

SF₆ Sales and Distribution by End Use (1961-1999)

Katie Smythe

RAND

Environmental Science & Policy Center

1200 South Hayes Street
Arlington, Virginia 22202

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SF₆ Data Summary

Key Questions

How much SF₆ is being produced worldwide?

What are the major applications?

What are the trends in sales over time?

SF₆ Data Summary

Presentation Overview

- ◆ Purpose and genesis of SF₆ data collection effort
- ◆ Approach and key features
- ◆ Results of current survey
 - Global coverage (participating companies)
 - Total annual sales (1961-1999)
 - Sales by end-use categories (1980-1999/1997-1999)
 - Sales projections (2000-2002)

SF₆ Data Summary

Purpose

- ◆ To provide the scientific community with historical SF₆ data for
 - Analyzing trends, sources, and applications
 - Calculating SF₆ emissions
 - Correlating production data with atmospheric measurements
- ◆ To inform policy makers of current SF₆ market data

SF₆ Data Summary

Initial Study (1996/1997)

- ◆ Initiated and sponsored by SF₆ manufacturers
 - International participation (US, Europe, Japan)
 - Voluntary industry initiative
- ◆ Compiled historical annual sales data (1961-1996)
- ◆ Reported sales data by major end-use applications
 - Data used to calculate emissions and correlate to atmospheric measurements (Maiss and Brenninkmeijer, ES&T, 1998)

SF₆ Data Summary

Follow-on Study (1999/2000)

- ◆ Updated previous survey to include 3 additional years of data (1997-1999)
 - 7 participating companies (6 original + 1 new)
- ◆ Initiated discussions with other known producers (e.g., China and Russia)
 - Producers had expanded beyond initial base in US, Europe, and Japan
 - Need for expanded survey to capture global production
- ◆ Examined information on regional market size

SF6 Data Summary

Key Features

- ◆ Voluntary participation
- ◆ Independent third party (RAND)
 - Survey companies
 - Compile and report aggregated data
- ◆ Confidentiality agreement

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Sponsors

- ◆ SF₆ manufacturers
- ◆ U.S. Environmental Protection Agency
- ◆ National Electrical Manufacturers Association/SF₆ Task Group

SF₆ Data Summary

Approach

Phase I. Investigation of SF₆ producers

- Confirm previous participants
- Identify and contact other producers

Phase II. Data collection (annual sales data)

- Survey distribution, data compilation, followup
- Final summary of results (report + presentation)

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Reporting Companies

- Air Products and Chemicals, Inc.
- Asahi Glass Chemicals
- Ausimont
- Honeywell International (formerly AlliedSignal)
- Kanto Denka Kogyo
- Nuclear Energy Corp. of South Africa (NECSA)
- Solvay Fluor

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Other Producers

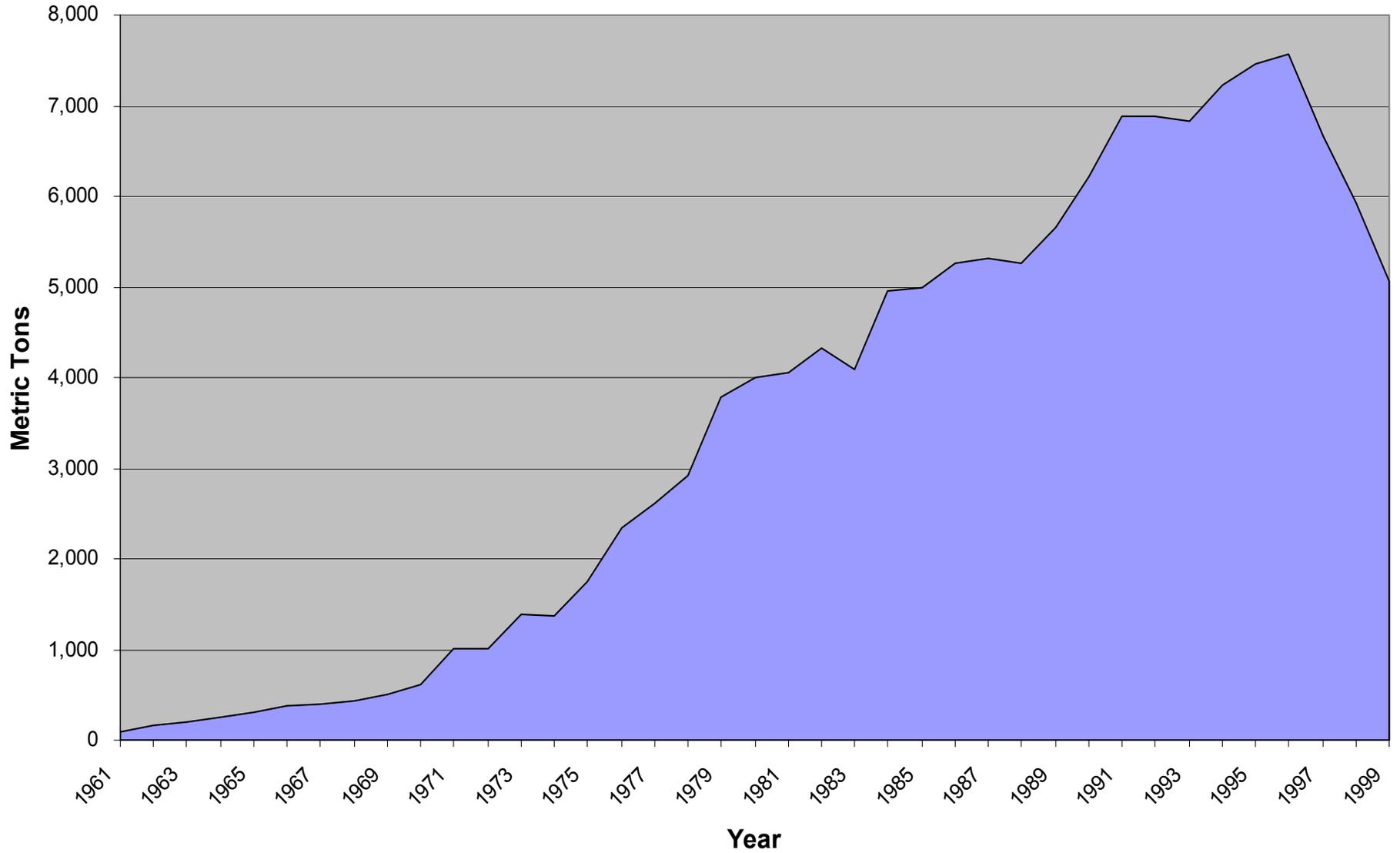
- ◆ Initiate contact with other known producers
 - China and Russia
 - Other countries?
- ◆ Maintain ongoing dialogue; share survey results
- ◆ Encourage participation in future updates

SF₆ Data Summary

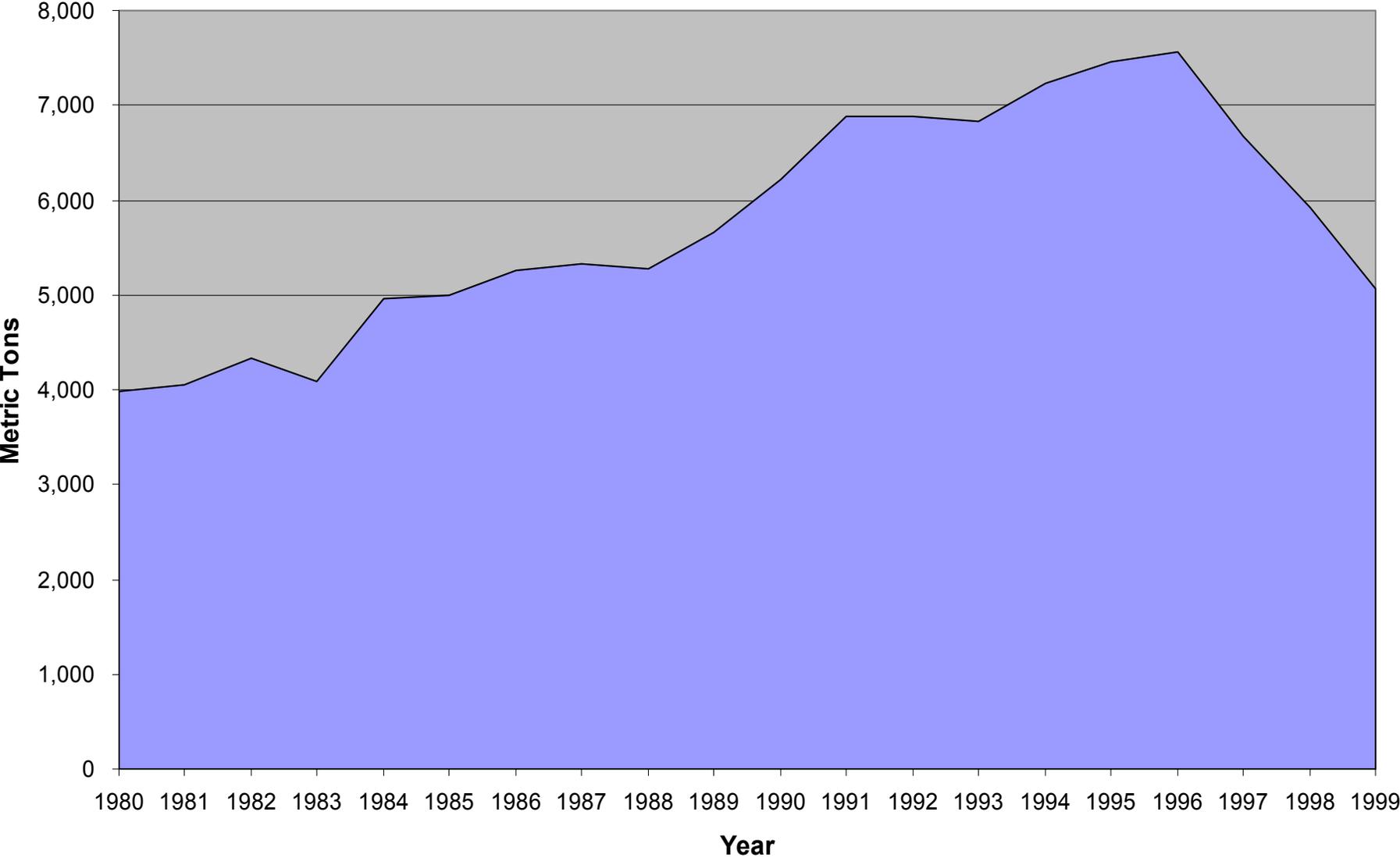
Overview of Results

- ◆ Total annual sales (1961-1999)
- ◆ Sales by end-use categories
 - Periods 1980-1999 and 1997-1999
- ◆ Sales projections (2000-2002)
 - Comparison of actual sales to 1996 projections

Total Annual Sales of SF₆ (1961-1999)



Total Annual Sales of SF₆ (1980-1999)



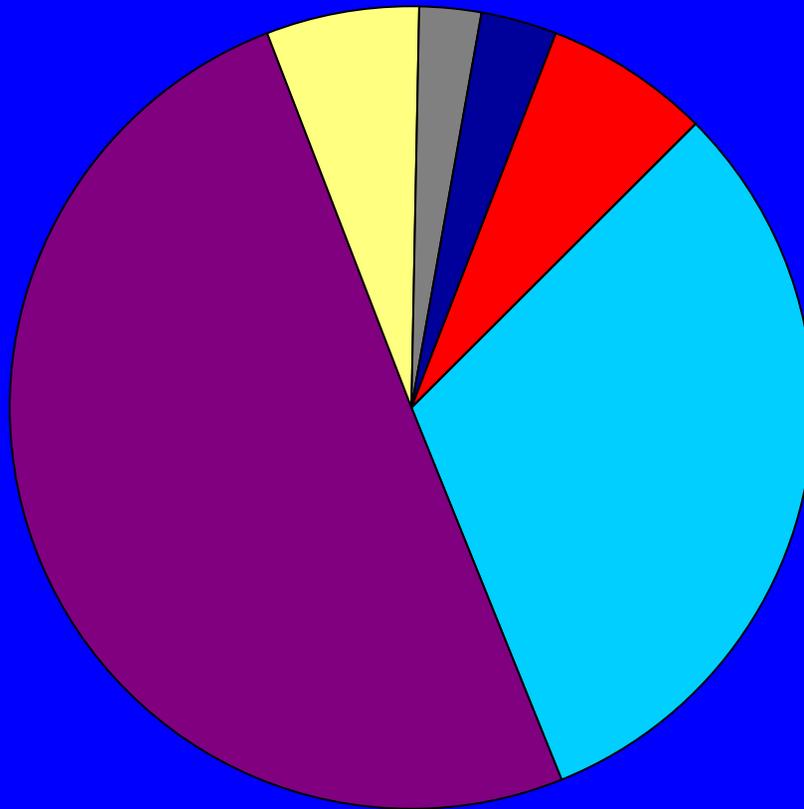
SF₆ Data Summary

End-Use Categories

- ◆ Electric utilities
- ◆ Original equipment manufacturers
- ◆ Magnesium industry
- ◆ Utilizing SF₆ adiabatic property (e.g., tires)
- ◆ Electronics industry
- ◆ All other uses

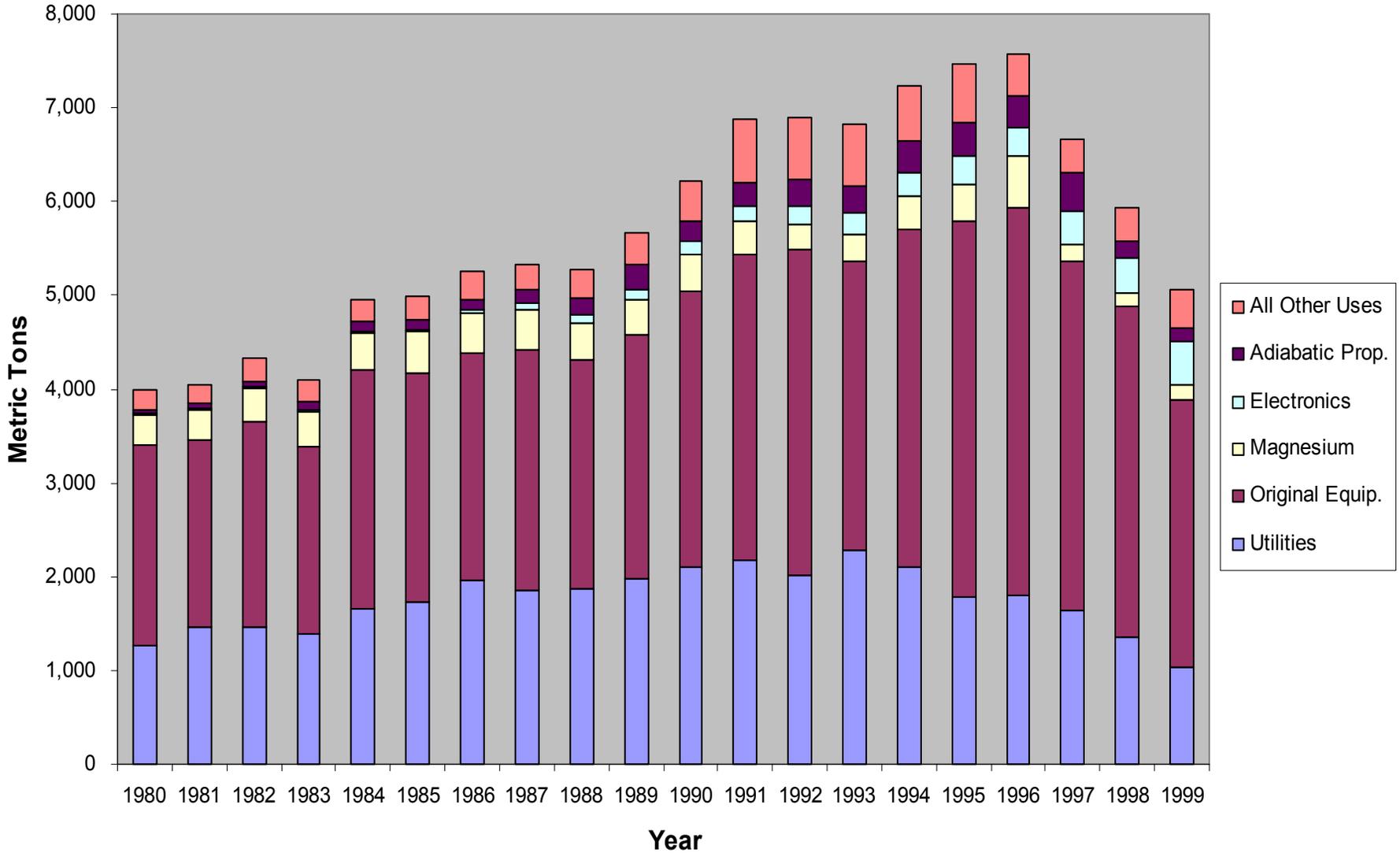
Accelerators, optical fiber production, glazing, lighting, biotechnology, medical, refining, pharmaceutical, laboratory/university research, sound proof windows

Breakdown of SF₆ Sales (1961-1999)

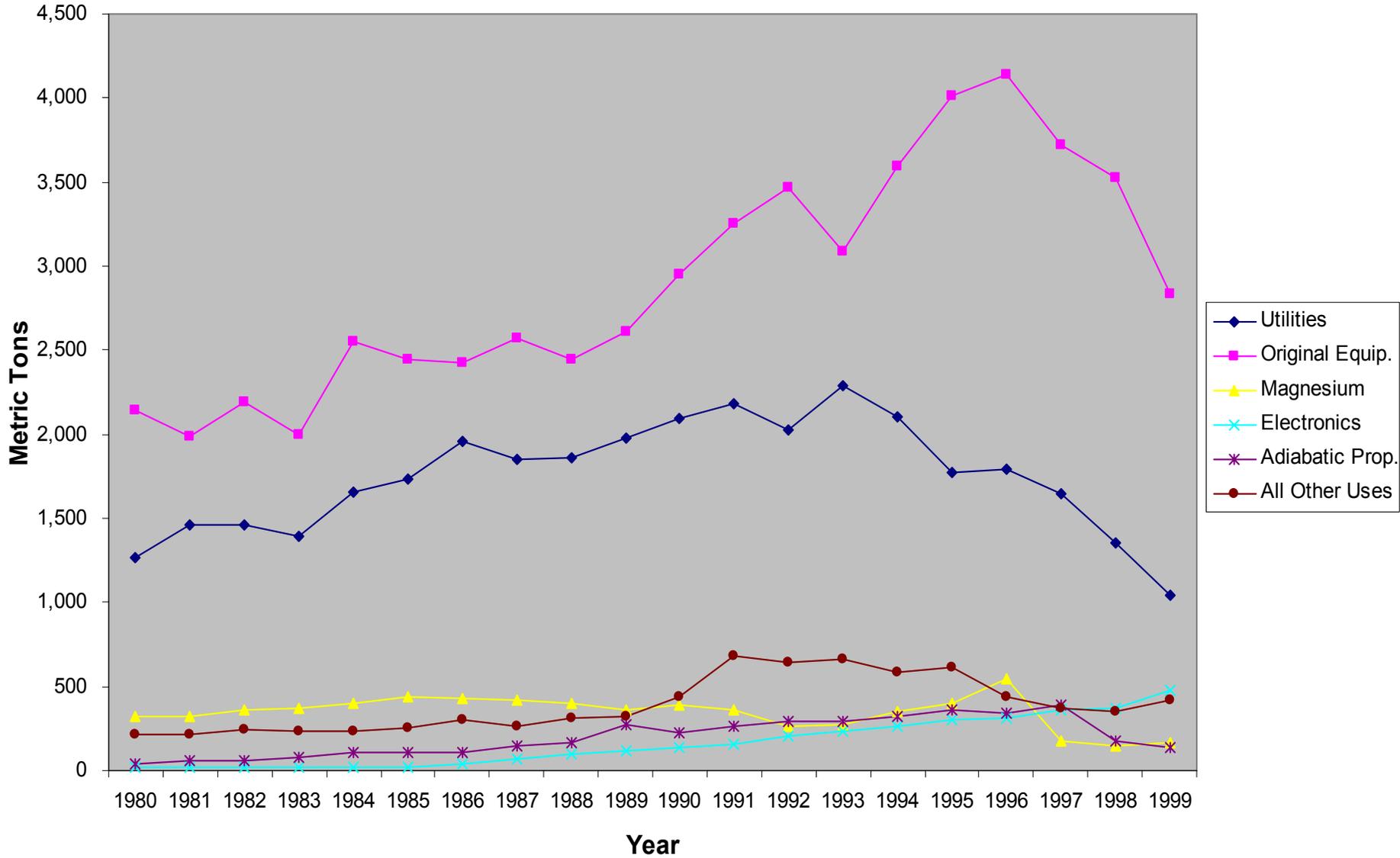


- Electric Utilities (31%)
- Orig. Equipment Manuf. (50%)
- Magnesium Industry (6%)
- Electronics Industry (3%)
- SF6 Adiabatic Properties (3%)
- All Other Uses (7%)

Sales of SF₆ by End-Use Category (1980-1999)



Annual Sales of SF₆ by End-Use Application (1980-1999)

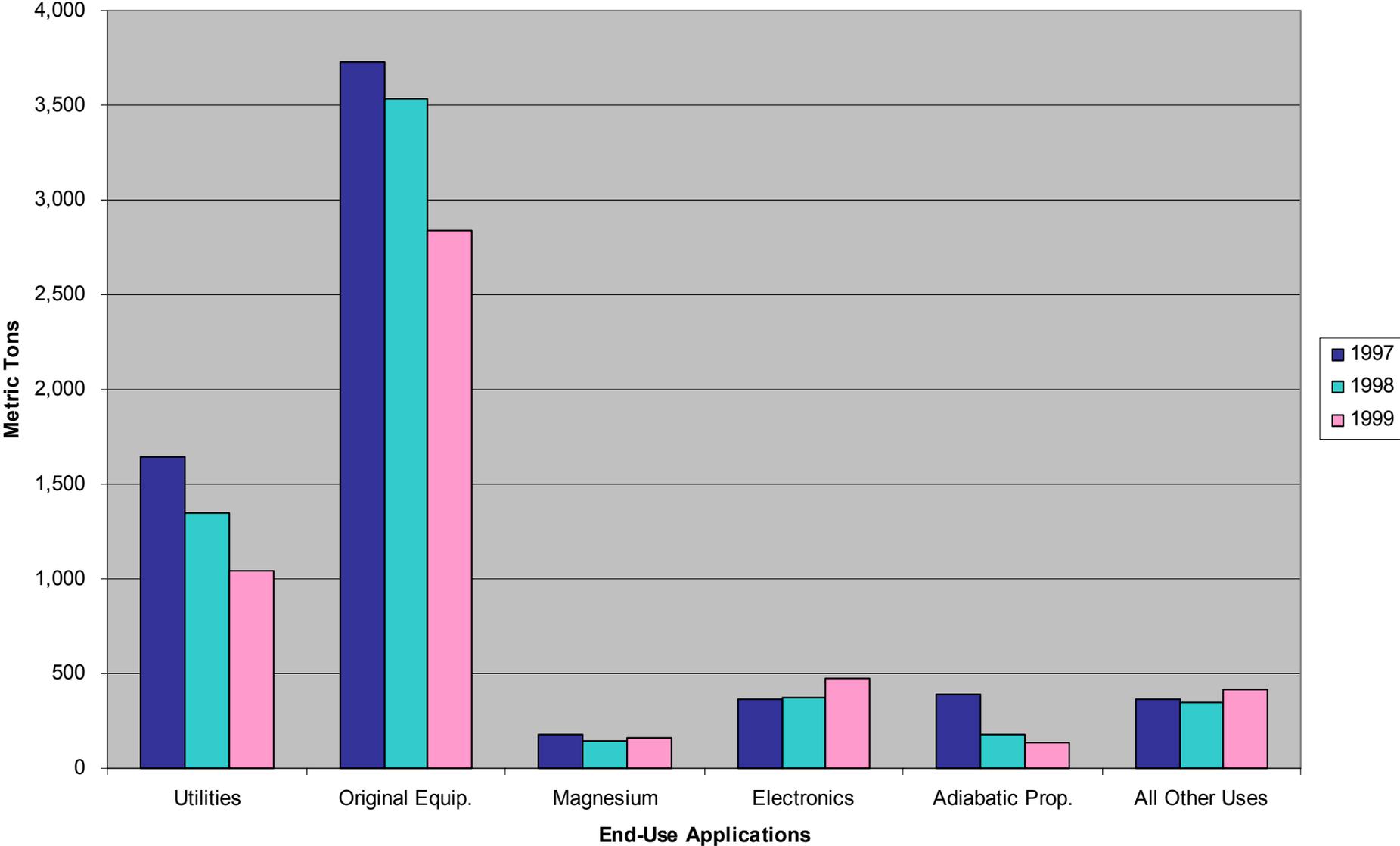


SF₆ Data Summary

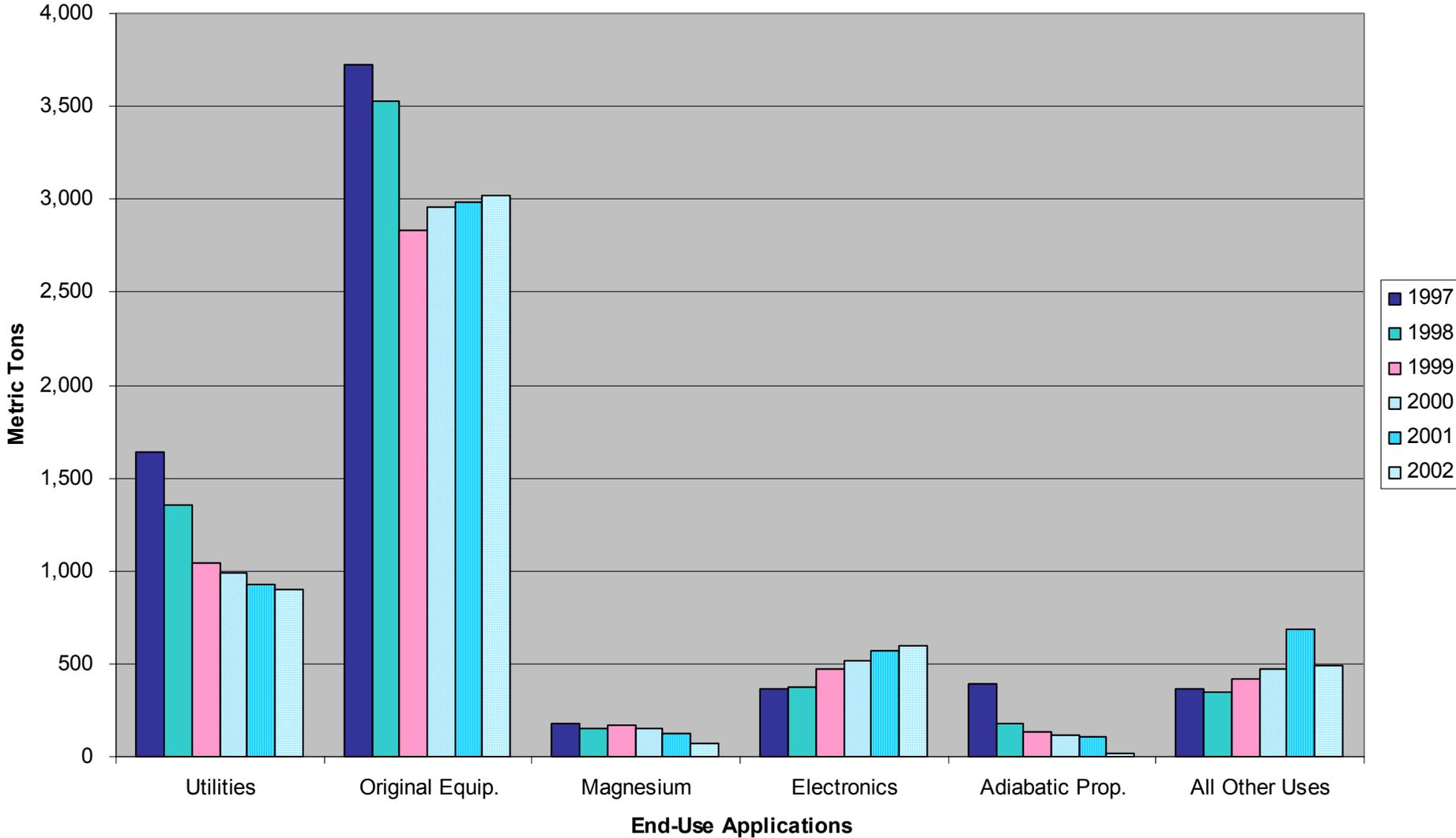
Current Reporting Period

- ◆ Annual sales by end use for 1997-1999
- ◆ Sales projections for 2000-2002
 - How well do past projections track current sales?
 - How accurate are future projections without all the global producers?

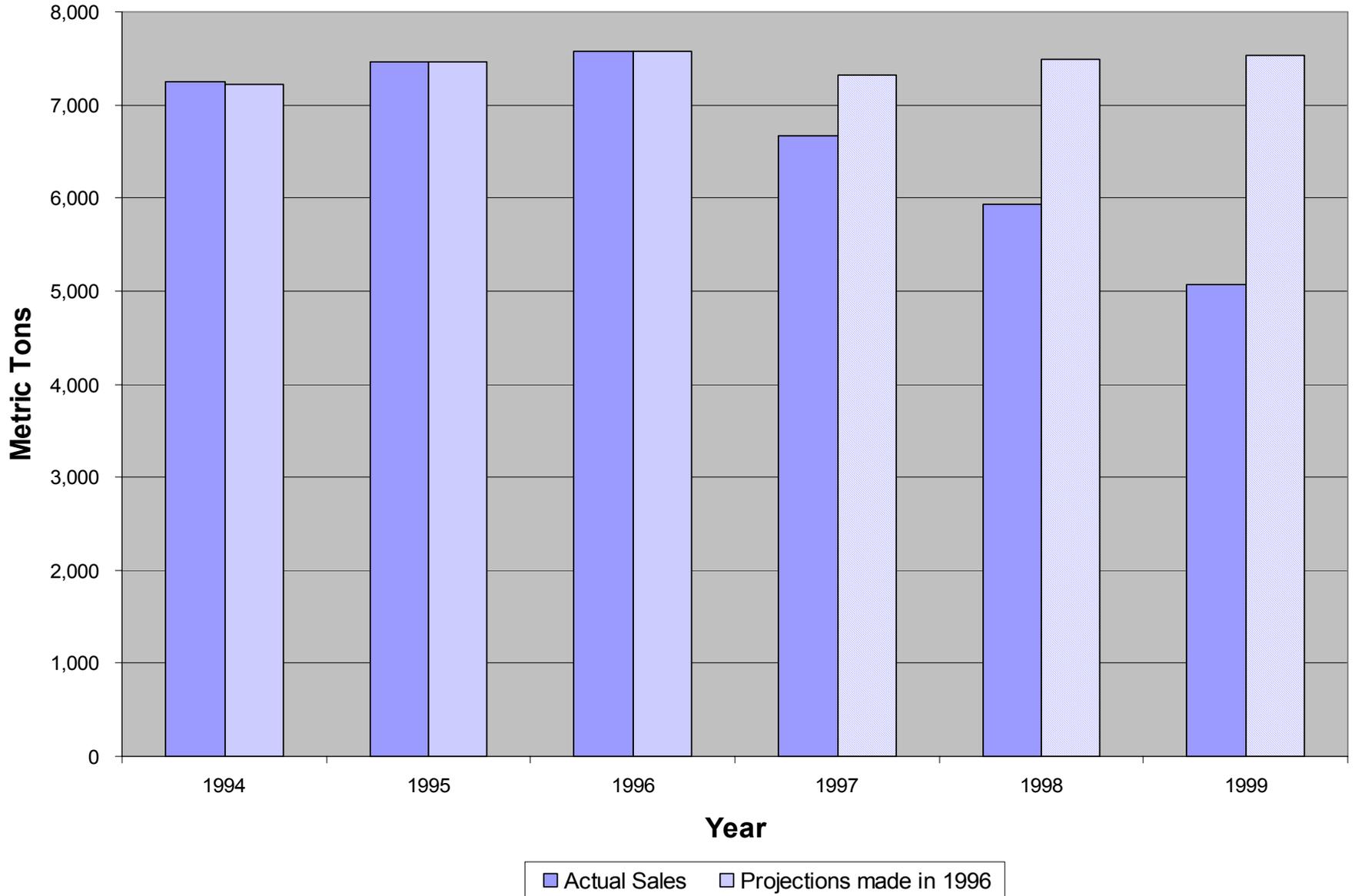
SF6 Sales for the Period 1997-1999



Annual Sales by Category (1997-1999) Sales Projections (2000-2002)



Total Annual Sales: Actual versus Projections



SF₆ Data Summary

Summary of Results

- ◆ Peak year for sales in 1996 (~7600 te)
(last year survey was conducted)
- ◆ Overall annual sales in decline since 1996
 - by 12% in 1997, 11% in 1998, 15% in 1999
 - by 2500 te between 1996 and 1999
- ◆ 1999 sales level same as in 1985 (~5000 te)
- ◆ Percent of world represented unknown;
other producers not included in study

SF₆ Data Summary

Significance

- ◆ Historical annual sales data (1961-1999)
- ◆ Distribution by major end-use applications
- ◆ Estimation of future sales levels
- ◆ International participation (with possible expansion)
- ◆ Source of data for research community and policy makers

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Future Activities

- ◆ Inclusion of other producers (e.g., China & Russia)
- ◆ Regular reporting cycle (annual, biennial ?)
- ◆ Collaboration with other data collection and emissions estimating programs