

A List of Publications by Dr. Kevin Huang

(* indicates corresponding author)

I. Books and Book Chapter

1. P. Zhang and K. Huang, “**Electrochemical CO₂ Capture and Conversion**”, Chapter 5 in “**Materials and Processes for CO₂ Capture and Conversion**”, November, 2017, John Wiley & Sons, Inc., ISBN: 9781119231035
2. K. Huang and J. B. Goodenough, “**Solid Oxide Fuel Cell Technology: Principles, Performance and Operations**”, September 2009, Woodhead Publishing Ltd., Cambridge, UK
(<http://www.woodheadpublishing.com/en/book.aspx?bookID=1613>).
3. K. Huang, “**Solid Oxide Fuel Cells**”, Chapter 8 in **Materials for Fuel Cells**, August 2008, Woodhead Publishing Ltd., Cambridge, UK
(<http://www.woodheadpublishing.com/en/book.aspx?bookID=1361>)
4. K. Huang and Q. Liu “**Direct Oxygen Determination Techniques for Steelmaking Industries**”, December 1993, Metallurgical Press, Beijing

II. Patents

Issued:

1. J. B. Goodenough and K. Huang, **Solid Oxide Fuel Cell and Doped Perovskite Lanthanum Gallate Electrolyte Therefor**. US patent 6,004,688, December 21, 1999.
2. K. Huang, P. Turkal and H. D. Harter, **Stepped Gradient Fuel Electrode and Method for Making the Same**, US Patent 7,637,967 B2, December 29, 2009
3. K. Huang and R. Ruka, **Tubular Solid Oxide Fuel Cells with Porous Metal Support and Ceramic Interconnect**, US patent 8,173,322 B2, May 8, 2012
4. C. Lu, K. Huang, J. L. Shull and S. W. Liu, **Self-Sealed Metal Electrode Rechargeable Oxide-ion Battery Cells**, US Patent 8,338,025 B2, December 25, 2012
5. K. Huang, **Membranes and Reactors for CO₂ Separation**, US Patent 8,506,677, August 13, 2013
6. K. Huang, **Composite Mixed Carbonate Ion and Electron Conducting Membranes and Reactant Gas Assisted Chemical Reactors for CO₂ Separation and Capture**, US Patent 8,845,784 B1, September 30, 2014
7. K. Huang, C. Lu, W. Liu, J. Shull, G. Zhang and K. Litzinger, **All Solid State Rechargeable Oxide-Ion Battery (ROB) System**, US Patent 8,911,895 B1, December 16, 2014
8. X. Li and K. Huang, **Method of Making Redox Materials for Solid Oxide Redox Flow Battery**, US Patent 9,130, 219 B1, September 8, 2015

9. X. Li and K. Huang, **Mixed Proton and Carbonate Ion Conductor**, US Patent 9,225,030 B1, December 29, 2015
10. K. Huang and X. Li, **Solid Oxide Redox Battery**, US Patent 9,236,627 B1, January 12, 2016.
11. K. Huang, **Combined CO₂ Capture and Conversion Method and System**, US 2015/0047989 A1, February 19, 2015.
12. K. Huang and L. Zhang, **Synthesis of Homogeneously Porous Solid Matrix with Tunable Porosity and Pore Size**, USPTO provisional patent filed on August 2, 2012, serial number 61/742,083, granted, to be issued.

Pending:

13. K. Huang, S. Vora, M. Tartibi, N. Vortmeyer, K. Litzinger, C. Lu and M. Suess, **Electrical Storage Device Including Oxide-Ion Battery Cell Bank and Module Configurations**, US2011/0033769 A1, January 28, 2010
14. C. Lu, K. Huang and R. Ruka, **Porous Carbon Oxide Nanocomposite Electrodes For High Energy Density Supercapacitors**, USPTO Application, Number 12/695,405, January 28, 2010
15. K. Huang and J. Dworek, **A Welded, Flexible and Low-Cost Nickel Foam Based Cell-to-Cell Connector for SOFC Bundles**, Siemens Docket No. 2009E10579US
16. K. Huang and J. Shull, **Delta-Type Solid Oxide Fuel Cells with a Asymmetric Wall Thickness**, Siemens Docket No. 2008E20761US
17. C. Lu, K. Huang, W. Liu, J. Shull, D. Harter and S. Vora, **Fabrication of Metal-Containing Electrodes for Rechargeable Oxide-Ion Batteries Using Thermal Spraying Techniques**, Siemens Docket No. 2009E19773US, March 5, 2010
18. K. Huang, C. Lu, W. Liu, J. Shull and S. Vora, **Molten Salt-Containing Metal Electrode For Rechargeable Oxide-Ion Battery Cells Operating Below 800°C**, USPTO application Publication: US 2011/0256448 A, October 20, 2011
19. K. Huang, **Direct Carbon Fuel Cells With Mixed Oxide Ion And Carbonate Ion Electrolytes**, USCRF, PPA857, filed on July 13, 2010
20. K. Huang and L. Zhang, **Method of Making Homogeneously Porous Solid Matrix with Tunable Porosity and Pore Size**, USPTO provisional patent filed on August 2, 2012, serial number 61/742,083
21. C. Li, K. Huang and K. Reifsnider, **Advanced Thermal Energy Storage Enabled by Ceramic Encapsulated Alloy-based PCMs**, USCRF#966, not filed
22. K. Huang and X. Liang, **Stable and Active Intermediate-Temperature Solid Oxide Fuel Cell Cathodes Achieved by Atomic Layer Deposition**, USCRF#993, USPO provisional application, serial number 61/907,576, filed on November 26, 2012, not filed
23. K. Huang, **Metal-on-Carbon-Foam for Lightning Strike Protection of Aircrafts and Wind Turbines**, USCRF#1022, USPTO provisional application, serial number 61/956,552, filed on June 11, 2013.

24. K. Huang, J. Roeder and A. Zeberoff, **Dual Conductor Surface Modified SOFC Cathode Particles and Methods of Making Same**, US Patent, serial number 62/265,076, filed on December 9, 2015.
25. K. Huang, **Solid State Electrolyte and Electrochemical Cell Including the Electrolyte**, US Patent, serial number 62/420,666, filed on November 11, 2016.
26. P. Zhang, K. Huang, “**A Self-Forming Membrane for High Flux and Selective Electrochemistry-Based CO₂ Capture**”, US Patent, serial number 15/975,807, filed on May 9, 2018.

III. Peer Reviewed Journal Papers

1. Peng Zhang, Jingjing Tong, Kevin Huang, "A Self-Formed, Low-Cost, Mixed Conducting Triple-Phase Membrane for Efficient CO₂/O₂ Capture from Flue Gas and In Situ Dry Oxy Methane Reforming", **ACS Sustainable Chemistry & Engineering**, in revision.
2. Victoria F. Mattick, Xinfang Jin, Tianrang Yang, Ralph E. White and Kevin Huang*, “Unraveling Oxygen Electrocatalysis Mechanisms on a Thin Film Oxygen Deficient Perovskite La_{0.6}Sr_{0.4}CoO_{3-δ}”, **ACS Applied Energy Materials**, <http://dx.doi.org/10.1021/acsaem.8b00669>.
3. Xinfang Jin, Anthony Ku, Atul Verma, Brandon Ohara, Kevin Huang*, Surinder Singh, “The Performance of Syngas-Fueled SOFCs Predicted by a Reduced Order Model (ROM): Temperature and Fuel Composition Effects”, **Journal of the Electrochemical Society**, 2018, **165**, (10), F786-F798.
4. Nansheng Xu, Jie Wang, Youngseok Jee and Kevin Huang*, “Determining Na⁺ Transport Number in Na₂Si₂O₅ Glass with Na Concentration Cell”, **Solid State Ionics**, accepted, 10.1016/j.ssi.2018.06.012.
5. Xiwen Wang, Chenghao Yang*, Xunhui Xiong, Jeng-Han Wang, Mingzhi Huang*, Meilin Liu, Kevin Huang*, “A Robust Sulfur Host with Dual Lithium Polysulfide Immobilization Mechanism for Long Cycle Life and High Capacity Li-S Batteries”, **Energy Storage Materials**, 10.1016/j.ensm.2018.06.015.
6. Hewen Wang, Musheng Wu, Xueling Lei, Zhengfang Tian, Bo Xu, Kevin Huang*, Chuying Ouyang*, “Siligraphene as a Promising Anode Material for Lithium-ion Batteries Predicted from First-Principles Calculations”, **Nano Energy**, 2018, **49**, 67-76.
7. Caterina Sarnoa, Tianrang Yang, Elisabetta Di Bartolomeo, Ashfia Huq, Kevin Huang, Steven McIntosh, “Oxygen vacancy localization and anisotropic oxygen anion transport in Sr_{1-x}Y_xCoO_{3-δ} (x = 0.1, 0.2) under solid oxide fuel cell cathode conditions”, **Solid State Ionics**, 2018, **321**, 34–42.
8. Tzia Ming Onn, Rainer Küngas, Paolo Fornasiero, Kevin Huang and Raymond J. Gorte, “Atomic Layer Deposition on Porous Materials: Problems with Conventional Approaches to Catalyst and Fuel Cell Electrode Preparation”, **Inorganics**, 2018, **6**, 34. DOI:10.3390/inorganics6010034

9. X. Jin, T. Yang and K. Huang*, “Defect Structure, Thermodynamic and Transport Properties of $\text{SrCo}_{0.9}\text{Nb}_{0.1}\text{O}_{2.5+\delta}$: A Combined Experimental and Defect Chemistry Approach”, **Solid State Ionics**, 2018, **320**, 159-171.
10. Peng Zhang, Jingjing Tong and Kevin Huang*, “A Study of Low-Cost NiO-MC Dual-Phase Membrane for High-Flux and Selective Electrochemistry-Based CO_2 Capture”, **ECS Trans.**, 2017, **80**(10): 861-870; doi:10.1149/08010.0861ecst.
11. T. Yang, V. Mattick, Y. Chen, K. An, D. Ma, K. Huang*, “Crystal Structure and Transport Properties of Oxygen-Deficient Perovskite $\text{Sr}_{0.9}\text{Y}_{0.1}\text{CoO}_{3-\delta}$ ”, **ACS Applied Energy Materials**, 2018, **1**, 822–832, DOI: 10.1021/acsaem.7b00275.
12. Chenghao Yang,* Jiawen Xiong, Xing Ou, Chun-Fu Wu, Xunhui Xiong, Jeng-Han Wang, Kevin Huang,* Meilin Liu, “A renewable natural cotton derived and nitrogen/sulfur co-doped carbon as a high-performance anode for sodium ion batteries”, **Materials Today – Energy**, 2018, **8**, 37–44.
13. Xueling Lei, Chuying Ouyang, Kevin Huang, “Bulk properties and transport mechanisms for solid state antiperovskite Li-ion conductor Li_3OCl : Insights from first principles calculations”, submitted to **Journal of Materials Chemistry A**, 2018, **6**, 1150-1160.
14. Jie Fang, Xinfang Jin, Nansheng Xu and Kevin Huang*, “Life cycle analysis of a combined CO_2 capture and conversion membrane reactor”, **Journal of Membrane Science**, 2017, **549**, 142-150. DOI: 10.1016/j.memsci.2017.12.006.
15. Lee, Dongkyu; Jacobs, Ryan; Jee, Youngseok; Seo, Ambrose; Sohn, Changhee; Ievlev, Anton; Ovchinnikova, Olga; Huang, Kevin; Morgan, Dane; Lee, Ho Nyung, “Stretching Epitaxial $\text{La}_{0.6}\text{Sr}_{0.4}\text{CoO}_{3-\delta}$ for Fast Oxygen Reduction”, **Journal of Physical Chemistry C**, 2017, **121**, 46, 25651-25658. DOI: 10.1021/acs.jpcc.7b06374.
16. Lei, Xueling, Xu, Bo, Ouyang, Chuying, and Huang, Kevin, “Structural and Electronic Features of Nb-Doped SrCoO_3 : Insight from First-Principles Calculations”, **Journal of Physical Chemistry C**, 2017, **121**, 45, 24987-24993. DOI: 10.1021/acs.jpcc.7b08852.
17. Tianrang Yang, Jie Wang, Yan Chen, Ke An, Dong Ma, Thomas Vogt, Kevin Huang*, “A Combined Variable Temperature Neutron Diffraction and Thermogravimetric Analysis Study on a Promising Oxygen Electrode $\text{SrCo}_{0.9}\text{Nb}_{0.1}\text{O}_{3-\delta}$ for Reversible Solid Oxide Fuel Cells”, **ACS Applied Materials & Interfaces**, 2017, **9**, 34855–34864, DOI:10.1021/acsaami.7b08697.
18. Cuijuan Zhang and Kevin Huang*, “MOF-derived iron as an active energy storage material for intermediate-temperature solid oxide iron-air redox battery”, **Chemical Communications**, 2017, **53**, 10564 – 10567. DOI: 10.1039/C7CC06131E
19. Kevin Huang, “An active and robust bifunctional oxygen electrocatalyst through carbon-free hierarchical functionalization”, **Angewandte Chemie**, 2017, **56**, 12826-12827. DOI:10.1002/anie.201707322 and 10.1002/ange.201707322.
20. Xunhui Xiong, Chenghao Yang*, Guanhua Wang, Yuwei Lin, Xing Ou, Jeng-Han Wang, Bote Zhao, Meilin Liu, Zhang Lin and Kevin Huang*, “SnS Nanoparticles

Electrostatically Anchored on Three-dimensional N-doped Graphene as an Active and Durable Anode for Sodium Ion Batteries”, **Energy & Environmental Science**, 2017, **10**, 1757. DOI: 10.1039/C7EE01628J.

21. Xinfang Jin, Jie Wang and Kevin Huang*, “Defect Chemistry and Transport Properties of $\text{SrCo}_{1-x}\text{Ta}_x\text{O}_{2.5+\delta}$ as a Promising Oxygen Electrocatalyst for Reversible Solid Oxide Fuel Cells”, **Solid State Ionics**, 2017, **309**, 48-57. DOI: 10.1016/j.ssi.2017.07.001.
22. Peng Zhang, Jingjing Tong and Kevin Huang*, “A self-forming dual-phase membrane for high-temperature electrochemical CO_2 capture”, **Journal of Materials Chemistry A**, 2017, **5**, 12769 – 2773, DOI: 10.1039/C7TA04096B
23. Peng Zhang, Jingjing Tong and Kevin Huang*, “Dry-oxy Methane Reforming with Mixed e^-/CO_3^{2-} Conducting Membranes”, **ACS Sustainable Chemistry & Engineering**, 2017, **5**, 6, 5432-5439. DOI: 10.1021/acssuschemeng.7b00773.
24. Xinfang Jin, Meng Guo, Ralph E. White, and Kevin Huang*, "Computational Analysis of Dynamic Tubular SOFC with a Built-in Chemical Iron Bed", **ECS Trans.** 2017 **78**(1): 2683-2698; doi:10.1149/07801.2683ecst.
25. Cuijuan Zhang and Kevin Huang*, "A Dual Functional Solid Oxide Fuel Cell for Power Generation and Energy Storage", **ECS Trans.** 2017 **78**(1): 287-297; doi:10.1149/07801.0287ecst.
26. Jeffrey F Roeder, Maryam Golalikhani, Anthony F Zeberoff, Peter C Van Buskirk, Alireza Torabi, Joseph Barton, Carl Willman, Hossein Ghezeli-Ayagh, Yeting Wen, and Kevin Huang, "Group IVA Oxide Surface Modification of LSCF Cathode Powders by Atomic Layer Deposition", **ECS Trans.** 2017 **78**(1): 935-942; doi:10.1149/07801.0935ecst
27. Jie Wang, Tianrang Yang, Libin Lei, Kevin Huang*, “Ta-Doped $\text{SrCoO}_{3.8}$ as a Promising Bifunctional Oxygen Electrode for Reversible Solid Oxide Fuel Cells: A Focused Study on Stability”, **Journal of Materials Chemistry A**, 2017, **5**, 8989-9002. DOI: 10.1039/C7TA02003A.
28. N. Xu*, X. Sun, F. Zhao, X. Zhang, K. Wang, K. Huang and Y. Ma, “The Role of Pre-Lithiation in Activated Carbon/ $\text{Li}_4\text{Ti}_5\text{O}_{12}$ Asymmetric Capacitors”, **Electrochimica Acta**, 2017, **236**, 443-450.
29. Yaoyu Ren, Yuan Cheng, Raymond J. Gorte, Kevin Huang*, “Toward Stabilizing Co_3O_4 Nanoparticles as an Oxygen Reduction Reaction Catalyst for Intermediate-temperature SOFCs”, **Journal of The Electrochemical Society**, 2017, **164**(10), F3001-F3007. 10.1149/2.0011710jes.
30. Xinfang Jin, Meng Guo, Ralph E. White, and Kevin Huang*, “Understanding Power Enhancement of SOFC by Built-in Chemical Iron Bed: A Computational Approach”, **Journal of The Electrochemical Society**, 2017, **164** (11) E3054-E3062. DOI: 10.1149/2.0071711jes.
31. Xing Ou, Chenghao Yang,* Xunhui Xiong, Fenghua Zheng, Qichang Pan, Chao Jin, Meilin Liu and Kevin Huang*, “A new rGO-overcoated Sb_2Se_3 nanorods anode for Na^+ battery: *In situ* x-ray diffraction study on a live sodiation/desodiation process”,

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33. C. Zhang and K. Huang*, “A new composite cathode for intermediate-temperature solid oxide fuel cells with zirconia electrolytes”, **Journal of Power Sources**, Vol. 342 (2017) 419-426.
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38. J. Fang, N. Xu, T. Yang, P. Zhang, J. Tong and K. Huang*, “CO₂ Capture Performance of Silver-Carbonate Membrane with Electrochemically Dealloyed Porous Silver Matrix”, **Journal of Membrane Science**, Vol.523 439-445 (2016).
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45. Gil Cohn, Jie Wang, Christopher Pellegrinelli, Kevin Huang, and Eric D. Wachsman, “Electrochemical and Catalytic Properties of Fe-Doped $\text{SrCo}_{0.9-x}\text{Nb}_{0.1}\text{Fe}_x\text{O}_{3-\delta}$ Cathode Materials”, **Journal of The Electrochemical Society**, Vol. 163 (9) (2016) F979-F987
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51. X. Jin, J. Wang, L. Jiang, R. White and K. Huang*, “A Finite Length Cylinder Model for Mixed Oxide-ion and Electron Conducting Cathodes Suited for Intermediate-temperature Solid Oxide Fuel Cells”, **Journal of the Electrochemical Society**, Vol.163 (6) (2016) F548-F563
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Invited Presentations at Professional Meetings

1. Annual ARPA-e Energy Summit, Washington DC, March, 2015-2017
2. 2017 Spring MRS meeting, Phoenix, April 16-21, 2017
3. Annual DOE AMR, Washington DC, June, 2015-2017
4. Annual DOE NETL SOFC meetings, Pittsburgh, July, 2015-2017
5. SOFC-14, July 23-26, Glasgow, Scotland, UK
6. SOFC-15, July 23-28, Hollywood, FL
1. Keynote speaker at 4th International Symposium on Energy Challenges & Mechanics – Working on Small Scales (ISECM), "A New Bifunctional Solid Oxide Fuel Cell for Power Generation and Energy Storage", Aberdeen, Scotland, UK, August 11, 2015
2. Invited speaker at MS&T2015, "Mixed conductors for efficient and selective carbon capture", Columbus, OH, October 4-8, 2015
3. Invited speaker at 11th PacRim Conference of Ceramic Societies, "A Fuel Cell/Battery Hybrid for Power Generation and Energy Storage", Jeju, Korea, August 30 - September 4, 2015
4. Invited speaker at TMS 2015 annual meeting, "Advanced Energy Storage through SOFC", March 17, 2015, Orlando, USA
5. Invited speaker at MRS 2014, "A Novel Solid Oxide Metal-air Redox Battery", November 4, 2014, Boston, USA
6. Invited speaker, "A Novel Combined CO₂ Capture and Conversion Reactor", MS&T2014, October 12-16, 2014, Pittsburgh, USA
7. Invited speaker, "Enhancing the performance of solid oxide metal-air redox battery with nanostructured multivalent chemical bed", February 16-20, 2014, San Diego, USA

8. Invited speaker, “Advanced energy storage with reversible solid oxide fuel cell and metal/metal-oxide chemical bed”, ICH2P-2014, February 2-5, 2014, Fukuoka, Japan
9. Invited speaker, “Solid Oxide metal-air Redox Battery – a New Chemistry for Advanced Energy Storage”, THERMEC2013, December 2-6, 2013, Las Vegas
10. Invited speaker, “ Solid Oxide Metal-air Redox Battery - a New Mechanism for Advanced Energy Storage”, PacRim 10 Conference, June 3-7, 2013, San Diego, CA, USA
11. Invited speaker, “Electrochemical CO₂ Capture and Instant Conversion into Fuels”, MS&T2013, October 27-31, 2013, Montreal, Canada
12. Invited speaker, “Review of Siemens Tubular Solid Oxide Fuel Cells Technology”, The sixteenth international conference of solid state ionics, Shanghai, 2007

Invited Seminar Speakers at Universities

1. Invited seminar speaker, “Solid oxide fuel cell and battery hybrid – a computational perspective, Huanzhong University of Science and Technology, June 11, 2015, Wuhan, China
2. Invited seminar speaker, “Sodium strontium silicate as an sodium-ion conductor”, Guilin Institute of Technology, June 8, 2015, Guilin, China
3. Invited seminar speaker, “Electrochemical energy conversion and storage”, Tsinghua University, May 29, 2015, Beijing, China
4. Invited seminar speaker, “ Electrochemical energy storage and conversion”, Florida State University, March 19, 2015, USA
5. Invited lecture speaker at ECS student chapter, “Electrochemical CO₂ Capture and Instant Conversion to Syngas”, October 23, 2013, University of South Carolina, Columbia, USA
6. Invited department seminar speaker, “A New Solid Oxide Metal-air redox Battery – beyond the Solid Oxide Fuel Cell”, October 3, 2013, University of South Carolina, Columbia, USA
7. Invited public seminar speaker, “Solid Oxide Fuel Cells for Advanced Energy Storage – a Story about Developing Solid Oxide Metal-air Redox Battery at University of South Carolina”, May 23, 2013, Hong Kong Polytechnic University, Hong Kong, China
8. Invited seminar speaker, “Solid Oxide “Metal-Air” Battery – A New Mechanism for Advanced Energy Storage”, December 20, 2012, Institute of Physics China, Beijing, China
9. Invited International Course Lecturer, “Energy Storage”, December 25-29, 2012, Huazhong University of Science and Technology, Wuhan, China
10. Invited seminar speaker, “Mixed Conducting Gas Separation Membranes for CO₂ Capture”, November 16, 2012, Department of Chemical and Biochemical Engineering, Missouri University of Science and Technology, Rolla, MO

11. Invited oversea seminar series, “Energy Materials”, May 15-19, 2012, China University of Mining and Technology Beijing, China and University of Science and Technology Beijing
12. Invited overseas seminar series, December 9-13, 2011, China University of Mining and Technology Beijing, China
13. “The challenge of energy storage” in ERFC program “Our Energy Future” for 6th and 8th grade teachers, March 2, 2011, Green Quard, USC
14. ME department seminar series, March 2010, “Materials for solid oxide fuel cells”
15. EFRC “Teach the Teachers” seminar, July 2010, “Energy materials for teachers”
16. SOFC Lab demonstration for the teachers, July 2010

Contributed Presentations

1. K. Huang, “ An Intermediate-temperature solid oxide iron-air redox battery operated on oxide-ion chemistry”, **MRS 2017 Spring Meeting**, Phoenix, April 17-21, 2017
2. X. Zhao, “All Solid State Tungsten-Air Battery: A New Metal-Air Chemistry”, **ECS224**, San Francisco, October 27-November 1, 2013
3. X. Zhao, “All Solid-State Iron-Air Redox Battery for Advanced Energy Storage”, **ECS224**, San Francisco, October 27-November 1, 2013
4. X. Zhao, X. Li, N. Xu, K. Huang, “A New Solid Oxide Metal-Air Rechargeable Battery for Grid Storage”, **ECS222**, Honolulu, October 7-12, 2012
5. X. Zhao, X. Li, N. Xu, K. Huang, “Solid Oxide Redox Flow Battery – A “Metal-Air” Storage Battery”, **ECS221**, Seattle, Mat 7-11, 2012
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Siemens Internal Memorandums

There are a total of 110 internal memos published by Siemens Energy from year 2000 to 2009. (can provide the list of these reports if needed)