SF_6 and switchgear technology: Situation in the EU 15 (1995 and 2000)

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS

1995: SF_6 emission world total = 6.200 t p.a. - including 2.800 t p.a. from the Electricity Sector

120 t p.a. estimated constant

leakage, handling losses (total from switchgear installed in Europe) 3 %. p.a.

installed in 1995: 4.000 t

total installed in 2010 estimated: 6.000 t

~ 80t p.a. (2000)

90 t p.a.(1995) development, manufacturing, installation ($^2/_3$ of installation outside Europe)

export

Europe

consumption for new SF_6 switchgear: 1.000 t p.a. (incl. export)

Emissions from the European Switchgear Industry

(manufacturers and users)

1995: < 210 t p.a. ----> 2000: < 200 t p.a.

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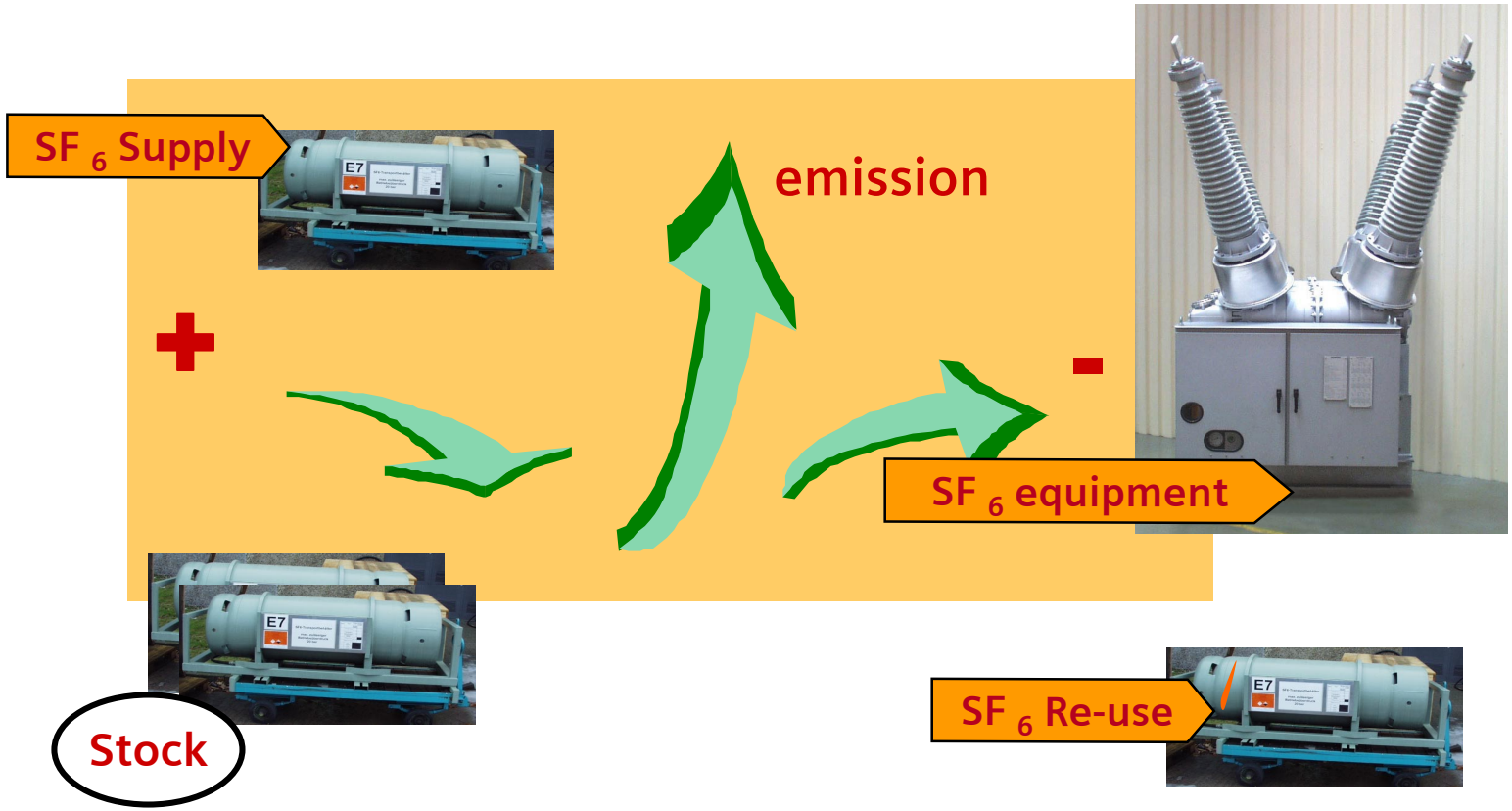
CAPIEL Inventory Methodology (1)

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS

Annual Assessment of SF_6- quantities at OEMs



SF_6 Input - SF_6 Output +/- Delta Stock = SF_6 Emission

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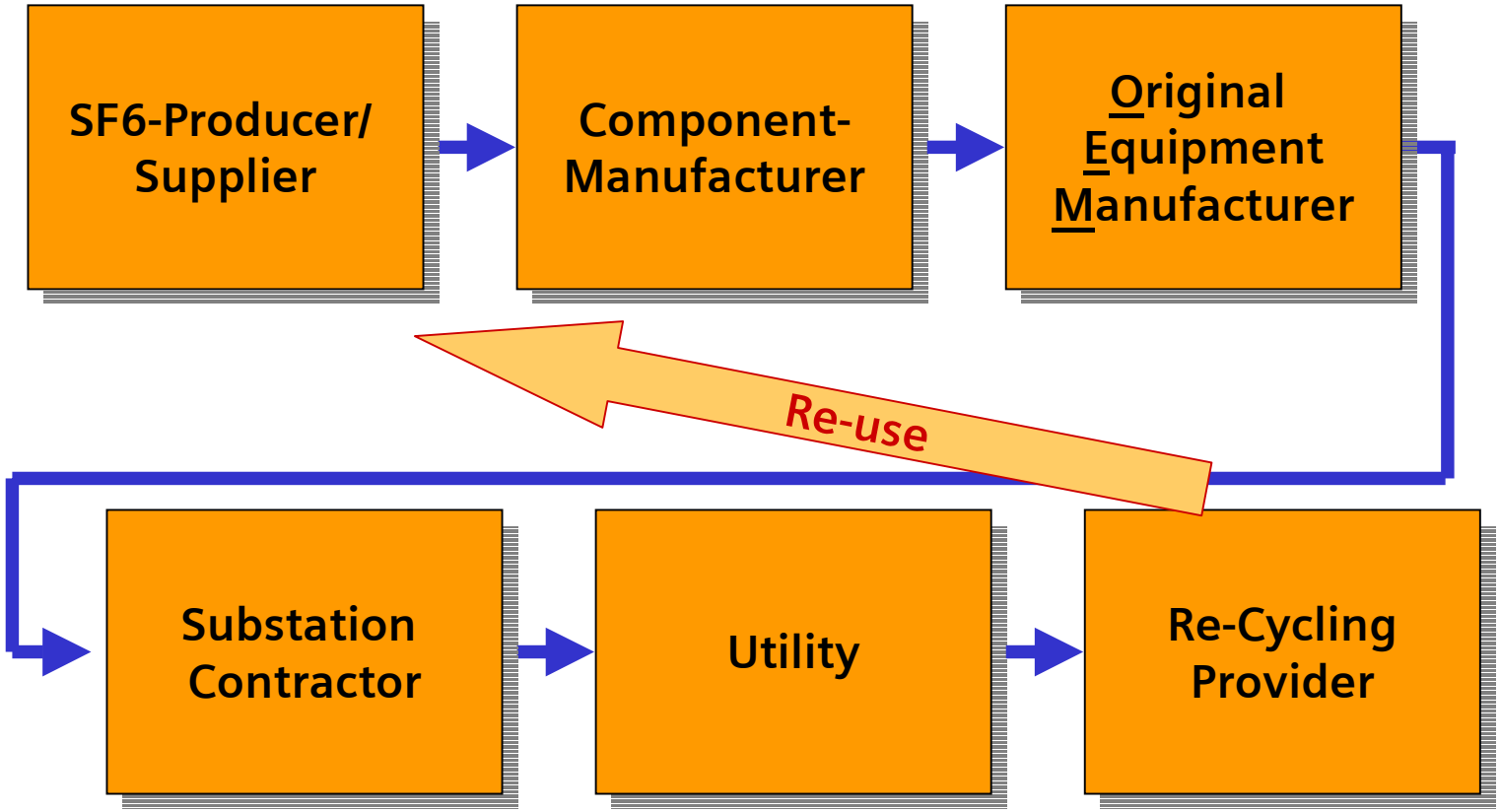
International Conference on SF_6, San Diego, 2002

CAPIEL Inventory Methodology (2)

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS

Annual Assessment of SF_6- Quantities for all Partners



n x (SF_6 Input - SF_6 Output +/- Delta Stock) = total SF_6 Emission

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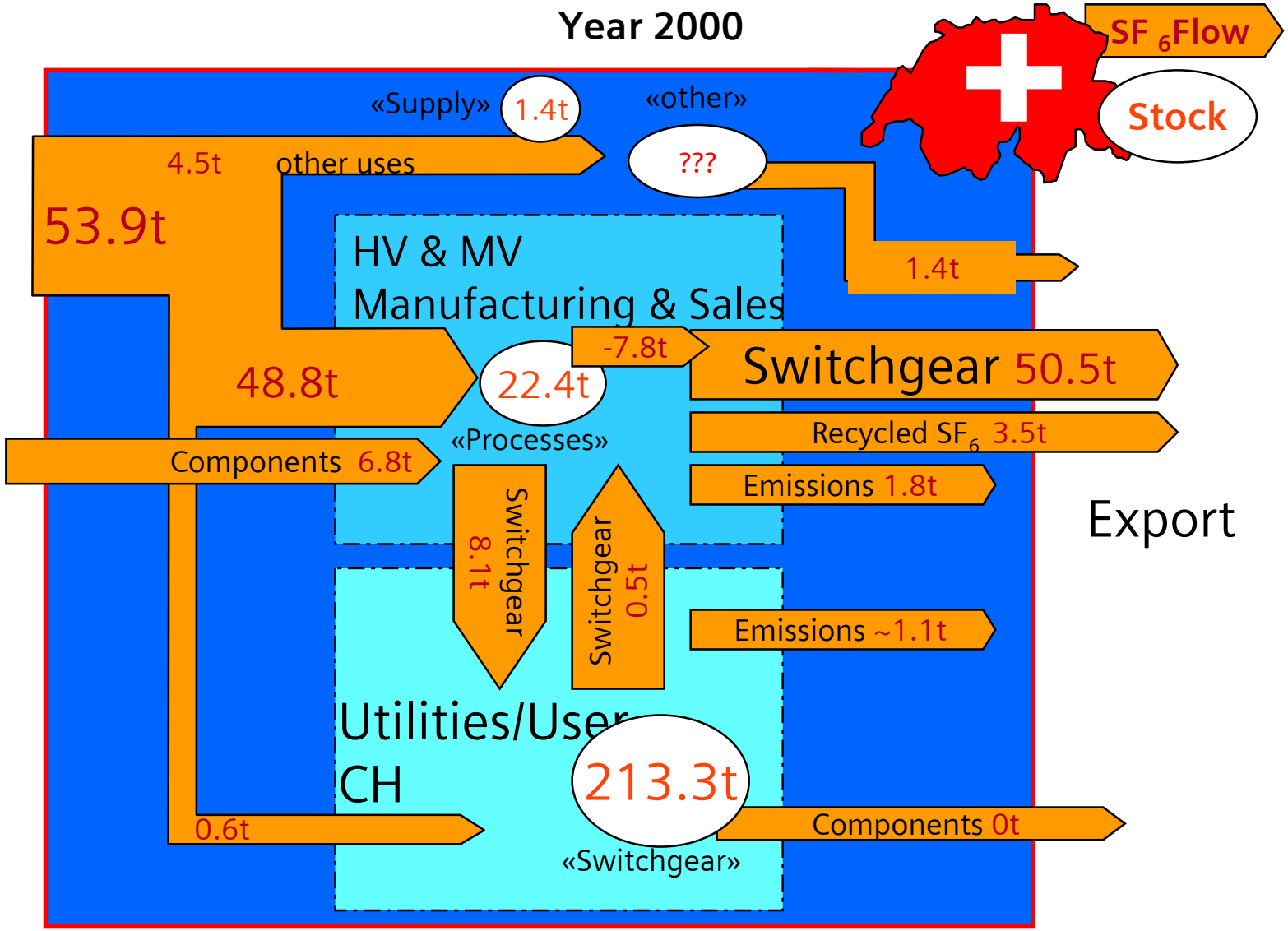
Inventory Methodology: Example Switzerland

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS



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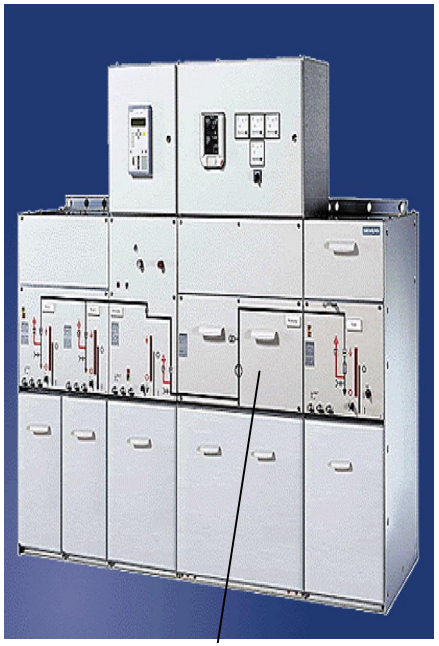
Switchgear Equipment Leakage (1)

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS

1....< 52 kV

> 52 kV.....1000 kV



MV-sealed for life switchgear: leakage rate 0,1%...0.01% p.a.

Dead-Tank Circuit-Breaker 145 kV

Live-Tank Circuit-Breaker 300 kV

MV switchgear: typical leakage rate < 0.1 % p.a.

HV switchgear: typical leakage < 0.5 % p.a.

CAPIEL commitment: Indication of SF_6 content on nameplate to support inventory-methodology and instruction for proper re-cycling and disposal

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Switchgear standards referring to SF_6 - issues

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS

Development

- IEC 60376 (new SF_6)
- IEC 60480 (used SF_6)

Manufacturing

- Manufacturers internal instructions, design- and routine-test principles
- IEC 62271 Series for High Voltage and Medium Voltage Switchgear Apparatus/Devices

Installation, erection, commissioning

- IEC 61634 (handling SF_6)
- IEC 60376 (new SF_6)
- IEC 60480 (used SF_6)

Leakage

- IEC 60376
- IEC 60480
- CIGRE 2002 (Electric Industry)

Handling losses during repair work and maintenance

- IEC 16634 (handling SF_6)
- CIGRE 1991 (handling SF_6)
- CIGRE 2000 (gas mixtures)

End of life, recycling

- CIGRE 1997 (Recycling Guide)

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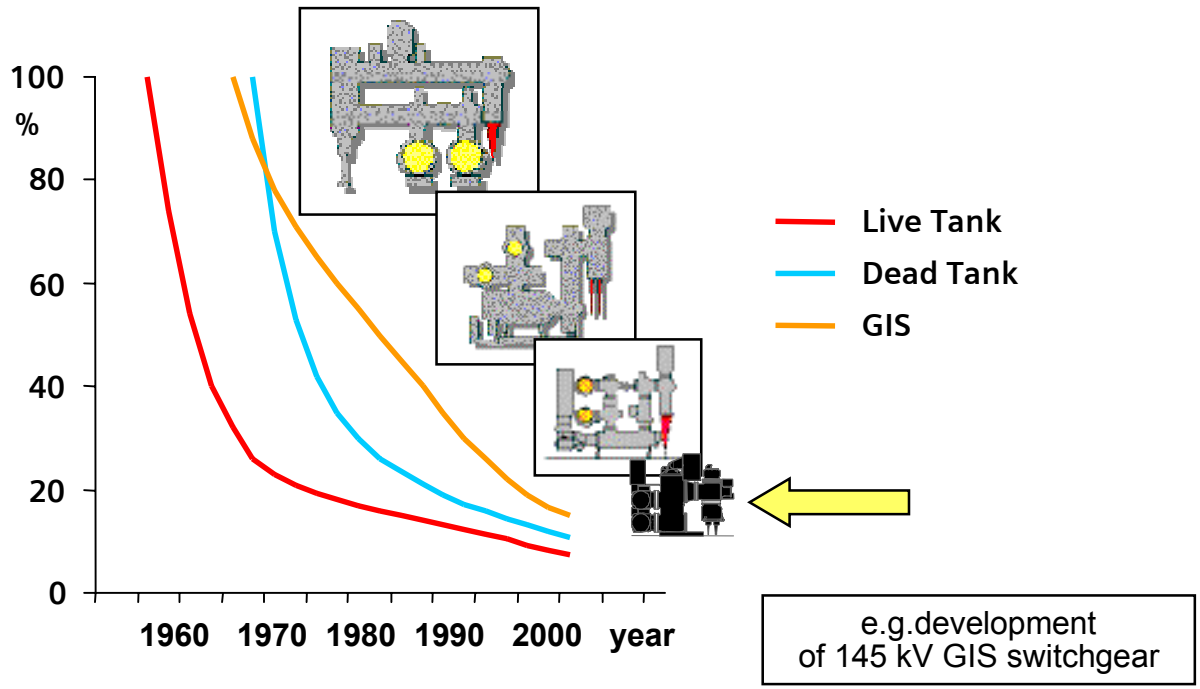
Development (1)

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS

Reduction of SF_6 quantities for switchgear was efficient



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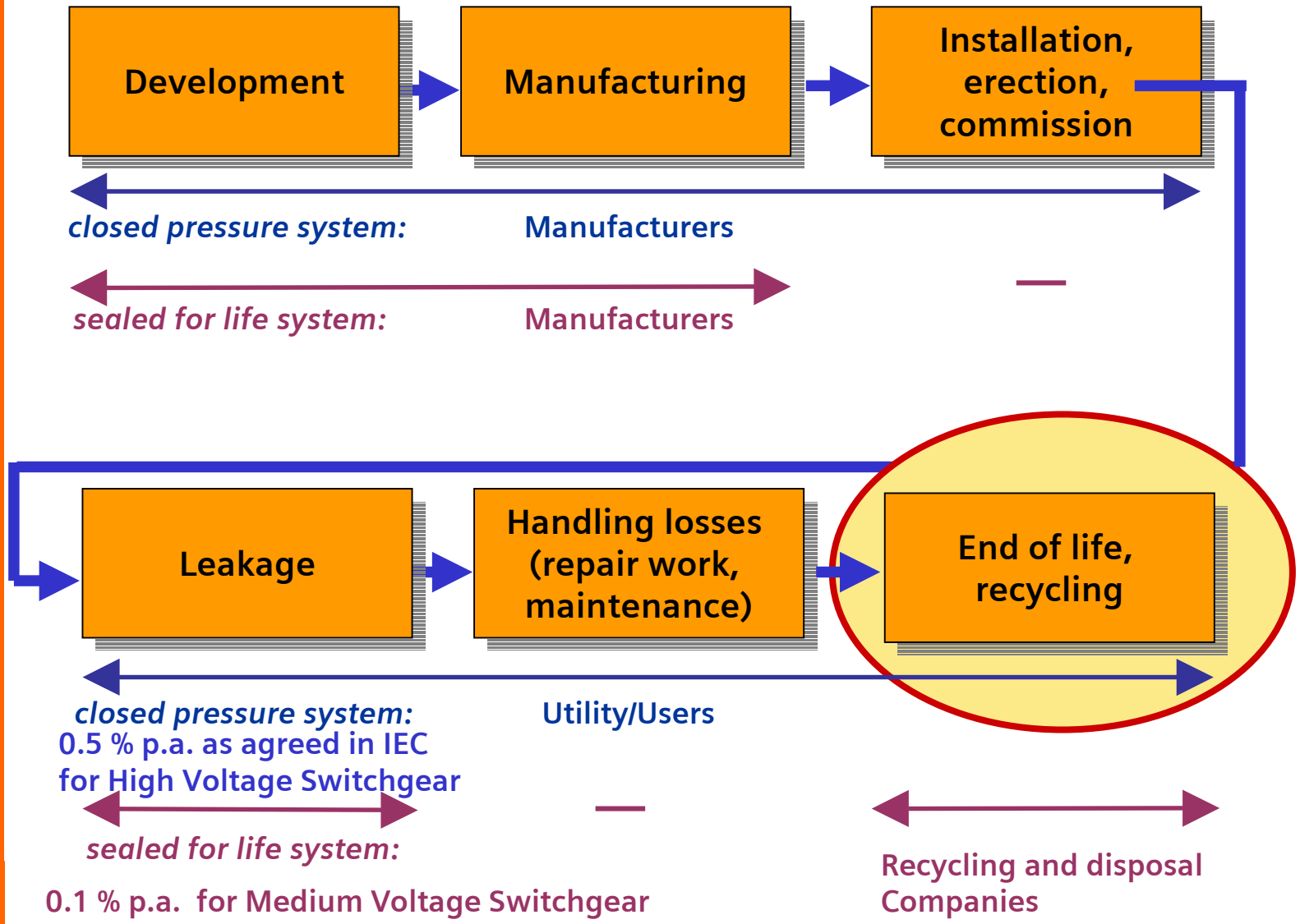
Responsibility Flowchart for SF_6 Monitoring

UTILITY BREAKOUT SESSION I

UTILITY SECTOR SF_6 EMISSIONS



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