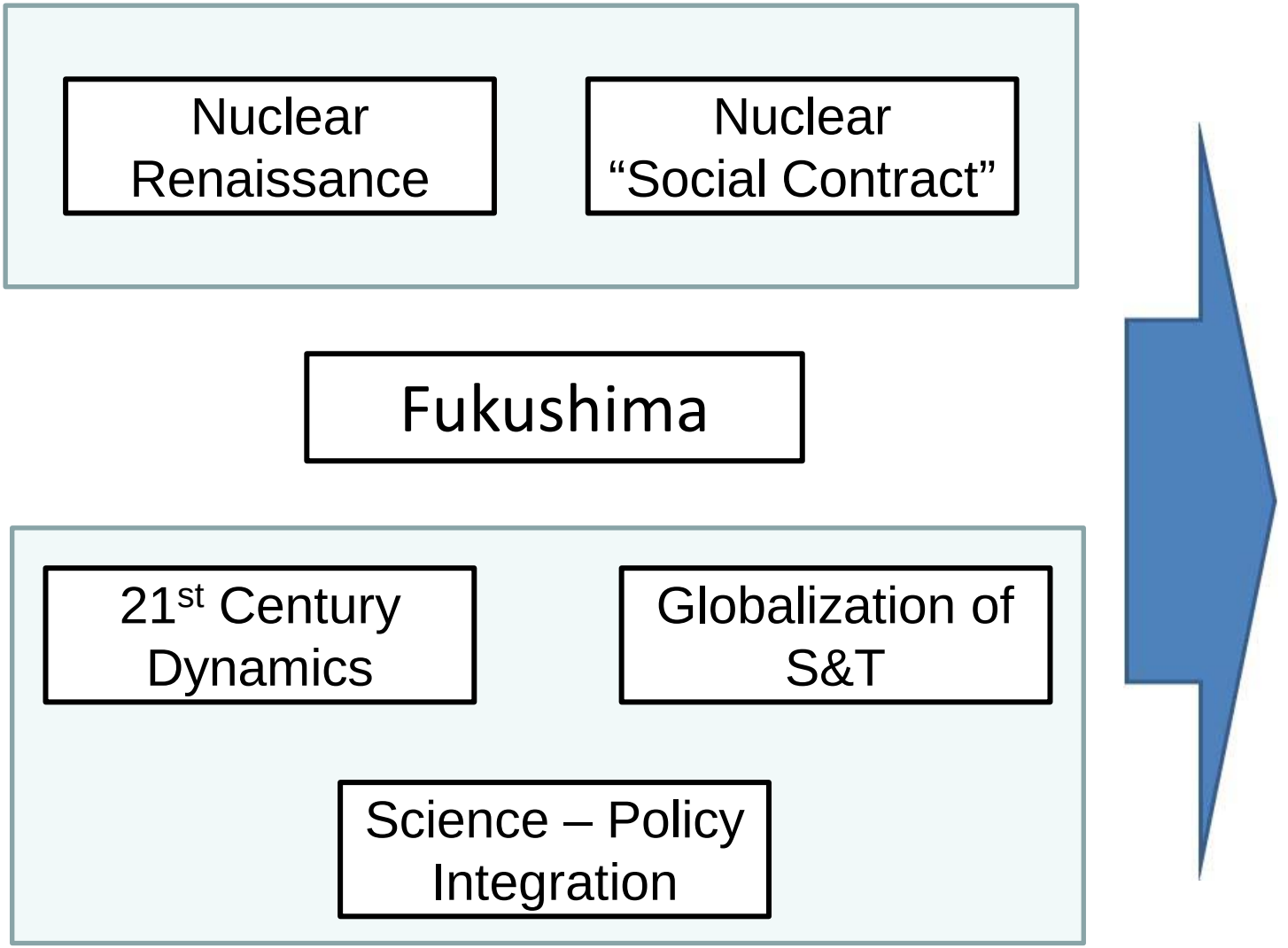
The Future of Nuclear (Science and) Technology

Robert Walker PhD, FCAE
Senior Vice-President,
Nuclear Laboratories, AECL
2011 June 06

AECL EACL

UNRESTRICTED / ILLIMITÉ

Context


Nuclear Renaissance
Nuclear "Social Contract"
Fukushima
21st Century Dynamics
Globalization of S&T
Science – Policy Integration
Implications for Nuclear S&T

21st Century Dynamics

- The world in paradox
- Complexity
- Speed

The world will surprise us!

Globalization of Science and Technology: Opportunities and Threats

The Good ⟸ *S&T Enabled Disruptions* ⟹ *The Bad*

- ***Connected Societies***
- ***E-Commerce***
- ***Improved Health Outcomes***
- ***Renewable Energy***
- ***Clean Technologies***

Information Technology

Biotechnology

Nanotechnology

Convergence

- ***Radicalization***
- ***Identity Theft***
- ***Bio-Terrorism***
- ***Environmental Degradation***
- ***"Power to the Fringe"***

AECL EACL

Science – Policy Integration

Science for Evidence-Based Knowledge
Science for Certainty
Precautionary Principle

Science – Policy Integration

Public Policy and Knowledge
Public Policy and Risk
Public Policy and Values

Unsure about nuclear power?

"Here are the five questions you must answer to decide."

Damian Carrington – UK

1. Do you think the global community can prevent the proliferation of nuclear weapons and, if not, do you think it can prevent a nuclear weapon being used?
2. Is the hazard of climate change greater than that posed by a nuclear disaster?
3. Is global political will too weak to create a low-carbon energy future that does not involve nuclear power and in time to avert climate chaos?
4. Is nuclear power vital to ensuring the security of energy supply?
5. Can the full costs of nuclear truly be calculated?

Not just "yes' or "no" - S&T is required to inform the answers

Implications for Nuclear S&T

S&T
for
the Nuclear Industry

- Performance
- Affordability
- Safety
- Sustainability
- Risk Mitigation

Implications

- Public Policy
- Regulation
- Liabilities
- Risk Management

- "Social Contract"
- Transparency
- Confidence
- Risk Perception

S&T
for
Government

S&T
for
Society

AECL EACL

Nuclear Energy and S&T

✓ Complicated

Nuclear Energy

✓ Complex

Physical Sciences

Life Sciences

Information Sciences

Social Sciences

Emerging Sciences

Nuclear S&T Priorities for Canada: thoughts ...

- Understand and address the fear of radiation
- Reduce the threats and address the fears of nuclear proliferation and terrorism
- Preclude core melt
- Make used fuel an asset
- Increase efficiencies and improve economics of nuclear plants
- Make human error a negligible contribution to accidents
- Make emergency response an independent variable

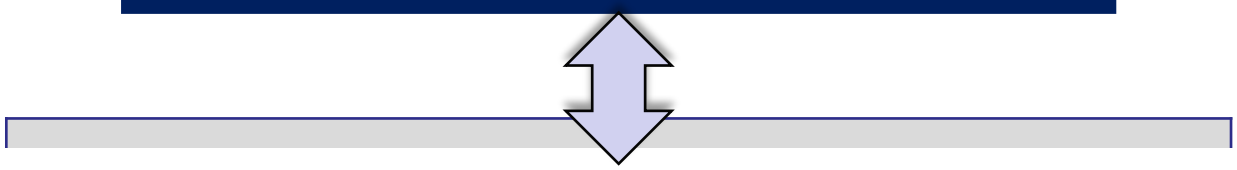
How does the Nuclear Laboratories fit in?

Nuclear Laboratories: Core Principles

- The NL is on a path to be a standalone science and technology organization.
- The NL's value proposition will embrace the concept of its leadership role in the "public good".
- The NL will help build clarity and agreement among its stakeholders on their investments and on their return on investments.

Outcome Focused

Federal Outcome Areas



- **A clean and healthy environment**
- **Healthy Canadians**
- **A safe and secure Canada**
- **An innovative and knowledge-based economy**

Outcome Focused

Federal Outcome Areas

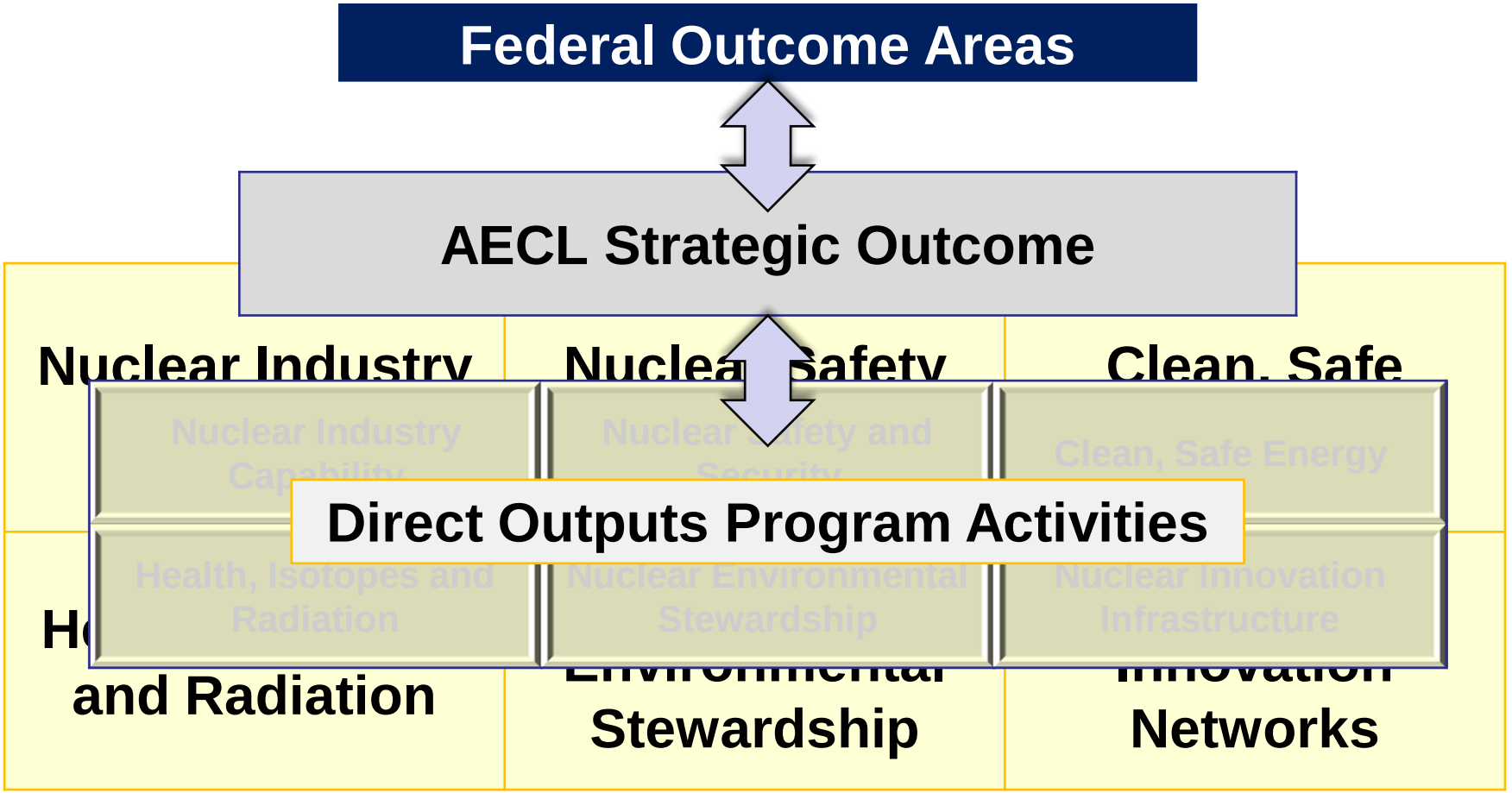
AECL Strategic Outcome

Canadians and the world receive energy, health, environmental and economic benefits from nuclear science and technology …

Direct Outputs Program Activities

with confidence that nuclear safety and security are assured.

Nuclear S&T Program today



Nuclear S&T Program today

Rick Didsbury/ Bill Kupferschmidt	Joanne Ball/ Andrew White	Bob Tapping/ Bill Kupferschmidt
Nuclear Industry Capability	**Nuclear Safety and Security**	**Clean, Safe Energy**
Health, Isotopes and Radiation	**Nuclear Environmental Stewardship**	**Nuclear Innovation Networks**
Steve Bushby	Steve Liblong/ Joan Miller	Tracy Gendron/ Bob Walker

Summary

- The World will surprise us
- Nuclear S&T: expanding horizons
- AECL Nuclear Laboratories: working together


AECL EACL

Messages about PA 1.6

A view of the status of the AECL Nuclear Laboratories as a stand-alone federal S&T organization reveals:

1. A recognition of the current role that the Nuclear Laboratories plays:
   - Nuclear safety and security S&T
   - Clean, safe energy systems including hydrogen
   - Health, isotopes and radiation
   - Environmental S&T

   …as well as knowledge base for CANDU ecosystem
2. A need to maximize the value delivered to others in each of those fields

Messages about PA 1.6

- *Nuclear Innovation Networks* program
  - Nuclear S&T partnerships
  - Nuclear workforce of the future
- Open access to the facilities / expertise at the Nuclear Laboratories for Canadian nuclear S&T initiatives.
- Engagement of the Nuclear Laboratories in the education programs of Canadian universities and colleges.

- Currently looking for opportunities where the Nuclear Laboratories can make a difference