

## S. Peter Baldwin

*base<sub>e</sub>*

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### 2024 ASME Dedicated Service Award for outstanding service to the gas turbine community

#### Professional Experience

##### Current

*base<sub>e</sub>*

**President**

*base<sub>e</sub>* is a Boston based independent consulting company focused on practical product positioning and commercialization strategies for Distributed Energy Technologies, Gas Turbines, and various Air & Gas Compression interests.

##### 2004 to 2014

**President, Ramgen Power Systems  
Bellevue, WA**

Ramgen Power Systems is a Seattle-based start-up company developing advanced shock compression technology, utilizing supersonic flight inlet design methods and practice. Shock compression can achieve very high compression ratios and efficiency, simultaneously and has the potential to substantially reduce compressor cost while improving efficiency in conventional applications, as well as extending the range of applications through superior performance capability.

- Member of the Ramgen Executive Team and Board of Directors
- Responsible for Strategic Planning, Product Positioning and Business Development activities for Ramgen Shock Compression Technologies
- Created Shock Compression positioning in general and Ramgen in particular as a high-efficiency, low-cost approach for the Carbon Capture & Sequestration (CCS) compression application
- Developed a variety of formal Business Plans for Ramgen's Compressor, Gas Turbine and Combustor activities
- Developed and provided all equipment selection, application, performance and pricing information to prospective OEMs and users, worldwide
- Developed all collateral sales and promotional materials
- Developed product line Cost Models to support profitability analyses
- Maintained active and ongoing relationships with CO2 capture system developers and electric utilities, as well as pipeline and underground technology elements within the industry, worldwide
- Maintained active and ongoing relationships within academia and government entities, worldwide
- Positioned Ramgen CO2 Compressor as an important contender in the CCS community

Dresser-Rand completed the purchase of Ramgen assets in June of 2014 and will pursue commercializing as part of the Siemens product portfolio.

Unfortunately, both the Renewable Portfolio Standard (RPS) and the current U.S. EPA regulations, replicated around the world, still allow, even encourage, natural gas fired power plants to be permitted without CCS, eliminating this large point source CCS potential.

2000-2004 &  
2014-Current

**base**  
President

Since inception *base* has completed approximately (60) different assignments with clients in the US, Europe, Japan, and the Middle East. It has also provided due diligence support for a variety of energy tech venture capital investment firms.

- Audited major international turbo-compressor company's current business practices and provided strategic/tactical direction to improve results.
- Developed Strategy and supporting Business Plan for a major international gas turbine manufacturer.
- Created and/or supported positioning strategies for various micro and mini-turbine developers.
- Identified and developed Strategic Partnership relationship for a new market entrant at 500kW and 1.6MW.
- Prepared a preliminary cost study for a novel 350kW gas turbine engine.
- Participated in a detailed risk assessment for a major U. S. gas turbine manufacturer.
- Developed product and commercialization strategies for various component manufacturers:
  - Compressor technologies
  - Recuperators
  - Web-based asset management and command & control software
  - Fuel gas boosters
  - High speed motor/generators
  - Power electronics
  - Investment castings
  - Wind turbines
- Performed investment due diligence work for venture capital firms J. P. Morgan Partners, Perseus, Thayer Capital and Metapoint Partners to evaluate opportunities:
  - Air & gas compressors
  - Micro and mini gas turbines
  - Natural gas fired reciprocating engine
  - Stirling engine
  - Steam turbine
  - Blowers/vacuum pumps
  - Hydrogen on-site generation
  - Zinc/Air fuel cell power system
- Consulting services for a small scale modular SOFC
- Advisor for an under-hood 5kW PTO generator
- Board Observer STM Power Stirling Engine developer
- Interim Program Manager for STM Power's Stirling engine development
- Developed both a detailed Corporate Business Plan and a Product Strategy for a novel Oil-free Turbo Compressor concept (Ramgen)
- Evaluated an Oil-Free Vane Compressor concept.
- Consultant to Cambridge Energy Research Associates Distributed Energy Practice (CERA)
- Contributing Editor Turbomachinery International with over 40 Op-Ed columns published
- Member ASME International Gas Turbine Institute, Electric Power Committee & Fuels Committee Chairman 2013-2023
- Featured speaker
  - Gas Technology Institute, EPRI DG, CERA Week, Gas Research Institute
  - DoE Energy Venture Fair, Harvard Cyberposium, Energy Frontiers International
  - Ohio Department of Economic Development, American Society of Materials
  - CERA Roundtables, Distributed Energy Advisory Service
  - ASME – International Gas Turbine Institute
- Ingersoll-Rand Corporate Witness & Subject Matter Expert
- Peer reviewer for DoE Advanced Microturbine and Recuperator Programs.
- Expert witness NY State Electric & Gas (NYSEG) and SoCal Gas
- Larta and NE Cleantech Incubator advisor
- Next-Gen Strategic Plan (Ramgen 2024)

## 1967 to 2000      **INGERSOLL-RAND COMPANY**

**President, Northern Research & Engineering Corporation - (NREC)**  
Woburn, MA

**3/96 to 5/00**

NREC is a wholly owned subsidiary of Ingersoll-Rand Company, specializing in turbomachinery, combustor and heat exchanger design and development. Projects/products include:

### **NREC POWERWORKS Microturbine**

Identified, defined, and implemented NREC's microturbine efforts including:

- Defined program scope and secured internal and external funding support for this \$15 million program
- Negotiated intellectual property and commercial rights
- Identified and quantified market opportunity and defined product and positioning strategies
- Established distribution and pricing strategies
- Identified Critical Success Factors and secured necessary resources
- Managed the project and maintained sponsor commitment throughout
- Forecast annual sales \$500 million to \$1 billion by 2010
- Market capitalization benchmarks exceed \$1+ billion
- No negative cash flow impact on I-R to date
- The PowerWorks Family of products includes:
  - 70 & 250kW Cogen & Peaker versions for distributed power generation
  - Air conditioning, refrigeration, and air compressor application packages
  - Microturbine for Siemens-Westinghouse **World's first Solid Oxide Fuel Cell Hybrid**
  - Opportunity fuels and biomass combustion systems

### **NRECUPERATOR Modular Components**

Identified recuperator as the critical enabling technology for the microturbine success, and a substantial opportunity for external component sales.

- Principal sales responsibility for the gas turbine OEMs.
- Secured a contract for the WR21, a \$400 million, 20MW propulsion engine development program sponsored by the U.S. Navy in cooperation with their British and French counterparts
- Leading contender on the 1.5MW British Royal Navy sponsored Gas Turbine Alternator Program
- Actively pursuing AlliedSignal/GE LV100 tank engine upgrade
- Various gas turbine manufacturers worldwide
- Component sales opportunity could exceed \$250 million.

### **Design & Development Projects**

- 500hp turboalternator engine for Chrysler's *Patriot Racecar*
- Alden Labs/DoE "Fish Friendly" Hydro Turbine
- Technical support Air Products/DoE "Ion Transport Membranes" for advanced oxygen production concept
- PEM Fuel Cell pressurization systems
- Ammonia turbine for sea water to energy project in India
- **World's first 53% efficient SOFC/GT Hybrid** with Westinghouse & UC Irvine Fuel Cell Technology Center

### **NREC Military Activities**

- VAROC Air Dynamometers for the U.S. Navy and Army helicopter engine testing
- Engine Drive Compressor for the Japan Defense Association
- U.S. Navy CFC submarine compressor re-rates

### **World-class Turbomachinery Design and 5-Axis Machining Software**

### **Vice President Business Development**

Northern Research and Engineering Corporation, Woburn, MA

**1/94 to 3/96**

**Vice President Sales and Service – North America**  
Air Compressor Group, Davidson, NC

**1/86 to 12/93**

Successfully implemented a major restructuring of the Sales and Service Organization to achieve greater customer focus, leverage expenses and improve morale.

- Increased sales volume from \$175 million to \$275 million in 7 years. Thirty-three percent improvement in expense ratio. Eliminated unplanned turnover.
- Dramatically improved the working relationship with, and the effectiveness of, our company-owned and private Distributor Networks.
- Implemented a Quality Improvement Process for all field personnel, including the distribution and field service networks.
- Successfully implemented a Field Sales and Service Automation Project.
- Provided on-going and significant input to the new product development process.
- Led successful Strategic Alliance negotiations with DuPont.

**Vice President/General Manager**  
Single Stage Products, Charlotte, NC

**6/82 to 12/85**

Negotiated a major license agreement with Kawasaki Heavy Industries of Japan for X-Flo, a new line of single-stage mixed-flow centrifugal blowers with a \$200 million incremental market.

- Established a start-up division to promote I-R's entry into this new market.
- Developed complete software and promotional material.
- Established pricing and cost structures.
- Defined target markets and strategies.
- Detailed companion development projects and related product acquisitions to achieve sales of \$100 million in (5) years.

**Vice President Marketing/Marketing Manager**  
Air Compressor Group, Charlotte, NC

**8/79 to 5/82**

- Initiated new product development programs for four major new products, as well as developments to upgrade much of the existing line.
- Developed a computer-based Marketing Management Information (CRM) System
- Developed a Sales Time and Territory Management program
- Development and use of Economic Forecasting Models.
- Detail analysis of the Blower and Vacuum Pump Market.
- Detailed analysis and marketing support for the Compressed Natural Gas (CNG) Vehicle opportunity.
- Detailed analysis and marketing support for Generon, a membrane-based, on-site Nitrogen Generator
- Evaluated candidates and initiated efforts for a corporate joint venture with Daewoo in Korea.

**Product Manager – US, Canada, Latin America, and Asia**  
Rotary and Recip Compressor Division, Davidson, NC

**1/79 to 7/79**

**Product Manager Europe, Mid-East & Africa**  
Centac Centrifugal Compressor Division, Milan, Italy

**10/76 to 12/78**

- Led the introduction of Centac II in Europe

**Area Manager – UK and Scandinavia**  
Centac Centrifugal Compressor Division, London, England

**1/75 to 9/76**

- Led I-R Sales Team to an order for (25) Centrifugal Air Compressors for gas-gathering projects at (5) separate Saudi Arabian Aramco refinery locations

**Sales Engineer**

7/68 to 12/74

Air Power Division, Charlotte, NC

- Top Sales Engineer several years running
- Sold (21) newly introduced Centac Centrifugal Air Compressors to Reynolds, Lorillard and American Tobacco, Fiber Industries, General Tire, Burlington Industries, Milliken, Duke Power
- Largest single order for (11) LLE's sold to (5) separate locations

**Application Engineer**

6/67 to 6/68

Air Power Division, Chicago, IL

**Education****Purdue University Bachelor of Science in Mechanical Engineering – 1967****Related Experiences**

- 2024 ASME Dedicated Service Award for outstanding service to the gas turbine community
- MAPI Marketing Council
- Developed a Harvard Case Study on Ingersoll-Rand's industrial distribution strategy
- Crosby QIPM, QES instructor level
- Mahler Advanced Management Development
- Ingersoll-Rand Management Development Course
- Leadership Development Course
- AMA Finance for Non-Financial Managers
- Philip Kotler Principles of Marketing
- Dan Neimer Pricing Fundamentals
- Kellogg School Advanced Sales Management
- The Hartford Graduate Center Computer System Fundamentals
- Association of Energy Engineers
- American Society of Naval Engineers – National Program Committee
- ASME-International Gas Turbine Institute, Electric Power Committee and Fuels Subcommittee Chair 2013 to 2023

**Public Speaking Events**

- Energy Frontiers International – March 2004
- US-Norway Bilateral DOE Conference – May 2004
- Energy Solutions Center – October 2004
- Clean Coal – November 2005
- Electric Utility Environmental Conference – January 2006
- ASNE Advanced Naval Propulsion Conference – October 2006
- Energy Venture Fair VII – October 2006
- Piper-Jaffrey CleanTech – January 2007
- University of Michigan FutureTech – January 2007
- Carbon Capture Summit – December 2007
- Carbon Management Conference – December 2007
- Electric Utility Environmental Conference – January 2008
- 7<sup>th</sup> Annual Conference on Carbon Capture & Sequestration – May 2008
- Electric Utility Environmental Conference – February 2009
- EPRI CO<sub>2</sub> Workshop – March 2009
- DOE/EPRI/NIST CO<sub>2</sub> Compressor Workshop – March 2009
- AIChE 2009 Spring Meeting
- Pittsburg Coal Conference – September 2009
- France-Canada CCS Technology – November 2009
- Next Generation Utilities – October 2009
- European Gas Processors Technical Committee – February 2010
- Coal Utilization Research Council Technology Sub-Committee Meeting – October 2010

- ASME-International Gas Turbine Institute – CO<sub>2</sub> Panel June 2013
- ASME Power & Energy Conference – Fuels Report Panel Session June 2016
- ASME-International Gas Turbine Institute – Fuel Report Panel Session June 2017
- Tufts Osher Life-Long Learning Institute “Energy – Its Sources, Uses & Impact” January 2018
- Tufts Osher Life-Long Learning Institute Facilitator “Great Decisions – 2019-2025”

## Featured Articles

Contributing Editor Turbomachinery International. Articles published in 2000-2010 include:

- “The Role of Turbomachinery in the Emerging Distributed Generation Opportunity” – September 2000
- “What's up with the Electric Generating Capacity?” - January 2001
- “Microturbines...Are they for real?” – March 2001
- “It's the Fuel Stupid!” – September 2001
- “Power-Gen International 2001” - March 2002
- “Identity Theft!” – May 2002
- “Truce!” – September 2002
- “SOFC/GT Fuel Cell Hybrids” – November 2002
- “The Hydrogen What?” – March 2003
- “Size Matters!” – July 2003
- “It's Time to Adopt the Standard Market Design” – November 2003
- “FuelCell 2003” – January 2004
- “Small Turbines Need New Approaches” – February 2004
- “DG Business Models” – May 2004
- “Turbo Expo 2004” – July 2004
- “Managing the Value Chain” – September 2004
- “Business is Back” – November 2004
- “FuelCell 2004” – January 2005
- “Dear George” – March 2005
- “What's Driving the Electric Drives” – March 2005
- “Sources & Sinks” – May 2005
- “Coal...the Solution to the Energy Crisis” – July 2005
- “The Airline Cycle” – November 2005
- “Succeeding a Graying Turbo Faculty” – January 2006
- “Somebody's Been Smokin' the “Switchgrass” – March 2006
- “Would That I Were King...” – May 2006
- “IGCC Pinch Points” – July 2006
- “CO<sub>2</sub> Shortage” – September 2006
- “Office of Electricity” – November 2006
- “Some Things Look Better on Paper” – January 2007
- “Texas Hold ‘em” – March 2007
- “The EPA and CO<sub>2</sub> Emissions” - May 2007
- “TurboExpo 2007” – July 2007
- “Energy Policy 2007” – September 2007
- “Black is the New Green” – October 2007
- “Passing Gas” – November 2007
- “Realizing a Carbon Economy” – January 2008
- “The Energy Box” – March 2008
- “ASME TurboExpo 2008” – July 2008
- “Thoughts from Three Conferences” November 2008
- “It's The Fuel Stupid Part 2” - January 2009
- “The Convenient Half-Truth” – March 2009
- “A Technology Driven Recovery” – May 2009

## **Trade Journals**

Contributing Author in various trade journals and publications. Articles include:

- Compressed Air Magazine “The X-Flo Compressor A Machine Whose Time has Come” - 1985
- Power Magazine “Capturing CO<sub>2</sub>: Gas Compression vs. Liquefaction” - June 2009
- Carbon Capture Journal Special Section – CO<sub>2</sub> Compressor Technology “Low-cost, High-efficiency CO<sub>2</sub> Compressors” - Sept/Oct 2009
- Carbon Capture Journal Special Section (co-authored with Mark Kuzdzal, Dresser-Rand) – “The Past, Present and Future of CO<sub>2</sub> Compression”
- Gas Turbine World “World Energy & Fuels Outlook” – Summer 2020
- Gas Turbine World “Steps to Achieving a Successful Global Decarbonization Strategy” - September 2021
- Gas Turbine World “Hope is not a Plan for Net Zero by 2050” – January 2022
- Gas Turbine World “Does Direct Air Capture make any sense” – December 2022

## **Blogs**

Blogs (<http://www.base-e.net>) related to CO<sub>2</sub> emissions and their impact on Climate Change:

- “CO<sub>2</sub> Waste Disposal Fee” – December 2014
- “EPA Clean Power Plan” – September 2015
- “The Impact of Fuel Switching on CO<sub>2</sub> Emissions” – September 2015
- “The CO<sub>2</sub> Budget – Let’s Talk Numbers” – September 2015
- “The Wind Load Factor” – September 2015
- “Competition Under the Clean Power Plan 2014 NSPS” – November 2015
- “Competition Under the Clean Power Plan 2015 NSPS” – November 2015
- “Renewable Energy System Integration Costs – November 2015
- “Energy Information Agency 2040 Forecast” – May 2016
- “Mission Accomplished!” – May 2016
- “The EIA Just Said the Clean Power Plan is not good enough!” – July 2016
- “Disingenuous! – November 2016
- “Earth to China!” – November 2016
- “The Middle Ground Between Coal and the Imperatives of Climate Change – November 2016
- “The 2017 EIA Annual Energy Outlook” – January 2017
- “The EIA has Resorted to Carbon Intensity in their 2017 Forecast” – September 2017
- “The EIA Annual Energy Outlook” – February 2018
- “Grid Stabilization or Enabling Renewables?” – February 2018
- “Grid Scale UPS System” – March 2018
- “The Future of Gas Turbines” – June 2018
- “We’re Wasting Time!” – November 2018
- “2019 New Source Performance Standard” – January 2019
- “45Q” – March 2019
- “Mostly Flat” – March 2019
- “PM<sub>2.5</sub>” – June 2019

## **Technical Papers & Publications**

- ASME TurboExpo 2005 GT2005-68349 “Conceptual Design of a Supersonic CO<sub>2</sub> Compressor”
- ASME TurboExpo 2005 GT2005-68203 “Insertion of Shock Wave Compression Technology into Microturbines for Increased Efficiency and Reduced Cost”
- 25<sup>th</sup> U.S. Army Science Conference November 2006 “Ramgen Power Systems-Supersonic Component Technology for Military Engine Applications”

## **Patents**

- United States Patent 5,586,429 December 24, 1996 Brayton Cycle Industrial Air Compressor
- United States Patent 7,603,841 October 20, 2009, Vortex Combustor for Low NO<sub>x</sub> Emissions when Burning Lean Premixed High Hydrogen Content Fuel
- United States Patent 8,312,725 November 20, 2012, Vortex Combustor for Low NO<sub>x</sub> Emissions when Burning Lean Premixed High Hydrogen Content Fuel