2004-2006 SF₆ DATA SUMMARY

DEBRA KNOPMAN, KATIE SMYTHE

PM-2327-NEMA
June 2007
Prepared for the National Electrical Manufacturers Association

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June 25, 2007

Memorandum

To: Sponsors

From: Debra Knopman and Katie Smythe

Subject: 2004-2006 SF$_6$ Data Summary

The attached tables and graphs summarize the data received from manufacturers of sulfur hexafluoride (SF$_6$) for the period 2004-2006. The purpose of the survey is to provide the scientific community with data on the production and use of sulfur hexafluoride.

The initial request for data was sent to the six SF$_6$ producers who have participated in the data collection exercise since its inception in 1996. However, only four companies responded to this data request despite multiple efforts on RAND’s part to secure responses from all six of the producers as had happened in the past. This report provides a compilation of the last three years of data from these four companies.

To summarize, the companies were requested to provide data on total actual sales by end-use applications for 2004, 2005 and 2006, and provide an additional breakdown of the data. Reported data include only the SF$_6$ sold by the company directly into the marketplace, including any amount purchased from co-producers for re-sale to customers. All information provided to RAND was treated as commercially confidential business information, was not divulged to any other individuals or organizations, and remains secure. Only aggregated data are reported, consistent with the agreement in place between RAND and sponsors.

The RAND survey questionnaire was organized according to the primary end-use markets:

- electric utilities
- original equipment manufacturers (for electric power systems)
- magnesium industry
- electronics industry (with an estimate of sales to semiconductor manufacturers and LCD/flat panel display manufacturers)
- use of SF$_6$ for adiabatic / shock absorbing properties (e.g., tires, athletic footwear)
- all other uses

Attached to this memorandum is a data summary table covering the period 1961-2006 along with plots and graphics depicting the results of this most recent survey. In previous years, the results have been presented at the “SF$_6$ and Environment Conference.”

If you have any questions about the SF$_6$ data, please contact Debra Knopman (Tel: 703-413-1100 ext. 5667; Fax: 703-413-8111; email: knopman@rand.org).
## SF6 Sales by End-Use Applications

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### Notes:
1) "All Other Uses" includes accelerators, leak detection, optical fiber production, glazing, biotechnology, lighting, medical, pharmaceutical, laboratory / university research, government sales, refining, sound proof windows.
2) For the years 1966-1974 (**), some companies could not provide a breakdown by end use. TOTAL SALES includes an additional 672 metric tons sold in these years. The sum of sales by end use does not equal total sales.
3) For the years 1961-1996, utilities and accelerators were reported together in the same category. Beginning with 1997, accelerators were included in the category of "All Other Uses" and "Utilities" was a stand-alone category.
4) In the 2000-2001 report, one company made a correction to the category distribution of their previously reported data. Sales shown previously as "Utilities" were moved to "Original Equipment Manufacturers". A similar change was made by another company in the 1999 report.
5) Data from Nuclear Energy Corp. of South Africa (NECSA) are included in the report beginning in 1997.
6) Ausimont was acquired by Solvay in Spring 2002; combined data were reported by Solvay for the 2000-2001 report.
8) The data reported in 2004-2006 reflects submissions from four companies; the request for data was sent to six companies.
Total Annual Sales of SF₆
(1961-2006)
Total Annual Sales of SF6
(1980-2006)
## Annual Sales of SF6 by End-Use Application (1980 - 2006)

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<th>Electronics</th>
<th>Adiabatic Prop.</th>
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Sales of SF₆ by End-Use Category
(1980-2006)
SF₆ Sales for the Period 1996-2006

End-Use Applications

Metric Tons

- Electric Utilities
- Original Equip.
- Magnesium
- Electronics
- Adiabatic Prop.
- All Other Uses

Year:
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
Total Annual Sales of SF₆ (1996-2006)
Breakdown of Total SF₆ Sales: 1961-2006

- Electric Utilities: 21%
- Original Equip.: 53%
- Magnesium: 4%
- Electronics: 19%
- Adiabatic Prop.: 0%
- All Other Uses: 3%

Original Equip. 53%
Electric Utilities 21%
Magnesium 4%
Electronics 19%
Adiabatic Prop. 0%
All Other Uses 3%

Legend:
- Electric Utilities
- Original Equip.
- Magnesium
- Electronics
- Adiabatic Prop.
- All Other Uses
Breakdown of Total SF₆ Sales: 1996

Electric Utilities: 15%
Original Equip.: 63%
Magnesium: 7%
Electronics: 4%
Adiabatic Prop.: 5%
All Other Uses: 6%

Electric Utilities
Original Equip.
Magnesium
Electronics
Electronics
Adiabatic Prop.
All Other Uses
Breakdown of Total SF₆ Sales: 1997

- Electric Utilities: 15%
- Original Equip.: 66%
- Magnesium: 3%
- Electronics: 5%
- Adiabatic Prop.: 6%
- All Other Uses: 5%

Legend:
- Electric Utilities
- Original Equip.
- Magnesium
- Electronics
- Adiabatic Prop.
- All Other Uses
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**Breakdown of Total SF₆ Sales: 1998**
Breakdown of Total SF₆ Sales: 1999

- Electric Utilities: 13%
- Original Equip.: 64%
- Magnesium: 3%
- Electronics: 9%
- Adiabatic Prop.: 3%
- All Other Uses: 8%
Breakdown of Total SF₆ Sales: 2000

- Electric Utilities: 18%
- Original Equip.: 64%
- Magnesium: 3%
- Electronics: 10%
- Adiabatic Prop.: 2%
- All Other Uses: 3%
Breakdown of Total SF₆ Sales: 2001

- Electric Utilities: 18%
- Original Equip.: 66%
- Magnesium: 3%
- Electronics: 8%
- Adiabatic Prop.: 1%
- All Other Uses: 4%
Breakdown of Total SF₆ Sales: 2002

- Electric Utilities: 23%
- Original Equip.: 57%
- Magnesium: 5%
- Electronics: 10%
- Adiabatic Prop.: 0%
- All Other Uses: 5%
Breakdown of Total SF₆ Sales: 2003

- Electric Utilities: 24%
- Original Equip.: 54%
- Magnesium: 4%
- Electronics: 13%
- Adiabatic Prop.: 0%
- All Other Uses: 5%
Breakdown of Total SF₆ Sales: 2004

- Electric Utilities: 25%
- Original Equip.: 58%
- Magnesium: 4%
- Electronics: 9%
- Adiabatic Prop.: 0%
- All Other Uses: 4%

Legend:
- Electric Utilities
- Original Equip.
- Magnesium
- Electronics
- Electronics
- Adiabatic Prop.
- All Other Uses
Breakdown of Total SF₆ Sales: 2005

- Electric Utilities: 23%
- Original Equip.: 59%
- Electronics: 10%
- Magnesium: 4%
- Adiabatic Prop.: 0%
- All Other Uses: 4%
Breakdown of Total SF₆ Sales: 2005

- Electric Utilities: 21%
- Original Equip.: 53%
- Magnesium: 4%
- Electronics: 19%
- Adiabatic Prop.: 0%
- All Other Uses: 3%