



Jožef Stefan
Institute

R₄

Reactor
Engineering
Division



Towards Improved Public Perception of Nuclear Safety

through Strengthened Role of Research and Higher Education

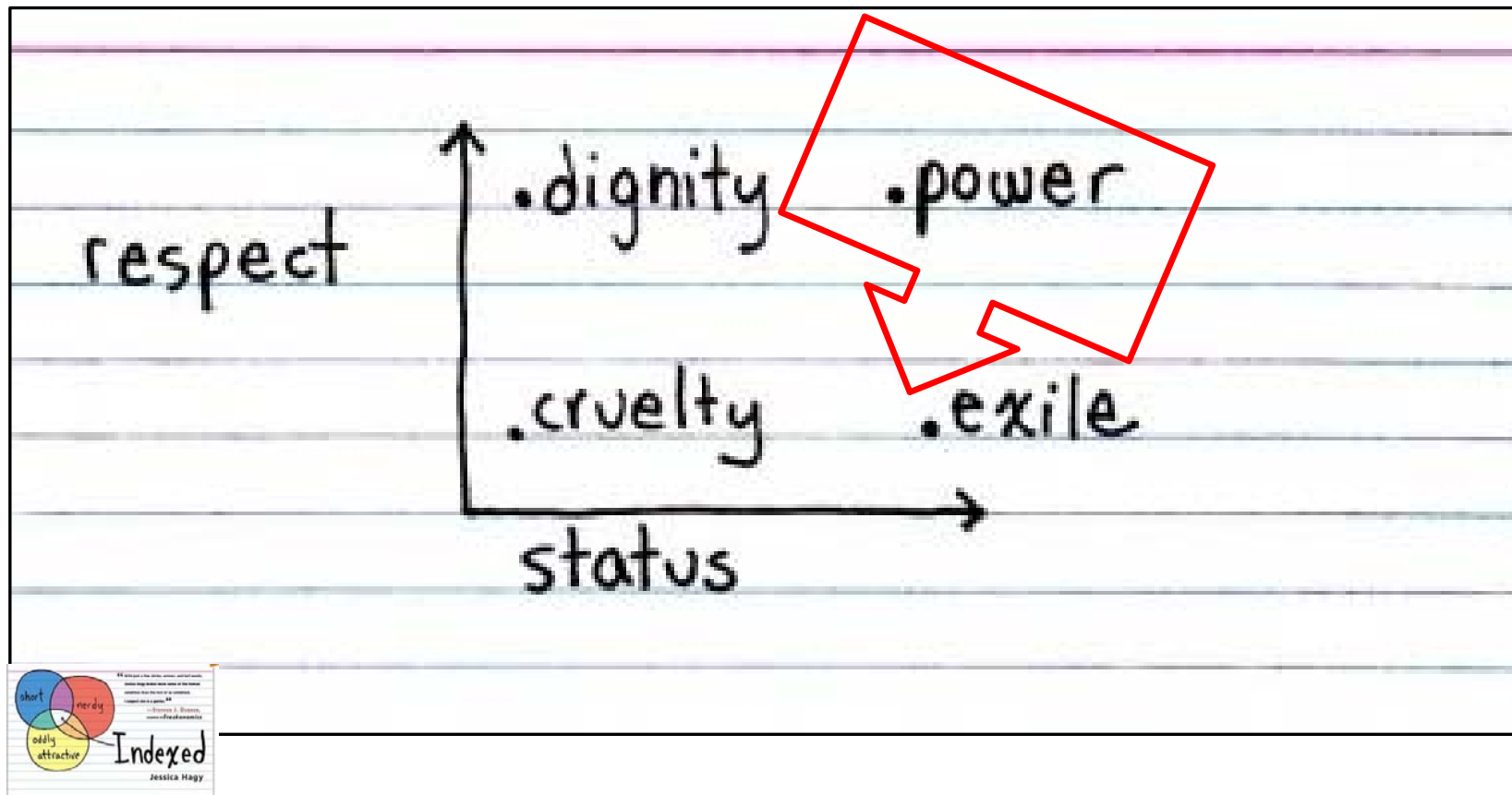
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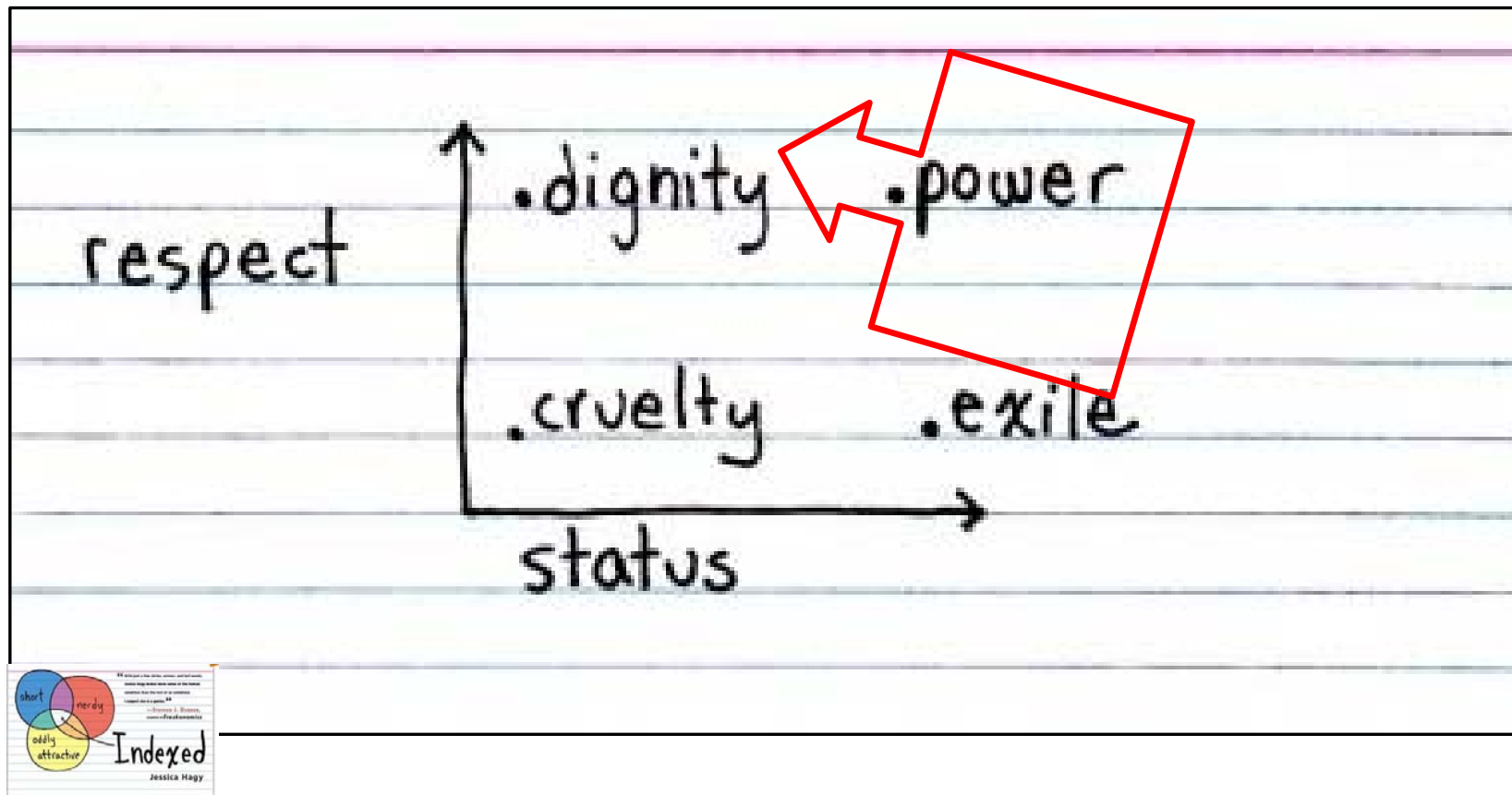


Public perception of nuclear energy.





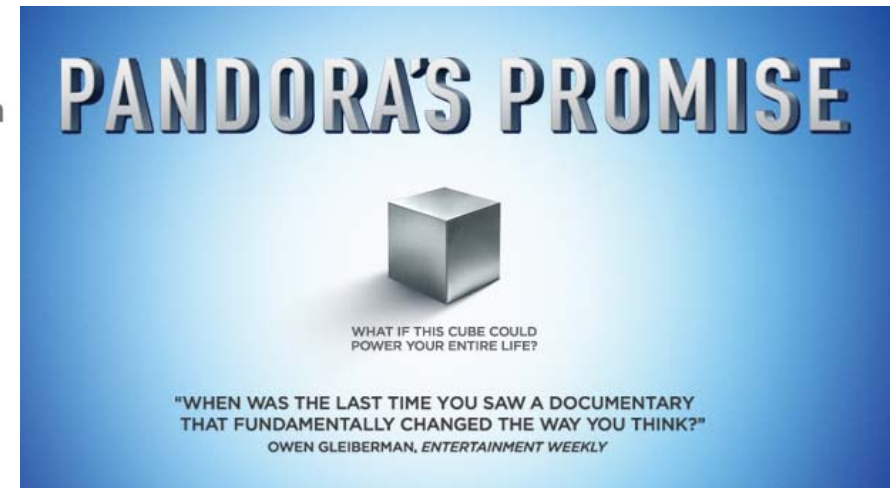
Public perception of nuclear energy.





Disclaimer

- I am a nuclear engineer
- I do promote:
 - Nuclear safety,
 - Research and research based education,
 - Competitive, environmentally friendly and sufficient energy sources
 - Robert Stone's movie Pandora's Promise.
„One can not fight against climate change and nuclear energy at the same time.“



Does this imply that I promote nuclear energy?



Disclaimer

I do support environmentally and economically sustainable safe nuclear energy.

An important note: Nuclear power plant is with us for a century of more. This implies huge changes in:

- the scientific and technical knowledge;
- the society (>25 governments, Ljubljana >8 states).

Nuclear energy should therefore strive for the use of **the best available people**, science, knowledge, technologies and operational experience.



Overview

- Background and Motivation
- The Basic Question(s)
- Some (Anecdotal) Evidence of Possible Answers
- Summary



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Background, Motivation

Maturity and stability of the industry and regulators

The electricity from the nuclear fission:

- is abundant and competitive low carbon energy;
- has one of the lowest impacts to the public health and environment.

This is a consequence of:

- large and long term efforts of the nuclear industry to sustain and improve the safety of the nuclear power plants.
- systematic support and occasional leadership by the competent regulatory authorities and academia worldwide.

Scientific and technical evidence clearly supports the above facts.



Background, Motivation

Dwindling Added Value of Research and Higher Education?

Nuclear industry and regulators → unparalleled safety record, levels of stability and maturity.

A possible perception:

- further research cannot bring much added value to the safe operation of the plants;
- higher education might be fully substituted by professional training;
- could be reinforced by the economic recession.

A possible substantiation:

- Post Fukushima improvements of the NPP largely include the implementations of technologies that were available before Fukushima.



Background, Motivation

Public acceptance is the key challenge of nuclear

One of the key remaining challenges for the nuclear industry is the dwindling public acceptance.

Possible perception:

- General public does not believe the facts about the nuclear energy.

A possible substantiation:

Public opinion (in the most of the EU countries):

- highly values and trusts the information received from the scientists;
- does not have much confidence in information provided by industry, regulators, media, government, even international organizations such as IAEA
- Ref: Eurobarometer 324, 2010



Background, Motivation

Is partnership of academia and industry a way out?

Nuclear industry and regulators → unparalleled safety record, levels of stability and maturity.

One of the key remaining challenges for the nuclear industry is the dwindling public acceptance.

Public opinion trusts the information received from the scientists.

Does this make an opportunity for stronger partnerships of academia and industry?



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The Basic Question(s)

Are research and higher education an essential part of fundamental national infrastructure?

☐ Yes

☐ No

Who is responsible to maintain the appropriate **infrastructure** (including research and education)?

☐ Government

☐ Industry

☐ Regulator

☐ Market



The Basic Question(s)

Are research and higher education an essential part of fundamental national infrastructure?

✓ Yes

○ No

Who is responsible to maintain the appropriate **infrastructure** (including research and education)?

✓ Government

✓ Industry

✓ Regulator

➤ Market

All stakeholders to work closely together and support each other to create and implement the necessary knowledge and knowhow.

Longterm effort!

A lot of money and top level experts!



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The Ontario Hydro „meltdown“ (1997)

Missmanaged safety culture (=infrastructure)

Long standing, **but not resolved**, management, process and equipment issues in Ontario Hydro (one of the world largest nuclear utilities with 19 NPP at the time).

Internal investigation ordered by the utility management: no intervention by the national regulator. Full report @ http://www.ccnr.org/hydro_report.html

Results

- Immediate shutdown of 7 out 19 reactors (2 remained out of service until today)
- Huge losses (economy and people)
- Nearly 20 years needed to recover

Pickering nuclear



The Ontario Hydro „meltdown“ (1997)

Some remarks from the report

Employees lack a questioning attitude;

Decisions are dominated by a production mentality and managers feel excessive pressure to continue planned evolutions.

At times, personnel cannot comply with the established processes or procedures

It's acceptable to cut corners. It is not acceptable to make waves. Those who have made waves have been fired or sidelined.

Serious shortages of key management, supervisory and some technical skills exist...

Design basis documentation is not accurately maintained.

The practice of offering critical services, such as training and engineering, on a **"fee for service"** basis has created an attitude that the groups providing the service are not a part of the team.



The Ontario Hydro „meltdown“ (1997)

Some remarks from the authors of the report

"The issue of culture is that nuclear tries to keep everything confined within it. [They] won't tell anybody anything. That's not just the Canadian culture, it's the nuclear culture.,,"

Carl Andognini

"Good teams can turn bad over 10 years if they're not self-checking and probing.,,"

John Zwolinski

"We've been telling you that for a number of years. Over and over again, sir.,,"

Maurice Brenner

"There's people in management that shouldn't be in management and they don't want to be in management, but it's the only way they can get more money.,,"

Carl Andognini

<http://www.thecanadianencyclopedia.ca/en/article/ontario-hydro-meltdown/>



Privatized rail **infrastructure** in UK (1996)

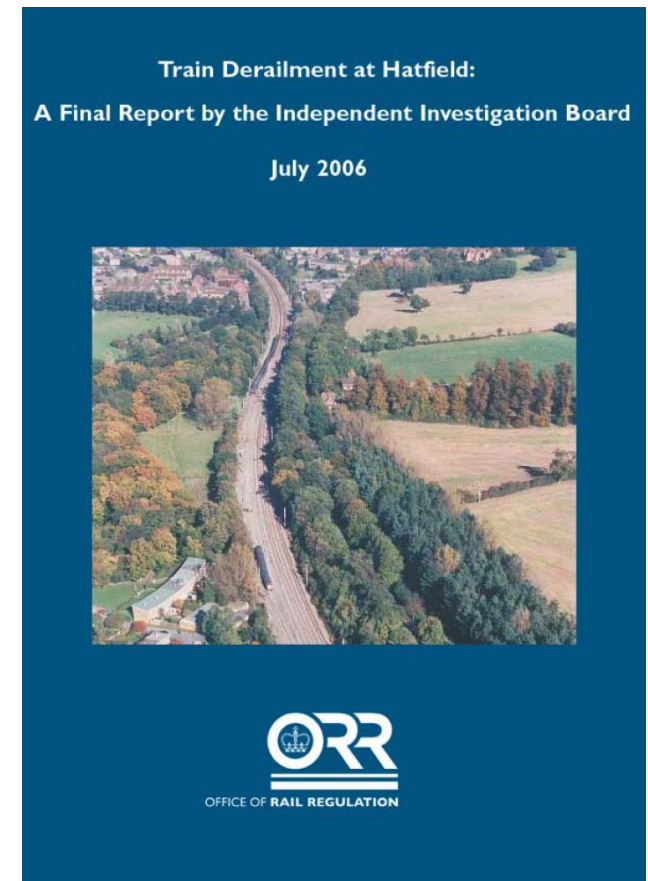
On the problem of new (and not fully explored) interfaces

Train Derailment at Hatfield, UK.

4 casualties, over 70 injured.

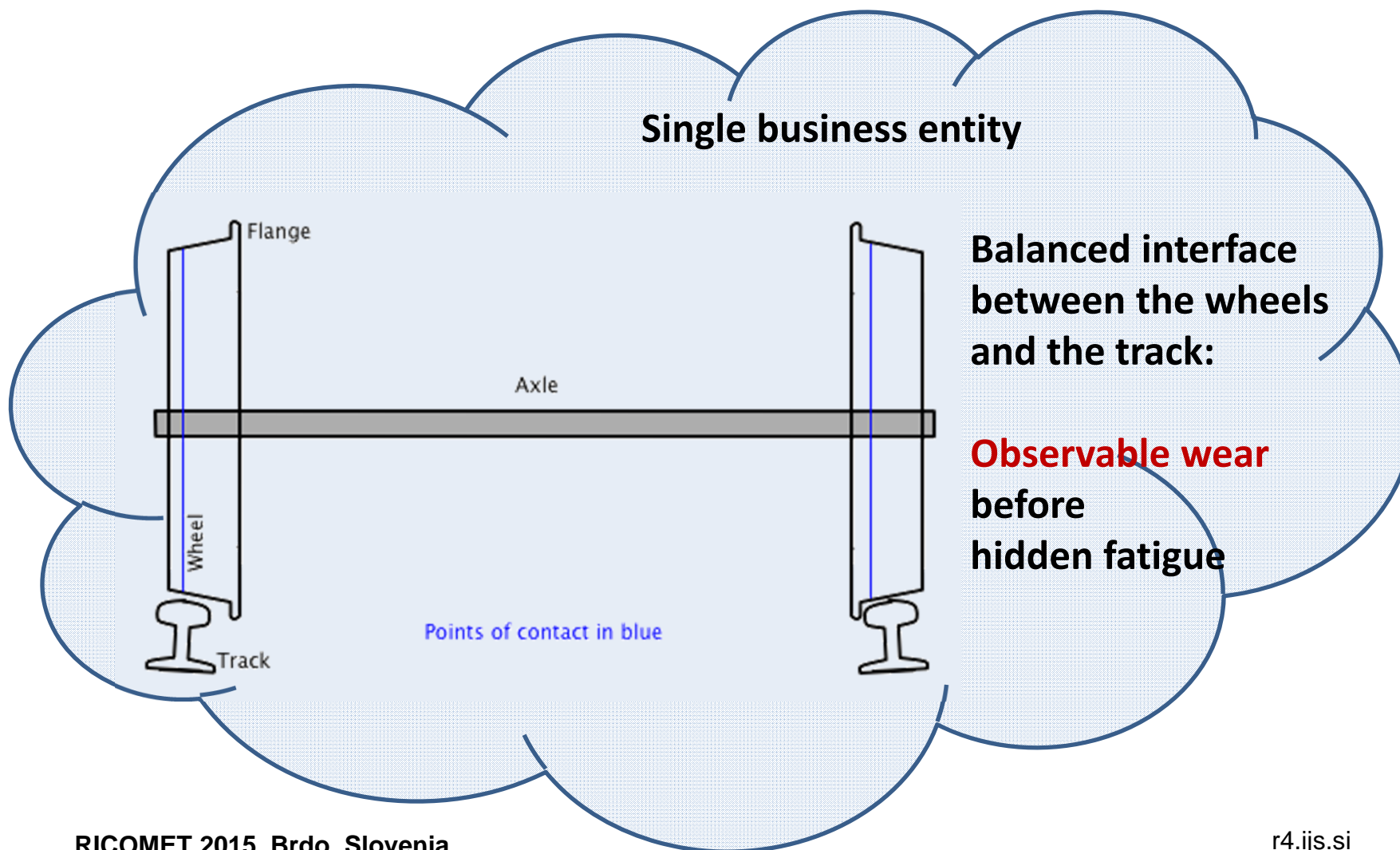
The main causes:

- Shortcomings of the maintenance of the **infrastructure** (fatigued rail broke)
- Failing of the regulatory oversight
- Full report @ www.railwaysarchive.co.uk/docsu/mmary.php?docID=465



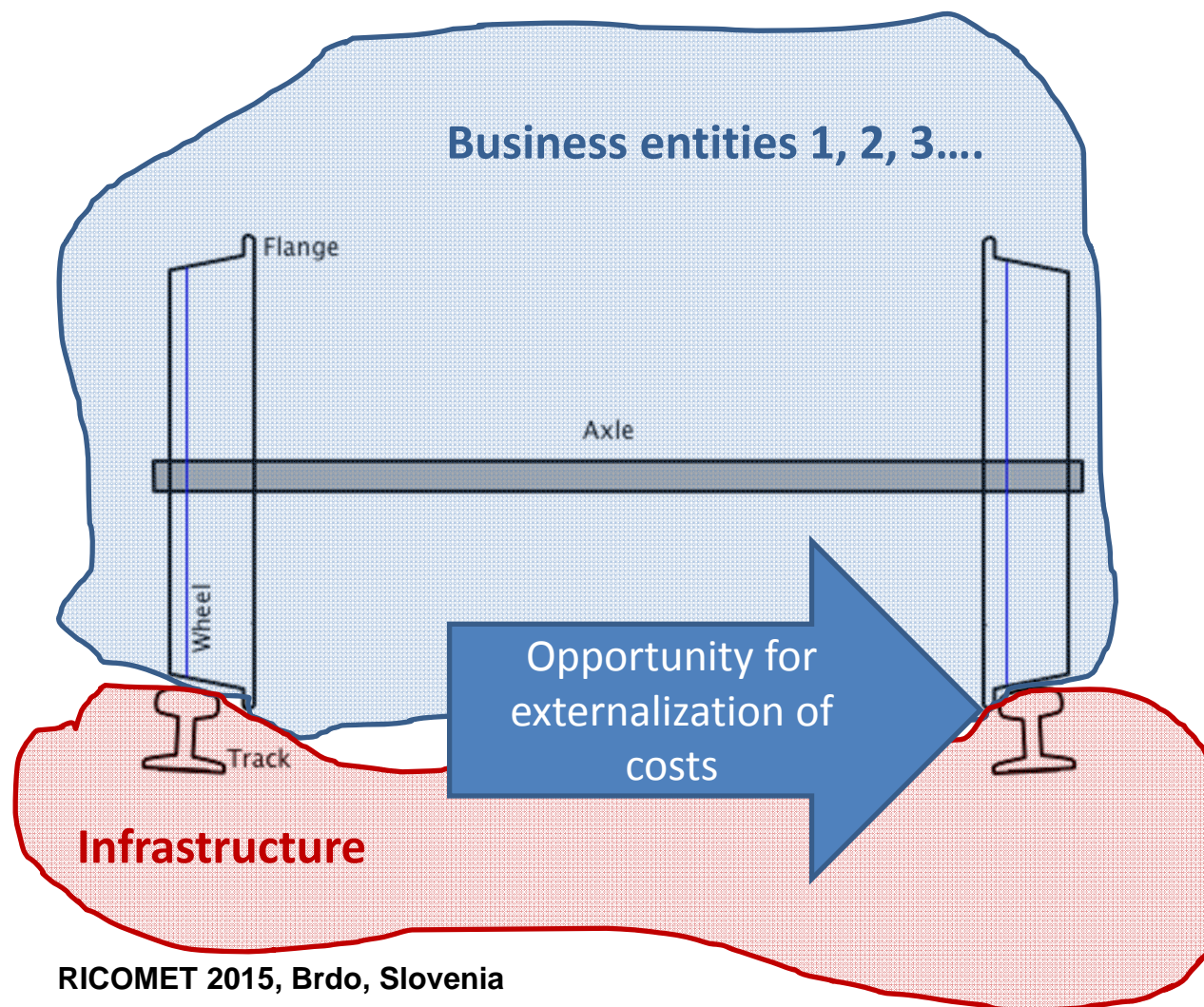


Before privatization/liberalization in 1996





After privatisation/liberalization in 1996

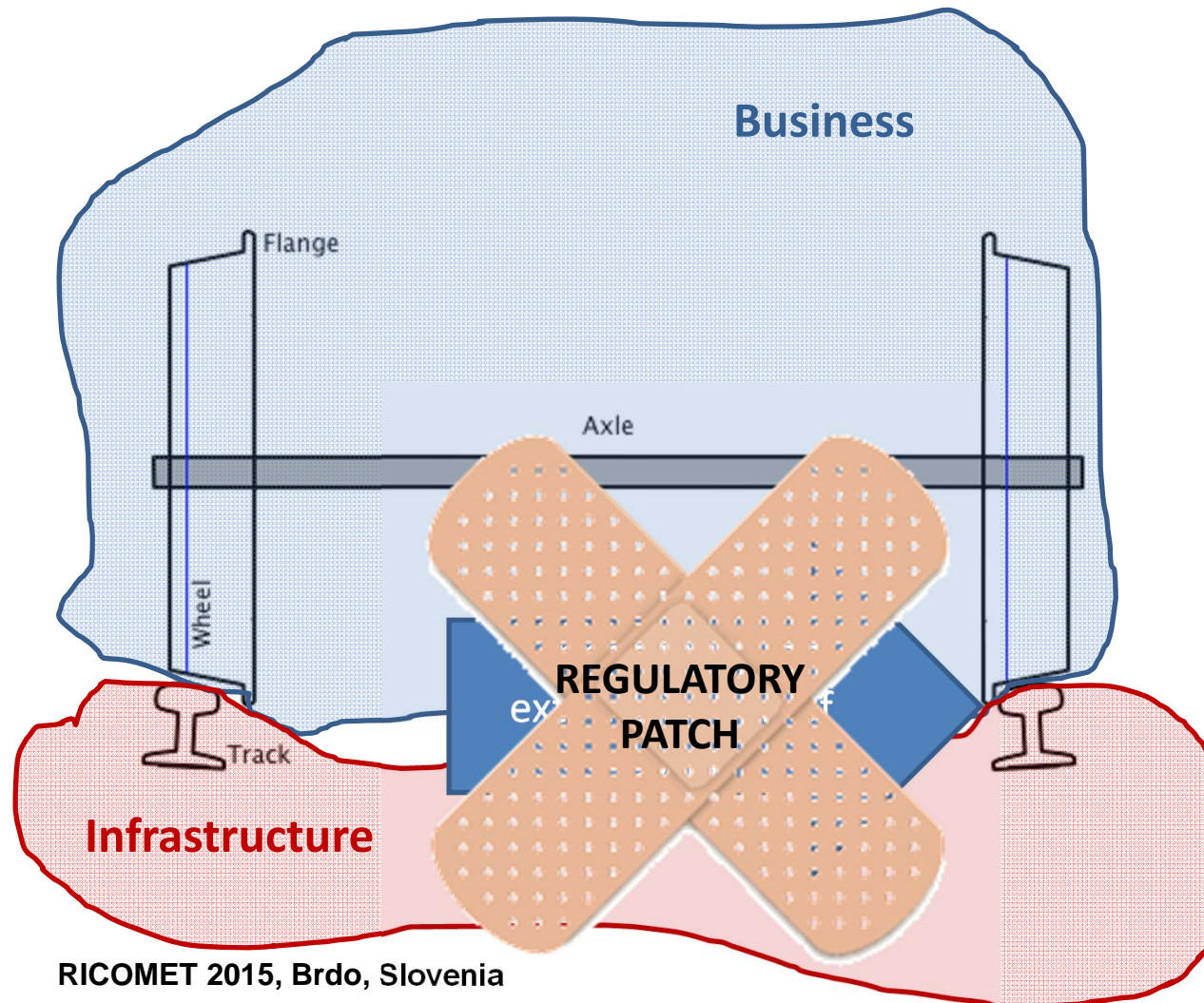


Unbalanced
interface between
the wheels and the
track:

Hidden fatigue
before
observable wear



After the accident in 2000

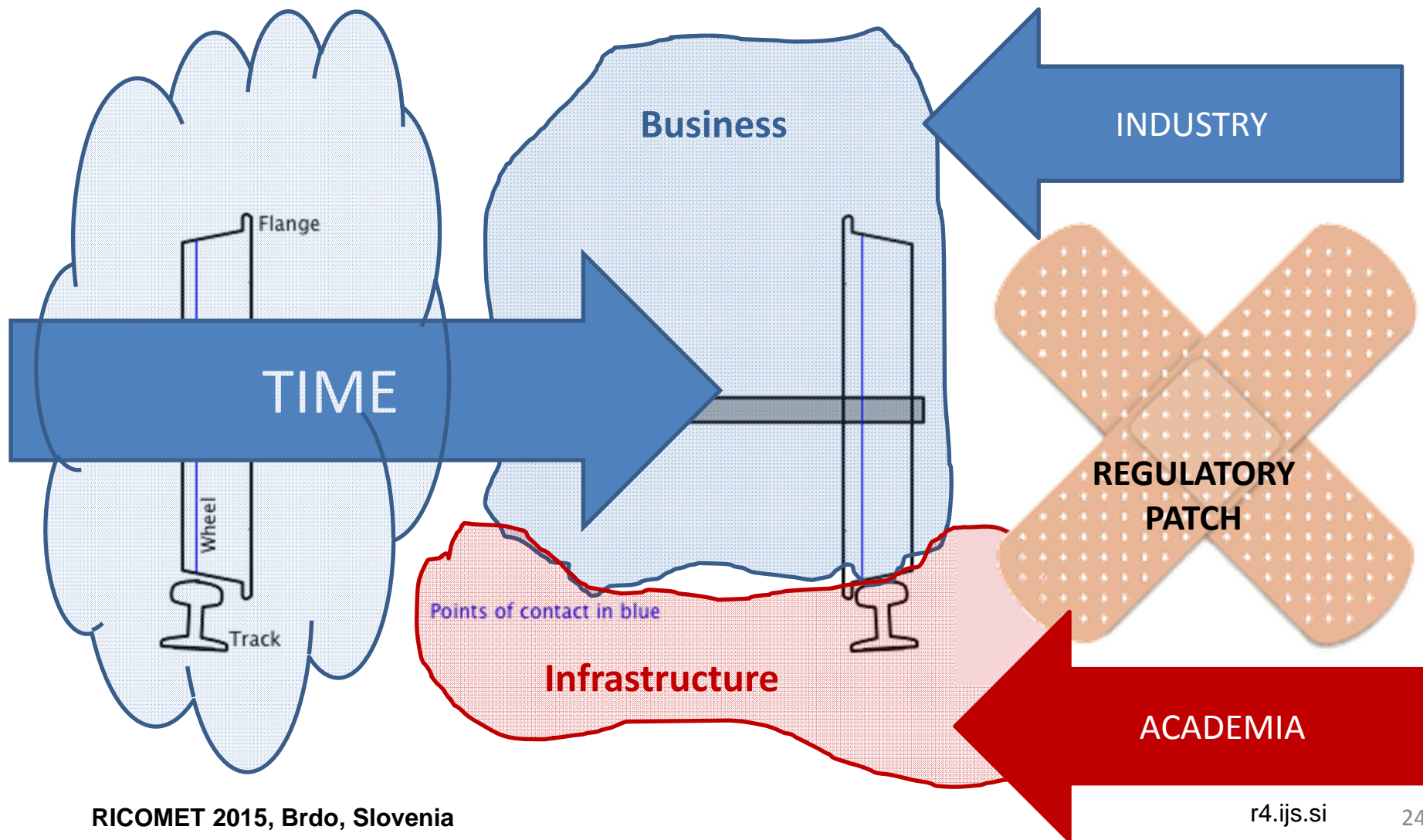


Unbalanced
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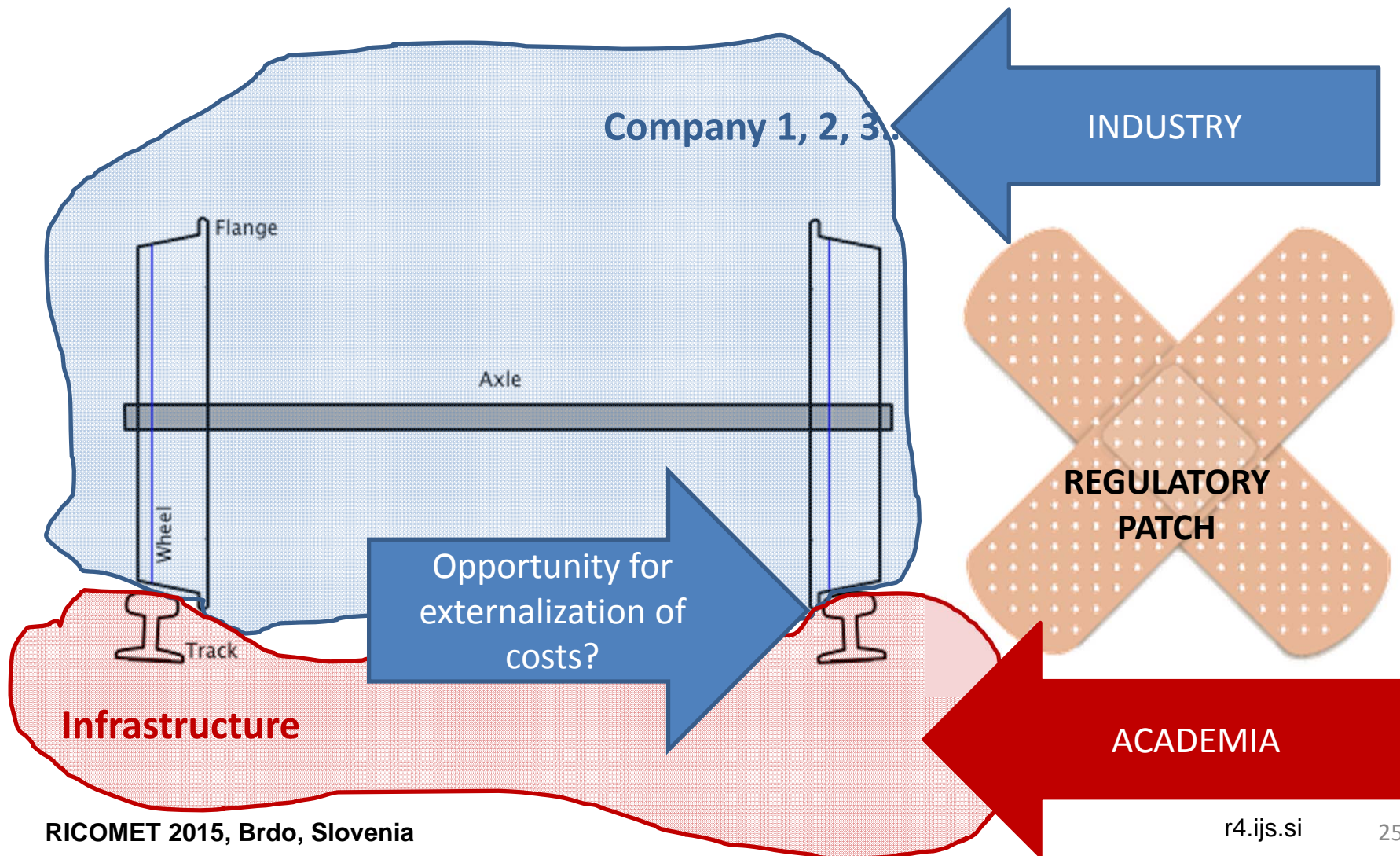


Possible Nuclear Parallels





Similarities With Fukushima?





Closure of San Onofre NPP (Ca, 2013)

Missmanaged Design Bases (=infrastructure)

2 Units of San Onofre NPP closed in 2013:

- Replaced steam generators in 2009
- Never reached full power after replacement

Decision economic, not safety

Root cause as seen by NRC:

- Design bases in FSAR outdated
- Poor oversight by NRC
- Full report see

[world-nuclear-news.org](http://www.world-nuclear-news.org)

<http://www.world-nuclear-news.org/RS-NRC-overlooked-San-Onofre-steam-generator-problem-09101401.html>





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Summary

Our common goal: environmentally and economically sustainable safe nuclear energy.

Nuclear industry and regulators → unparalleled safety record, levels of stability and maturity.

One of the key remaining challenges for the nuclear industry is the dwindling public acceptance.

Public opinion trusts the information received from the scientists.

Does this make an opportunity for stronger partnerships between academia and industry?



Summary

Nuclear energy should strive for the use of **the best available** people, science, knowledge, technologies and operational experience.

Excellent infrastructure **is vital** to support that. Relying on the markets may result in additional risks.

Excellent infrastructure (including research and education) is **concern of all stakeholders**.



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