.27E-01 Lower Bound 5%: 0.00E+00	**FR/P Unit:** /D	**Probability Distribution :** Exponential (EF)
MTTF:	**MTTF Unit:**	
MDTF :	**MDTF Unit :**	
Mean Time To Repair :	**MTTR Unit :**	**MTTR Probability distribution :**
Mean Repair Rate :	**MRR Unit :**	
Preventive Maintenance Policy:	**Test/Inspection interval:**	**No of Failures:** 0
No of Components: 4	**Cumulative Working Time:**	**Cumulative Working Demands:** 22
Validation: APPROVED	**IEA Consensus:** Y	
Reference: INEL EGG-FSP-8973, rev. 1	Attach New Reference Attach Reference	
Created By: dataEntry	**Data entry:** 03/12/2011	**Last modification date:** 20/05/2012

Down | Up | Copy in New Component | Edit | Mark For Deletion

Note- about 25 % of records include Mean Time To Repair (MTTR) data stats

Overview FCFRDB: data applications

- Design RAMI assessments e.g. ITER TBM systems



https://doi.org/10.1016/j.fusengdes.2019.03.016

- Estimation of DEMO disruptions due to component failures

Table 5
Yearly events of disruptions, fast and soft PSD allocated by systems. N = Negligible (i.e. less than 1 event every ten years).

PBS		Disruptions		Fast		Soft		Total	
		Min	Max	Min	Max	Min	Max	Min	Max
11	Magnet system	0.1	1.9	0.1	0.6	0.4	6.1	0.5	8.6
12	Vacuum Vessel (VV)	N	0.1			N	N	N	0.1
13	Divertor	N	0.3			N	0.1	0.1	0.4
14	BB (HCPB)	0.3	4.5			4.9	24.4	5.2	28.9
15	BB (HCLL)	72.7	607.5			223.4	1870.1	296.1	2477.6
16	BB (WCLL)	0.5	6.9			58.0	385.9	58.5	392.8
17	BB (DCLL)	0.1	1.0			2.0	16.9	2.1	17.9
20	Cryostat	N	N			N	0.2	N	0.2
21	Thermal Shields					0.2	0.8	0.2	0.8
22	Tritium, Fuelling, Vacuum (TFV)	0.3	1.7	N	N	0.2	1.4	0.4	3.1
23	Remote Handling								

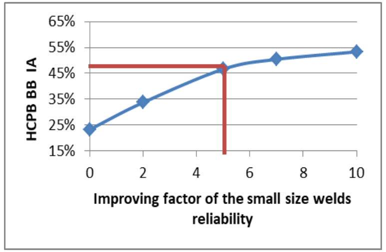
https://doi.org/10.1016/j.fusengdes.2018.04.114

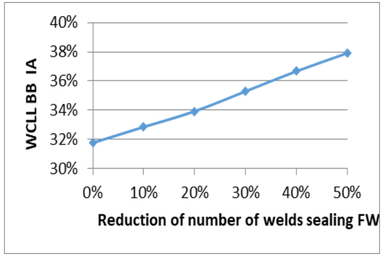
- PSA-driven approach to safety Classification in DEMO

PBS elements (Components)	Safety function	Op. Md.	Possible Failure of SSC	Event Category	Significant safety event	Safety Classif. Criteria	Failure rate	Yearly Failure	Function safety category	Safety Class
50-1-2 - Cooling trains of HCPB BB PHTS										
50-1-2-1 - Piping, joints and valves		NOp	Small size leak		No					
	S1a		Rupture; Clogging	3	Large LOCA	A	2.50E-11 /h	7.33E-4	F2-S3	SIC-3
			Valve-Fail to remain in position		No					
50-1-2-2 - Steam Generator/HX		NOp	Small size leak		No					
	S1a		Multiple tubes rupture	3	Large LOCA	A	1.00E-07 /h	8.76E-4	F2-S3	SIC-3
			Shell rupture		No					
50-1-2-3 - Pressure relief devices	S1a	NOp	Leak/Rupture	4	Ex-vessel leak	A	3.00E-10 /h	5.26E-6	F2-S3	SIC-3
			Spurious pressure relief		No					
	S3a	Inc	Failure to open on demand	5	Large LOCA	C	6.00E-07 /h	3.15E-9	F1-S3	SIC-3
50-1-2-5 - HCS-Circulator		NOp	Small size leak		No					
	S1a		Rupture	3	Large LOCA	A	1.00E-08 /h	1.75E-4	F2-S3	SIC-3
			Blower trip		No					
52-1-2 - Cooling trains of WCLL BB PHTS										
52-1-2-1 - Piping		NOp	Small size leak		No					

https://doi.org/10.1016/j.fusengdes.2019.01.040

- Reliability-grow Sensitivity studies on DEMO Breeding Blanket design





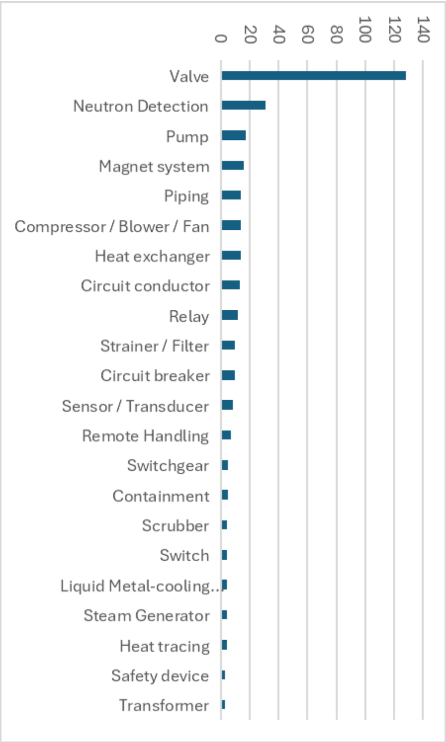
https://doi.org/10.1016/j.fusengdes.2020.111937

FCFRDB development: data from literature selection, suppliers

Expert RAMI analyst can propose/select literature data from other facilities / domain of applications to estimate system performance.

About 500 new records added to FCFRDB:

Reference	# records	Category	Type	PLANT	System
INEEL_EXT-99-11044	194	Nuclear Facilities	Liquid	Metal	Cooling - Liquid Metal
INEL-95/0422	129	Chemical Process	Failure Stats	INL Chemical Process Plant	Chemical
INEEL_EXT-01	48	Nuclear Facilities	Screening	Vaiours	Plant Electrical Distribution Systems
ITER Radial Neutron Camera	38	Fusion	Vendor Data / Models	ITER Design	Neutron Diagnostics
INEEL/EXT-99-001318	26	Nuclear Facilities	Screening	Vaiours	Ventilation Systems
DRAGON- EAST data	15	Fusion	Failure Stats	Dragon-East	Cryosystem, Lithium loop
Fast Discharge Unit - Model	13	Fusion	Reliability Model	ITER Design	Magnets & PS
Accelerator Application -	8	Fusion	Screening	Vaiours	Magnets
ITER Blanket Remote Handling System	7	Fusion	Vendor data	ITER DESIGN	Remote Handling
INEL_0299	5	Fusion	Screening	Vaiours	Liquid Metal
DIII-D	5	Fusion	Failure Stats	D-IIID	Magnet



FCFRDB development: data for fusion specific component qualification tests

Fusion specific component, load dependent

Qualification dataset: 26 Divertor Inner Vertical Target mock-ups. HighHeatFlux tests:10 MW/m2 for 5000 cycles (10 sec flux on, 10 sec off) and at 20 MW/m2 for additional 300 cycles.

https://doi.org/10.1016/j.fusengdes.2014.12.006

Number of mock-up	Number of cycles	Heat Flux (MW/m²)	Survived
26	5000	10	26
20	1000	20	17
6	300	20	6

A Bayesian framework + Step-Stress Accelerated Life Testing (SSALT) framework exploited for failure model inference:

Posterior distribution $f(\theta/X) \sim f(\theta)\, L(X|\theta) = f(\theta) \prod_i l_i$

likelihood function $L(X|\theta)$ depending on surviving time and stress levels V

Exponential ***Ti~exp(λ)*** **:** $\lambda = C^{-1} e^{-B/V}$

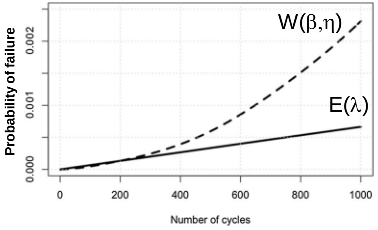
Weibull ***Ti~Weibull(β,η)*****:** $\lambda(t) = \beta C^{-\beta} e^{-\beta B/V} t^{\beta-1}$

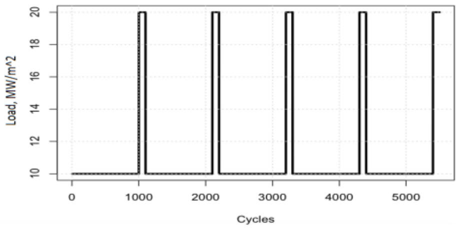
https://doi.org/10.1016/j.fusengdes.2018.05.077

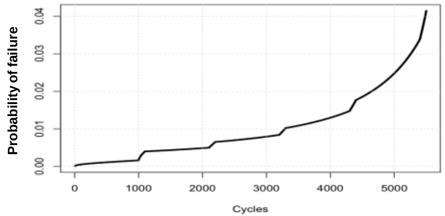
Estimated Mean Time To Failure (MTTF)

Weibull takes into account degradation in time and enables building more realistic/operational sequences

Method	MTTF (cycles)
Exponential (just 10 MW/m2 data)	187550
Exponential (λ)	150000
Weibull (β,η)	8700







FCFRDB development: data for fusion specific component qualification tests

Fusion specific component, load dependent

- single crystal Chemical Vapour Deposited fast D-T neutron diamond detectors to be exploited in ITER
- an expected life of expressed as max cumulated fluence of uncollided neutrons 1.E15 neutrons /cm^2 before degradation was derived from radiation hardness tests

https://doi.org/10.1016/j.nima.2021.165574

- A mapping between cumulated neutron fluence (n/cm^2) and Mean Time To Failure (MTTF) (h) was obtained exploiting a reference irradiation scenario at different Lines Of Sight (LOS)
- A MTTF averaged over LOS of 23.76 ITER operational year was found, by assuming 4608h per ITER operational year (excluding the calibration by alpha sources hours).
- A fit to lognormal distribution over different LOS resulted in (m,s)=(11.60, 0.56) parameters

scCVD detector location

Cumulated neutron fluence in operation time

Cumulated Uncollided Fluence

	Years	LOS4	LOS5	LOS6	LOS7	LOS8	LOS9	LOS10	LOS12	LOS14	LOS16	LOS18	LOS19	LOS20	LOS21	LOS22	LOS23
DD and DT Trace Tritium Campaign	0	7,01E+11	6,20E+11	7,13E+11	7,98E+11	9,30E+11	9,38E+11	9,71E+11	1,16E+12	1,00E+12	9,34E+11	8,10E+11	7,36E+11	6,18E+11	9,07E+11	9,03E+11	8,94E+11
	1	1,40E+12	1,24E+12	1,43E+12	1,60E+12	1,86E+12	1,88E+12	1,94E+12	2,31E+12	2,01E+12	1,87E+12	1,62E+12	1,47E+12	1,24E+12	1,81E+12	1,81E+12	1,79E+12
	2	2,10E+12	1,86E+12	2,14E+12	2,40E+12	2,79E+12	2,81E+12	2,91E+12	3,47E+12	3,01E+12	2,80E+12	2,43E+12	2,21E+12	1,85E+12	2,72E+12	2,71E+12	2,68E+12
	3	2,80E+12	2,48E+12	2,85E+12	3,19E+12	3,72E+12	3,75E+12	3,88E+12	4,62E+12	4,01E+12	3,73E+12	3,24E+12	2,94E+12	2,47E+12	3,63E+12	3,61E+12	3,58E+12
	4	3,50E+12	3,10E+12	3,56E+12	3,99E+12	4,65E+12	4,69E+12	4,85E+12	5,78E+12	5,02E+12	4,67E+12	4,05E+12	3,68E+12	3,09E+12	4,53E+12	4,51E+12	4,47E+12
	5	4,20E+12	3,72E+12	4,28E+12	4,79E+12	5,58E+12	5,63E+12	5,83E+12	6,94E+12	6,02E+12	5,60E+12	4,86E+12	4,42E+12	3,71E+12	5,44E+12	5,42E+12	5,36E+12
	6	4,90E+12	4,34E+12	4,99E+12	5,59E+12	6,51E+12	6,57E+12	6,80E+12	8,09E+12	7,03E+12	6,54E+12	5,67E+12	5,15E+12	4,33E+12	6,35E+12	6,32E+12	6,26E+12
	7	5,61E+12	4,96E+12	5,70E+12	6,39E+12	7,44E+12	7,51E+12	7,77E+12	9,25E+12	8,03E+12	7,47E+12	6,48E+12	5,89E+12	4,94E+12	7,25E+12	7,22E+12	7,15E+12
No operations	8	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
DT1 Campaign	9	7,15E+12	6,32E+12	7,27E+12	8,14E+12	9,48E+12	9,57E+12	9,90E+12	1,18E+13	1,02E+13	9,52E+12	8,26E+12	7,51E+12	6,30E+12	9,25E+12	9,20E+12	9,12E+12
	10	8,69E+12	7,68E+12	8,84E+12	9,90E+12	1,15E+13	1,16E+13	1,20E+13	1,43E+13	1,24E+13	1,16E+13	1,00E+13	9,13E+12	7,66E+12	1,12E+13	1,12E+13	1,11E+13
	11	1,02E+13	9,04E+12	1,04E+13	1,17E+13	1,36E+13	1,37E+13	1,42E+13	1,69E+13	1,47E+13	1,36E+13	1,18E+13	1,07E+13	9,02E+12	1,32E+13	1,32E+13	1,30E+13
DT1 Campaign	12	6,38E+13	5,64E+13	6,49E+13	7,27E+13	8,46E+13	8,54E+13	8,83E+13	1,05E+14	9,13E+13	8,50E+13	7,37E+13	6,70E+13	5,62E+13	8,25E+13	8,21E+13	8,13E+13
	13	1,17E+14	1,04E+14	1,19E+14	1,34E+14	1,56E+14	1,57E+14	1,63E+14	1,94E+14	1,68E+14	1,56E+14	1,36E+14	1,23E+14	1,03E+14	1,52E+14	1,51E+14	1,50E+14
	14	1,71E+14	1,51E+14	1,74E+14	1,95E+14	2,27E+14	2,29E+14	2,37E+14	2,82E+14	2,45E+14	2,28E+14	1,97E+14	1,79E+14	1,51E+14	2,21E+14	2,20E+14	2,18E+14
DT2 2/3 Campaign	15	2,24E+14	1,98E+14	2,28E+14	2,55E+14	2,97E+14	3,00E+14	3,10E+14	3,69E+14	3,21E+14	2,98E+14	2,59E+14	2,35E+14	1,97E+14	2,90E+14	2,88E+14	2,86E+14
	16	2,77E+14	2,45E+14	2,82E+14	3,16E+14	3,67E+14	3,71E+14	3,84E+14	4,57E+14	3,97E+14	3,69E+14	3,20E+14	2,91E+14	2,44E+14	3,58E+14	3,57E+14	3,53E+14
	17	3,30E+14	2,92E+14	3,36E+14	3,76E+14	4,38E+14	4,42E+14	4,57E+14	5,45E+14	4,73E+14	4,40E+14	3,81E+14	3,47E+14	2,91E+14	4,27E+14	4,25E+14	4,21E+14
DT2 4/5 Campaign	18	3,83E+14	3,39E+14	3,90E+14	4,37E+14	5,08E+14	5,13E+14	5,31E+14	6,32E+14	5,49E+14	5,10E+14	4,43E+14	4,03E+14	3,38E+14	4,96E+14	4,93E+14	4,89E+14
	19	4,36E+14	3,86E+14	4,44E+14	4,97E+14	5,79E+14	5,84E+14	6,04E+14	7,19E+14	6,25E+14	5,81E+14	5,04E+14	4,58E+14	3,85E+14	5,64E+14	5,62E+14	5,56E+14
	20	4,89E+14	4,32E+14	4,98E+14	5,57E+14	6,49E+14	6,55E+14	6,78E+14	8,07E+14	7,01E+14	6,52E+14	5,65E+14	5,14E+14	4,31E+14	6,33E+14	6,30E+14	6,24E+14
	21	5,42E+14	4,79E+14	5,52E+14	6,18E+14	7,19E+14	7,26E+14	7,51E+14	8,94E+14	7,77E+14	7,22E+14	6,26E+14	5,70E+14	4,78E+14	7,01E+14	6,98E+14	6,92E+14
	22	5,95E+14	5,26E+14	6,05E+14	6,78E+14	7,90E+14	7,97E+14	8,25E+14	9,82E+14	8,53E+14	7,93E+14	6,88E+14	6,25E+14	5,25E+14	7,70E+14	7,67E+14	7,59E+14
	23	6,48E+14	5,73E+14	6,59E+14	7,39E+14	8,60E+14	8,68E+14	8,98E+14	1,07E+15	9,29E+14	8,64E+14	7,49E+14	6,81E+14	5,72E+14	8,39E+14	8,35E+14	8,27E+14
	24	7,01E+14	6,20E+14	7,13E+14	7,99E+14	9,30E+14	9,39E+14	9,72E+14	1,16E+15	1,00E+15	9,34E+14	8,10E+14	7,37E+14	6,18E+14	9,07E+14	9,03E+14	8,94E+14
	25	7,54E+14	6,67E+14	7,67E+14	8,59E+14	1,00E+15	1,01E+15	1,05E+15	1,24E+15	1,08E+15	1,01E+15	8,71E+14	7,92E+14	6,65E+14	9,76E+14	9,71E+14	9,62E+14
	26	8,07E+14	7,14E+14	8,21E+14	9,20E+14	1,07E+15	1,08E+15	1,12E+15	1,33E+15	1,16E+15	1,08E+15	9,33E+14	8,48E+14	7,12E+14	1,04E+15	1,04E+15	1,03E+15
	27	8,60E+14	7,61E+14	8,75E+14	9,80E+14	1,14E+15	1,15E+15	1,19E+15	1,42E+15	1,23E+15	1,15E+15	9,94E+14	9,04E+14	7,59E+14	1,11E+15	1,11E+15	1,10E+15
	28	9,13E+14	8,08E+14	9,29E+14	1,04E+15	1,21E+15	1,22E+15	1,27E+15	1,51E+15	1,31E+15	1,22E+15	1,06E+15	9,60E+14	8,05E+14	1,18E+15	1,18E+15	1,16E+15
	29	9,66E+14	8,54E+14	9,83E+14	1,10E+15	1,28E+15	1,29E+15	1,34E+15	1,59E+15	1,38E+15	1,29E+15	1,12E+15	1,02E+15	8,52E+14	1,25E+15	1,24E+15	1,23E+15
	30	1,02E+15	9,01E+14	1,04E+15	1,16E+15	1,35E+15	1,36E+15	1,41E+15	1,68E+15	1,46E+15	1,36E+15	1,18E+15	1,07E+15	8,99E+14	1,32E+15	1,31E+15	1,30E+15
	31	1,07E+15	9,48E+14	1,09E+15	1,22E+15	1,42E+15	1,44E+15	1,49E+15	1,77E+15	1,54E+15	1,43E+15	1,24E+15	1,13E+15	9,46E+14	1,39E+15	1,38E+15	1,37E+15
	32	1,13E+15	9,95E+14	1,14E+15	1,28E+15	1,49E+15	1,51E+15	1,56E+15	1,86E+15	1,61E+15	1,50E+15	1,30E+15	1,18E+15	9,92E+14	1,46E+15	1,45E+15	1,44E+15
	33	1,18E+15	1,04E+15	1,20E+15	1,34E+15	1,56E+15	1,58E+15	1,63E+15	1,94E+15	1,69E+15	1,57E+15	1,36E+15	1,24E+15	1,04E+15	1,52E+15	1,52E+15	1,50E+15
	34	1,23E+15	1,09E+15	1,25E+15	1,40E+15	1,63E+15	1,65E+15	1,71E+15	2,03E+15	1,76E+15	1,64E+15	1,42E+15	1,29E+15	1,09E+15	1,59E+15	1,59E+15	1,57E+15
	35	1,28E+15	1,14E+15	1,31E+15	1,46E+15	1,70E+15	1,72E+15	1,78E+15	2,12E+15	1,84E+15	1,71E+15	1,48E+15	1,35E+15	1,13E+15	1,66E+15	1,65E+15	1,64E+15

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FCFRDB development: new data from fusion facilities

Availability/Reliability global performance statistics on specific plant needs to be disaggregated to become informative for new systems reliability-driven design

- Sensitize facility operators to raw failure events/ maintenance <u>**data collection at component level**</u>,
- Machine operation data perspective not always superposable to RAMI data perspective
- Collaborations with facilities being established - Definition of raw data collection forms

		Date and Place of Form Compilation	Family Name	Given Name	Institution / Affiliation	Qualification	Role	Contact (email)				Notes
	User/Form Identification											
GENERAL INFO SECTION		Laboratory / Facility	Acquisition Date	Acquisition Context	Acquisition Process	Data Processing						Notes
	Data Acquisition Information											
		Component ID	Function	Operation Mode	Component Boundary	Design Characteristics	Application Characteristics	Preventive Maintenance Policy	Test / Inspection interval			
	Component											
		Start date	Stop date	Operation parameters (System)	Operation parameters							
	Operating time											
COMPONENT FAILURE INFO SECTION RECORD 1		Failure Mode	Cause	Time/ Demand # of Failure	Time/Demand # To Failure	Failure Detection / Action on detection	Time to repair (Prepare)	Time to repair (Perform)	Time to repair (Commissioning)	Time to repair (Total)	N° of Workers	Notes
	Failure/Corrective Maintenance identification											
		Activity	Cause	Date	Time to Maintenance	N° of Demands to maintenance	Time to Perform Preventive Maintenance (Prepare)	Time to Perform Preventive Maintenance (Perform)	Time to Perform Preventive Maintenance (Commissioning)	Time to Perform Preventive Maintenance (Total)	N° of Workers	Notes
	Preventive maintenance identification											

Component definition

Operation definition

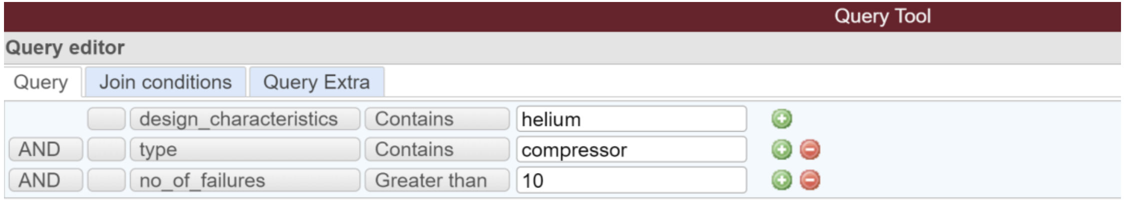
Failure/Repair definition

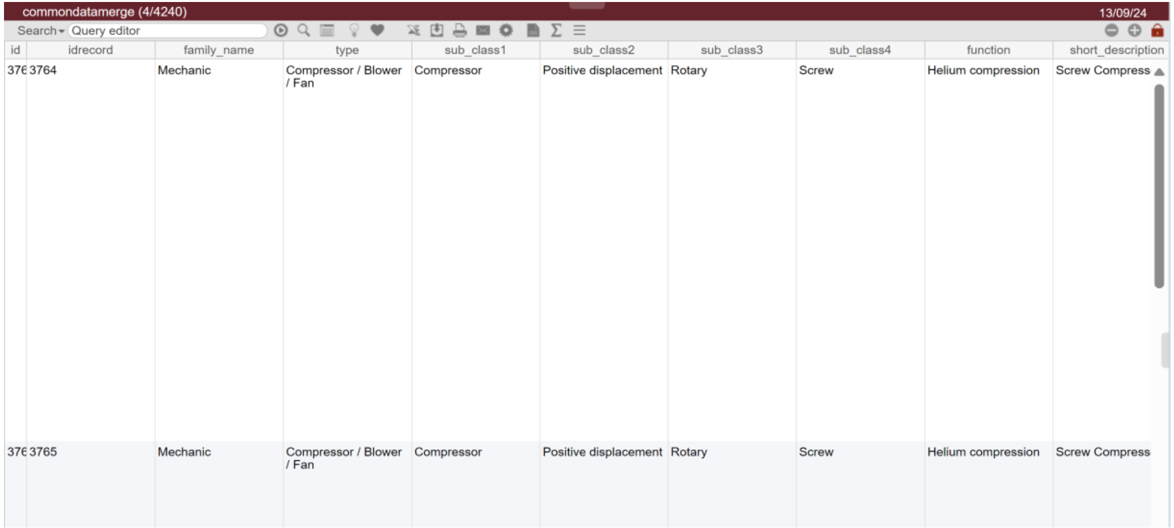
Maintenance policy definition

FCFRDB development: new user interface website

Under development a new user website enabling:

- Search on records by keyword
- complex queries editing, saving
- data export to excel





Summary and Conclusion

- A high plant availability (~80%) is the target for nuclear fusion to compete in the energy market.
- Reliability-driven design is mandatory and shall be supported by collection of fusion facilities failure and maintenance data at component level
- Collaborative effort IEA – ESEFP Task 5 is aimed at such purpose with the Fusion Component Failure Rate Data Base, made available for fusion community
- Data collection is ongoing, ~4700 records now available:
  - Data from expert selection among literature data
  - Data from fusion specific qualification and testing of components
  - Data from suppliers system analyses
  - Invest time/resources in collecting/sharing data from your FACILITY
- Development of a new user web interface enabling advaced data search is ongoing

Thanks for your attention

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