Cutting Through the Complexity of Crude Oil with an X-Ray Light Saber

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Innovation for today's energy needs

Overview

- Who are we?
- What are we doing and why is it important to you?
- Where are we in development?
- What are we doing at BNL?
- Why is it important?
- How do we think NSLS2 can better serve other people like us?

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Company Overview

- Located near Albany, NY
- Team of 20 professionals
  - 18 engineers & chemists; 2 admin
- Founded in 2003 focused on nano-materials
- Discovered chemical upgrading technology for treating heavy sour oil
  - New Catalyst Compositions for Selective S/N Oxidation in 2007
  - Selective Heteroatom Cleavage Chemistry shortly thereafter
- Focused on Process Development exclusively in 2010

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Development Status

- Catalyst & Process
  - Strong IP position > 13 patents filed across 64 countries
  - Life - projected > 6 years (industry average <1-2 yrs.)
  - Poisons: heat > 100C; no coking due to low temperature, traditional poisons (S, N & metals) are oxidized
  - Manufacturing – commodity inputs; completed toll run @ 500#
  - Numerous optimization opportunities identified with partners
- Engineering & Scale Up
  - Design basis for BEP complete 6/2014, 40 bpd skid P&ID thereafter
  - Houston-based engineering firm contracted for design
  - Traditional "pots & pans" utilized which keeps costs low
  - <u>Strategic partner committed to installing skid & 1st commercial unit</u>
  - Sufficient room in economics to accommodate any scaling issues

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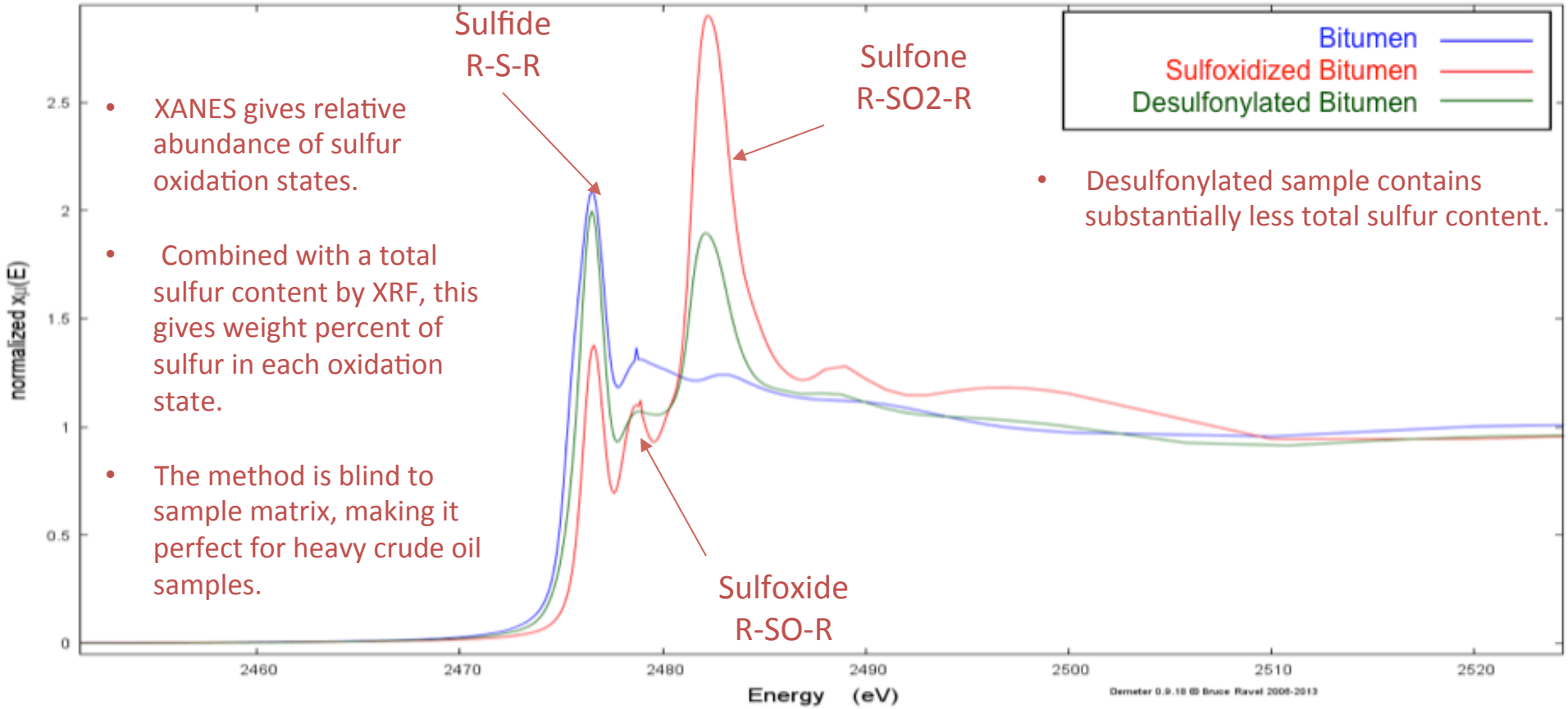
Mild FlexDS® Treatment of Athabasca Bitumen

- XANES gives relative abundance of sulfur oxidation states.
- Combined with a total sulfur content by XRF, this gives weight percent of sulfur in each oxidation state.
- The method is blind to sample matrix, making it perfect for heavy crude oil samples.



- Desulfonylated sample contains substantially less total sulfur content.

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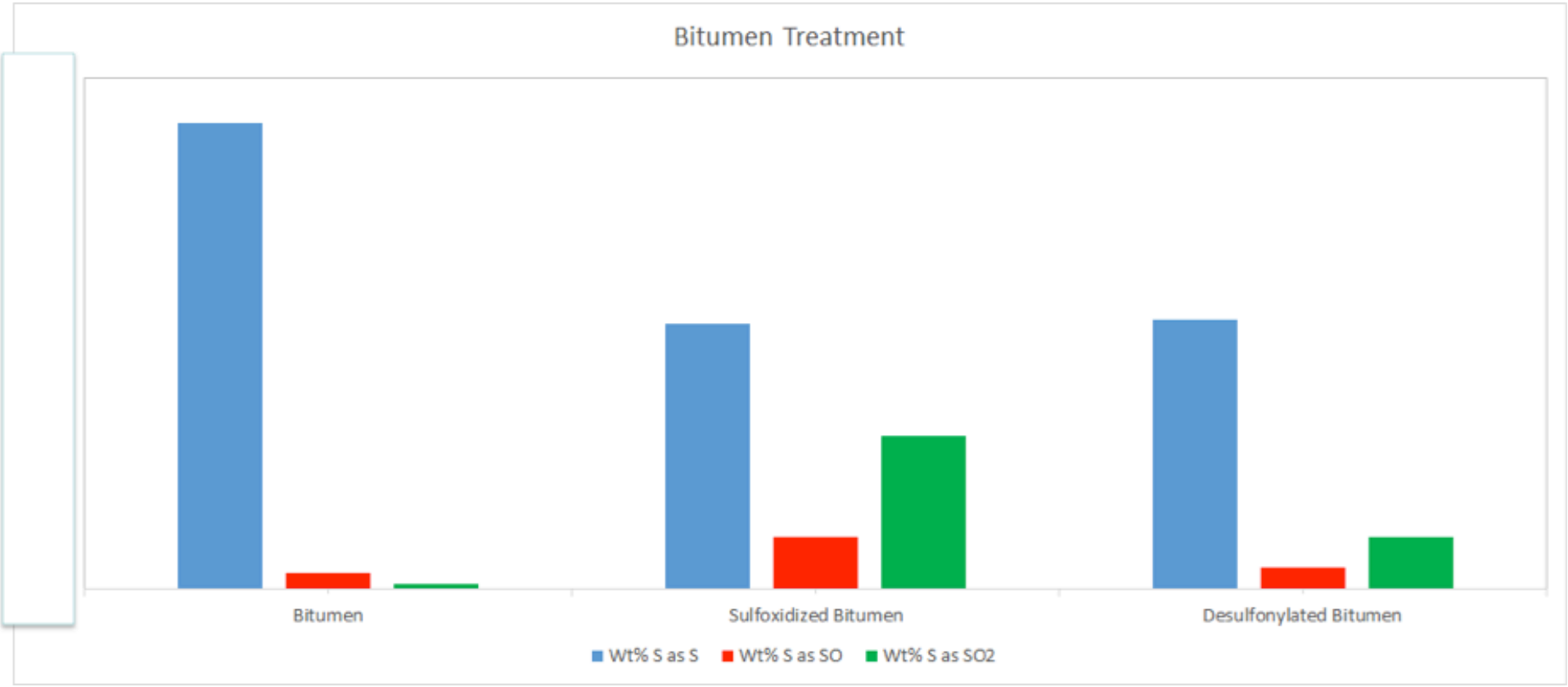
Relative Abundance of Species of Mild FlexDS® Treated Bitumen



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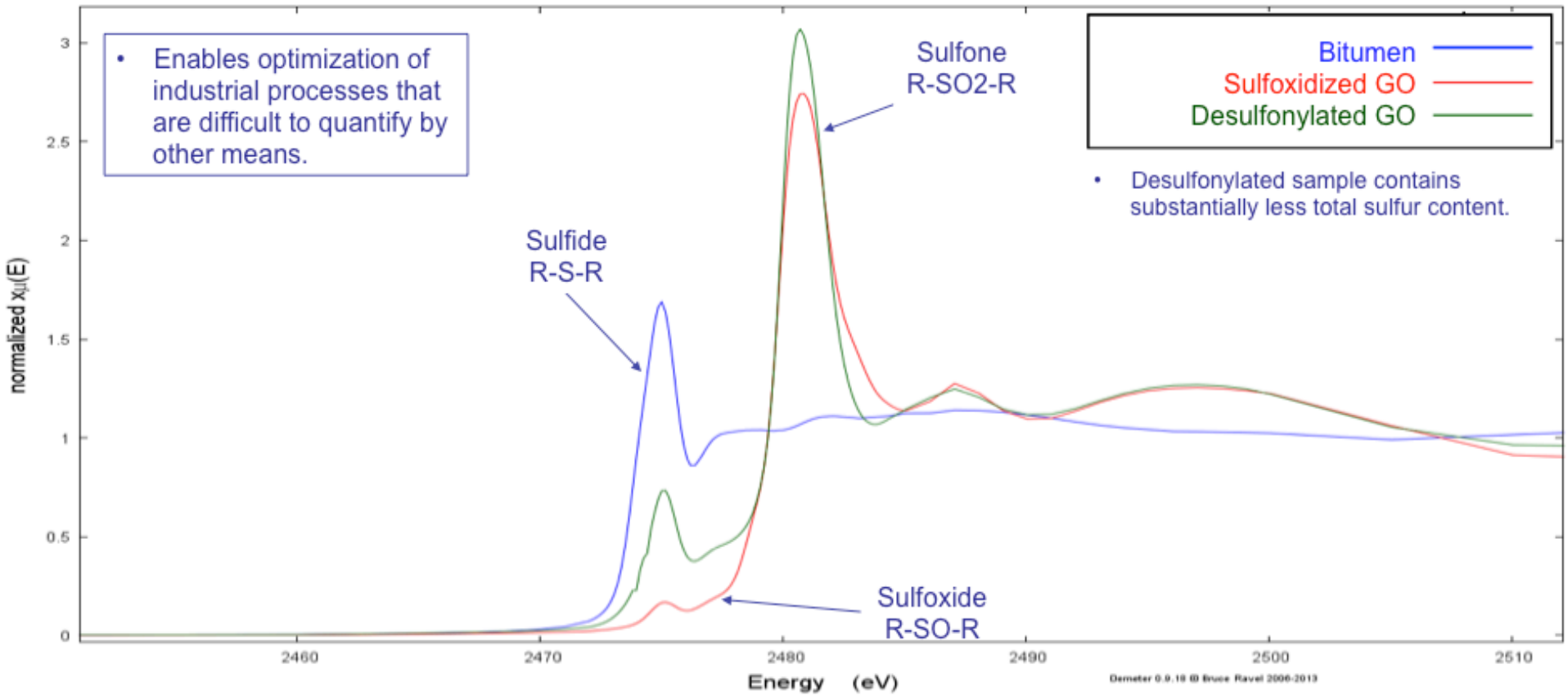
FlexDS® Treatment of Vacuum Gas Oil



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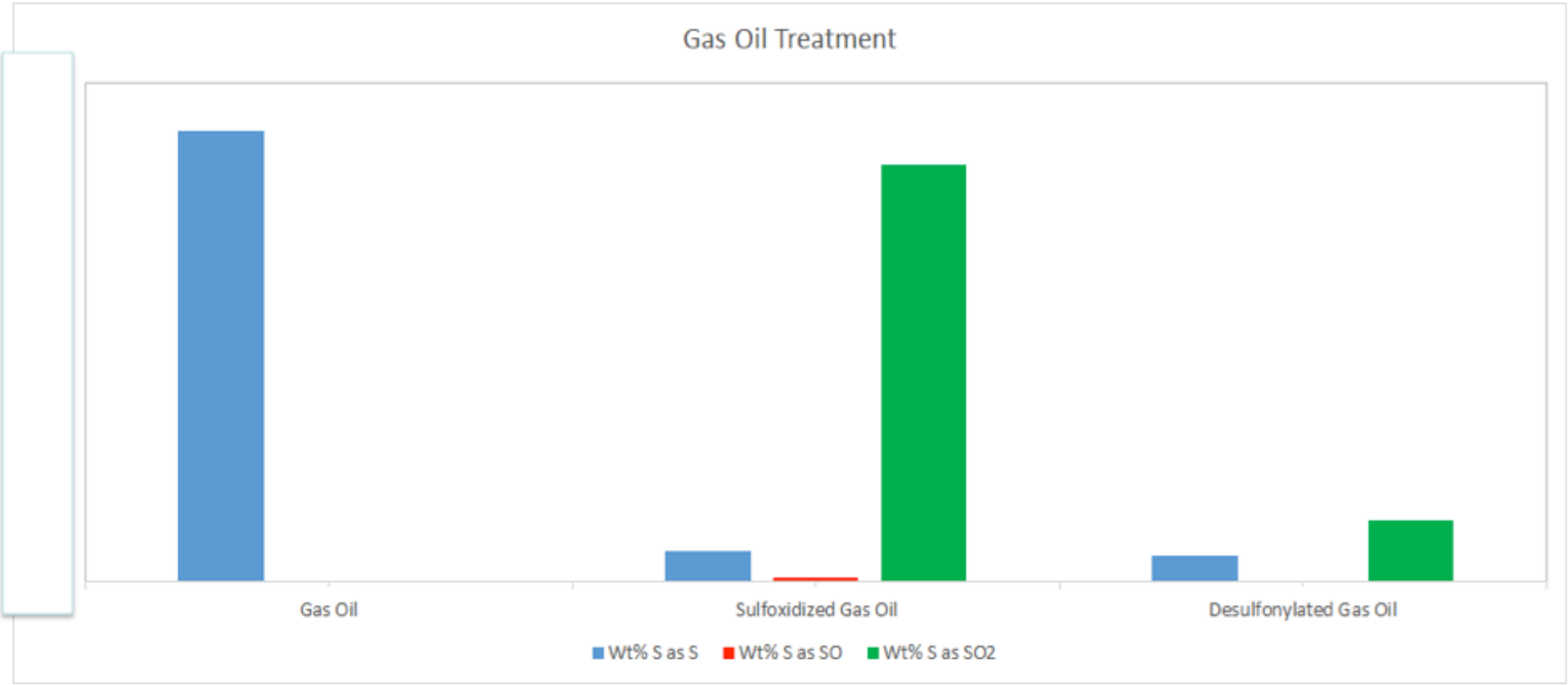
Relative Abundance of Species of FlexDS® Treated Vacuum GO



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Why is our work important?

- Our work will reduce the amount of diluent needed to transport crude from Canada.
- Heavy sour crude will require less hydrogen to process in refineries.
- FlexDS® treated crude can be processed in many more refineries.
- Chemical upgrading is more energy efficient than hydrocracking or carbon rejection upgrading methods

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How can NSLS2 Better Serve Companies Like Auterra?

- We'd like to see NSLS2 incorporate a Beam Line Scheduled User Time Exchange System whereby users can exchange allocated time more flexibly.
- We'd like to see added flexibility to allocate time on another beam line, if access and training time is available.
- We'd like to be able to bank unused – allocated time without being charged if we finish earlier than expected.

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FlexDS: Discussion and Questions

Thank you

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