Active Facility Management
(Life-cycle Planning)

Michelle Rehmann
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Four Topic Areas

- **Background**
  - Evolution of Sustainability and Sustainability Concepts

- **Life-Cycle Management of Active Facilities**
  - Relationship between Life-Cycle Approach and Sustainability
  - Focus: GRI Reporting

- **International Practice**
  - Sustainability and the Nuclear Fuel Cycle

- **International Case Study**
Background – Evolution of Sustainability

No Control

"See no evil, Hear no evil, Speak no evil"

Pre-1950

"The Technology Fix"
1950 - 1990

EMS/ISO 14001

"Continuous Improvement"
1997 - present

Prevention

"Attacking the Source"

1989-1992 – Agenda 21

Sustainability

Environmental
A viable natural environment

Sustainable
economic development

Social
Nurturing community

Economic
Sufficient economy

Sustainable natural and built environment
Sustainable social environment
Sustainability Definition and Concepts

Definition:

"Meeting the needs of the present without compromising the ability of future generations to meet their needs."

World Commission on Environment and Development
“Our Common Future”
1987
Key Concepts

- Three pillars: Economics, environmental, and sociopolitical
- Seven questions to sustainability, with engagement at the center
Three Pillars of Sustainability (or “Triple Bottom Line”)

- Economic Sustainability
- Environmental Sustainability
- Sociopolitical Sustainability
Seven Questions to Sustainability
Seven Questions to Sustainability (continued)

Assessing for Sustainability

1. Engagement. Are engagement processes in place and working effectively?

2. People. Will people's well-being be maintained or improved?

3. Environment. Is the integrity of the environment assured over the long term?

4. Economy. Is the economic viability of the project or operation assured, and will the economy of the community and beyond be better off as a result?

5. Traditional and Non-market Activities. Are traditional and non-market activities in the community and surrounding area accounted for in a way that is acceptable to the local people?

6. Institutional Arrangements and Governance. Are rules, incentives, programs and capacities in place to address project or operational consequences?

7. Synthesis and Continuous Learning. Does a full synthesis show that the net result will be positive or negative in the long term, and will there be periodic reassessments?
Seven Questions to Sustainability (continued)

1 Engagement
2 People
3 Environment
4 Economy
5 Traditional and Non-Market Activities
6 Institutional Arrangement and Governance
7 Synthesis and Continuous Learning
Like “Operating in a Fishbowl”
Applicability: Sustainability in Nuclear Fuel Production

- Sensitive to legacies of fuel cycle and attendant outrage
- Real contributions the fuel cycle makes to sustainable development
- New fuel cycle operations must consider complete life cycle
Nuclear Demand

- 16% of worlds electricity and 18% of US electricity
- 103 nuclear reactors in U.S.
- 30 new nuclear reactors over next 15 years
- 74 million pound annual shortfall anticipated

A broad array of interrelated technical, environmental, and social issues face the mining/minerals community. Legal and financial implications have multiplied as investors, indigenous people, communities, non-governmental organizations and other interests apply increasing scrutiny to mining operations. With the immediacy of worldwide communications, local incidents become global news overnight.
**Nuclear Fuel Production**

## Legacy Issues

<table>
<thead>
<tr>
<th>Life Cycle Stage</th>
<th>Example Legacy Issue</th>
<th>Relative Cost</th>
<th>Negative Perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>Abandoned mines</td>
<td>Low</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>Mining, milling</td>
<td>Tailings cleanup, groundwater, etc.</td>
<td>Moderate to High</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>Conversion, Enrichment, Fuel Production</td>
<td>Manufacturing plants, enrichment facilities, waste</td>
<td>High</td>
<td>Moderate to High?</td>
</tr>
<tr>
<td>Nuclear Power Plant</td>
<td>Three Mile Island, Chernobyl, Closure of others</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Waste Storage, Interim and Final</td>
<td>Multiple locations, Utah interim storage site, Yucca Mountain</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Weapons</td>
<td>Manufacturing plants, Nevada Test Site, Japan WWII, terrorism</td>
<td>High</td>
<td>High</td>
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</table>
The Outrage Factor

- Risk = Hazard + Outrage

- **In Short:**
  - *Hazard* is what assessors call *Risk*
  - *Outrage* is all the things that people worry about and that the experts ignore
  - *Outrage* suggests strong emotions and suggests that the emotions is justified

Terminology from: Sandman, Peter M. (1993)
*Responding to Community Outrage: Strategies for Effective Communication*
# Perceptions of Risk by Experts and the Public

## The Disconnect

<table>
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<th>Experts</th>
<th>Public</th>
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<tbody>
<tr>
<td>Risk – focus on hazard and ignore outrage</td>
<td>Risk – focus on outrage and ignore hazard</td>
</tr>
<tr>
<td>High hazard and low outrage – overestimate the risk</td>
<td>High hazard and low outrage – underestimate the risk</td>
</tr>
<tr>
<td>Low hazard and high outrage – underestimate the risk</td>
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</table>
Life-Cycle Management of Active Facilities

Definition:

The Life Cycle Assessment Tool defined in ISO14040 is the standard for quantitative assessment of potential environmental impacts of products and services on their life cycle.
Methodologies for Life-Cycle Assessment for Management of Active Facilities

- Life cycle assessment (LCA) is a powerful tool for evaluating manufacturing processes.
- LCA for processes takes into account flexibility and decision-making potential of knowledge base systems.
- Emphasis placed on on-site waste minimization and sustainability characteristics:
  - environmental impact assessment
  - process improvement
Life Cycle Assessment Tool

Includes:

- Environmental management
  - Manage
  - Innovate
- Risk prevention
- Performance improvement
The Link between LCA and Sustainability

- **LCA:**
  - Raw materials acquisition
  - Manufacturing stages
  - Product produced, used and discarded

- **ISO 14040 [1] methodology - framework**
  - Goals/scope of LCA defined,
  - Inventory analysis/impact assessments formulated
  - Results interpreted
  - No single method for conducting LCA

- Framework allows study of wide ranging environmental practices
- LCA takes into account sustainable development principles

"Since the reservoir of raw materials is finite, the flow of substances through the various stages of processing, consumption and use should be so managed as to encourage optimum reuse and recycling, thereby avoiding wastage and preventing depletion of the natural resources stock”.

“Towards Sustainability”,
European Commission
Principles Common to LCA and Sustainable Development

- Transparency
- Integration
- Community
- Conservation
- Equity
- Valuation
About the Global Reporting Initiative (GRI)

- **Vision:** Disclosure of economic, environmental, and social performance become as commonplace and comparable as financial reporting, and as important to organizational success.

- **Mission:** Create conditions for transparent and reliable exchange of sustainability information through the development and continuous improvement of the GRI Sustainability Reporting Framework.
What is GRI?

- Network-based organization
- Pioneered development of sustainability reporting framework
- Committed to continuous improvement and worldwide application
- To ensure highest degree of technical quality, credibility, and relevance, framework is developed through:
  - Consensus-seeking process
  - Participants from business, civil society, labor, professional institutions
History of GRI

- GRI formed in 1997 by United States based non-profits
  - Ceres (formerly Coalition for Environmentally Responsible Economies)
  - Tellus Institute
  - With support of United Nations Environment Programme (UNEP)
- Released Sustainability Reporting Guidelines
  - Draft – 1999
  - First full version – 2000
  - 2nd version released at World Summit for Sustainable Development in Johannesburg
- 2000 - permanent institution with Secretariat in Amsterdam, the Netherlands
- Independent
  - Collaborating centre of UNEP
  - Cooperates with United Nations Global Compact
GRI Reporting Framework

- Principles and indicators – measure and report performance
  - Economic
  - Environmental
  - Social

- Cornerstone: Sustainability Reporting Guidelines

- 3rd Version (G3) published in 2006
  - Public Document
  - Sector Supplements
  - National Annexes
Benefits of GRI Reporting

- Sustainability reports based on framework are used to:
  - Benchmark organizational performance
  - Demonstrate organizational commitment to sustainable development
  - Compare organizational performance over time

- Standardized approach stimulates demand for sustainability information
  - Benefits reporting organizations and those who use the information reported

- Accounts for both benefits and impacts

- Builds foundations for trusting relationships

Credit to: http://en.wikipedia.org/wiki/Findhorn_Ecovillage
GRI Reporting per Region

- Fact: In 2008, countries from Europe produced 50% of GRI reports.

- This fact corresponds with historical trends, while North America and Asia have been continuously trading places as the second largest reporting region over the years.
Integrated Approaches to Sustainability for the Mine Life Cycle
Mining and Metals Sector Supplement

- Now available at: http://www.globalreporting.org/ReportingFramework/SectorSupplements/MiningAndMetals/

- Main sector topics expanded to the G3 Guidelines are:
  - Biodiversity
  - Emissions, effluents and waste
  - Labor
  - Indigenous rights
  - Community
  - Artisanal and small-scale mining
  - Resettlement
  - Closure planning
  - Materials stewardship
International Practices

- BHP Billiton – Olympic Dam, Australia
  - Long-term contracts to utilities in many countries
  - Politically stable project location

  “With employees, host governments, and business partners we work towards making a contribution to the long-term sustainability of the communities in which we operate.”

  Marius Kloppers, CEO,
  in BHP Billiton, Resourcing the Future: Sustainability Summary Report, 2009

- Uranium Equities
  - Balancing Social, Environmental and Economic Impacts

  “Developing partnerships that enhance the social and economic development of local communities;” and to “Preserve the future land use of all our sites through biodiversity management and rehabilitation of all land disturbed in its exploration and development activities...”
International Practices (continued)

- Uranium Equities - Early stages of development sustainable development is focused on:
  - Safe, efficient project activities;
  - Sound Environmental Management;
  - Open and consultative Community Relations activities;
  - Support of Uranium Industry groups in establishing Uranium as a sustainable energy solution; and
  - Appropriate returns on investment.

- Partnered with Cameco, another leader in sustainable uranium operations
International Practices – the AREVA Example

- Operates in diverse environments and cultures (including USA)

- Integrates corporate sustainability culture into settings

- Mining group covers exploration, extraction, and processing or ore; and reclamation after production is complete

- Largest uranium mining producer in 2009 (4,600 people)

- Corporate culture includes:
  - Making energy available
  - Protecting the planet
  - Acting responsibly toward future generations
International Case Study

- **AREVA and Niger – lasting partnership**
  - Health and Development programs
  - Health Policy
  - Mining and employment continued throughout uranium price declines

- **AREVA NC Niger**
  - Developing new deposits in regions across the Country

- **COMINAK Mine**
  - Largest underground uranium mine in the world
  - Depth of 250 meters
  - 250 kilometers of tunnels
  - Average U content 4%
  - On-site mill with capacity of 2,000 metric tons
  - Workforce of 1,200, with 98% being Nigerian
  - Mine life of 17 to 23 years based on current reserves
Mine Planning Implications

- We can’t all be AREVA – but we can strive to be

- Closure involves more than shut down, reclamation/decommissioning

- Livelihoods can be affected, as can social and environmental programs established during life of the mine

- Becoming a trusted partner in the community or country requires the right kind of investments in time and money

- Integrating closure planning into all stages of project development is vital for leaving a positive legacy of sustainable development.
Conclusions

- Nuclear/nuclear fuel cycle contributions to sustainable development are real
- New operations must consider complete life cycle/all systems
- Be sensitive to nuclear legacies and outrage they generate
- Seven Questions good starting point to evaluate projects at all stages
- Interconnected world - hard to separate parts of nuclear industry and associated perceptions about legacies
- Measuring nuclear industry contributions to sustainable development - a challenge that must be addressed.