
BECHT
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Back to PRACTICAL Energy Optimization
ENGINEERING SOLUTIONS | PLANT SERVICES | SOFTWARE TOOLS | LEARNING & DEVELOPMENT

Knowledge Is Power

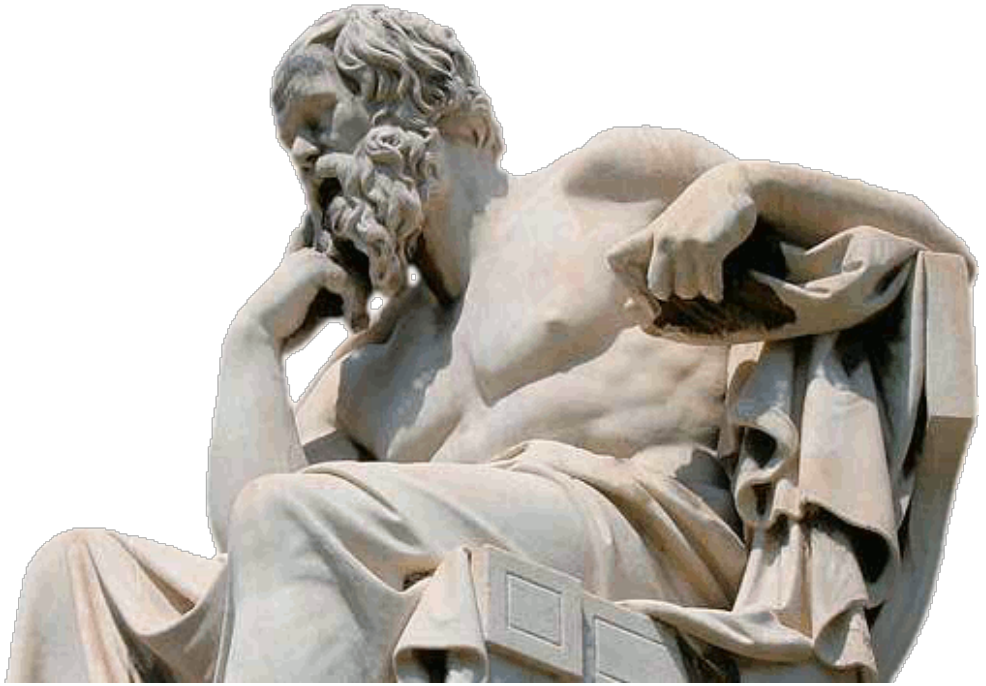
Socrates Triple Filter Test

Is it **true**?

Is it something **good**?

Is it going to be **useful**?

Looking forward to discussion!



Agenda

- Energy AND… Mindset
- Practical Energy Improvement - PEAK
- More Complex Tools / Methods
- What does good look like?

Bio – Grant Jacobson

- Fired Heater Services, Division Manager
- +15 Years in Refining/Chemical
  - ExxonMobil, Valero, Becht
- Field of Expertise: Thermography, Fired Equipment, Process Engineering Generalist
- Industry Involvement/Recognition: API 560

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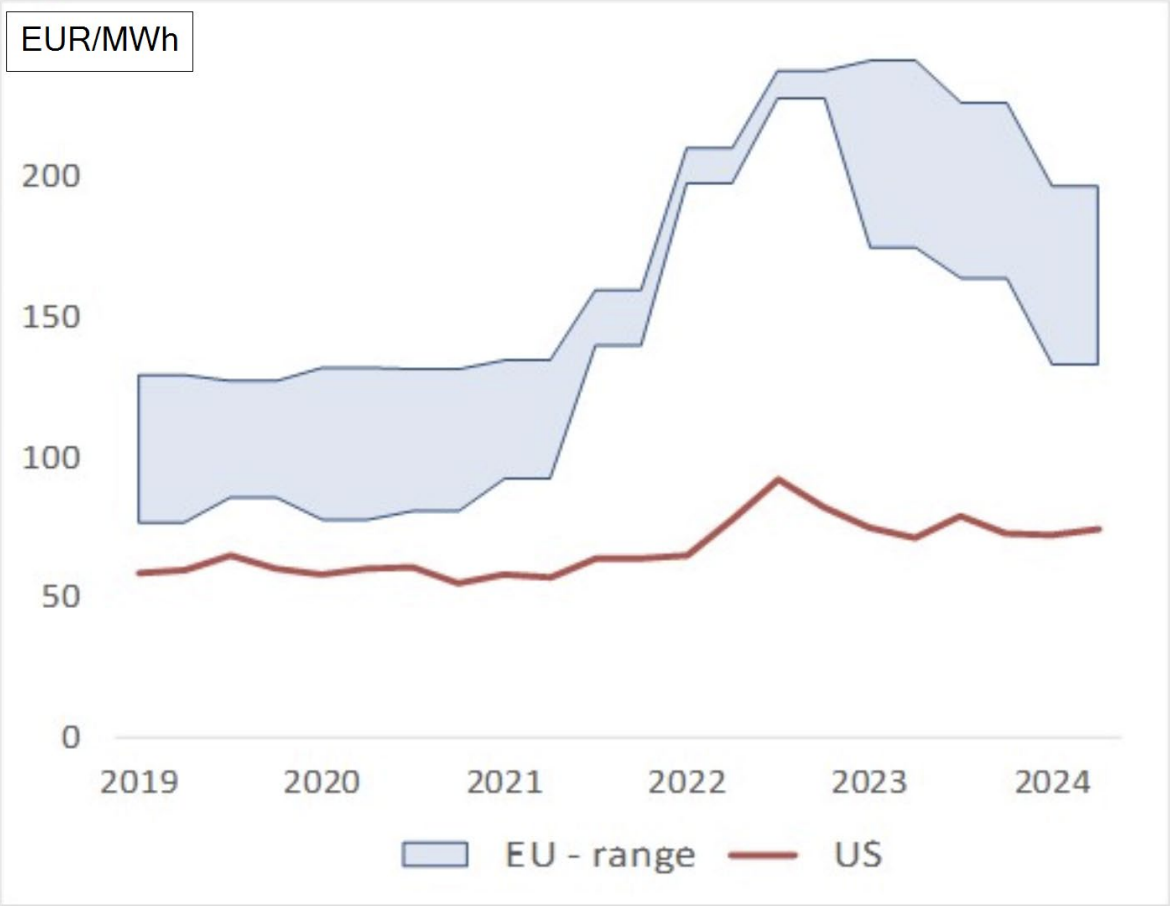
Energy AND … Safety / Margin / Reliability Culture



- **Energy is priority # ????**
  - #1 Safety
  - #2 Reliability
  - #3 Profitability
  - #4 Energy (maybe)

- **US Energy Prices Remain Low**

Sources: EIA, Eurostat and staff calculations.

Energy AND … Safety / Margin / Reliability

	Practical Energy Assessment Kit	Becht Reliable Asset Value Optimization
Complexity	Higher level, faster, low hanging fruit	Detailed, all low hanging fruit and high value targets
Value	>5 times cost (return on investment)	>10 times cost (return on investment)
Cost	$100-150K (USD)	$250-600K (USD)
Duration	8 – 10 weeks, ~6 days onsite	20-40 weeks, ~20 days onsite
Team	3 experts (including facilitator)	6-8 experts (including facilitator + data support)
Tracking	Standardized method, can track progress	Less than PEAK, very customized per client
Modeling	No	Yes, Pinch / steam / fuel / etc

PEAK Blog Link

BRAVO Blog Link

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Practical Energy Assessment Kit – Methodology

Peer Performance Matrix			
	Developing	**Established**	**Advanced**
Total Score	20-50%	50-75%	75-100%
Assessment Cycle	1st to 2nd	2nd to 4th	5th onward
Year	0 - 2	2 - 4	+ 4
Culture	Lower site priority, developing systems, setting resources, getting started	Higher priority, systems developing and maturing, key resources set	Priority to maintain, systems mature with verification measures

Tool Design

- Focused on **people/processes/practices** not on plant design. Optimize what is on hand. Capital not critical to score.
- 4 elements, 21 sub-elements, 115 topics
- Scoring via **design** and **effect** of systems
- Max score is 100%, see **Peer Matrix**
- Scoring is weighted to drive focus on most important gaps to maximize **VALUE** quickly
- Elements and scoring based on subject matter experience and value vs effort

Scoring	
Design	
0	Expectation is not being addressed by a systems approach. There are no documented programs, procedures or practices or organizational actions and activities relative to the expectation.
1	Programs, procedures or practices to meet the expectation are under development. The need for documented programs, procedures and processes recognized and development underway.
2	Programs, procedures, or practices to meet expectation are mostly developed. The programs, procedures and/or practices are documented, approved and resources are provided.
3	Programs, procedures or practices to meet expectation are fully developed, recorded and communicated to the organization. Verification measures are developing.
4	Programs, procedures and practices to meet the expectation are fully developed and recorded for continuous improvement. Measurements of results and outputs have been established.
Effectiveness	
0	Expectation has not been implemented. (0 – 10% implemented)
1	Expectation is in the early stages of implementation. (10% - 50% implemented)
2	Expectation is being implemented and is partially satisfied. (50% - 75% implemented)
3	Expectation is being implemented and is mostly satisfied. (75% - <100% implemented)
4	Expectation is fully satisfied. (100 % implemented)

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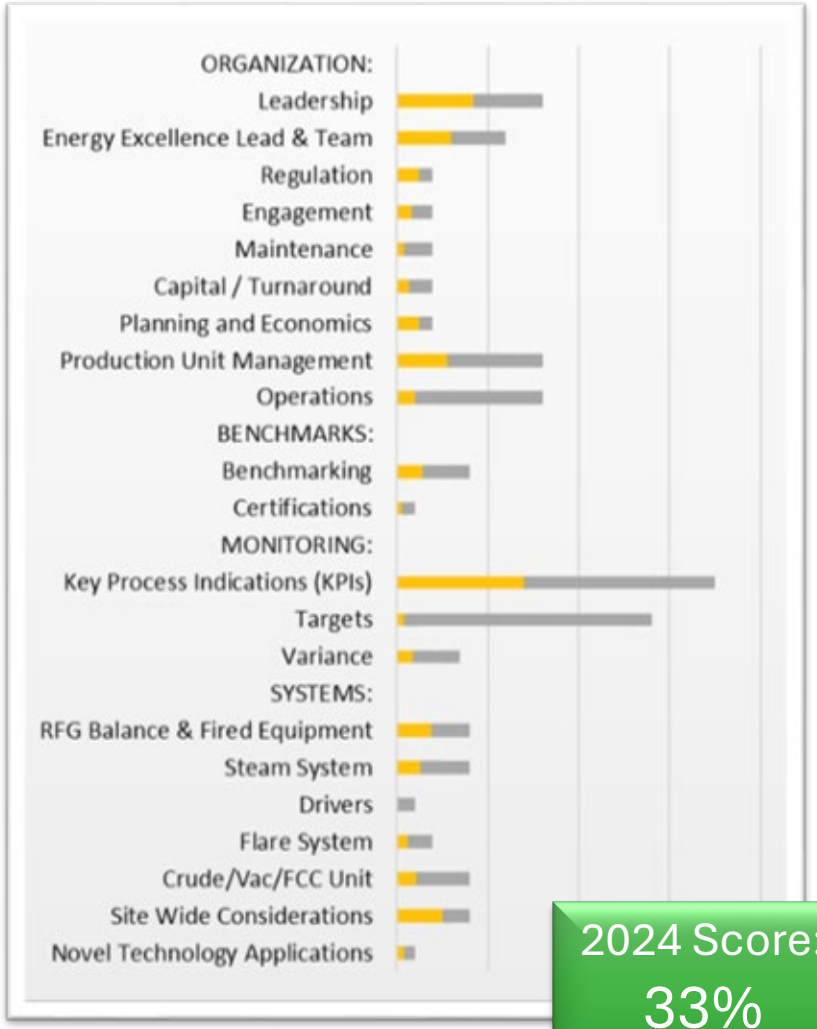
Example PEAK Findings

Example from 1st time effort at a mid sized fuels refinery

- Organization (40% of total):
  - PEAK Assessment: **promising start onsite** and energy focus needs to mature
  - KPI monitoring: some tools in place via excel sheets, not data historian
  - **Panel operators not directly empowered to optimize on energy opportunities**
  - Informal communication, missing celebration of wins and not mentioning path forward
- Benchmarks (5% of total):
  - Plan/do/check cycle, xxxx annual energy audit by the energy engineer
  - EII is being tracked by the site on a monthly basis
  - ISO 50001 is referenced in xxxx, site is not ISO 50001/2 certified
- Monitoring (35% of total):
  - **Number of KEVs monitored is limited**
  - There are doubts about accuracy of calculations
  - No clear energy targets are set on KEVs with limited access to the KEVs by operations
- Systems (20% of total):
  - **Target setting (e.g. excess O2, stripping steam, …) is done at "comfort" level**
  - Many KEV development opportunities observed on the various systems
  - Burner fouling is tackled through a dedicated burner cleaning crew. Reactive vs proactive.
  - Site is focusing on building tools to monitor flaring. Next step to empower ops to chase flare system loading is still to come.
  - Ops walk the instrument, steam, and N2 checking for gross leaks. Currently ad hoc.



2024 Score: 33%

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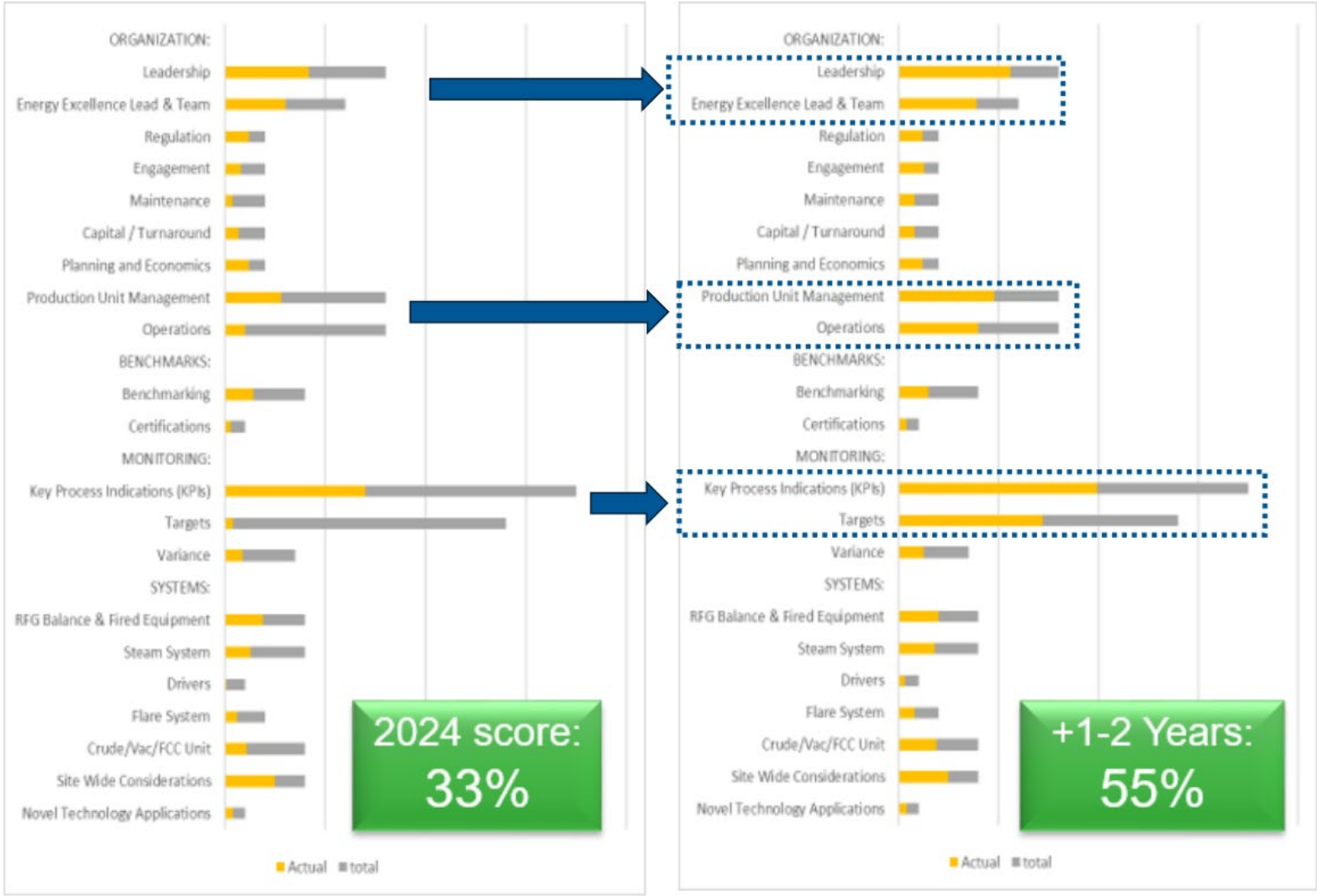
Example PEAK Roadmap Improvement Case

Example from 1st time effort at a mid sized fuels refinery

- Organization (+8%):
  - **Operators know KEVs and are empowered to optimize to them**
  - Shift teams discuss KEVs, part of normal ops culture
  - **Area Managers and Operators know it is their job to think about KEVs**
- Benchmarks (+2%):
  - No major change, points gained by maintaining current set up
- Monitoring (+10%):
  - Quality KEVs developed
  - **Quality KEVs visible via historian**
  - Quality targets
- Systems (+2%):
  - Continue optimizations on flare, steam, crude/vac/FCC systems via opportunities A through L

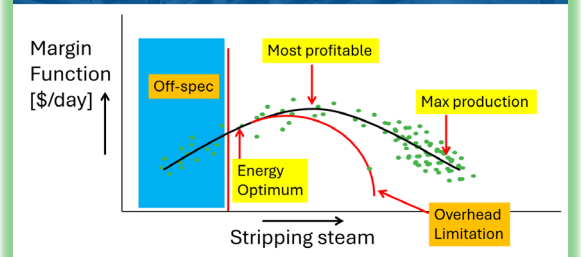


Example PEAK Roadmap - 2025

Improvement Priorities

*See *Implementation Recommendations Details A through Q (examples shown)*

J. Energy & Steam (3Crude)

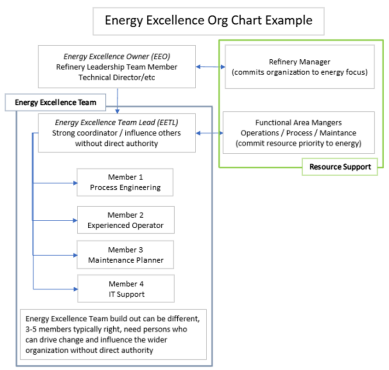


B. Formalize Energy Team

Example Energy team layout

Critical for Energy team, with little/no real authority over resources, to communicate well on value and priority of focus items to the resource owners

Important for Energy team to champion the Energy AND … (Margin, Production, Reliability) culture



Q1 2025

- B. Formalize Energy Team
- C. Energy AND Margin Focus
- A. Quality KEVs
- G. FCC Steam Turbine Fouling
- H. Fired Heater Tuning Training
- O. Deaerator Dump LP Steam
- P. FGC Reliability
- K. Fans Summer (min flare)

Q2 2025

- F. KEVs Visibility (DCS)
- A. Quality KEVs, Summer Ops
- L. TEBA Meetings Kick Off
- I. FCC WGC Cooling Wins
- J. Energy & Steam (3Crude)

Q3 2025

- A. Quality KEVs
- M. Test Run FCC (Turb Wins)
- D. Celebrate Early Successes
- N. Fans Winter

Q4 2025

- A. Quality KEVs
- Q. Set 2026 Priorities

Q1 2026

- R. KEV Maintain Mode
- T. Self Assess PEAK Score

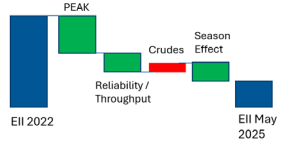
D. Communicate and Celebrate

Start communicating on the PEAK journey and celebrate quick wins and early success.

PEAK improvements should be escalated to the Technical Director and the Energy Team via a formalized process so Operations can feed back to the Energy Team.

Start a site workshop/session to support new energy/loss savings ideas/tactics/goals. Include a larger cross functional team than just Energy Team. Formalize a process to discuss and create clarity on the agenda of the meeting and ensure effective use of the knowledge in the room. This will help create a sustaining program.

Once sufficient KEVs are in place and making a difference, show the effect in an EII (Solomon/etc) waterfall chart:



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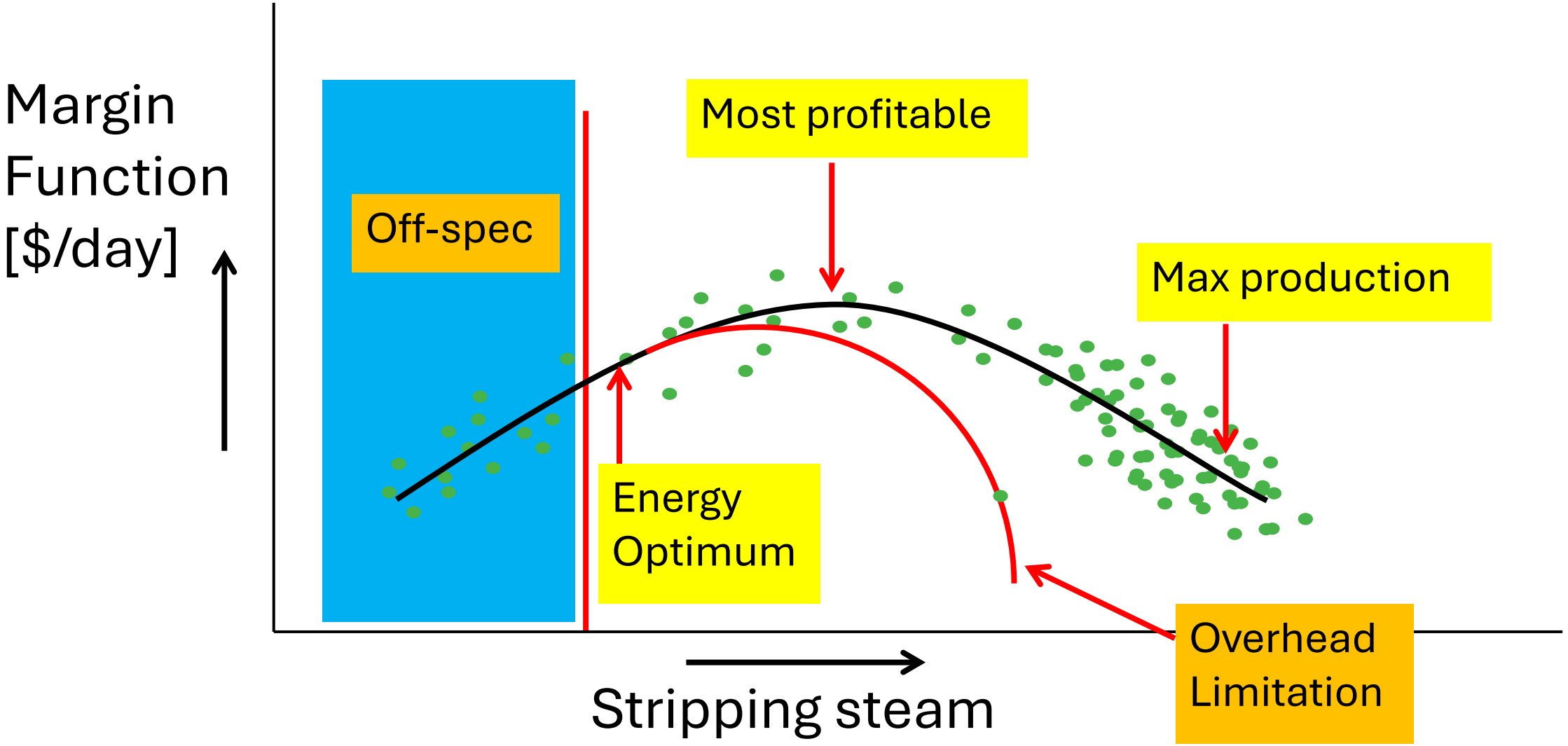
J. Energy & Steam (Crude Atmos Example)



Increasing Complexity Tools

Becht Energy & Technology Benchmark Levels

Macro Level - Relative Energy Performance (REP)

- *Best Application – Overall Facility Benchmark*
- REP approach is focused on a ***technical basis*** for each process technology and process area within a facility, rather than a quartile basis of comparing peers
- Each unit is given an energy allowance (Energy Guideline Factor), with the summation of each unit's allowance + offsites leads to a full site energy allowance
- Each site allowance is reflective of their specific configuration and operation
- Allowance is compared to actual plant energy usage
- Allows for benchmarking of internal peer facilities as well as trending against time

Micro Level – Key Performance Indicators

- *Best Application – Process Unit and Energy System Benchmarks*
- KPIs are defined on a unit-by-unit or energy system (e.g. steam system) basis to define targeted operation and flag out-of-target performance
- KPIs should include guidance to the end-user for returning operation to desired state, including both technical and economic context
- Additional KPIs should address process technology and configuration elements to highlight improvement opportunities, rationalize performance, and incentivize modifications (e.g. steam vs power turbines, tray / packing technology, feed nozzles, heat integration, rundown vs direct feed routing, etc)

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PEAK

PEAK addresses people / processes / practices energy benchmarking

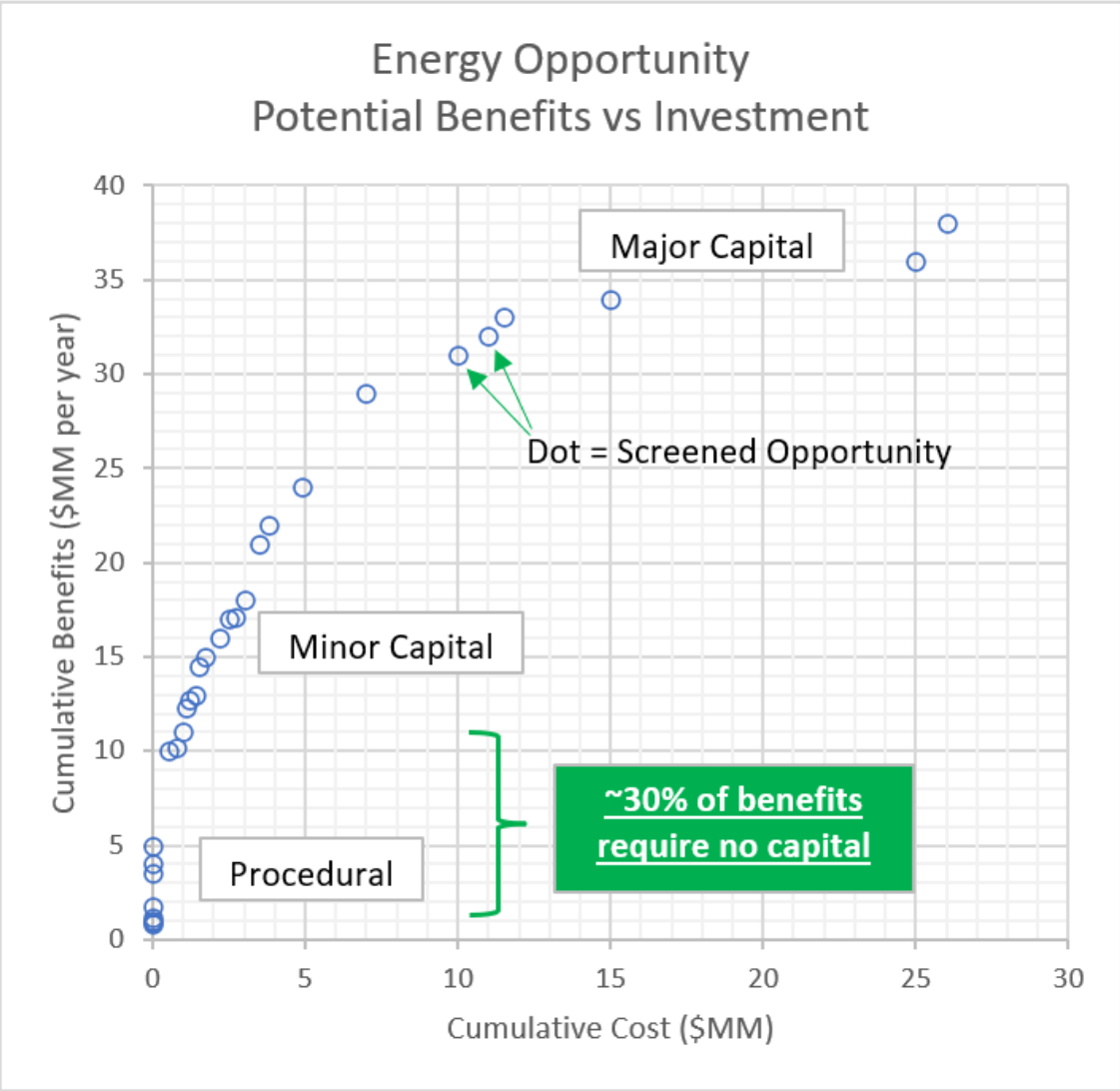
PINCH Technology

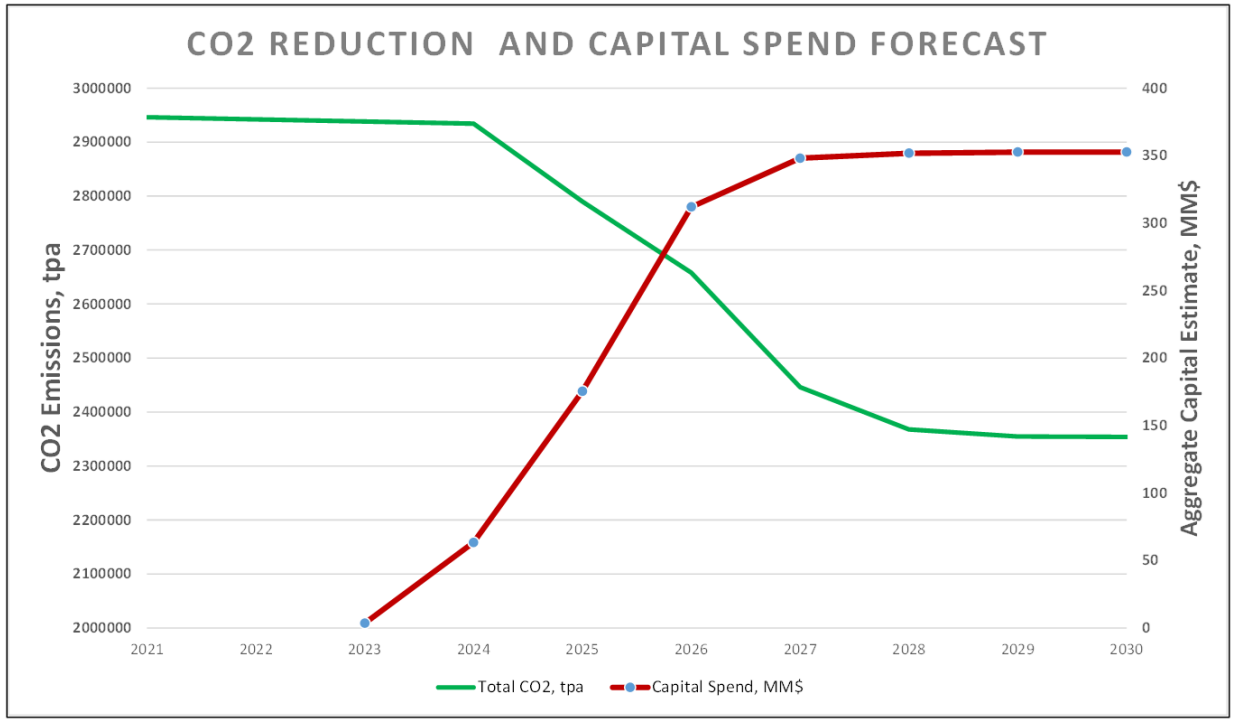
- Techniques developed in later 1970's
- Specialized software needed
  - (e.g., Linnhoff-March's Supertarget or ASPEN Advent)
- Overlapping process heating and cooling curves to find optimized matches
- One of the tools to help design and operate plants more efficiently
- Requires substantial efforts, therefore typically are done as a follow up to site energy reviews

How Becht Applies PINCH

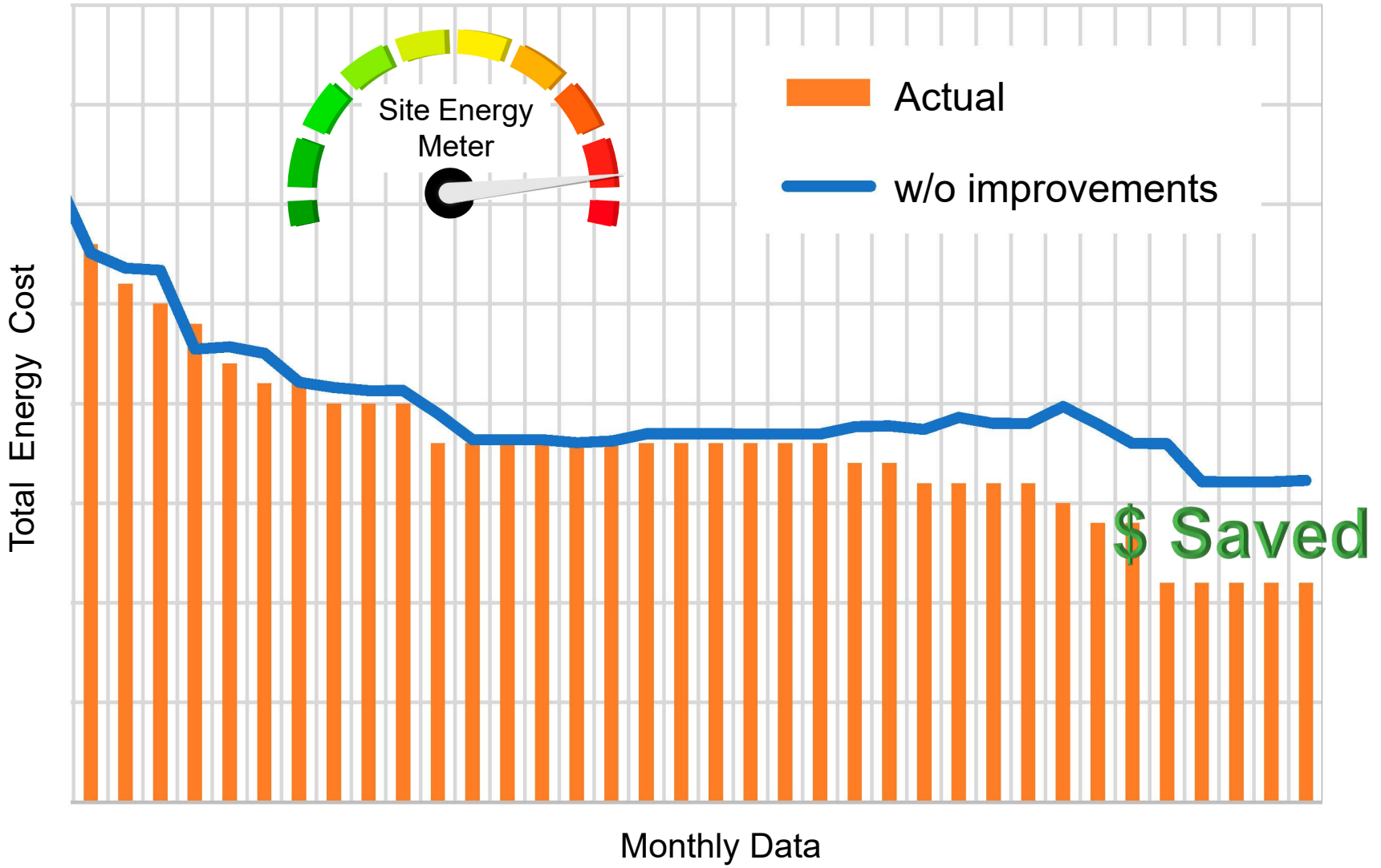
- **Integrated Approach** – link with heat exchanger fouling, process simulation, and utility optimization studies
- **Reality Based Targets** – apply 80/20 rule to quickly identify most benefits vs costs **before** in-depth analysis
- **Comprehensive Application** –include EPC, financing, startup support, and benefit tracking
- **Focus on Low Capital First** – **low capital first**, then major revamps
- **Proven Track Record** -- **$50MM+ project wins** are possible

Final Energy Project Ranking





Implementing & Sustaining



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