COLLEGE OF ENGINEERING
NUCLEAR ENGINEERING & RADIOLOGICAL SCIENCES
UNIVERSITY OF MICHIGAN

Role of Research in Building Core Capabilities and Advancing Nuclear Safety

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30 May 2019

Story #1: The Coriou Effect
Research not Sufficient

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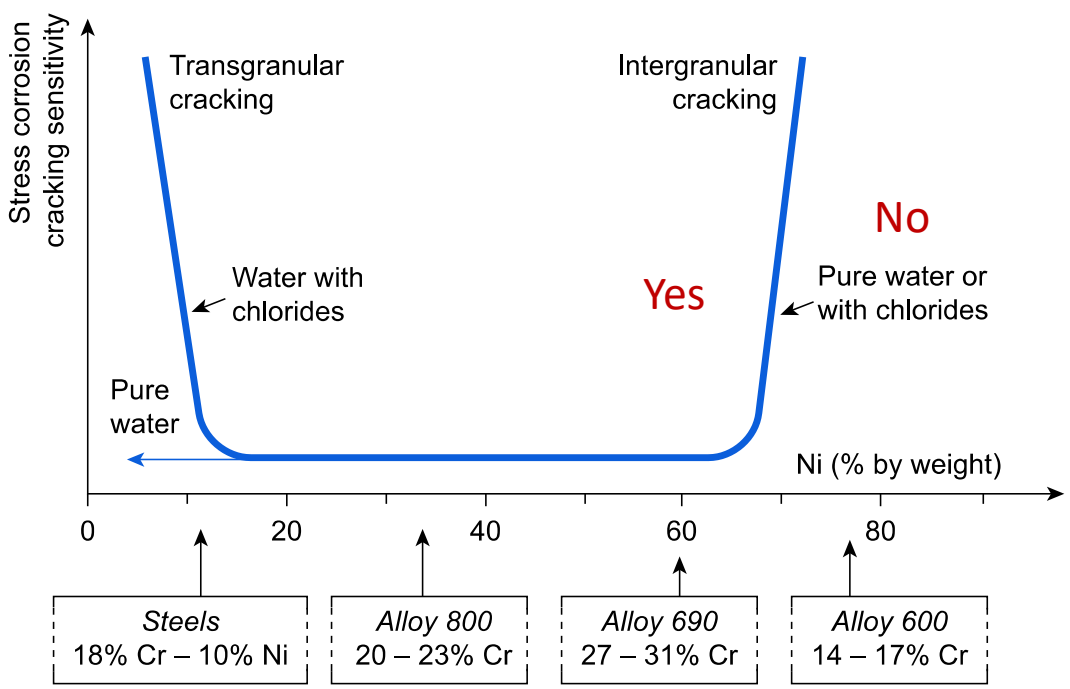

Figure 2.4 Detrimental effect of a high nickel content on the stress corrosion cracking resistance of Fe–18%Cr–Ni alloys in pure or chloride-contaminated water at 350°C. From Techniques de l'Ingénieur.

Alloy 690 is the modern choice for most PWR steam generators

Alloy 600 was the initial choice

P. Berge, Stress Corrosion Cracking of Nickel-based Alloys in Water-cooled Nuclear Reactors Elsevier Ltd.

Story #1: The Coriou Effect

In 1959 Henri Coriou, head of the CEA's Aqueous Corrosion Service, had reported disturbing evidence concerning the behavior of Alloy 600 (it cracked)

The "Coriou syndrome" seemed to be specifically French and gave rise to lively controversies on account of its potential industrial impact.

An even more astounding event happened when an American colleague admitted later that he suspected Coriou of being a KGB agent and spreading false rumors to raise doubts among the American public about the reliability of American nuclear submarines.

More than 10 years went by before people actually started to admit the risk involved, especially when the first cracks appeared in a reactor in service at Obrigheim, Germany.

An improved alloy (690) was finally selected in 1984 after 52 French plants were already built

P. Berge, Stress Corrosion Cracking of Nickel-based Alloys in Water-cooled Nuclear Reactors
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Story #2: TRACE/PARCS/MELLA+ Research Made Tools Ready

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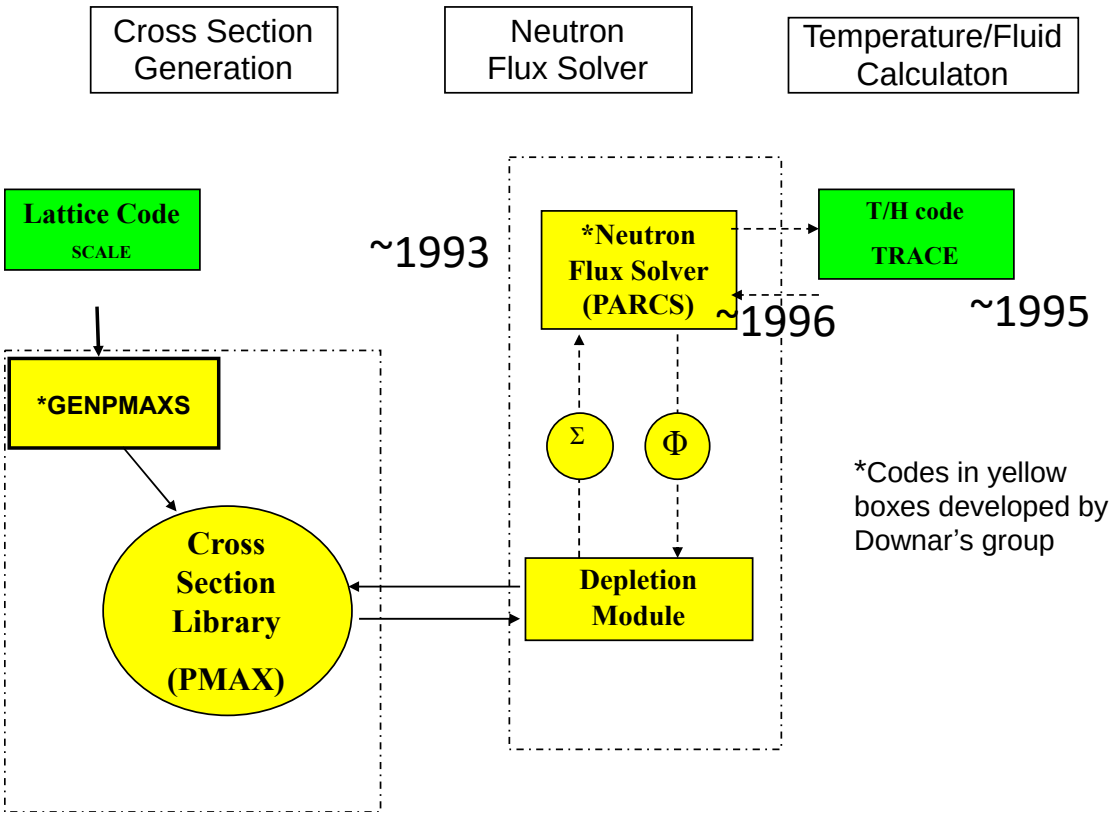
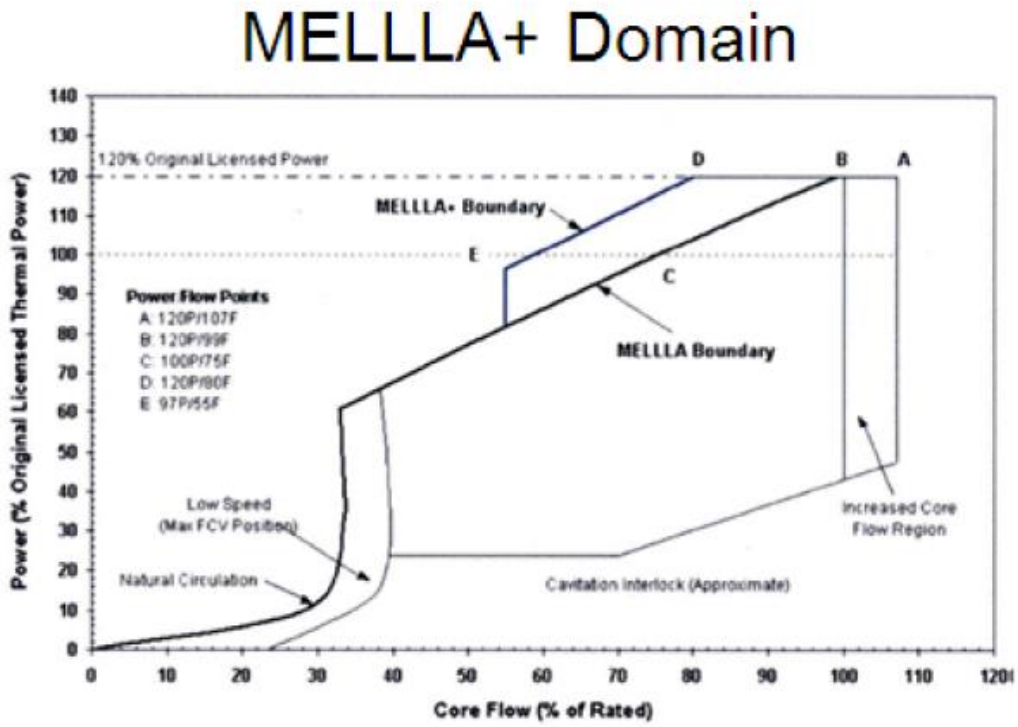


U.S. NRC Coupled Code System

Story #2: TRACE/PARCS/MELLA+ Research Made Tools Ready



Maximum Extended Load Line Limit Analysis Plus (**MELLA**+)

~2010

Story #3: Imaging post-CHF Flows in Complex Geometries Advancing Research Tools

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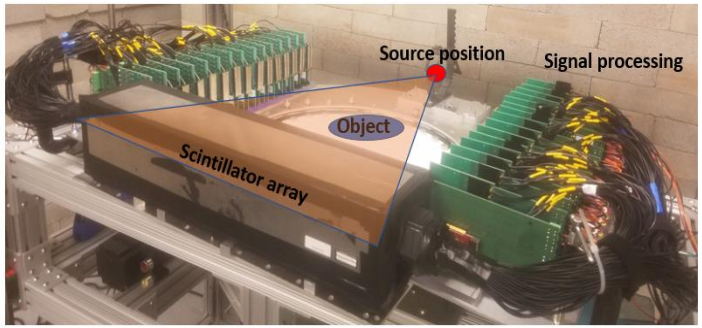

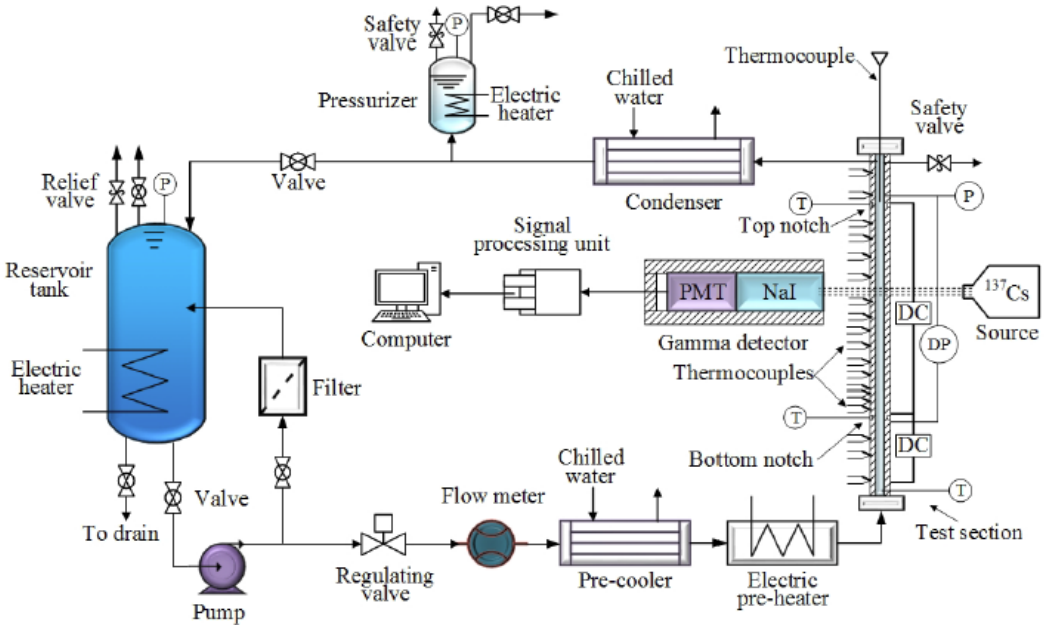

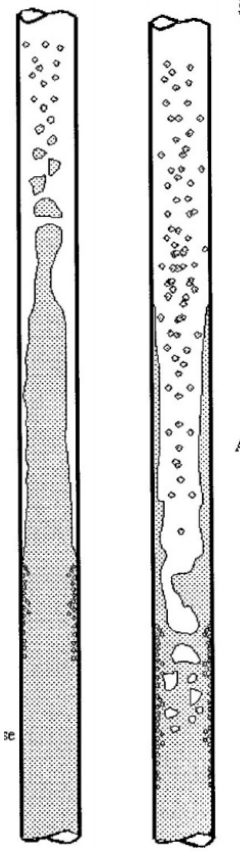

- **Advance subchannel codes and system code models**
- **Employment of high-speed X-ray radiography for high-resolution**

Research Results are Only Part of the Value

Current NRC Staff
(who developed their foundations at Michigan)