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SF6 Gas Management Australia
SF₆ Presentation Overview

- Clean Energy Future Legislation
- Power industry problem
- Significance of ABB’s recycling technology
- ABB Strategy for SF₆ Gas Management in Australia
- SF₆ Gas Management Service offering
- Customer benefits
- SF₆ safety issues
- Best practice inventory management
- Summary of Proposed SF₆ lifecycle
Clean Energy Futures Legislation

- From 1 July 2012 SF$_6$ imported into or manufactured in Australia will incur the carbon tax, that is;
  - on all gas
  - and gas filled equipment

- Importers of SF$_6$ and importers of equipment containing SF$_6$ will require a license.
  - ABB will be licensed

- Recycling of SF$_6$ will not be considered as manufacturing and therefore does not incur a carbon tax
Clean Energy Futures Legislation

- Formula for calculating levy on imported or manufactured Synthetic Greenhouse Gas

\[
\left( \text{Number of tonnes of carbon dioxide equivalence of SGG} \times \text{Applicable Charge} \right) + \left( \text{Number of tonnes of SGG} \times \text{Prescribed Rate} \right)
\]
Clean Energy Futures Legislation
Carbon Price Mechanism - Cost per tonne of SF\textsubscript{6}

<table>
<thead>
<tr>
<th>Year</th>
<th>Carbon price $/tCO\textsubscript{2}e</th>
<th>Carbon price eq. / tonne SF\textsubscript{6}</th>
<th>Total Levy (^1) / tonne SF\textsubscript{6}</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2013</td>
<td>$23.00</td>
<td>$549,700</td>
<td>$549,865</td>
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<td>FY 2014</td>
<td>$24.15</td>
<td>$577,185</td>
<td>$577,350</td>
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<td>FY 2015</td>
<td>$25.40</td>
<td>$607,060</td>
<td>$607,225</td>
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<tr>
<td>FY 2016</td>
<td>benchmark average auction charge</td>
<td></td>
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1. This includes the cost recovery levy or prescribed rate of $165/tonne of synthetic greenhouse gas imported and will be administered as a total levy.
Power industry problem
Why offer SF₆ management as a service?

- First generation SF₆ equipment now being replaced
- Classified as a Greenhouse Gas
- Compliant recovery and disposal required at end of life
- Limited disposal options available
- Cost to business
- Safety and environmental risk
ABB Innovation
SF6 Recycling Plant
Significance of new technology

**Pure SF₆**

Technical grade SF₆

(IEC60376) > 99.7 w/w % pure

Used SF₆ acceptable for reuse

(IEC60480) > 97.0 v/v% pure

Possibility of gas recycling by manufacturer

ABB Recycling Plant handles all levels of contaminated gas

Recycled to > than IEC 60376
SF₆ value chain – Power products industry

SUPPLY
SF₆ distributors

BUILD
SF₆ used in commissioning new HV and MV switchgear and circuit breakers

MAINTAIN
Filling, refilling, reclaiming, quality assessment, leak detection, gas sensing, logistics, inventory, reporting

DECOMMISSION
Decommissioning of old switchgear, SF₆ needs to be reclaimed and disposed of in a compliant manner

DISPOSE
Contaminated SF₆ gas is incinerated or processed for reuse by gas distributors

SF₆ cleaning using gas carts

High logistic costs and energy consumption

Carbon Tax

Regulations
SF₆ value chain – Power products industry

ABB Strategy for SF₆ Gas Management

**SUPPLY**

SF₆ distributors

**BUILD**

SF₆ used in commissioning new HV and MV switchgear and circuit breakers

**MAINTAIN**

Filling, refilling, reclaiming, quality assessment, leak detection, gas sensing, logistics, inventory, reporting

**DECOMMISSION**

 Decommissioning of old switchgear, SF₆ needs to be reclaimed and disposed of in a compliant manner

**DISPOSE**

Contaminated SF₆ gas is incinerated or processed for reuse by gas distributors

ABB is providing a complete environmental management solution

- Amount imported is reduced
- Need to dispose is eliminated

ABB SF₆ Recycling Centre
SF₆ management activities

- Disposal of gas
- SF₆ inventory management
- Recycling of SF₆ to technical grade standard IEC 60376
- Reclaiming used and contaminated gas
- Decommissioning of HV and MV switchgear
- Live Monitoring of SF₆ equipment.
Customer benefits

Lower risk

- Improved safety performance
- Reduced risk of non compliance to regulations
- Adherence to local standards
- Use of ABB’s qualified service technicians
- Make reporting to authorities easier
Customer benefits (continued)

Reduced costs

- Reduced maintenance and replacement costs
- Reduced work time on site
- Improved protection and extension of product life
- Enhanced asset management capabilities
Customer benefits (continued)
Decreased carbon footprint

- Support environmental policy objectives
- Reduction in greenhouse gas emissions
Safety management issues
Managing SF₆ decomposition by-products

- Highly arced gas can produce hazardous decomposition by-products
- Contact with water (moisture) can turn by-products into corrosive acid
- Suitable cylinders/valves for gas recovery must be used
  - Acid by-products may corrode cylinders and or valves
- PPE for handling acid by-products required
Best practice SF₆ inventory management
Cylinders and valves

- Colour co-ordinated cylinders
  - Green shoulder technical grade gas
  - Yellow shoulder used gas

- Special RPV valves for new SF₆
  - Reduce risk of compromising purity of clean gas

- Corrosive resistant valves and cylinders for contaminated gas
  - Improves safety
Summary of Proposed SF₆ lifecycle

1. Use of SF₆ in electrical equipment
2. Decommission, maintain SF₆ switchgear
3. Recycle using ABB’s Patented Technology
4. Reclaim contaminated, used or unwanted SF₆
5. Transport used SF₆ to ABB Recycling Centre
6. Deliver technical grade SF₆ to customer
7. Reuse clean green SF₆
8. Quality assurance check to IEC60376
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