#### Reducing Errors: Developments at Sellafield to Aid the Criticality Assessor

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## Computing moves on ...



VAX 11/780 minicomputer









# A simple process ...





# **Visualisation (1)**











# **Visualisation (3)**

### When I started!

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MMMMM91D1111111111111111111111111111111	8888888FFFFFFFFFFFFFFFFFF <b>11111111</b>
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# **Defining geometry**

#### 'Standard' geometry

#### A bit more difficult!





#### **CAD Models - Oinc**





#### **CAD Models**





#### **Criticality Handbook**



 Series 0 - Series 1 Beries 2

100.00

### **Input requirements - parameterization**

- Before calculation & transcription errors and typos
  'Easy' to check
- CONC MN 8.66646E-04 NI 7.2999EE-03 CR 1.60244E-02 FE 6.18092E-02
- Now complex parameterization
  - More difficult to check

 $@u235 = [(@enr/100.0*@u238_atm)/(@u235_atm+@enr/100.0*@u238_atm-(@enr/100.0*@u235_atm))]$ 



### **MONKCheck**

	А	В	С	D	E	F	G	H	
6	# Operating System : Linux 2.6.16.21-0.25-smp Processor type								
7	# Nuclear Data Library	ile dice96j2v10.	dat						
8	Filename	K-eff	STDV	K-eff+3STDV	CONC	height	Status		
9	finite_11888_02_01.lis	0.4455	0.0015	0.4498	0.02	3	pass		
10	finite_11888_02_02.lis	0.5329	0.0015	0.5373	0.02	4	pass		
11	finite_11888_02_03.lis	0.602	0.0015	0.6064	0.02	5	pass		
12	finite_11888_02_04.lis	0.6706	0.0015	0.675	0.02	6	warning: Estimators		
13	finite_11888_02_05.lis	0.7284	0.0015	0.7329	0.02	7	warning: Estimators		
14	finite_11888_02_06.lis	0.7811	0.0015	0.7855	0.02	8	pass		
15	finite_11888_02_07.lis	0.8279	0.0015	0.8323	0.02	9	warning: Estimators		
16	finite_11888_02_08.lis	0.8714	0.0015	0.8758	0.02	10	pass		
17	finite_11888_02_09.lis	0.9095	0.0015	0.9139	0.02	11	pass		
18	finite_11888_02_10.lis	0.9465	0.0015	0.9509	0.02	12	pass		
19	finite_11888_02_11.lis	0.978	0.0015	0.9824	0.02	13	pass		
20	finite_11888_03_01.lis	0.4915	0.0015	0.496	0.025	3	pass		
21	finite_11888_03_02.lis	0.5816	0.0015	0.586	0.025	4	pass		



### Critik





# Critik (2)



Sellafield Ltd

### **Knowledge Management**







#### Nuclear Codes and Data

Criticality: MONK | MCNP | SCALE | KENO | Criticality Assistant | NUMDEN (>>NUMDEN3c@>>MOXNUM\_ module ) | Deterministic criticality code | Monte Carlo methods | MATSPECS Shielding: MCBEND | RANKERN | ANISN | CYLIND | Attila | MicroShield | MCNP | DECOM | BETA Visualisation: Visage | Vista-Ray | Vista-Wire | Visual Workshop | Sabrina | MCNP Vised | GNUplot Source GAMMA | FISPIN determination: Nuclear data: Nuclear Data | JANIS | MONK Nuclear Data Libraries (UKNDL - JEF - BINGO - JENDL - ENDF) | ICSBEP | IRPhEP | NEA data bank | SFCOMPO Misc: WORM | CodeMore | MONKCHECK | CriTik



#### General notes on MONK modelling and checking

Article Discussion Edit History Move Watch

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- 2 General Comments
- 3 Scoping out a MONK Assessment
- 4 MONK Safety Criteria

#### Role in Safety Assessment

[edit]

The main role of calculation methods in criticality assessment is to quantify critical and safe values for controlled parameters. In particular the assessment will usually include the definition of the 'Safe Envelope' inside which the operation is demonstrated to be safely sub-critical. If any Fault Sequence were to progress to such a stage where the envelope is breached a criticality might occur. In contrast to many other hazards such as dose from radioactive materials, there is no



## **Summary**

- Developments have been made to reduce:
  - modeling pessimisms
  - time for assessors to produce and process models
  - the potential for user errors during the process



