



SF6 Research Update

Richard Lordan
Senior Technical Executive
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SF₆ Research and Applications

- Establishment of an SF₆/GIS laboratory on the EPRI Charlotte campus
- Tracking Practices – ***a Proposal!***
- Detection and sealing Practices
- Adsorbents to reduce SF₆ emissions
- SF₆ replacements
- SF₆ training



*Outdoor portion of the SF₆ laboratory in
Charlotte, NC*

Establishment SF₆/GIS Laboratory in Charlotte

Fully assembled (with air)

Planned research and testing in the laboratory

1. Leak detection and sealing techniques
2. SF₆ tracking and reporting
3. Testing of commercial SF₆ analysis devices
4. Member training: SF₆ handling, safety, leak detection, and SF₆ analysis



SF₆ Tracking

SF₆ Tracking and Reporting

Best Practices for Utilities to Comply with EPA SF₆ Tracking and Reporting Regulations

1024225 (12/31/12)

EPRI would like to gratefully acknowledge the contributions of the following utility personnel:

- Ken Boyd, Southern Company
- Mike McNulty, ITC Holding Corp
- Robert Preston Lloyd, Southern California Edison
- Vin Pezzullo, New York Power Authority
- Mark Slezak, Commonwealth Edison



Visual Field Guide of Common SF6 Leak Locations and Sealing Solutions

SF6 Questionnaire:

1. Where do the majority (say 80%) of your leaks come from (flanges, porcelain, metal interfaces, fittings. etc.)?
2. Which makes and models comprise most of your leaks?
3. What is your leak detection methodology?
4. What is your leak seal methodology (i.e., what works)?
5. What have you tried that does not work so well? _____
6. Can you provide any other ideas for the benefit of the industry? _____
7. Can you provide any supporting photographs with explanation?



Emissions Reporting & Recordkeeping



Improved Handling Practices



Training & Certification of Personnel



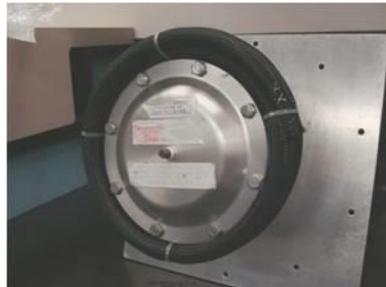
Improved Leak Detection & Repair

In computer-based Training

Adsorbents to Reduce SF₆ emissions

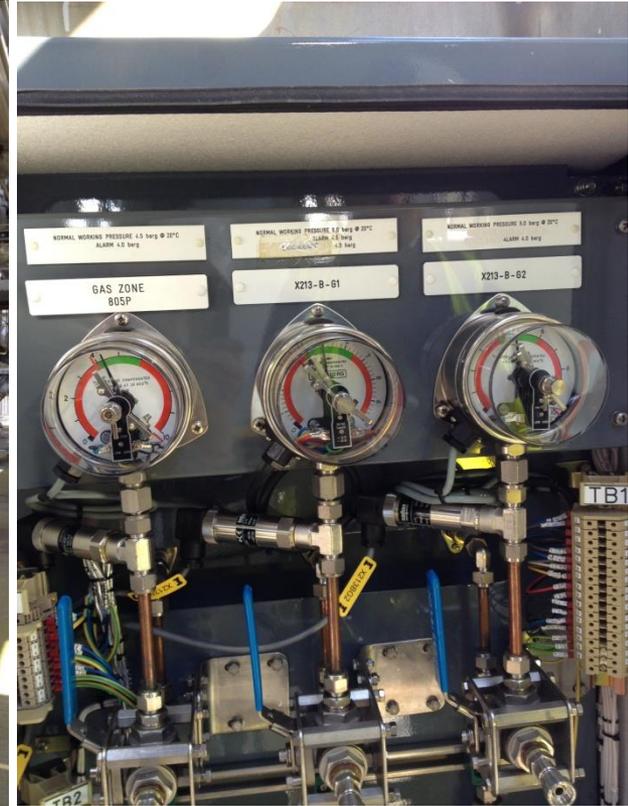
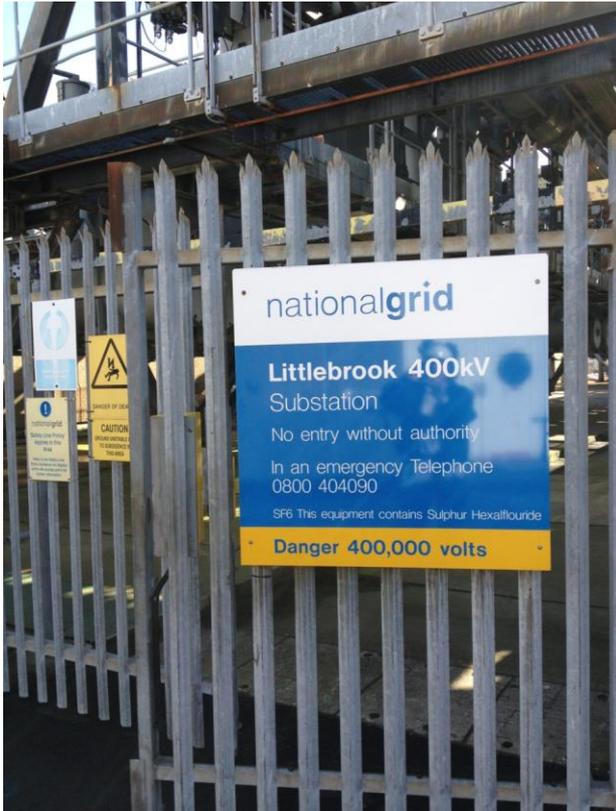
How to address rogue leakers in constrained substations?

- Activated carbon is an effective adsorbent of SF₆
- Sock containing adsorbent is effective
- Future research:
 - Packaging and handling, efficiency
 - Full scale testing and field trials



Installation of Sock Assembly (left) showing the adsorbent sock wrapped in plastic (right)

SF6 Capture Trial (October, 2012)



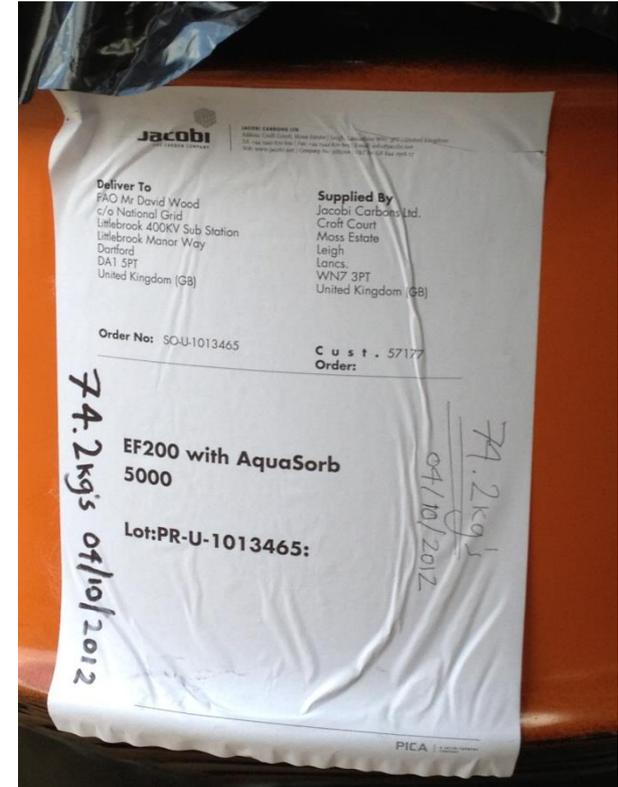
SF6 Capture Sock



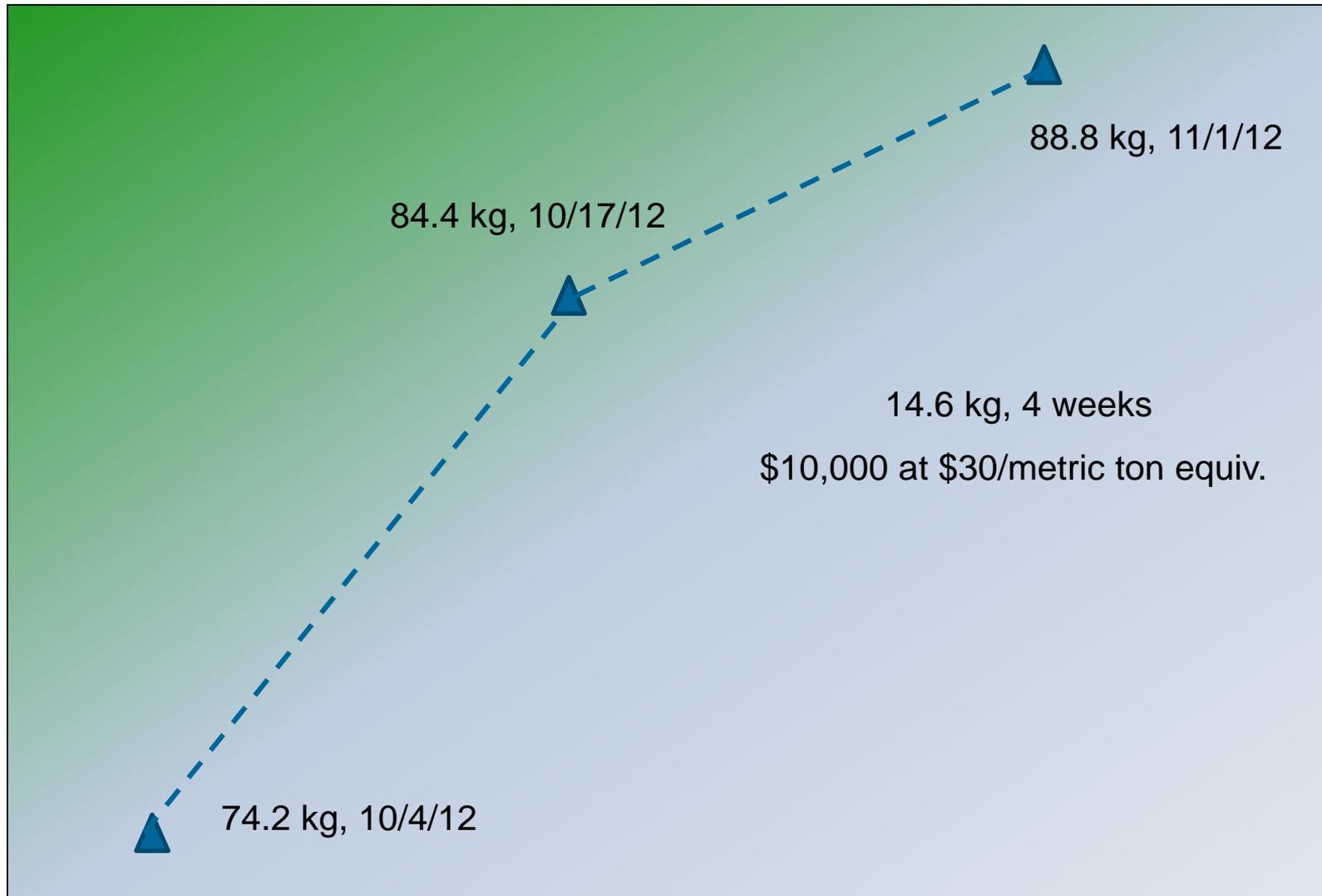
SF6 Capture Barrel and Piping



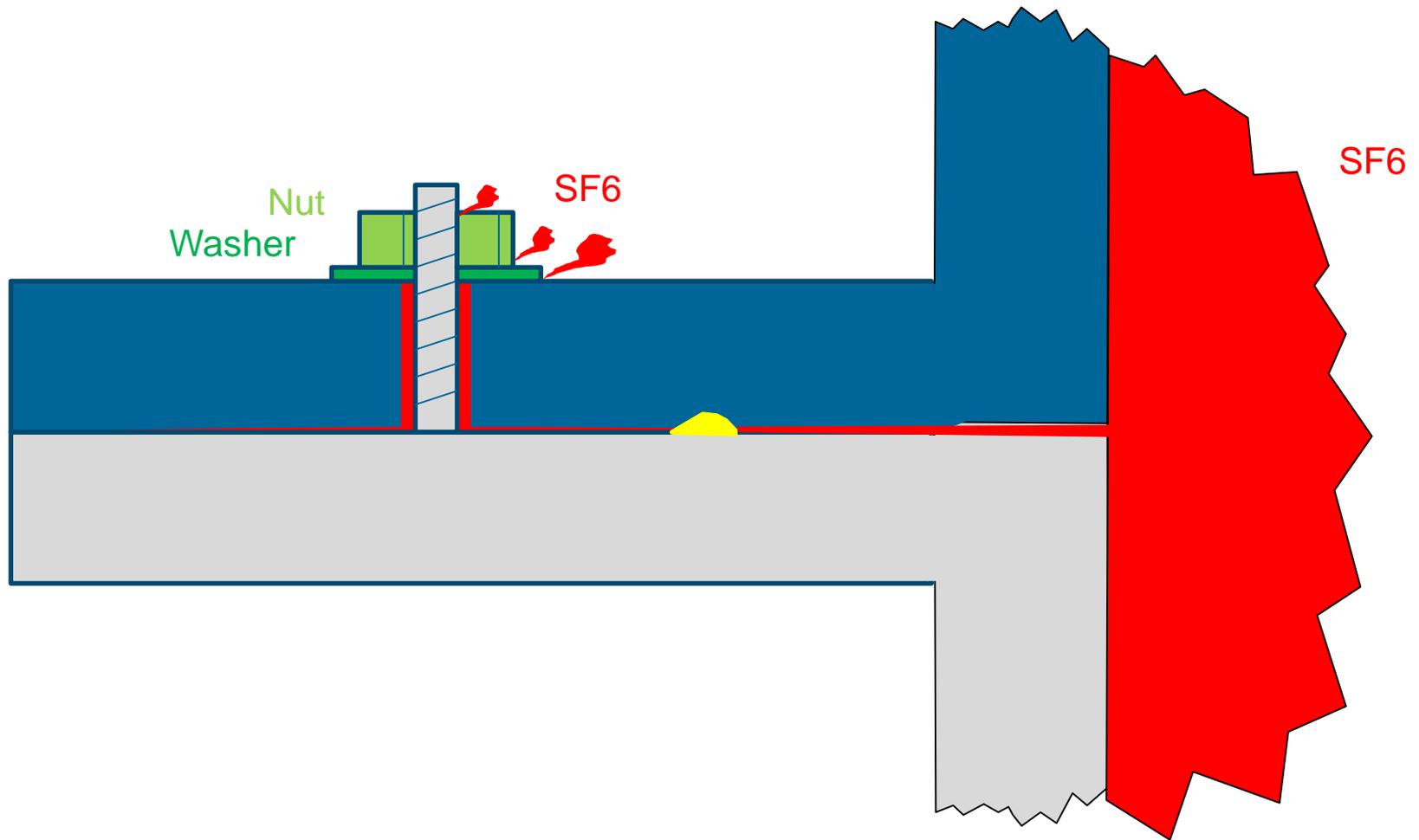
SF6 Capture Barrel and Piping



SF6 Capture Barrel and Piping

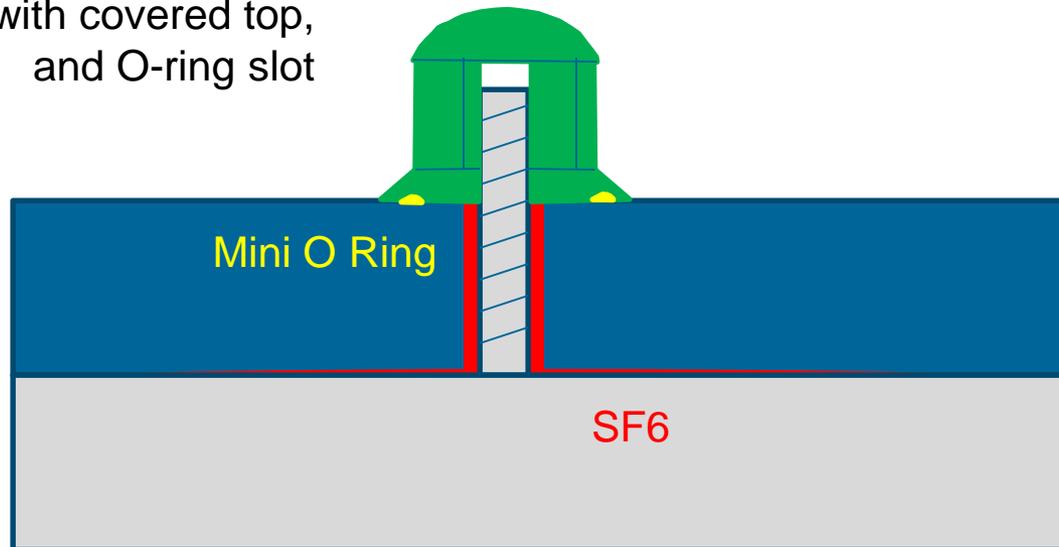


Problem Area for Leaking Nut Assembly



Nut Design Area for Leaking Nut Assembly

Nut with covered top,
and O-ring slot



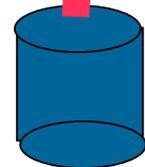
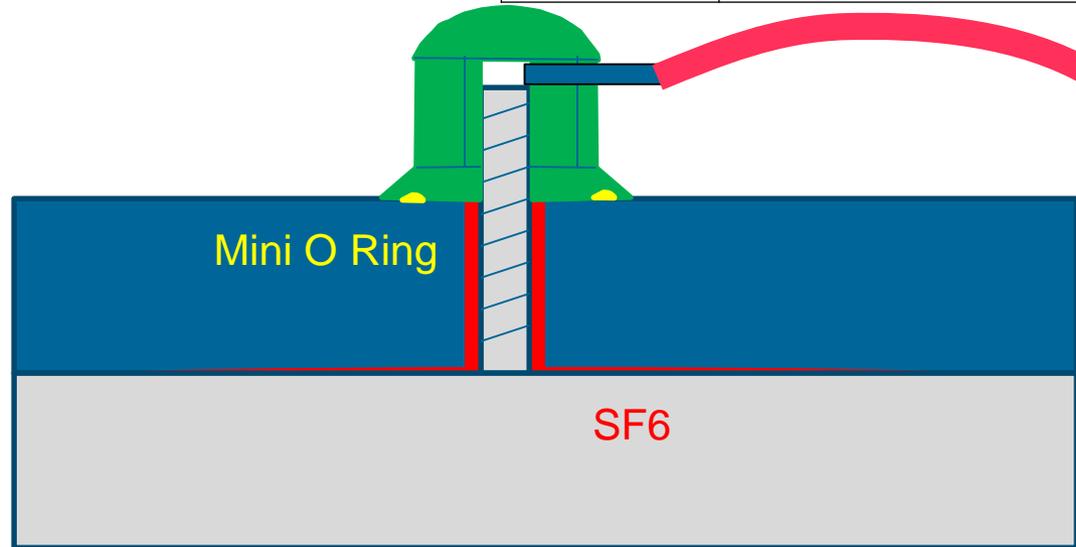
Nut Design Area for Leaking Nut Assembly... If you are chasing the Leak

Nut with covered top, and O-ring slot

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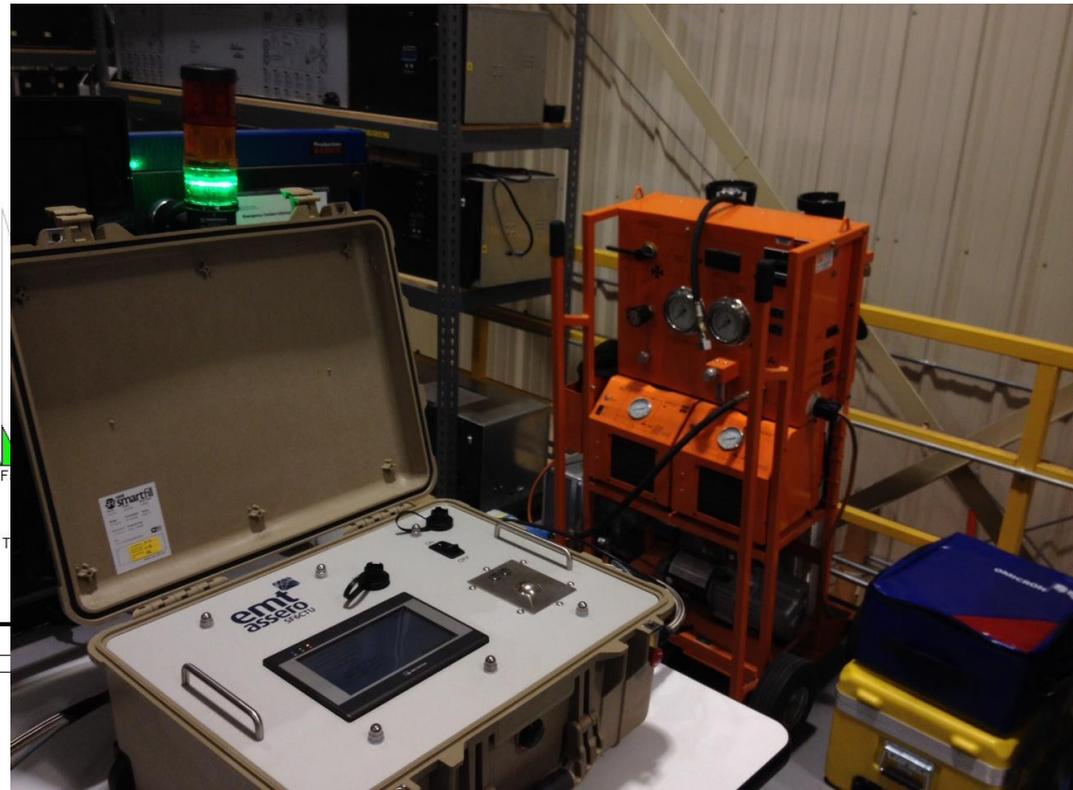
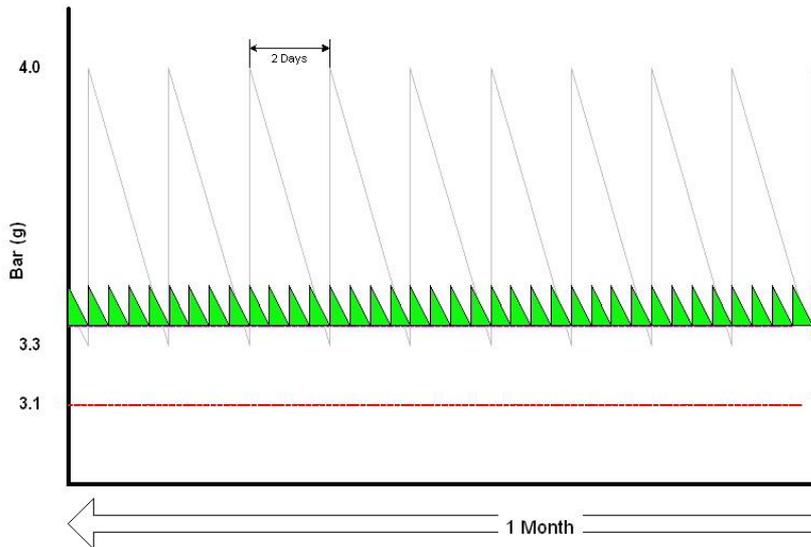
Novel SF6 capture technologies for emission reduction

- Looking to test and improve process ... in the US!



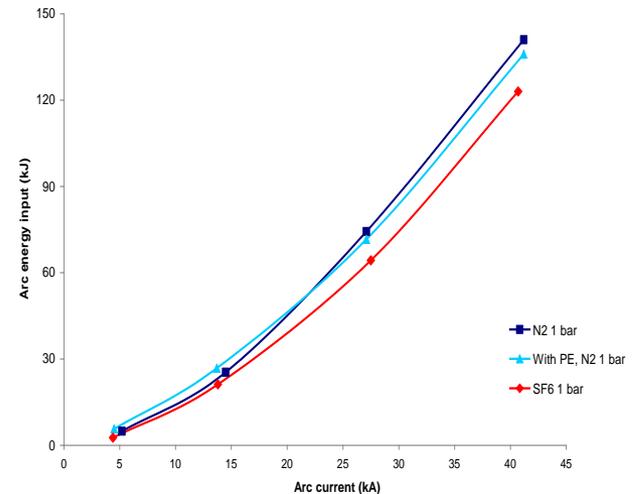
Continuous Top Up

- You set start and stop pressure (at lower end of range)
- Communicates with the operator
- Saves trips to site, safe
- Looking to test in the field



SF₆ Replacements

- Polymer ablation technology could lead to an SF₆-free circuit breaker
- Support of development at University of Liverpool
- Future research:
 - Low current interruption
 - Toxicity
 - Number of interruptions before powder replacement
 - Manufacturer engagement



Total arc energy input versus peak arc current in different arc environments

Together...Shaping the Future of Electricity