

A large, stylized red letter 'A' logo. The letter is composed of thick, solid red strokes. The top bar is horizontal, and the two vertical strokes are slightly angled outwards. A diagonal stroke crosses from the top right to the bottom left, intersecting the vertical strokes.

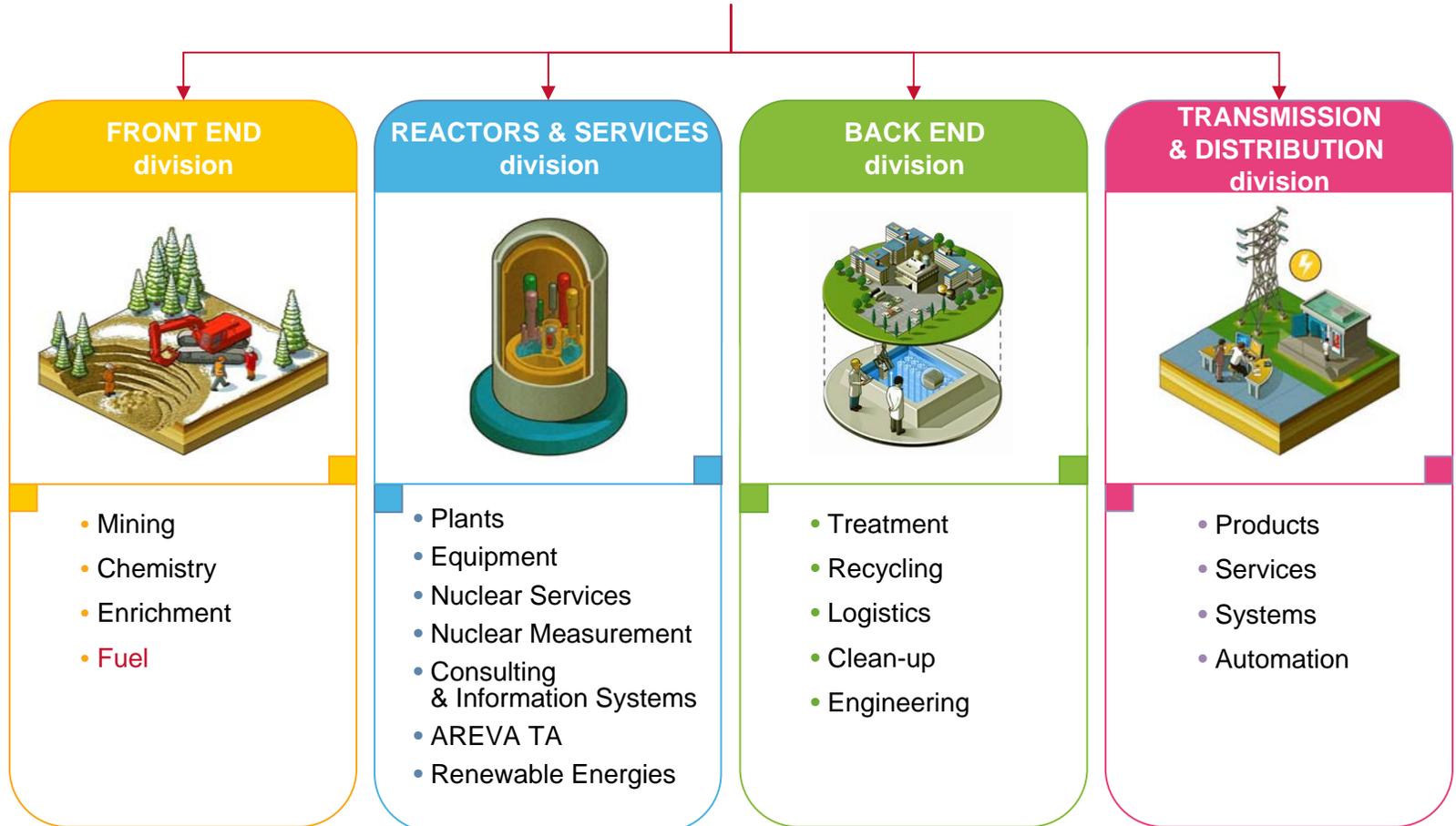
AREVA

***How Quality and Safety
contribute to Fuel Performance***

***Ralf Gueldner,
Lynne Washington,
Marie-Edith Robin,
Fuel Sector, AREVA NP***

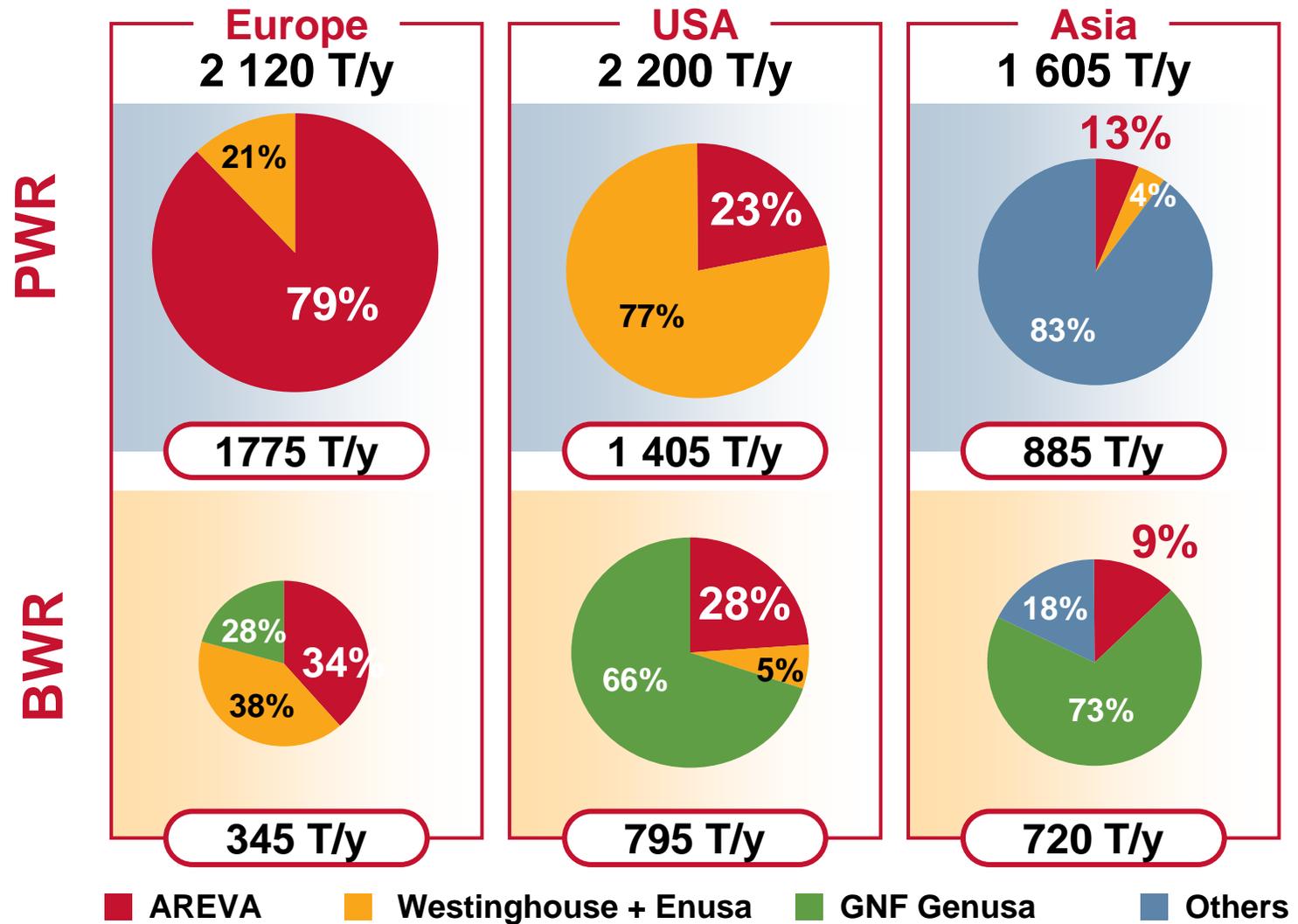
WNA 2007 – London September 7th

Introduction to the AREVA group



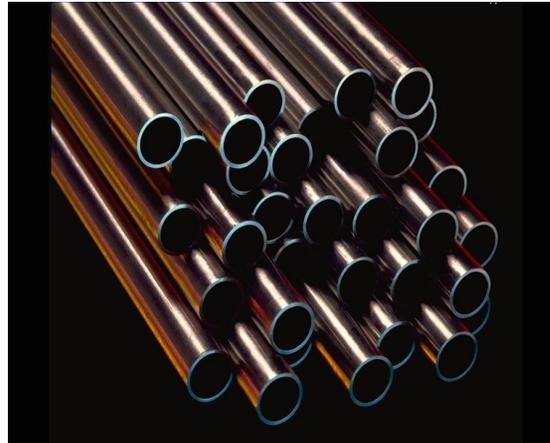
The Fuel Sector of AREVA NP

AREVA Covers about 40% of the LWR World Fuel Needs (not including VVER)



Source : Nuclear Assurance Corporation (Fuel Trac edition 08/2006); averaged values 2006+/- 1 year

The Fuel Sector : a worldwide integrated and customer centered organization



Design & Sales

- **4 sites**
- **3 Customers Centers: Europe, USA, Asia Pacific**
- **Global functions for product development and market strategy**

Zirconium

- **6 sites**
- **Fully integrated manufacturing from Zircon sand, through semi products to final products: tubes, bar stock and sheets**

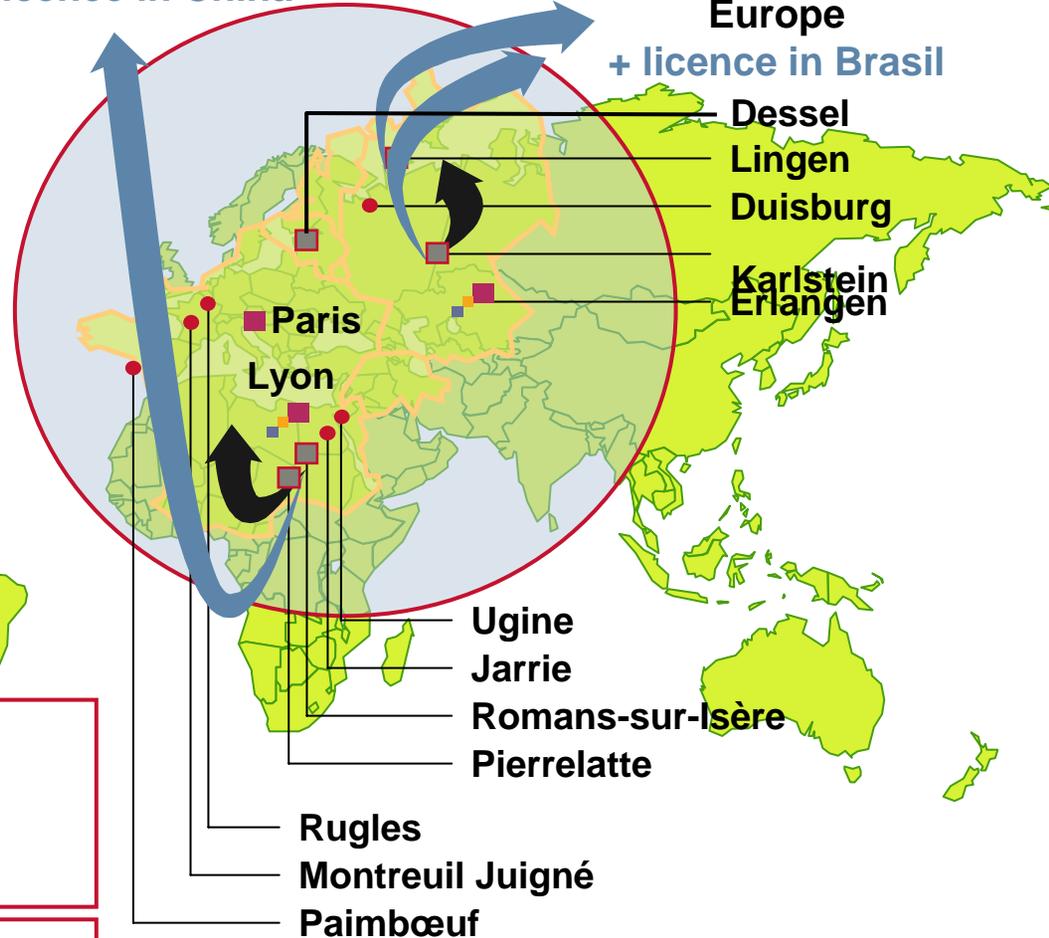
Fuel Manufacturing

- **7 sites**
- **Worldwide organization with FA lines (Europe and USA) and worldwide Components line**

USA + ASIA (except China)

Europe + South Africa
+ licence in China

Europe
+ licence in Brasil

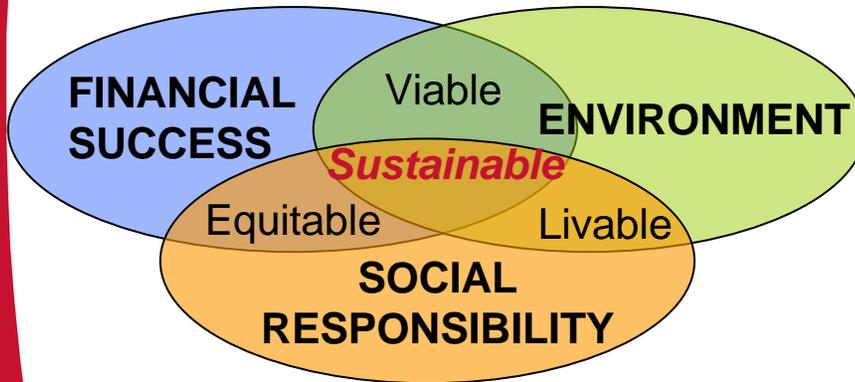


- Design & Sales
- Engineering
- Services
- Fuel Manufacturing
- Zirconium Cladding

Markets Served

The AREVA Way Model

Ten AREVA Way Principles supporting Sustainable Development



1. **Governance**
2. **Financial Performance**
3. **Customer Satisfaction**
4. **Commitment to Employees**
5. **Risk Management & Prevention**
6. **Respect for the Environment**
7. **Innovation**
8. **Community Involvement**
9. **Dialogue & Consensus-Building**
10. **Continuous Improvement**

Translating the AREVA Way Principles into Meeting Customer Demands

- ▶ The principle of **Risk Management and Prevention** sets expectations for each site to strive for zero defects/zero accidents
- ▶ The principle of **Continuous Improvement** sets expectations for systematically searching for Best Practices in all aspect of designing and manufacturing fuel
- ▶ The principle of **Customer Satisfaction** includes addressing both Quality and Safety throughout the organization.

Attention to Quality and attention to Safety require the same kind of mindsets in the corporate culture.

What are the Customers' Concerns?

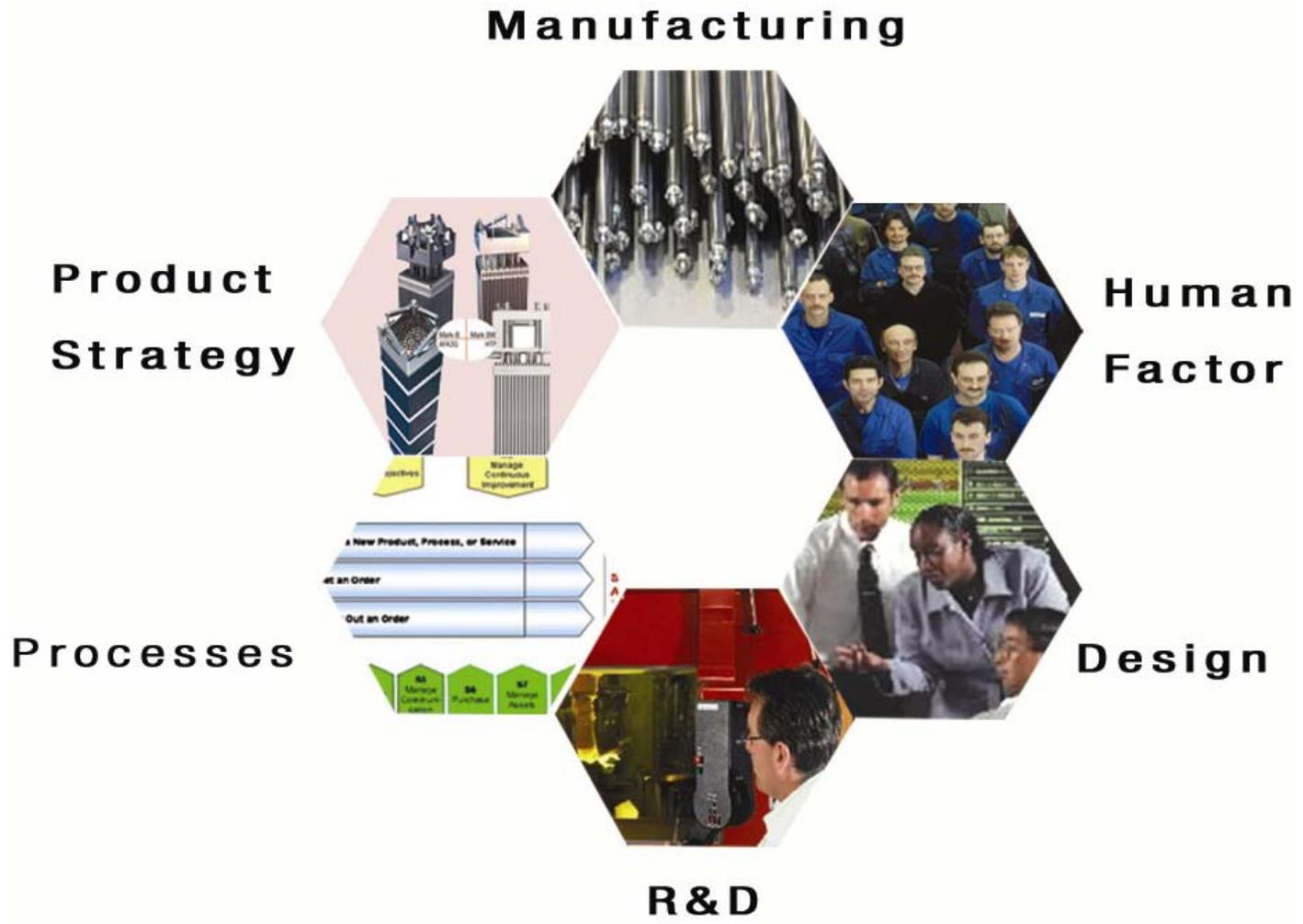
AREVA's customers are saying:

- ▶ We need the highest possible availability of our plants
- ▶ We want no fuel failures in our reactors
- ▶ We expect handling of Fuel without any problems
- ▶ INPO has set an ambitious goal for U.S. reactors:
Zero leakers until 2010
- ▶ We have to optimize uranium utilization

What is the AREVA Fuel Sector doing to support these customer needs?

The ZTF Initiative: Continuous Improvement at AREVA

Zero Tolerance for Failure: The Six Aspects



LEAN Manufacturing: One Approach to Support ZTF

- ▶ A Philosophy leading to a common purpose following common principles and synergizing people and ideas

- ▶ some LEAN tools :
 - ◆ **5S** Rules for workshop organization provide a “quick hit” and visible change in the workplace.
 - ◆ **Value Stream Mapping** is a tool to identify waste and bottlenecks in a process, and provides a focus for where to begin.
 - ◆ **5S** and Value Stream Mapping are common places to begin the LEAN Manufacturing journey.

LEAN Manufacturing is a best-in-class continuous improvement process ensuring safety, quality, on-time delivery, cost and innovation improvement exceeding our competitors

LEAN Manufacturing

5S Workplace Organization Rules

1. Sort Eliminate what is not needed
2. Straighten A place for everything and everything in its place
3. Shine Cleaning and looking for ways to keep it clean
4. Standardize Maintain and monitor the first 3 S's
5. Sustain Stick to the rules - Practice and develop good habits

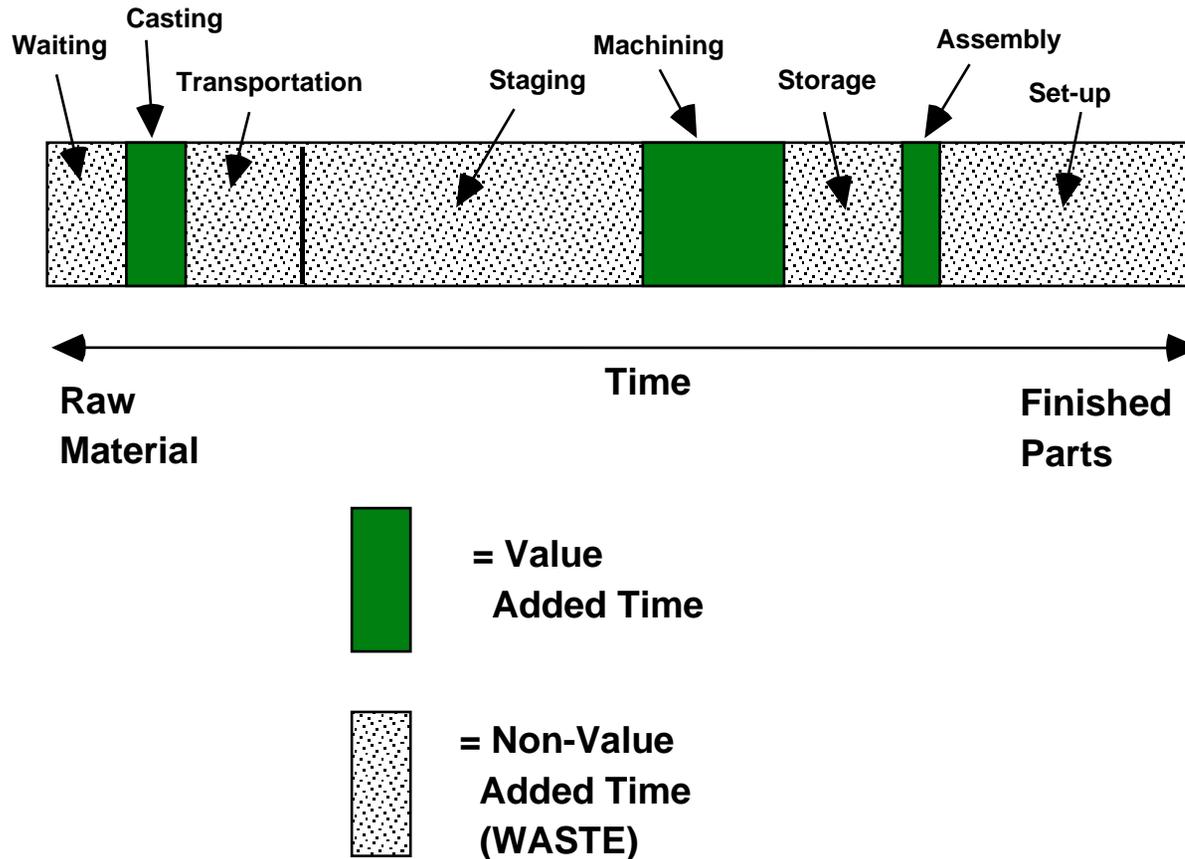
LEAN Manufacturing Gage Calibration Room before 5S



LEAN Manufacturing Gage Calibration Room after 5S



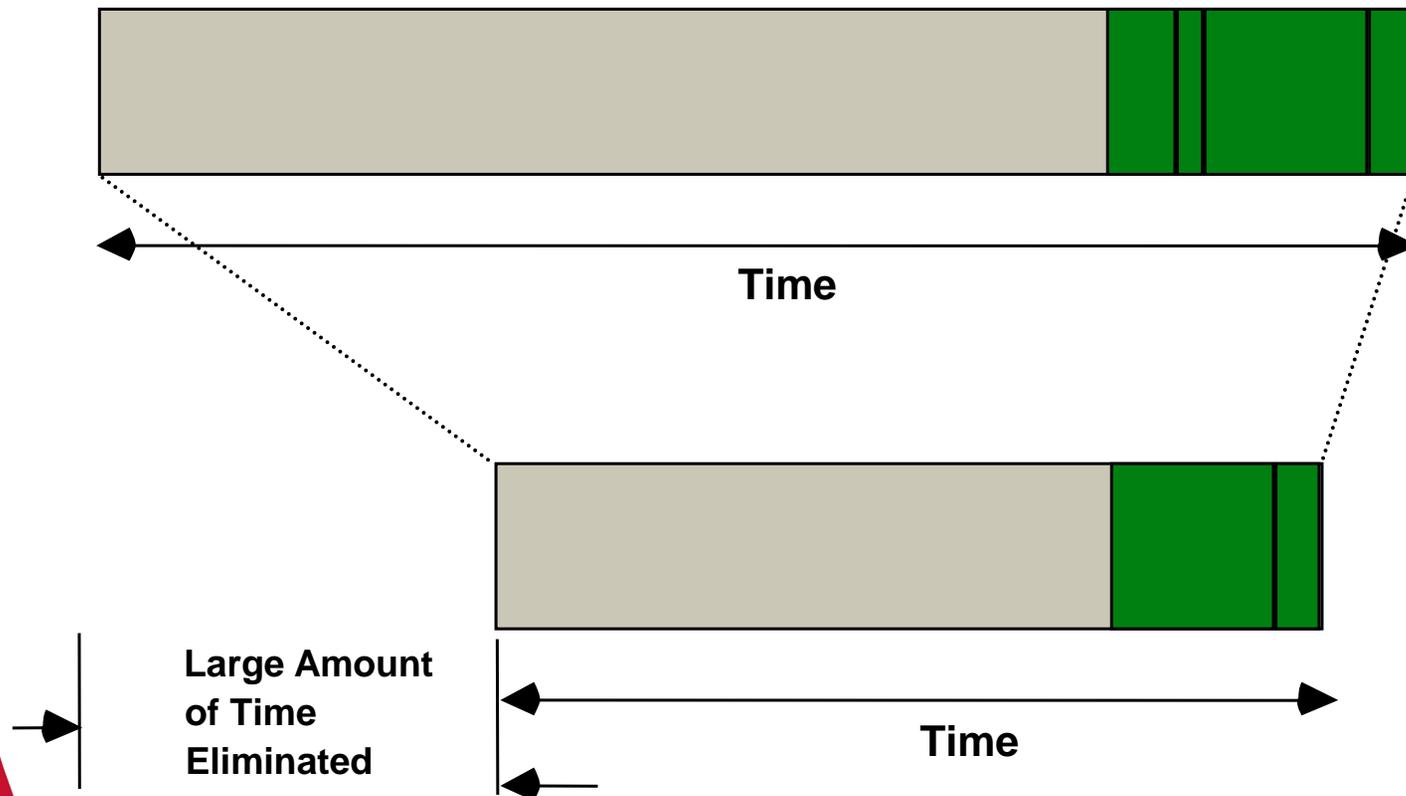
LEAN Manufacturing Value Stream Mapping



Identifying Value-Added vs Non Value-Added Steps

LEAN Manufacturing: Value Stream Mapping: The LEAN Approach

Focused on Non-Value Added Items



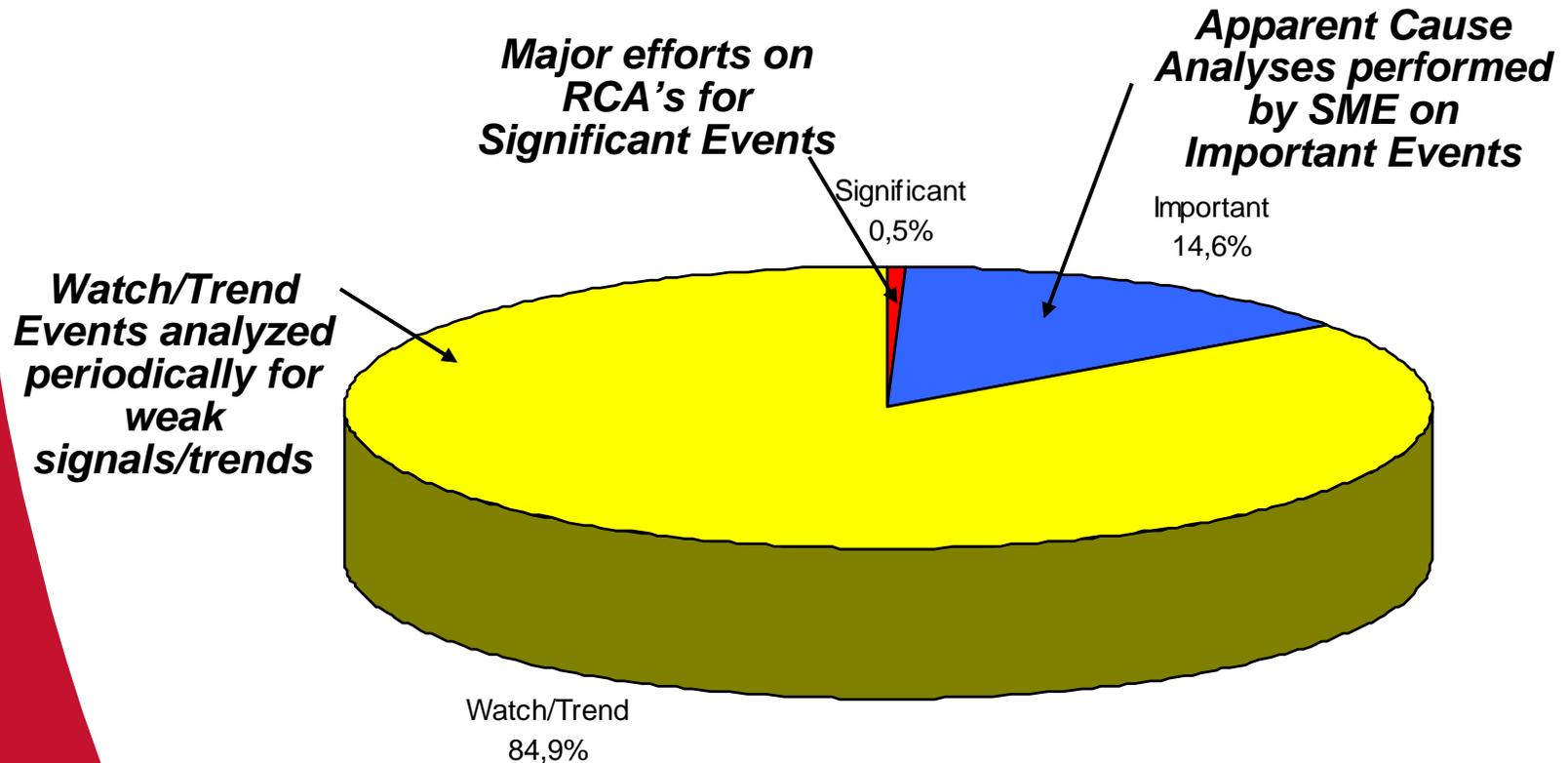
Root Cause Analyses: Focus on ZTF by Learning from Mistakes

AREVA has a 3-tiered system to address non-quality events:

- ▶ **Level 1: Significant Events**, which require a Root Cause Analysis (written charter: formally appointed team leader, management sponsor, scope, and time to completion) and Corrective/Preventive Actions.
- ▶ **Level 2: Important Events**, which require an Apparent Cause Analysis, typically performed by a Subject Matter Expert, including Corrective/Preventive Actions.
- ▶ **Level 3: Watch/Trend Events**, not requiring a formal analysis, but followed for weak signal and trend indications.

Non-Quality Events: Where to focus priorities?

Importance Levels

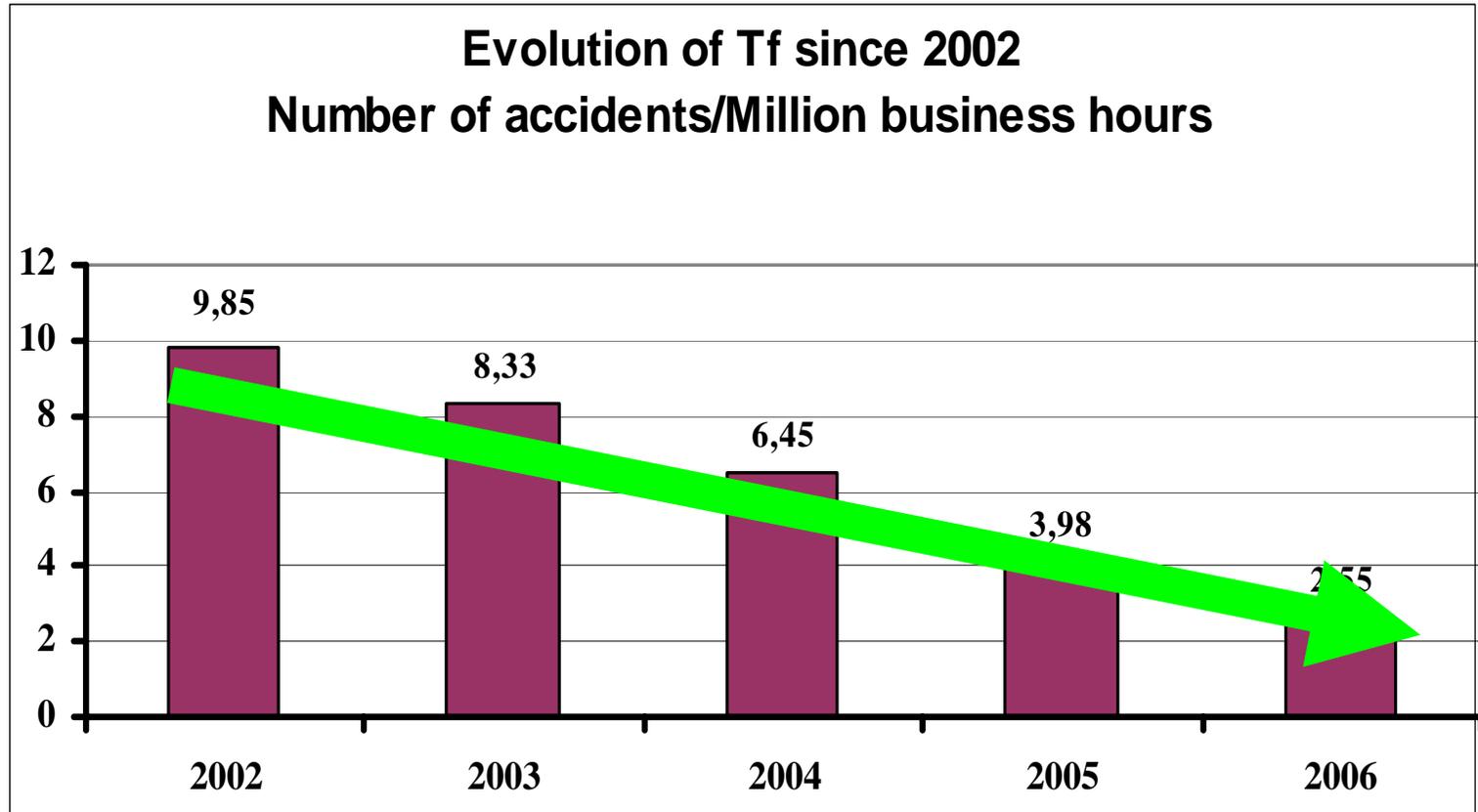


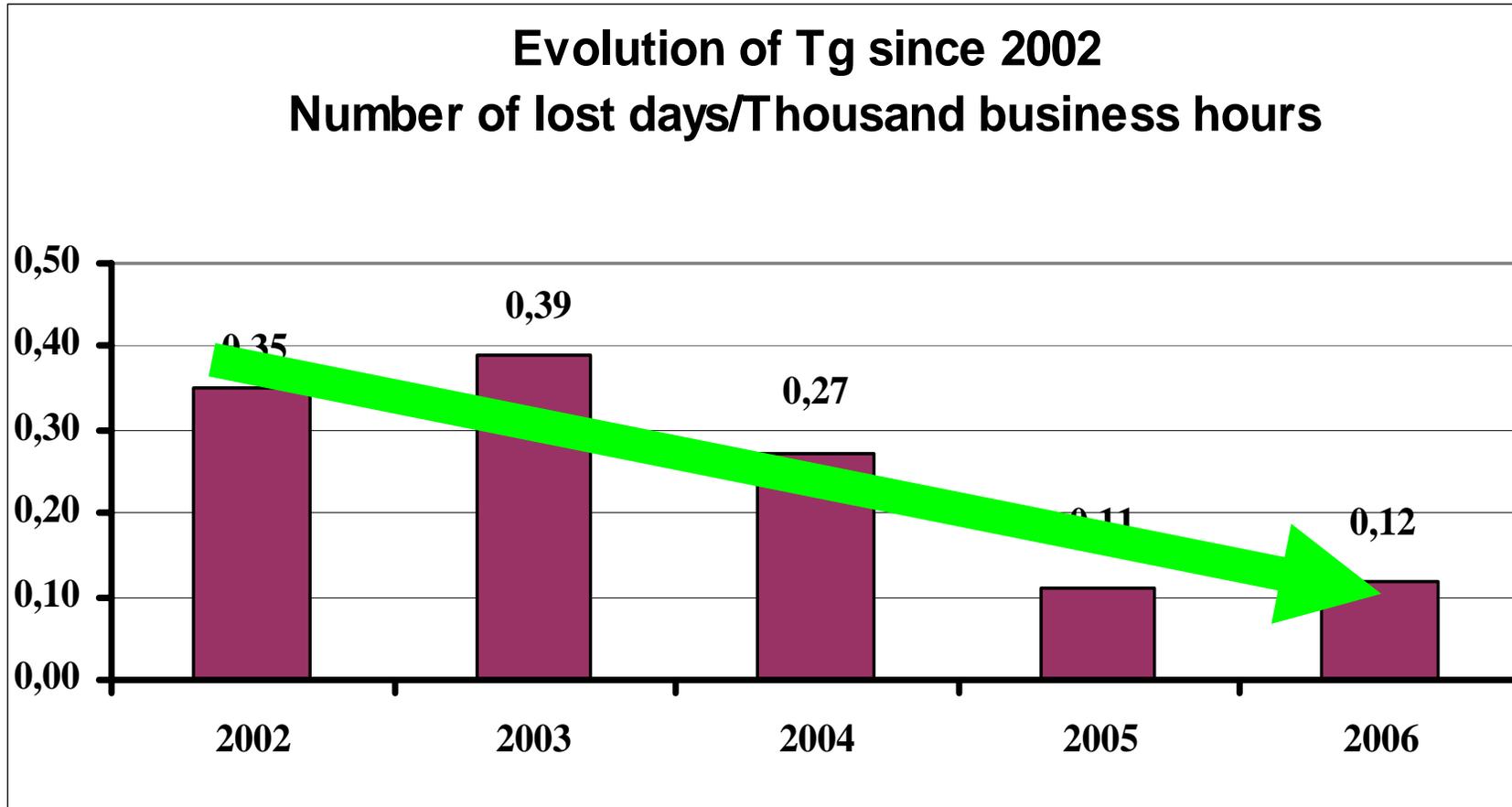
Focus on Safety

Focus on Safety

ZTF through Human Performance

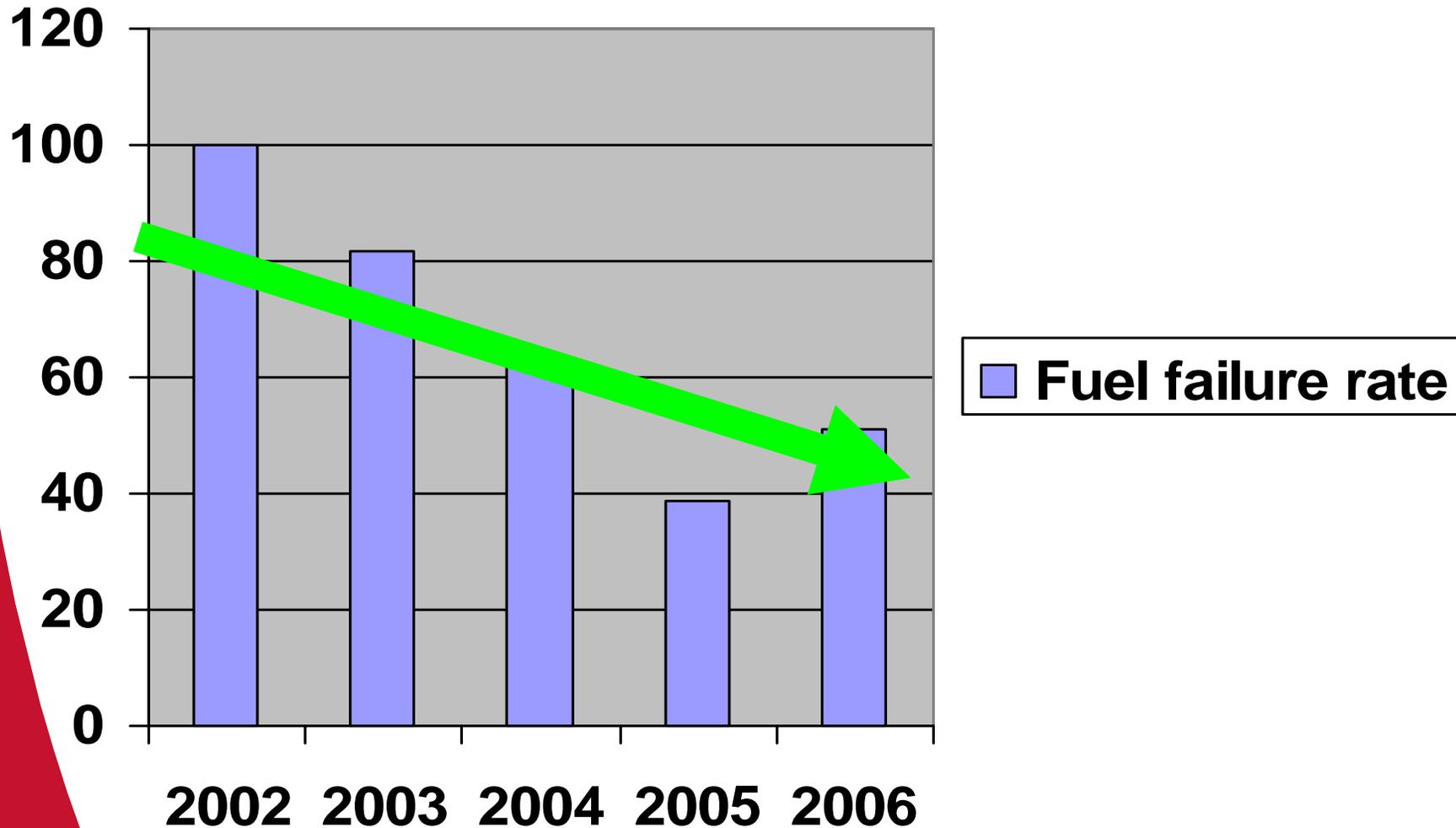
- ▶ **Human Performance training sessions at several Fuel Sector sites over the past five years.**
- ▶ **Human Performance Initiative launched at AREVA level:**
 - ◆ **Designation of a corporate expert, leading a network of representatives from each site.**
 - ◆ **Scope :**
 - **Human factors in process/equipment design,**
 - **Individual performance of manufacturing personnel and design engineers.**





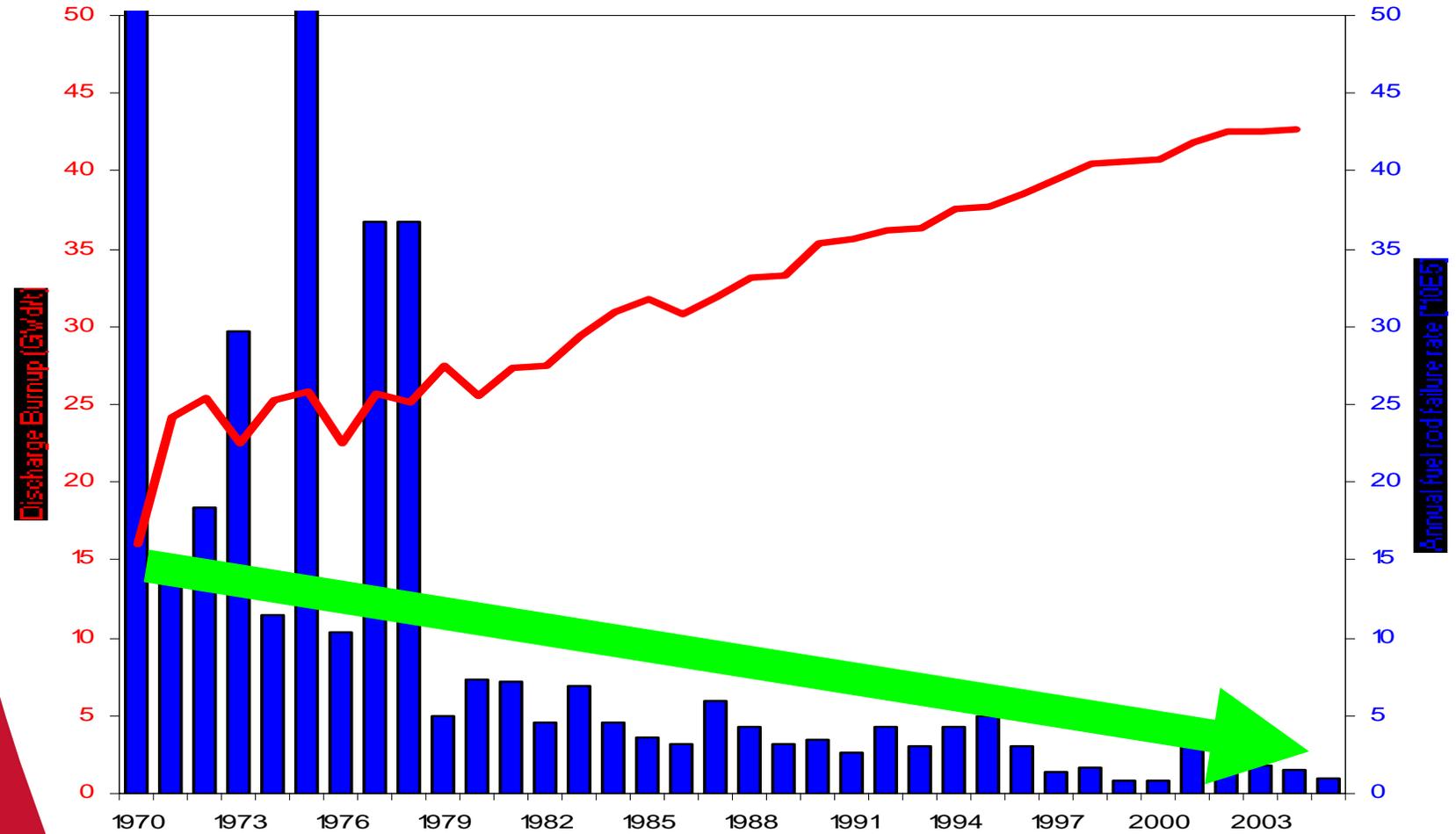
***Fuel Performance:
How does the focus on Quality and
Safety affect the « Bottom Line »?***

Fuel Failure Evolution 2002-2006 Performance Relative to 2002



Fuel Failures as compared to Burnup AREVA PWR Fuel

Evolution of the discharge burnup of AREVA NP PWR fuel assemblies and the annual fuel rod failure rate



Conclusion

Quality and Safety Contributing to Fuel Performance

Through the Zero Tolerance for Failure Initiative, including:

- ◆ **5S Workshop Organization**
- ◆ **Value Stream Mapping**
- ◆ **Root Cause Analyses and Corrective/Preventive Actions**
- ◆ **Handling of Non-Quality Events through a tiered system**
- ◆ **Human Performance Training, focus on Safety**

... AREVA continuously improves safety on its sites and quality of its products

- ◆ **contributing to achieve the highest possible operating availability**
- ◆ **eliminating inpile fuel failures**
- ◆ **providing carefree Fuel handling on site**
- ◆ **optimizing Fuel cycle cost.**

- ▶ **AREVA Fuel Business Unit,**
 - ◆ ... a unique integrated fuel assembly designer and manufacturer,
 - ◆ ... sets high priority on quality, safety, security and environment
 - ◆ ... and is fully committed to Sustainable Development and the success of its customers

AREVA is a reliable long-term supplier, committed to Excellence and dedicated to the success of its customers.

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