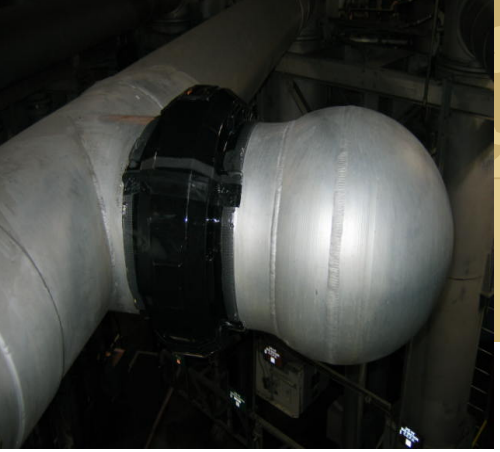

SF_6 Leak Detection and Mitigation Techniques

4th International Conference on SF6 and the Environment
November 29, 2006
San Antonio, TX

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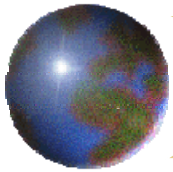


The Challenge

- Con Edison was a pioneer in adopting SF_6 technology to meet massive load growth in the 1950s and 1960s. Although this early development work led to substantial improvements in circuit breaker designs, this earlier vintage equipment required modifications and special maintenance techniques to minimize SF_6 emissions. They were not designed for low leakage.
- Though valuable for its unique combined properties as an insulating and arc-extinguishing medium, SF_6 has a global warming potential 22,200 times greater than carbon dioxide (CO_2), the most plentiful greenhouse gas. And, while CO_2 will last in the atmosphere for 200 years, SF_6 has an estimated lifetime of 3,200 years.

The Challenge

- The global demand for SF_6 gas is escalating the cost.
- At Con Edison, our Substations Operations Department has made reducing SF_6 leaks a Key Performance Indicator for the company.
- The Challenge → Keep the SF_6 gas in the equipment.

Con Edison's Response

- Heightened attention to SF_6 usage.
- Simplified entry of Gas Calls in Maximo.
- Faster identification of leaking equipment.
- Pinpointing and preparing for repairs with ground leak checks and GasVue SF_6 camera prior to equipment outages.
- Requesting equipment out of service on a Category 2 emergency to expedite repairs.
- Replacement of leaking and problematic circuit breakers.
  - In 2006, 5-345kV circuit breakers are scheduled for replacement.
  - In 2006, we started a 138kV circuit breaker replacement program.
- Auto ground switch overhaul program
  - 2005 – 7 replaced; 2006 – 8 scheduled

Con Edison's Response

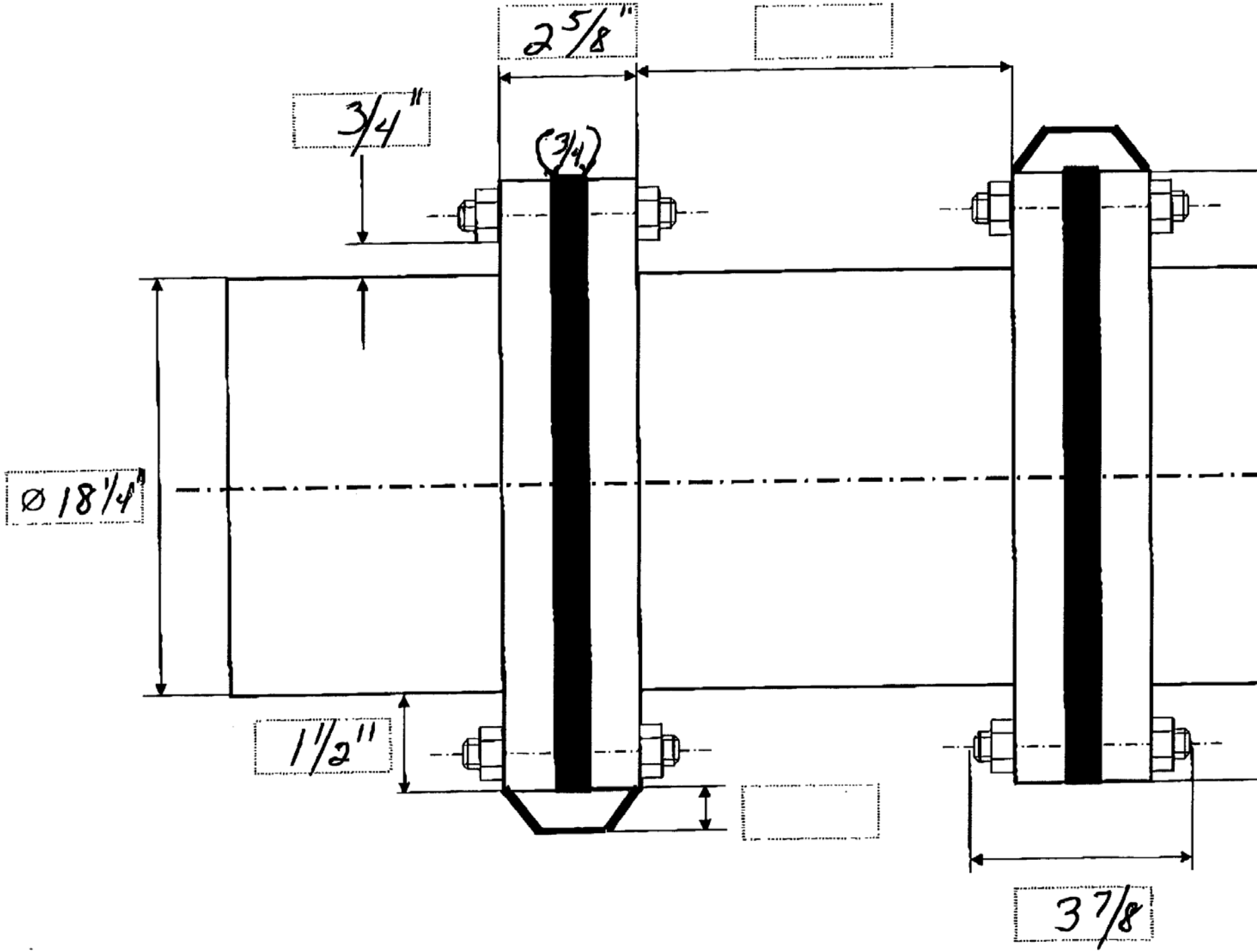
- Increased maintenance efforts.
  - Replaced piping, sealed bushings, manifold system checks.
- Con Edison worked directly with manufacturers to eliminate original equipment seal material and design problems from older SF_6 equipment.
- To better manage and reduce emissions from both original and the latest SF_6 equipment, Con Edison, EPRI and many other utilities have worked together to develop:
  - Better gas carts and handling techniques to capture and recycle SF_6,
  - SF_6 laser cameras to more easily identify even small leaks,
  - Improved methods to seal SF_6 leaks prior to equipment overhauls and
  - Providing feedback to manufacturers to reduce leaks on new equipment.

Con Edison's Response

- These industry collaborations have enabled the utilities to continue to retain the many benefits of SF_6, while protecting our environment.
- EPRI has been a leader in orchestrating utility and industry response to this problem, fostering collaboration between utilities, manufacturers and USEPA.
- This work continues, most recently with efforts to accelerate a new prototype SF_6 camera from KEMA and technology transfer of EDF's new flange sealing techniques to US utilities.

Specific Response on Leak Sealing and Leak Identification

- Consolidated Edison and EPRI successfully demonstrated a novel SF_6 sealing technology to a GIS flange at a midtown Manhattan 345kV GIS station. Consolidated Edison supported the research – and then took the next step of being the first utility in the USA to implement this new leak seal approach to a GIS flange. The results of the application provided valuable research data on techniques to reducing SF_6 leaks in the field.
- Consolidated Edison with EPRI support and facilitation, demonstrated a prototype SF_6 leak detection camera being developed by KEMA . Through this field demonstration a number of improvements have been identified.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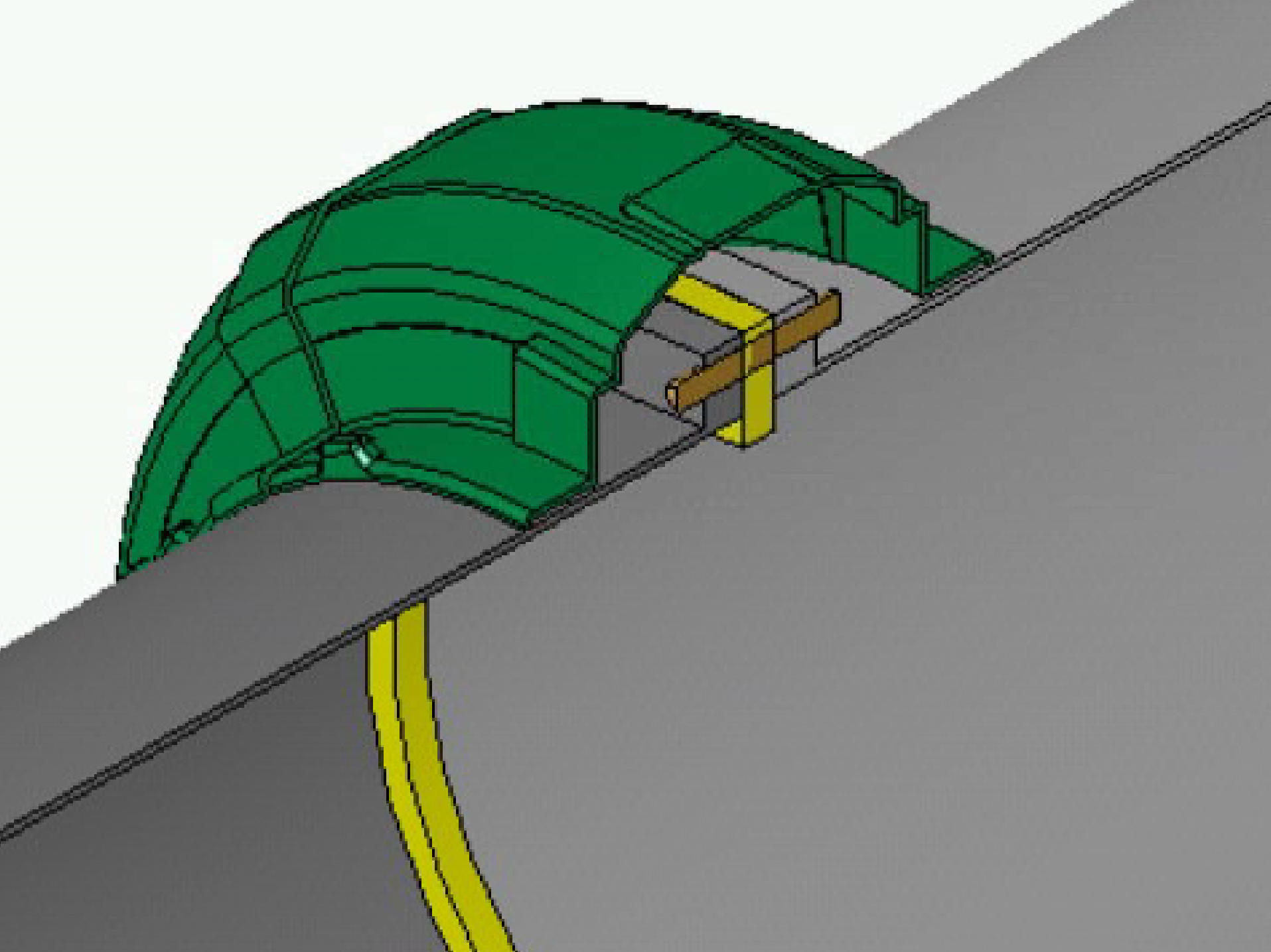
3 7/8

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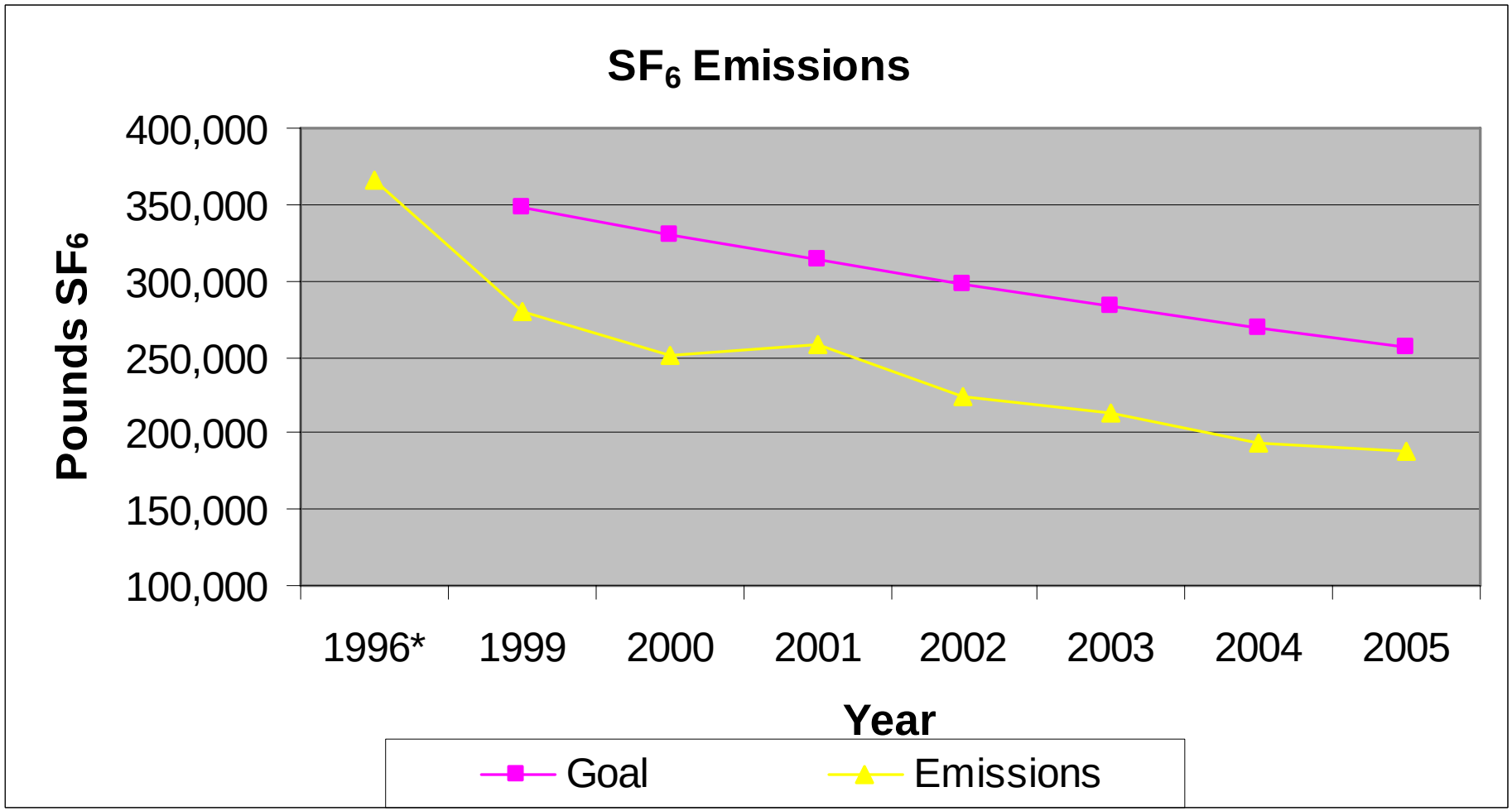
Benefits

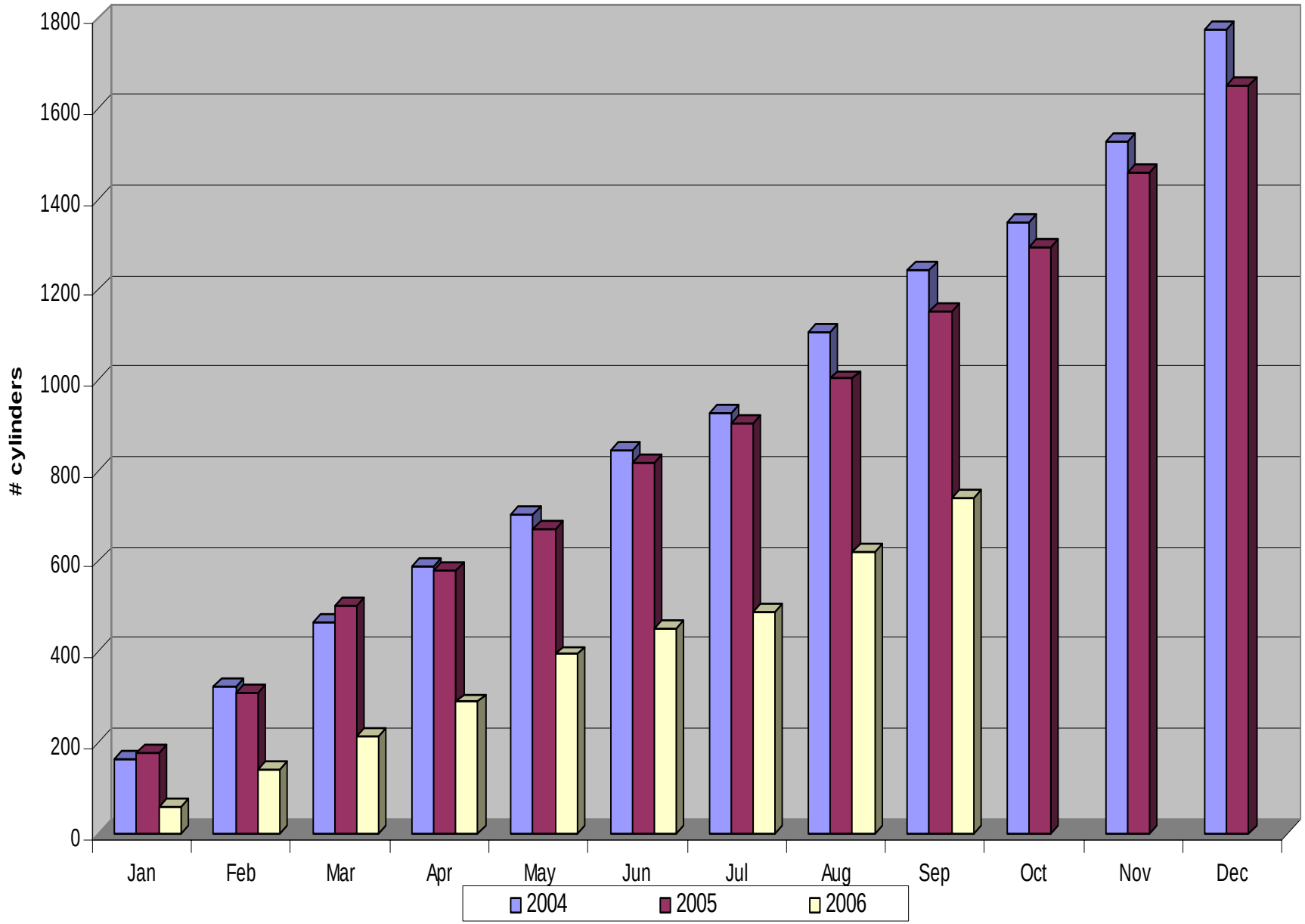
- Starting in 1999, in accordance with a voluntary EPA MOU, Con Edison agreed to reduce SF_6 emissions annually by 5% from a 1996 baseline. Con Edison has exceeded it's 2005 goal by 26%.
- In addition to very substantial reductions in SF6 emissions, this ongoing effort shows utilities to be good environmental citizens of the communities we serve.
- EPRI has been instrumental in working with utilities to identify SF_6 concerns and then working with manufacturers to address these concerns with an ultimate goal of product commercialization.

Reductions in SF_6 Emissions at Con Edison



CUMULATIVE SF_6 CYLINDER PURCHASES

2004 - 2006



Moving Forward

- EPRI's bi-annual SF_6 Gas Handling Workshop provides a valuable forum to exchange ideas and experience and an ideal training opportunity for those new to SF_6.
- Work is continuing on:
  - improved multi-step sealing materials and techniques,
  - Improving the features, portability and performance of the new KEMA SF_6 Camera,
  - Research into alternative passive SF_6 cameras,
  - Other improvements in handling, monitoring and/or diagnostics based on utility needs.

Questions

Thank you for your attention.