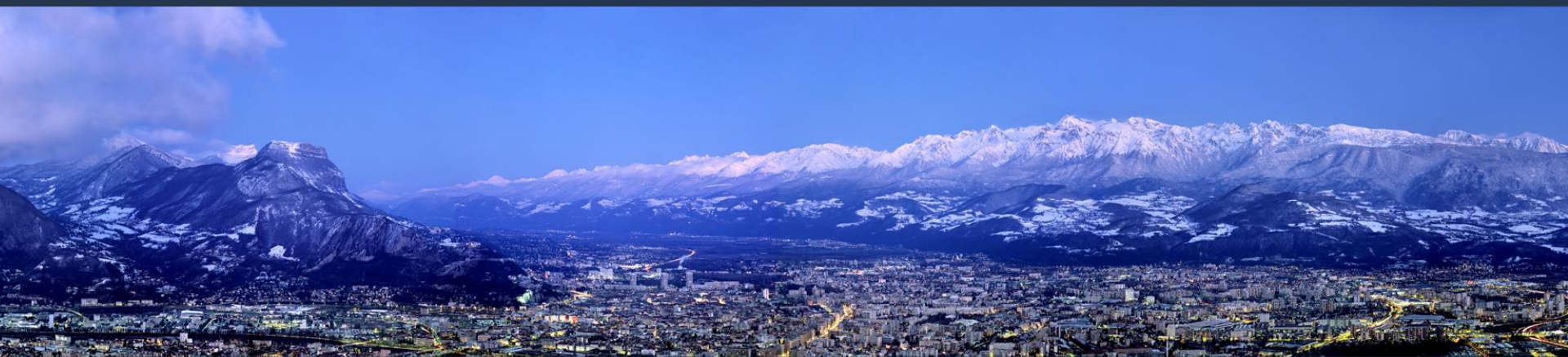


ILL Project Management

Jerome BEAUCOUR beaucour@ill.fr

Coordination of Millennium Project



— GRENOBLE —

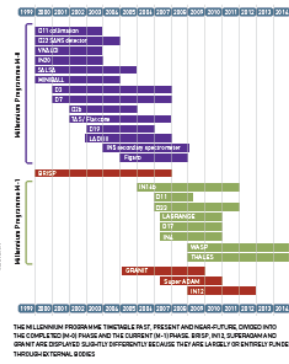
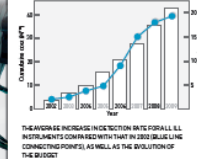
The ILL Renaissance

Beginning of 2000 years, a major program was agreed concerning Instrument suites and Key reactor Component :

RENAISSANCE – A DECADE OF DEVELOPMENT AT THE ILL

In 2000, the ILL launched the Millennium Programme designed to establish a sustainable strategy for the continual improvement of its infrastructure and instruments.

In the 1990s, it became clear that there was an urgent need for a fresh and vigorous initiative to keep the ILL at the leading edge of neutron science, and so an ambitious roadmap for renewal was drawn up. Founded on new scientific opportunities, as well as exciting developments in instrument design – detectors, monochromators, spin polarisers and higher-performance neutron guides, this strategy attracted substantial funding from the ILL's Associate Members. Together with the skill and diligence of ILL staff, we have been able to deliver six new instruments, and extensively upgrade a further eight. A new CRG instrument has been added in parallel. (so-called Collaborating Research Groups, or CRGs, from various partner countries develop



2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

40 M€

Instruments : MILLENNIUM PHASE M0

60 M€

Instruments: MILLENNIUM PHASE M1

30 M€

Nuclear Reactor: Seismic reinforcement

20 M€

Nuclear Reactor: Key reactor & Rex Fukushima

ILL had to implement new rules

Millennium new phase M1 :

- **60M€** over 7 years
- Renewal of the ILL instrument suite and part of experimental halls
- The lack of project control was identified

=> **Request from ILL's associate to improve**



Set the scene : the ILL projects

- **Typical ILL projects** we are speaking about are:
 - Scientific instrument and Infrastructure projects
 - Nuclear reactor key equipments
- They share similar **typical characteristics**
 - 3-5 years duration;
 - 2-4M€ procurement cost
 - Technics :
 - fine positioning mechanics & big mechanics (tank, structure)
 - automation, electronic, software,
 - civil engineering, vacuum technologies, safety issues etc
 - **final customer:** the ILL
- **Make or Buy:** 90% of Manufacturing subcontracted ; 75% of in House studies
- **Legal framework :** Not critical except for nuclear related project

Before 2006 at the ILL....

- **Work Organisation :**

- No matrix organisation; Concurrent engineering rather uncommon; each service is working after each other with low level of interactions.

- **Management :**

- Role unclear for the middle management; are they Experts? Project leaders? Staff providers?
- Project leader and Final client: the Scientist; project team implicit
- Decision process efficient within the Project boundaries; very poor outside: no Project management comitee

- **Budget :**

- Budget allocated per year and rediscussed each year; no multiannual Project budget
- If a budget is allocated : Spend as much as you can

- **Project goals & technical baseline**

- Goals identified but not quantified;
- No faisability studies ; technical baseline not explicit compensated by a strong comitment of ILL staff for technical issues

How to proceed?

- **Decision from direction** : july 2006
- **Audit** of the R&D processus by an external consultancy : sept- nov 2006
- A **working group** is set with key people (some where reluctant to a new project organisation): jan- april 2007
- Very strong **support from ILL direction**
- Communication, training Implementation April/oct 2007

Process duration : 15 month

ILL project management the main 2007

No change required
set a **Project orga**

- Strong **support** for
matrix organisat

- Set a **Project M**
behalf of the ILL

- Split the two roles
project leader

- Set a reference
guidelines, v

- Set an explicit
phases, deliv



PROJECT MANAGEMENT GUIDELINES

The ILL Project Management Guidelines

INTRODUCTION

Many of the projects carried out at the ILL have been performed with exceptional success, as illustrated by the commissioning of the new instruments developed during the early phase of the Millennium Programme.

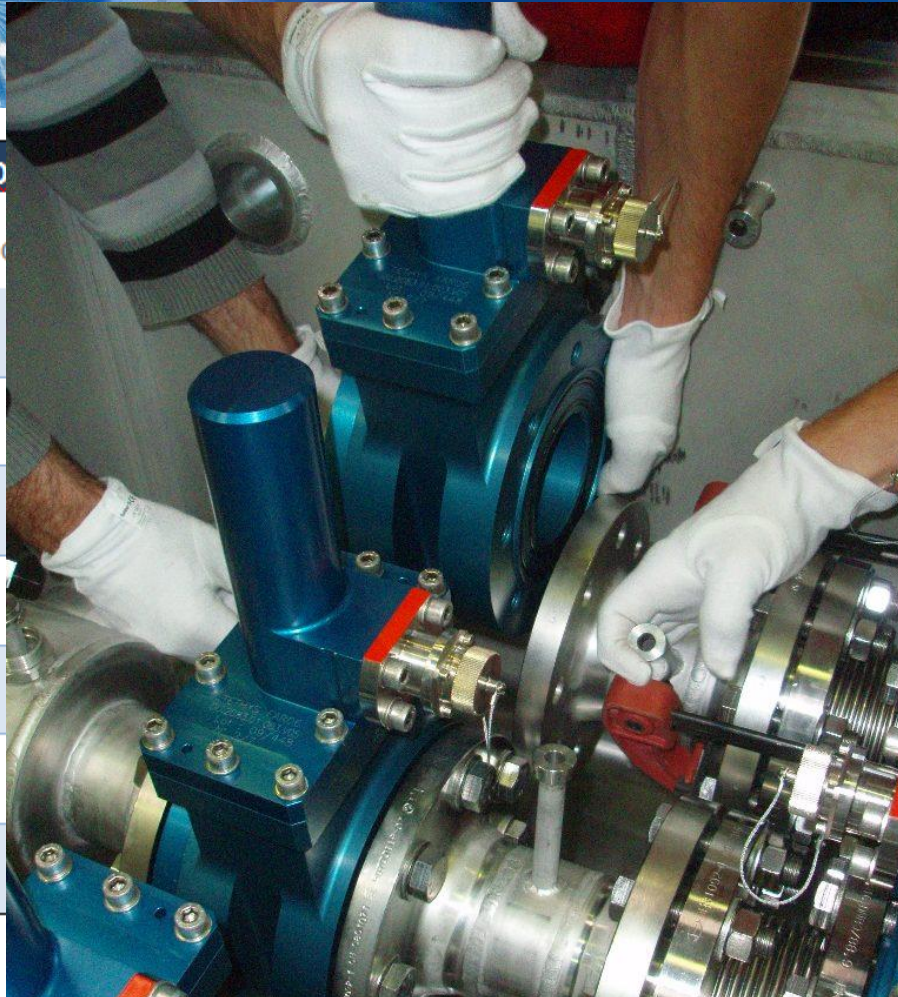
In order to confirm and develop ILL's leadership in the field of neutron physics, challenging new instrument and infrastructure projects are planned over the next five years.

To provide the neutron scattering user community with the best instruments, completed on time and within the allocated budget, the ILL's project management organisation and methodology have been reviewed and optimised.

Intended for the scientists, engineers and technicians involved in projects, the purpose of this document is to set out the guidelines applicable to ILL projects for new instruments and neutron delivery systems, as well as to Key Reactor Component projects.

Matrix organisation at the ILL

	Project & Techno		
	Proj Engineer	Mechan.	Optics
Instr Project 1	x	x	x
Instr Project 2	x	x	
Instr Project 3	x	x	x
Infrastruct ure Pr 1	x	x	
Infrastruct ure Pr 2	x	x	



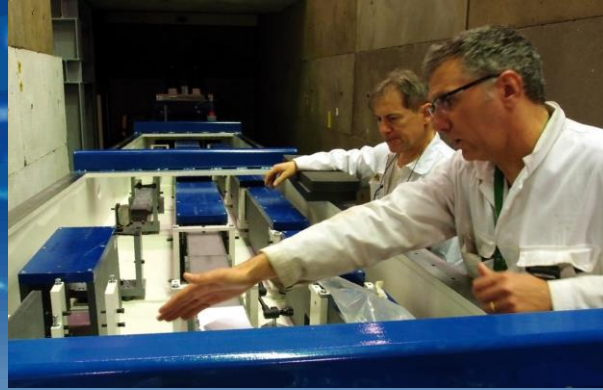
	Reactor Div		
	Sc Comput.	Mechanics	Nucl Safety
			x
x			x
		x	x
			x

**The Project Leader drives engineers, technicians from different services & division.
COLLABORATIVE WORKS**





Projects Team



- ILL projects are carried out by project teams.
 - These are project-specific temporary structures which bring together the technical and management required for the project success
- Each project team is composed of :
 - a **Scientific Project Leader** in charge of needs definition and results validation
 - a **Technical Project Leader** , in charge of the design and realisation,
 - Several **Project Team Members**, from each groups concerned, dedicated to the project up to its completion
- Both Project Leaders report to the PMC

The ILL Project Phases & Deliverables

φA- PRE-PROJECT

DELIVERABLES

- Project ideas
- Scientific case
- Project relevance
- Functions required
- Technical assessments

φB- FEASIBILITY

- Project Plan
- Models

φC/D- EXECUTION

C/ DESIGN

- Updated Project Plan
- Validation plan
- Prototypes
- Solutions (design)

D/ MANUFACTURING

- Updated Project Plan
- Manufacturing
- Testing (component level)
- Documentation

φE- COMMISSIONING

- Validation report
- Safety/health phys. files
- As-built drawings;
- Maintenance inst.; critical spare parts
- User manual, final report
- Putting into service

Launch
Feasibility

Launch
Execution

Intermediate
validation

Launch
Commissioning

Project
closing

DECISIONS

Launch Feasibility
Appointment of Scientific & Technical Project Leader
Feasibility Budget & HR
Setting-up of PMC
Feasibility deadline

PROJECT MANAGEMENT COMMITTEE DECISIONS =>

- Approval of Project Plan
- Final membership of PMC
- Project launch

- Validation of results and Project Plan updates

- Validation of results; accept. / reject. of request for deviation
- Agreement on Project Plan updates

- Validation of performance
- Authorisation to start operation
- Project closing

STARTING POINT (INPUTS)
<ul style="list-style-type: none"> Validated deliverables of the Pre-project phase Official appointment of a Scientific Project Leader and Technical Project Leader Budget and human resources for the Feasibility phase Deadline for the Feasibility phase
PURPOSE OF THE PHASE (OBJECTIVES)
Identify or compile information needed to allow the decision to launch the project to be taken: <ul style="list-style-type: none"> Define the scientific and technical content of the project Set up the project team Identify several possible technical solutions Assess the budgetary and human resources required (skills and availability) Fix the project deadlines Analyse the risks
DELIVERABLES (OUTPUTS)
<ul style="list-style-type: none"> PROJECT PLAN: <ul style="list-style-type: none"> Statement setting out the needs and objectives Functional specifications Description and analysis of possible solutions Project risk analysis (technical, financial, human, legal, natural and economic) Budget estimate for the project as a whole Master schedule (description of possible intermediate stages within the Execution phase) Project team Estimated workload Project Work Breakdown Structure (WBS) Models
WHO IS RESPONSIBLE FOR THE DELIVERABLES
Compliance of deliverables with requirements (scientific, cost, schedule): SCIENTIFIC PROJECT LEADER Deliverables generation: TECHNICAL PROJECT LEADER
DECISIONS (COMPLETION OF THE PHASE)
<ul style="list-style-type: none"> Decision to launch the Execution phase of the project Approval of the Project Plan: <ul style="list-style-type: none"> Decide on needs and objectives Finalise the functional specifications Select the type of solution to adopt (principles) Validate the risk analysis Allocate the project budget Validate the master schedule and reporting deadlines Allocate the human resources Validate the Project Work Breakdown Structure Finalise membership of the Project Management Committee
WHO DECIDES
THE PROJECT MANAGEMENT COMMITTEE

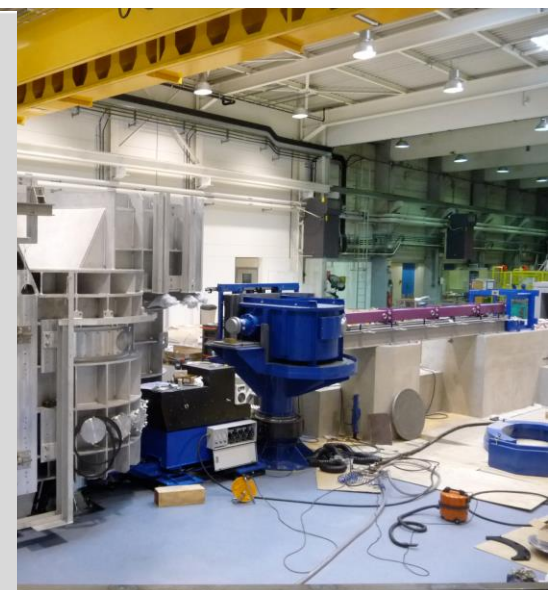
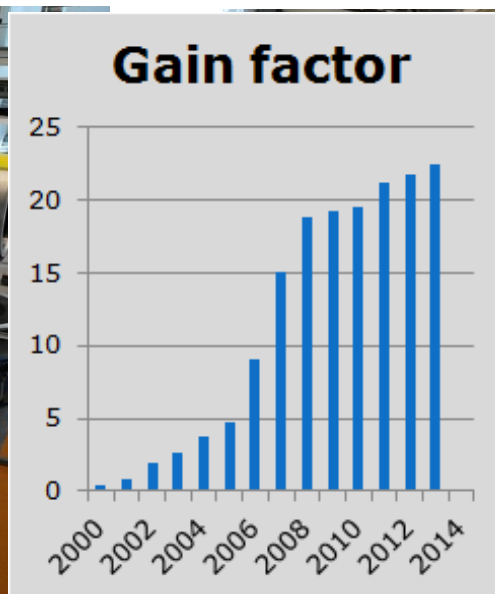
Activity for each phase are defined.

Example: the feasibility phase

- | Expenses & Allocated Budget for Millennium Projects | | | | | | | | | | |
|---|-------|-------|----------------|-------|-------|-------|-------|-------|------|--------|
| Projects | | Phase | Before
2010 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Total |
| Instruments Projects | | | | | | | | | | |
| INT98 NEW | M0+M1 | | 887 | | | | | | | 887 |
| RH68 New -1E | M0+M1 | | 1 227 | | | | | | | 3 221 |
| New Instrument -1E | M1 | | 0 | 1025 | | | | | | 200 |
| WASP/Spin Eclat | M1 | | 26 | 200 | | | | | | 2 810 |
| IMC Refurbish | M1 | | 375 | 80 | | | | | | 3 286 |
| LAGRANGE | M1 | | 165 | 200 | 100 | | | | | 296 |
| LAGRANGE -1E | M1 | | 220 | 131 | 400 | 200 | | | | 400 |
| D77 refurbish | M1 | | 230 | 280 | | 1350 | 700 | 1704 | | 690 |
| THALES | M1 | | 51 | 349 | | | | 271 | | 271 |
| SUPER ADAM | M1 | | 216 | | | | | | | 216 |
| INT5 upgrade (Mill contribution) | M1 | | 103 | | | | | | | 500 |
| USAHS (D11 option) | M1+ | | 138 | 80 | | | | | | 216 |
| USAHS (D11 option) | M1 | | 0 | 15 | 250 | | | | | 2 600 |
| | M1 | | 523 | 580 | | 1300 | 590 | | | 153 |
| | M0+M1 | | 30 | 80 | 30 | | | 277 | | 500 |
| | M0+M1 | | 18 295 | 3 430 | 4 110 | | 320 | | | 216 |
| | M0+M1 | | 1 972 | 250 | 230 | | | 100 | | 2 600 |
| Infrastructure Projects | | | | | | | | | | 153 |
| H52/H63 | M1 | | 32 | | | | | | | 500 |
| H112 | M1 | | 147 | 60 | | | | | | 4 130 |
| H113 (H141/H142/H143) | M1 | | 321 | 825 | | | | | | 120 |
| Others Guides | M0+M1 | | 414 | 270 | 130 | | | | | 4 130 |
| GRANT zone | M1 | | 150 | 150 | 378 | 380 | | | | 500 |
| New UCN/H172 | M1 | | 272 | 0 | 150 | | 2000 | | | 33 833 |
| H172B for UCN&CG@H172 | M1+ | | 0 | 50 | 2236 | 580 | | | | 3402 |
| PERC (Mill contribution) | M1+ | | 0 | 50 | | | | | | 4 404 |
| TISANE@G22 | M1+ | | 0 | 57 | | 50 | | | | 2 350 |
| ILL5-7 Casemate additional shielding | M1+ | | 0 | 30 | 180 | | | 80 | | 1 051 |
| Sum (a) | | | 913 | 10 | 300 | | 20 | | | 4 050 |
| | | | 650 | 22 | 370 | | | | | 600 |
| | | | 3282 | 70 | | 0 | 80 | | | 922 |
| (b) Other Infrastructure | | | | | | | | | | 329 |
| Renovation Guides Halls | M0+M1 | | 108 | | | | | | | 330 |
| new cabins/ Hall modernisation | M1 | | 50 | | | | | | | 700 |
| Extension of Guide hall LL7 | M1 | | 50 | | | | | | | 32 |
| Cabins for Extension of Guide hall LL7 | M1 | | 2 050 | | | | | | | 1 633 |
| Extension of Guide hall LL7 | M1 | | 0 | 1045 | | | | | | 22 173 |
| Extension of Guide hall LL22 | M1 | | 0 | 50 | 275 | | | | | 0 |
| Dry pumps | M0+M1 | | 30 | | 100 | | | | | 158 |
| DT6 Reaiting H62 | M0+M1 | | 98 | | | | | | | 3 270 |
| Reaiting LADI (H141) | M1 | | 2 739 | 50 | 0 | | | | | 150 |
| Reaiting IN12 (H143) | M1 | | 0 | 350 | | | | | | 1830 |
| Millennium Preparation | M0+M1 | | 125 | | 55 | 100 | 0 | 136 | | 146 |
| | | | 8 | | 35 | | | 50 | | 3 500 |
| Sum (b) | | | 11 914 | 1 643 | 677 | 23 | 20 | 30 | | 50 |
| | | | 4 925 | 4 213 | 423 | 1 843 | 3 280 | 2 154 | 95 | 35 |
| 4. Total infrastructure (a + | | | | | | | | | | |

Results

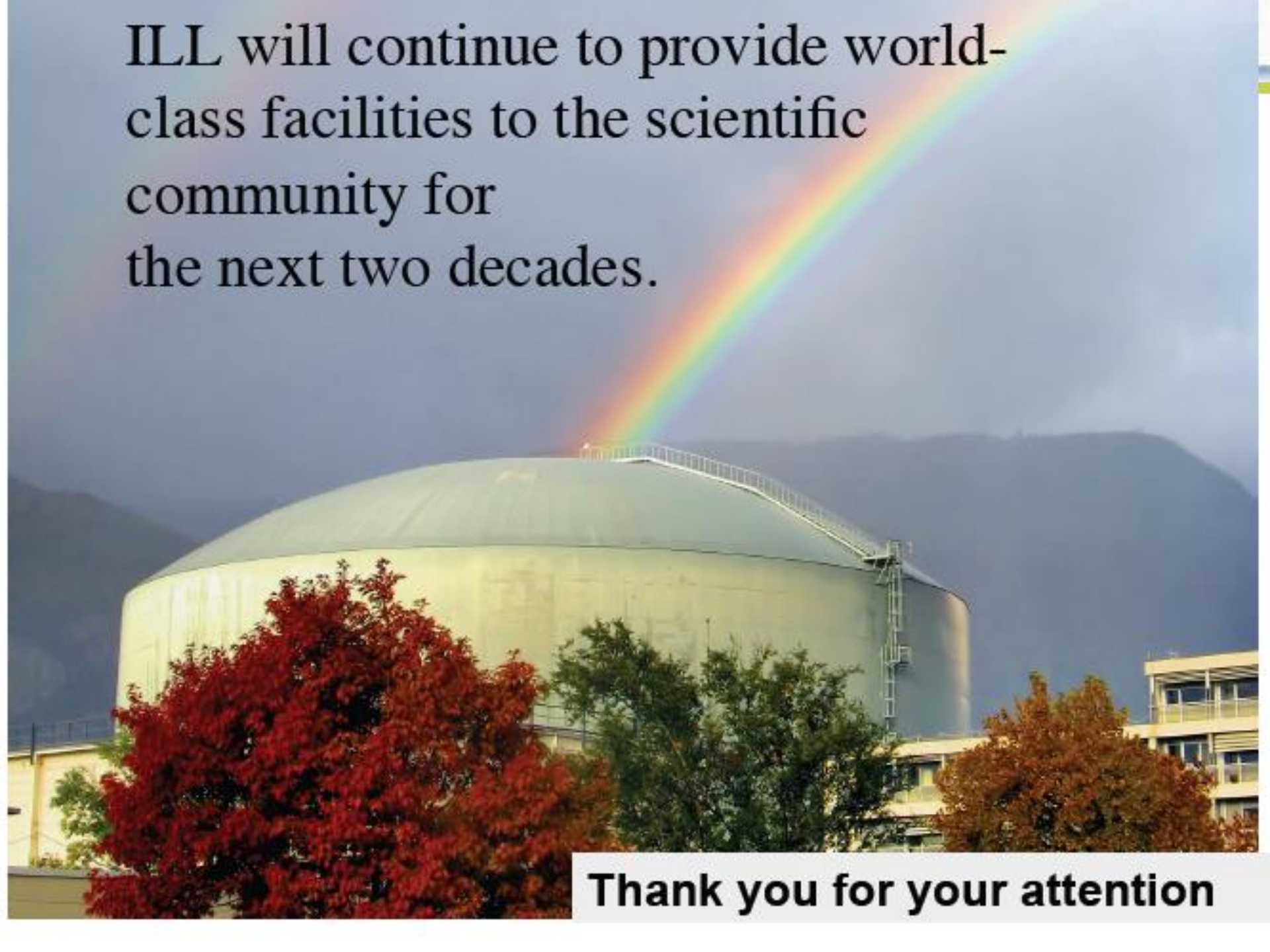
- Schedule: 1 year delay over 7 years
- **Very good control of spending** on 70M€ Millennium program: 2014 expenses are 5% larger than 2007 budget allocation
- Technical goals achieved: **23 times more neutrons** for Science.
- Such a success gives a very good context to launch a new modernisation program :
a 6 years/ 60M€ program



Some lessons Learned

- Technical staff is very cooperative for implementation of Project Management
- Good cooperation from Scientists
- Middle management was the most reluctant, as PM changes Middle management role,
- Directorate support is vital
- Implementation of the Project Management Committee is vital for project controlling at the Institute level, to prevent major \$\$ problems

ILL will continue to provide world-class facilities to the scientific community for the next two decades.



Thank you for your attention

A quick view on Industrial Activity at the ILL

Industrial Liaison

- **Two way to access ILL :**
 1. Scientific Proposal, to be evaluated through Peer rReview process
 2. Buy Beam time (typ 20k€/24hours for public instruments, much cheaper for ILL instruments)
- Income : around 200k€/Year

Industrial Liaison staff:

A very small but efficient team backed by external partners:

1. J Beaucour, part time working as head of Indus Liaison Office
2. Team of part time ILL staff
 - Dunkan Atkins : Tomography and customers interface
 - Martin Walter: contracts
 - Valerie Duchastenier: secretary
 - 7 scientists, expert in their field, as scientific support to customers
3. Partners companies : SERMA technology
 - Provide flexible additional ressources and customer interface services
 - Provide specfic services (routine meas.)

Example of Industrial activities at ILL

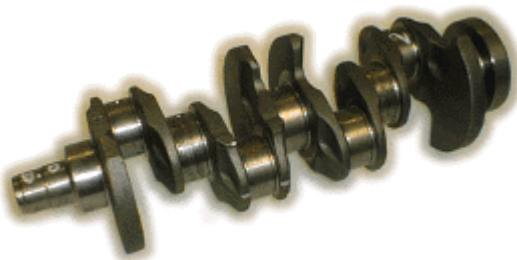
Keeping power stations safe



- Ageing of the structural components under neutron and gamma irradiation ?
 - check on the microstructure of the steel in operating nuclear power reactors.
 - The measurements provide quantitative information about the ageing of the steel and contribute to the decision-making process concerning the safe operating lifetime of reactors.
- Under intense radiation, the steel becomes gradually more brittle
 - Changes in its microstructure.
 - Observation of tiny clusters of copper in the steel.

Improving the performance of car engines

- Optimisation of hardening.
- Finite element calculations need parameters.

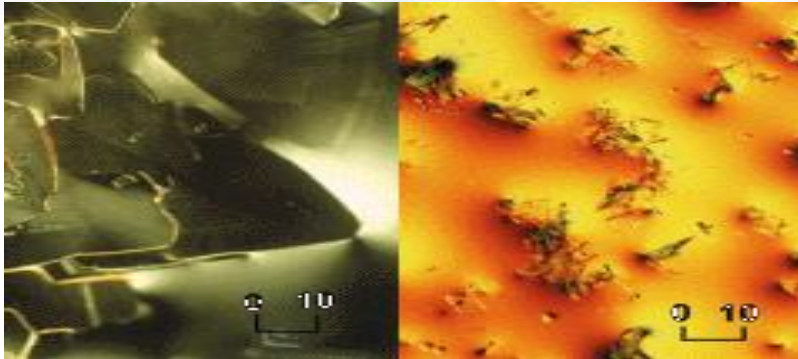


The neutron strain scanning technique is a non-destructive method used to measure stresses in the surface and up to several centimetres deep in the material with high lateral resolution.

Flow improvers for Diesel fuels

Keeping vehicles running at very cold temperatures

EXXON INFINITUM



The photo shows large crystals formed at -13°C and the same fuel treated with additives which lead to a significant reduction in crystal size.

At low temperatures, the growth of wax crystals block diesel fuel filters and can cause engine stoppage.

Modern diesel fuels contain block-copolymer additives which lead to a significant reduction in crystal size and allow low temperature vehicle operation.

Neutrons results suggest that the supramolecular structure formed by self-assembly of the additives interacts with the alkanes to control crystallisation in diesel fuel.

Magnetic shape memory alloys

- Metals that change their shape in a magnetic field : Actuators, sensors and other devices...
- Combining the shape memory property with ferromagnetism, vastly increases the range of applications.
- Detailed study of the transformation processes that give rise to the shape memory effect.

Non destructive ... Archaeology and palaeontology

A neutron texture analysis performed at the ILL could demonstrate that the axe of 5200-year-old man Ötzi, was manufactured in alternate stages of hot and cold forging.



The analysis of small quantities of egyptian make-up using neutrons and X-rays has proved that besides natural ingredients they also contain lead-based synthesised products. This means that 3000 or 4000 years B.C. Egyptians used chemistry!



IRT NanoElec 2012 - 2019

The IRT NanoElec was founded through a joint venture between the French National Research Agency (ANR) and the CEA.

The institute CEA-Leti acts as global coordinator of the IRT, which involves:

- 18 partners

Total budget: M€ 400

incl. M€ 160 of public funds



Characterization program – Large-scale instruments

6M€ project to Facilitate access ILL, ESRF & CEA/LETI
characterisation means,

- Off line preparation labs at Science Building
- On line equipments at ILL and ESRF :
a new facility dedicated for industry both at the ILL (APEX);
a similar initiative at the ESRF
- Manpower for industry
related activities

Partners:



Soitec



Thanks for your attention

