Electricity Generation, Storage and Distribution

Health and Safety

Peter Ellwood (HSL)
Common Themes

- Decentralisation
- New materials
- Conflict between Green and OSH
- Rate of innovation
- Increasing automation
- Need for new OSH knowledge and skills
- Skills shortage
- Polarisation of workforce high-skilled jobs vs. precarious works
- Diverse workforce – fewer job opportunities in (highly skilled) green jobs for vulnerable groups incl. female/older/migrant/disabled workers?
Decentralisation

• Decentralisation of workplaces into smaller, dispersed units, incl. rise of sub-contracted work, self-employed and micro-enterprises: lower OSH awareness/culture and fewer resources for OSH
  – Small businesses, possibly with low OSH awareness, for example, domestic solar panel and wind turbine installation

• Difficulty enforcing good OSH conditions and safe working practices in dispersed and difficult to reach workplaces with poorer access to OSH services (labour inspection, preventive services, training, etc.).
Decentralisation – Renewable Energy

• Distributed, small scale installations
• Non-standard installations: risks to maintenance workers
• New entrants without necessary skills
• Sub-contracting
• Retrofitting
  – Manual handling of heavy loads
  – Noise and vibration from drilling
  – Dust, lead, asbestos, work at height, etc. – risks not new but in new situations
  – Re-insulation of buildings: exposure to insulation materials, e.g. MMMF (Man Made Mineral Fibres)
  – Roof spraying of polyurethane foam insulation: OEL (Occupational Exposure Limit) for isocyanate exceeded
New Materials

• Nanomaterials
• Composites
• Biomaterials
• Ceramics
• Smart Materials
• Quantum Materials
• Metal organic frameworks
• Plastic electronics
New Materials – Electricity Sector

• Wind turbines – new light composites
• Solar panels – new materials for improve efficiency, including nanomaterials
• Batteries – a wide range of new electrolytes – polymer, glass, graphene

⇒ (New, long-latency) work-related diseases from new materials?
   - Difficulty to trace diseases back to jobs without exposure registers
• “Construction” hazards combined with electrical hazards

• Manufacturing - involves large quantities of chemicals - many highly toxic

• Nanomaterials in new panels

• Leaching hazard, including at the waste treatment stage

• PV remains live even when the mains supply is cut - risks for emergency workers
Conflict between Green and OSH

- Political pressure – grants, subsidies
  - OSH risks from work rushed before subsidies’ withdrawal
  - In-house waste treatment due to high waste disposal charges: risk shifting from professional waste operator to waste producer
    - E.g. in-house conversion of bio-waste/bio-energy processes

- Hazardous materials and processes
  - Higher incident rate in green-certified construction projects
  - Re-furbishing: OSH risks from the re-use of old equipment
  - Green construction sites: 2 to 3x more manual work due to on-site waste separation
OSH in the wind energy sector

- Access to remote areas
- Going up in the tower: Falls from height, MSDs
  - Tower height increases rapidly with innovation
- Electrocution – from the switching installation, electrical arcs
- Fire - e.g. if tower struck by lightning
- Maintenance in extreme conditions:
  - In very windy conditions, rappelling down the blade or inside the blade
  - Exposure to dust, carbon fibres, etc.
  - Machine related hazards
- Blade failure: parts of up to 200kg thrown up to 1km far away
- Blades can also throw ice
- Structural failures - HSE investigated 2 turbine collapses in 2007
- Manufacturing: epoxy resins, styrene, MSDs
- Transport of big components
- Off-shore – additional risks: complex dives, cable laying, isolation, extreme weather, fall into water, splash from salty water
‘DEEP GREEN’ - WIND ENERGY

Look at that turbine – way beyond its design life!! We can only get refurbished spare parts these days...

It is exhausting to spend all day climbing up these old turbines without lifts... I wish we had new ones.
Increasing reliance on electricity

• Electric vehicles
  – Risks in maintenance
    • Workers unaware of high voltages (360-500V)
  – Risks to emergency services
  – Risks not confined to the vehicle
    • End-of-life batteries for vehicle service re-used to store electricity in buildings
  – Risks from fuel cells

• Electricity for heating of buildings
  – PV risks to installers
  – PV risks to fire services
Distributed Generation OSH Risks

- Electrocution/burns
- Fire/explosion
- Falls
- Skills shortages
- Compressed and liquefied gases
- Chemicals, nanomaterials, asbestos
- Manual handling
- DIY/Cowboys
- Risks to firefighters

Image: Anna Regelsberger
Electricity Storage OSH Risks

- Electrocution/burns
- Fire/explosion
- Skills shortages
- Compressed and liquefied gases
- Integrity of pipes/containers
- Chemicals, nanomaterials
Distribution OSH Risks

- Electrocution and burns
- Construction and excavation activities
- Skills shortages, e.g. for smart meter installation
- Cyber security
- DIY/Cowboys
- Blackouts
Psychosocial Issues

• Long periods offshore
• Lone working
• Rapid rate of innovation
• Human machine interfaces
• Work organisation/communication
• Stress from job uncertainty, increasing complexity and intensification of work
• Unpredictable shift patterns owing to intermittent nature of renewable energy.
Other Issues

- Ageing workforce
- Metal theft
- Subcontracting
- Skills shortages
- Gender issues
Exercise 3: Health and safety risks

• Review the health and safety challenges in your scenario
• Identify any missing ones
• From these select:
  – What is the most challenging new or emerging risk?
  – What is the greatest opportunity to reduce the risk?
  – What is the risk (positive or negative) that is most surprising or we have least understanding of?
## Exercise 3 – feedback form

<table>
<thead>
<tr>
<th>Description</th>
<th>Describe health and safety implications (incl. nature of impacts, who is most affected, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most challenging risk</td>
<td></td>
</tr>
<tr>
<td>Opportunity</td>
<td></td>
</tr>
<tr>
<td>Surprising/novel</td>
<td></td>
</tr>
</tbody>
</table>
Break
Exercise 4: Policy response to risks

• Develop a policy response for each of the following:
  – The most challenging new or emerging risk
  – The greatest opportunity to reduce the risk?
  – The risk (positive or negative) that is most surprising or we have least understand of?

• Include implementation of policy response

• Complete feedback form
# Exercise 4 – feedback form

<table>
<thead>
<tr>
<th>Description of action/policy</th>
<th>Expected H&amp;S benefits</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surprising/novel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Testing policies across scenarios - Wind tunnelling

- Tests robustness of policies against different scenarios
- Explores ways to optimise future success
- Helps to identify future risks
- Challenges ‘official view’ of the future
- Creates an environment for open debate on options
Wind tunnelling – Analytic Approach

Policy Option 1

Policy Option 2

Policy Option 3

Orange SCENARIO

Blue SCENARIO

Green SCENARIO

Yellow SCENARIO

Implications
- Success
- Failure
- Contingent on scenario

Action Plans
- Do Now
- Reject
- Monitor future events & Contingency Planning
## Example template/approach

<table>
<thead>
<tr>
<th></th>
<th>Win - win</th>
<th>Bonus World</th>
<th>Deep green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy 1</td>
<td>+5</td>
<td>+4</td>
<td>0</td>
</tr>
<tr>
<td>Policy 2</td>
<td>-4</td>
<td>+2</td>
<td>+4</td>
</tr>
<tr>
<td>Policy 3</td>
<td>+4</td>
<td>+5</td>
<td>+3</td>
</tr>
<tr>
<td>Policy 4</td>
<td>+2</td>
<td>0</td>
<td>-2</td>
</tr>
</tbody>
</table>
Feedback and discussion

• Groups to outline their priority actions/policies and how it will be implemented

• Each group consider the policies from the other two groups in their scenario
  – is it relevant?
  – would it achieve the desired benefits?
  – would you implement the same way?

• Rank between +5 and -5 and why
# Windtunnelling

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Ranking -5 to +5</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

- Consider the results of the wind tunnelling and implications for potential energy sector policy
- What are the most ‘successful’ policies across the scenarios?
- What are the implications for policies that are highly scenario dependant?
- What are implications of different implementation requirements across the scenarios?
- What is surprising?
Social dialogue
Foresight of New and Emerging Risks to Occupational Safety and Health Associated with New Technologies in Green Jobs by 2020

Thank you!

Vielen Dank
Dank u
Merci
Dziękujemy
Děkuji
Tak dig
Obrigado
Va multumesc
Ringraziarla
Gracias
Σας ευχαριστώ