Innovative financial tool for compressor station retrofits

US EPA Natural Gas STAR Technology Transfer Workshop

Glen Allen, VA

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Executive Summary

- Centrifugal compressors equipped with wet seal technology are generally acknowledged as a leading source of methane emissions in the natural gas value chain.
- There are 3 approaches to reduce methane emissions from such equipment
- This presentation showcases a decision support tool that evaluates the three options from an economic perspective.
- The Life Cycle Cost Calculator is a web-based decision support tool that builds on previous work and takes it to the next level. This tool provides economic comparisons of methane reduction options to assist customers in decision making and ensures all factors are considered for individual compressor units, including initial costs, operational savings and emissions reductions.

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Who is FSA?

- An association of North American companies who manufacture fluid sealing devices and suppliers to process industries.
- Represents over 80% of the manufacturing capacity for fluid sealing devices in North America.
- Member companies and distributors have manufacturing and service centers in all 50 States, Canada and Mexico.
- FSA partners closely with the European Sealing Association (ESA).
- Industry represents engineers, machinists, technicians, laborers…

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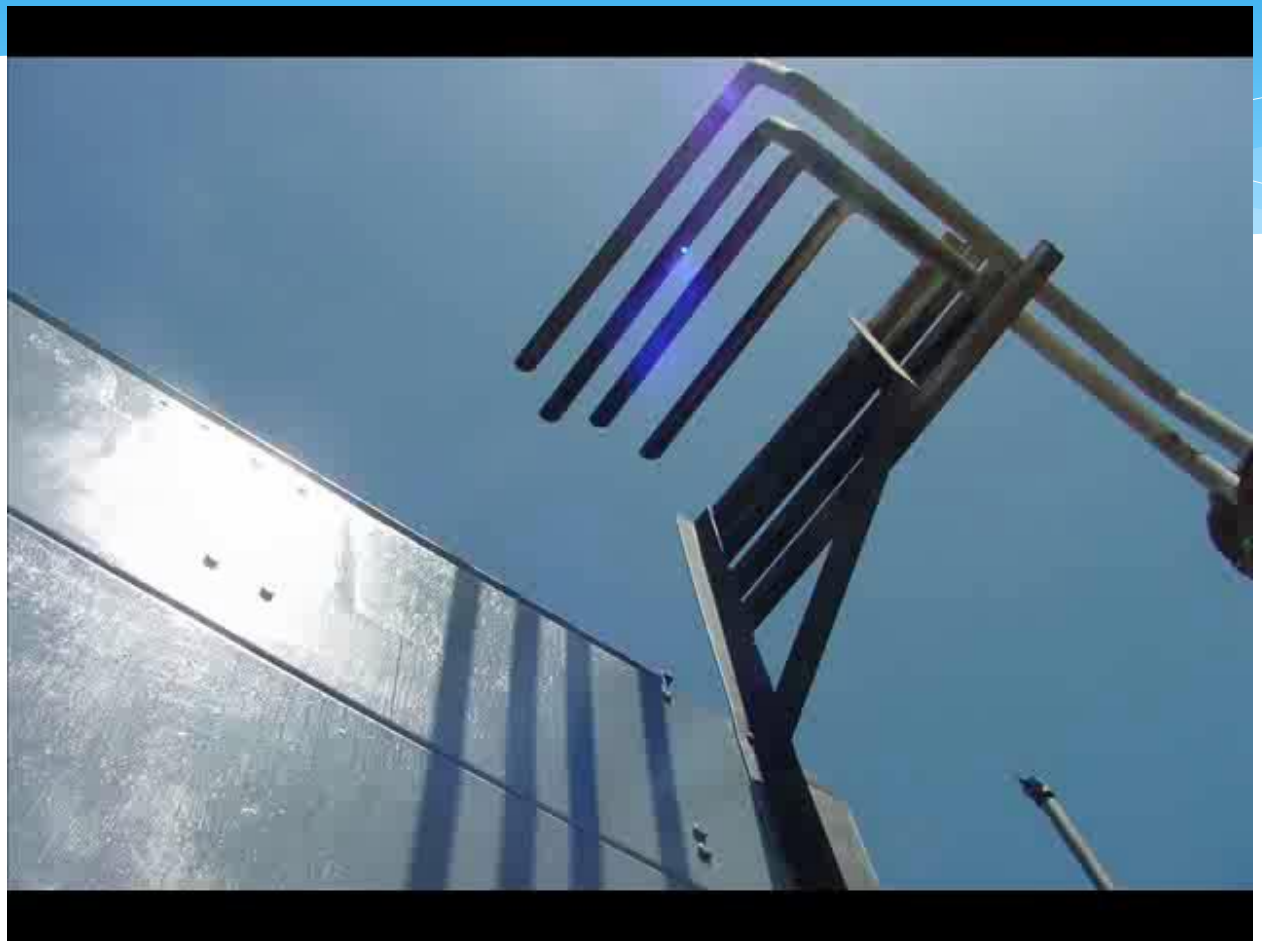
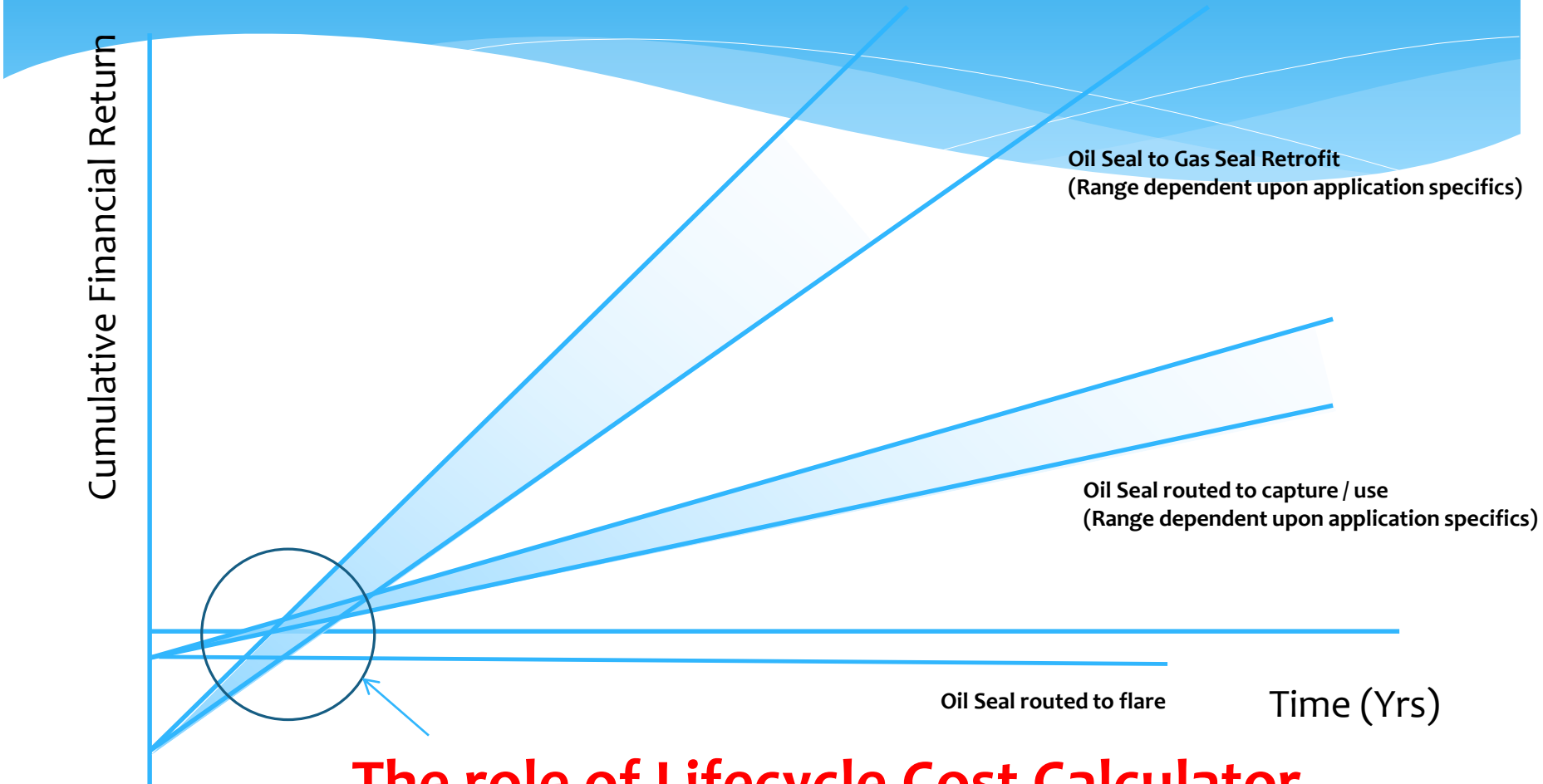
Our mutual objective



Source: US EPA Natural Gas STAR

Economic Payback



The role of Lifecycle Cost Calculator

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Life Cycle Cost Calculator

Process Data

- Methane content
- Flow rate
- Pressure
- Operational hours
- Process gas value

Compressor Data

- Driver
- Power
- Efficiency
- Number of seals
- Shaft Size

Reliability Data

- Planned maintenance costs
- Unplanned maintenance costs
- Spare parts cost
- Lost production time
- MTBR

Seal Support System Data

- Power requirements
- Cooling configuration

Seal Data

- Frictional power
- Leakage rate
- Gas injection source
- Leakage destination

Retrofit / Upgrade Data

- New seals and spares costs
- System upgrade/replacement costs
- Equipment modification costs
- Electrical and instrumentation costs
- Site materials and installation costs
- Decommissioning and disposal costs
- Lost production time

Utilities Data

- Driver fuel value
- Electricity value
- Purge gas value

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Life Cycle Cost Calculator Outputs

Costs Calculated

Annual Operating Costs

- Maintenance cost
- Value of leaked gas
- Consumables
- Energy consumed by seal
- Energy consumed by seal system

Total Life Cycle Cost

One-Time Costs

- Total retrofit costs
- Payback

Present Value

- Present value of annual operating costs over lifespan remaining

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Illustration

Pipeline compressor

Natural Gas:	96% Methane
	$3.00 / Mcf
Flow:	50,000 scfm (1416 m^3/min)
Pressure:	600 psig (41.3 Barg) Suction
	1,100 psig (75.8 Barg) Discharge
Shaft Speed:	9,000 RPM
Driver:	Gas Turbine 10,500 hp (7,800 kW)
Shaft Diameter:	5” (127 mm)
Operational hours:	4,000 hr/year (167 days/year)
Spared:	Yes

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Equipment operator owns the compressed gas

Illustration Outputs

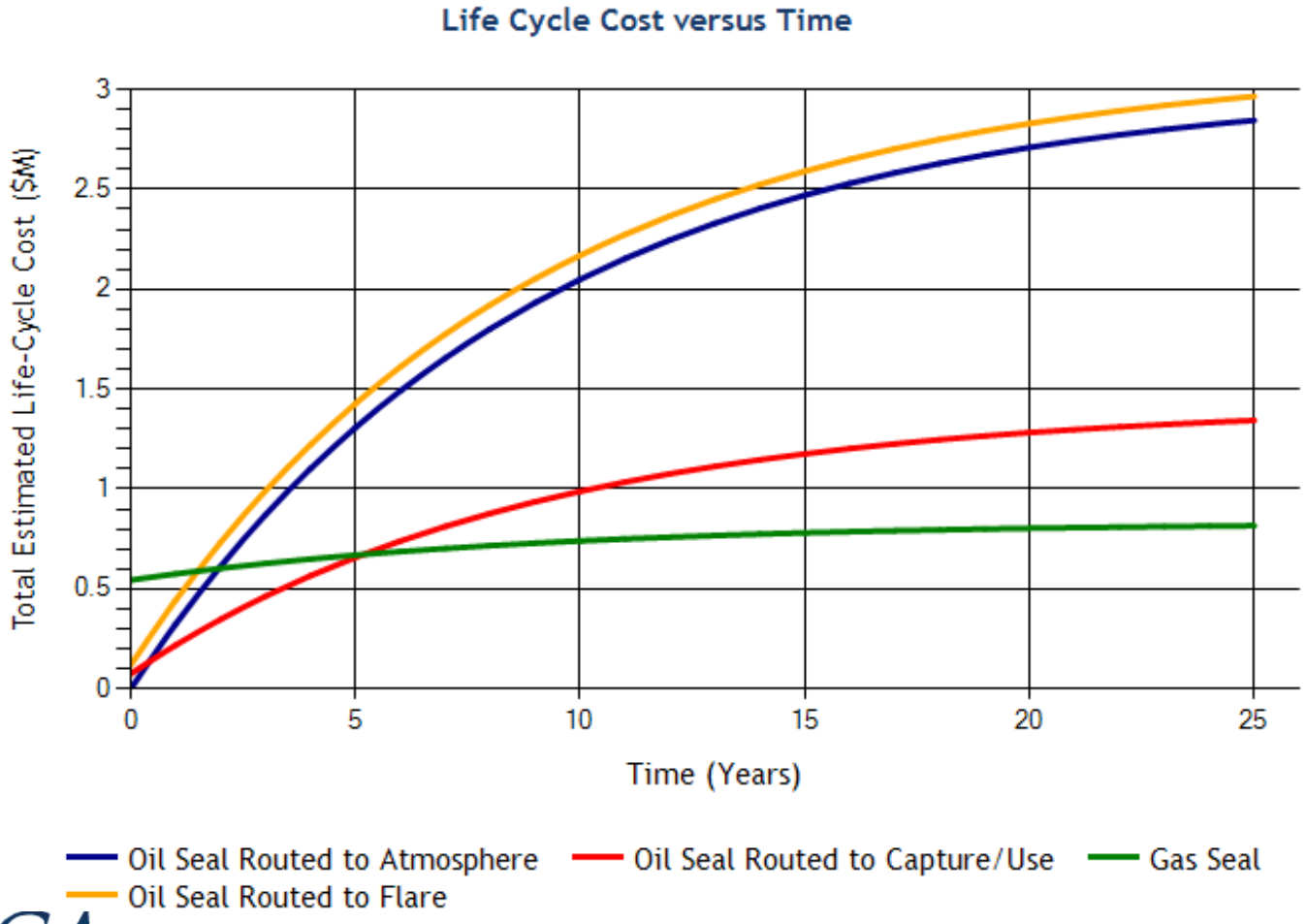

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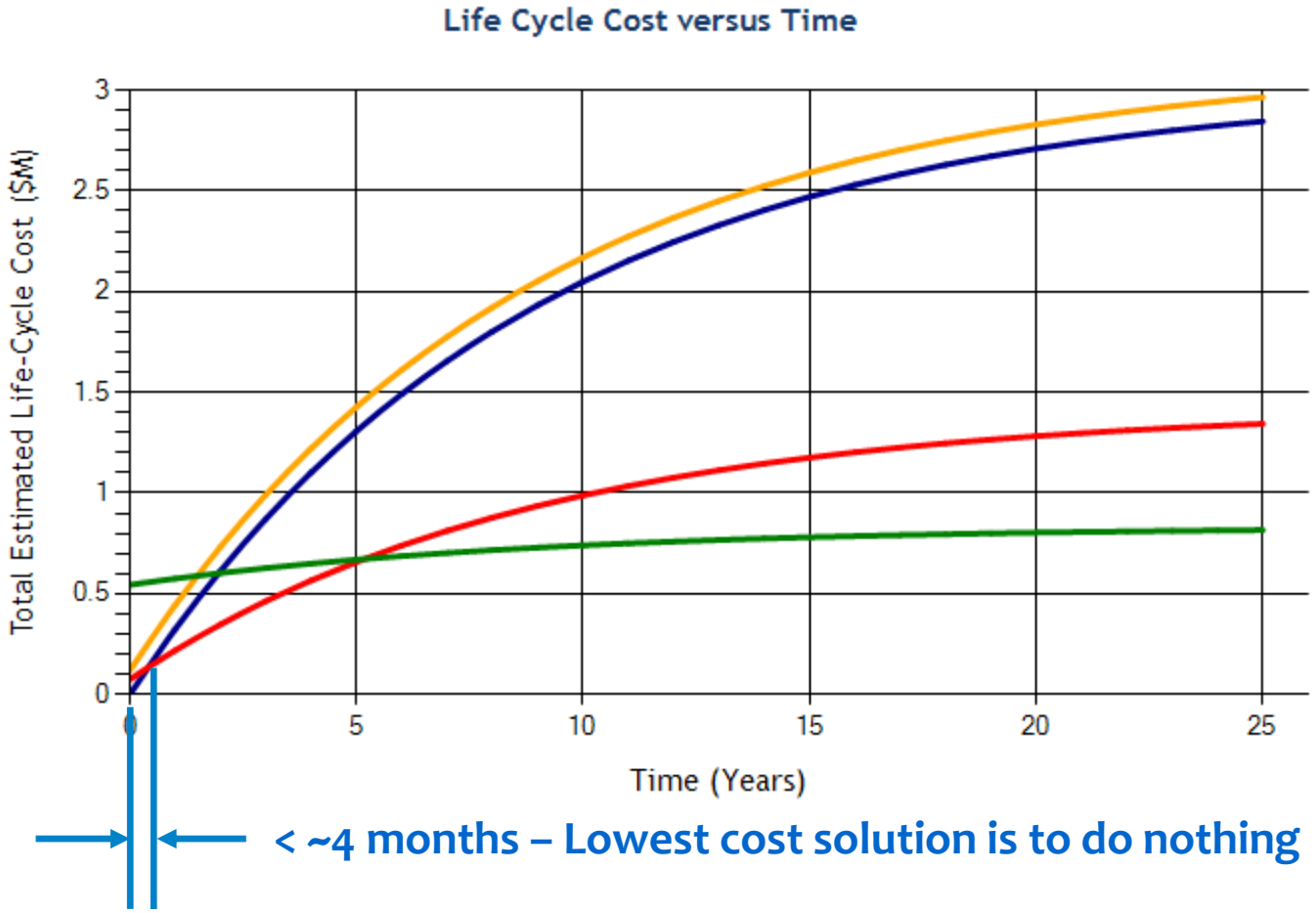
Illustration Outputs



< ~4 months – Lowest cost solution is to do nothing

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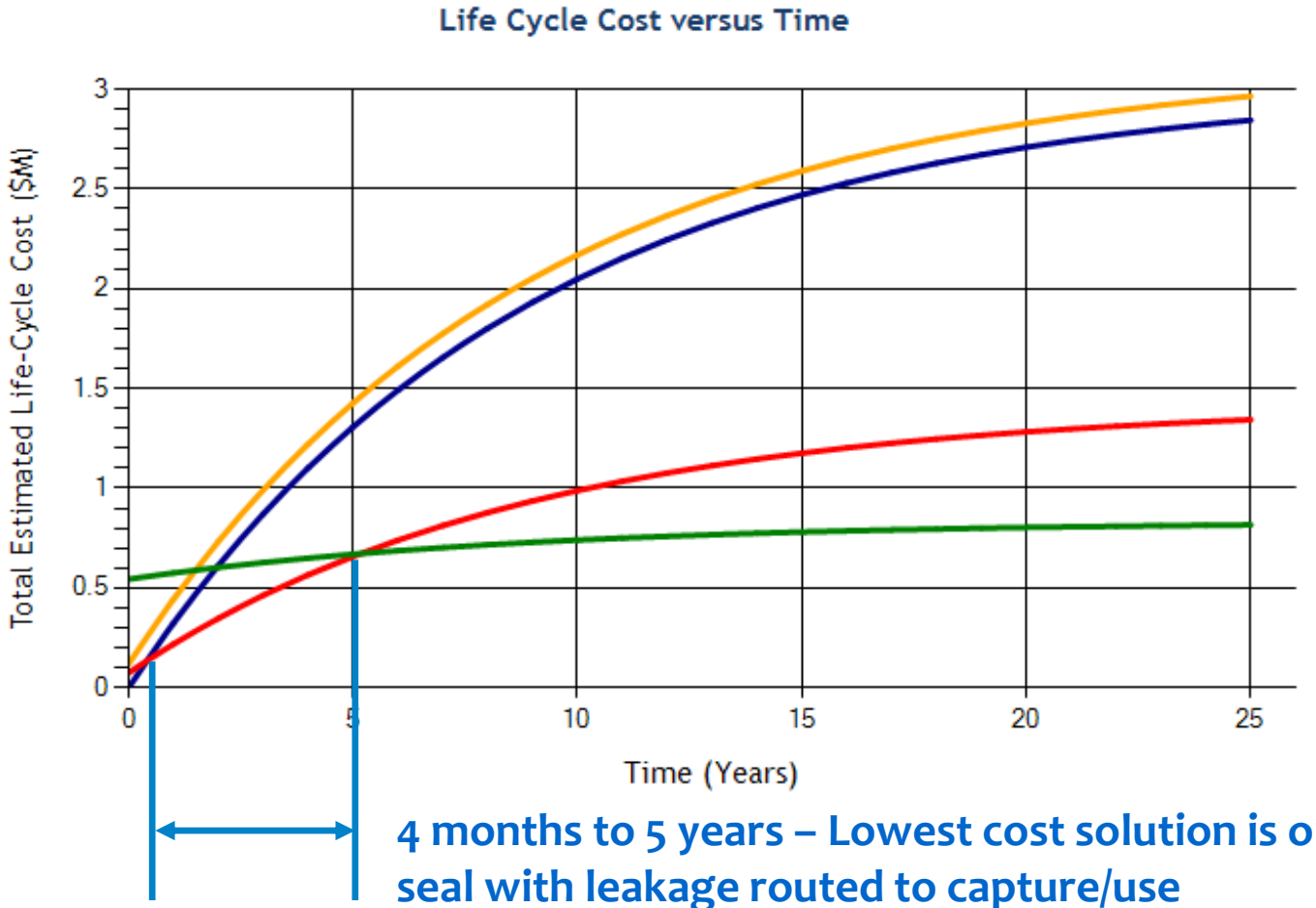
Illustration Outputs



4 months to 5 years – Lowest cost solution is oil seal with leakage routed to capture/use

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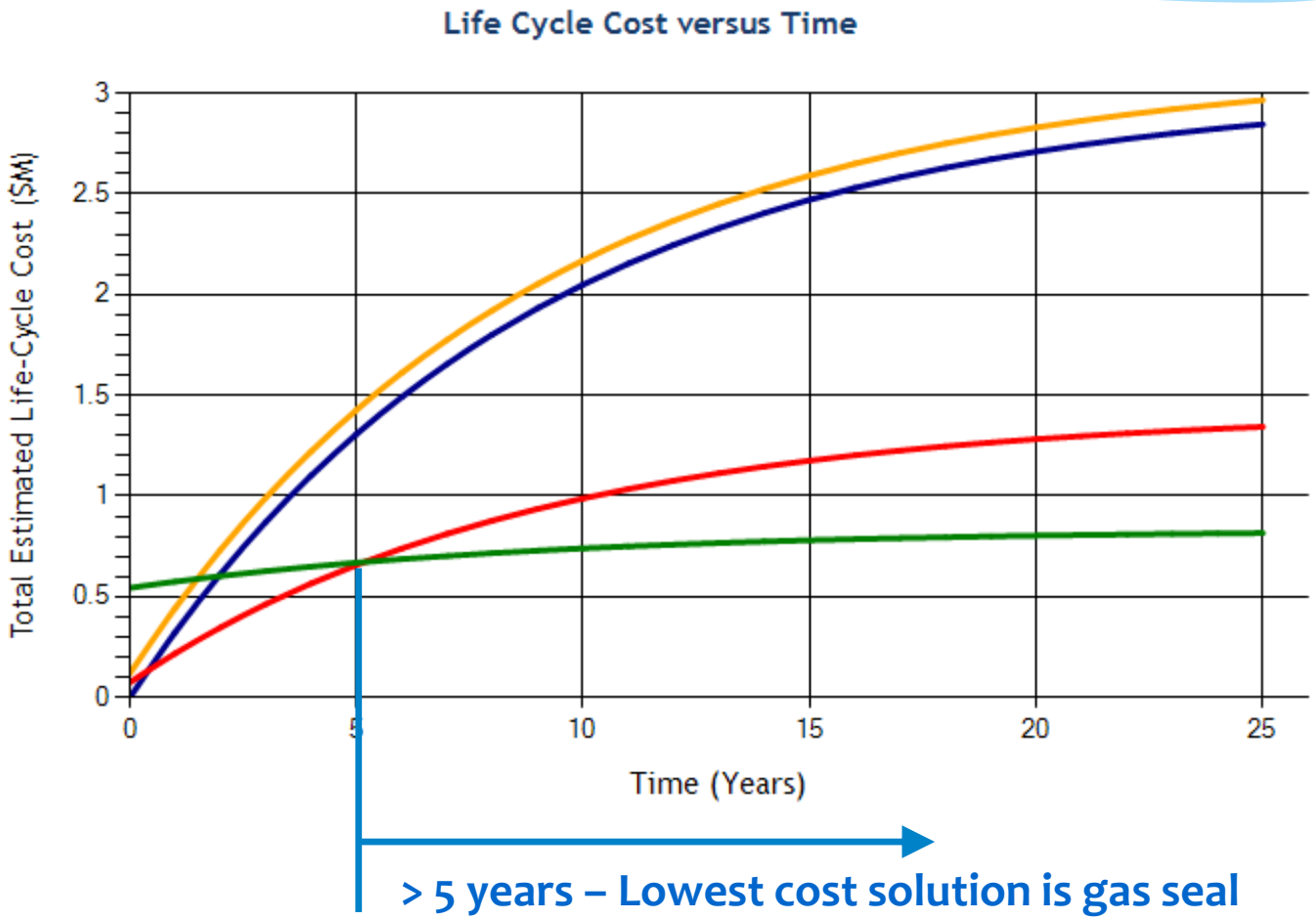
Illustration Outputs



> 5 years – Lowest cost solution is gas seal

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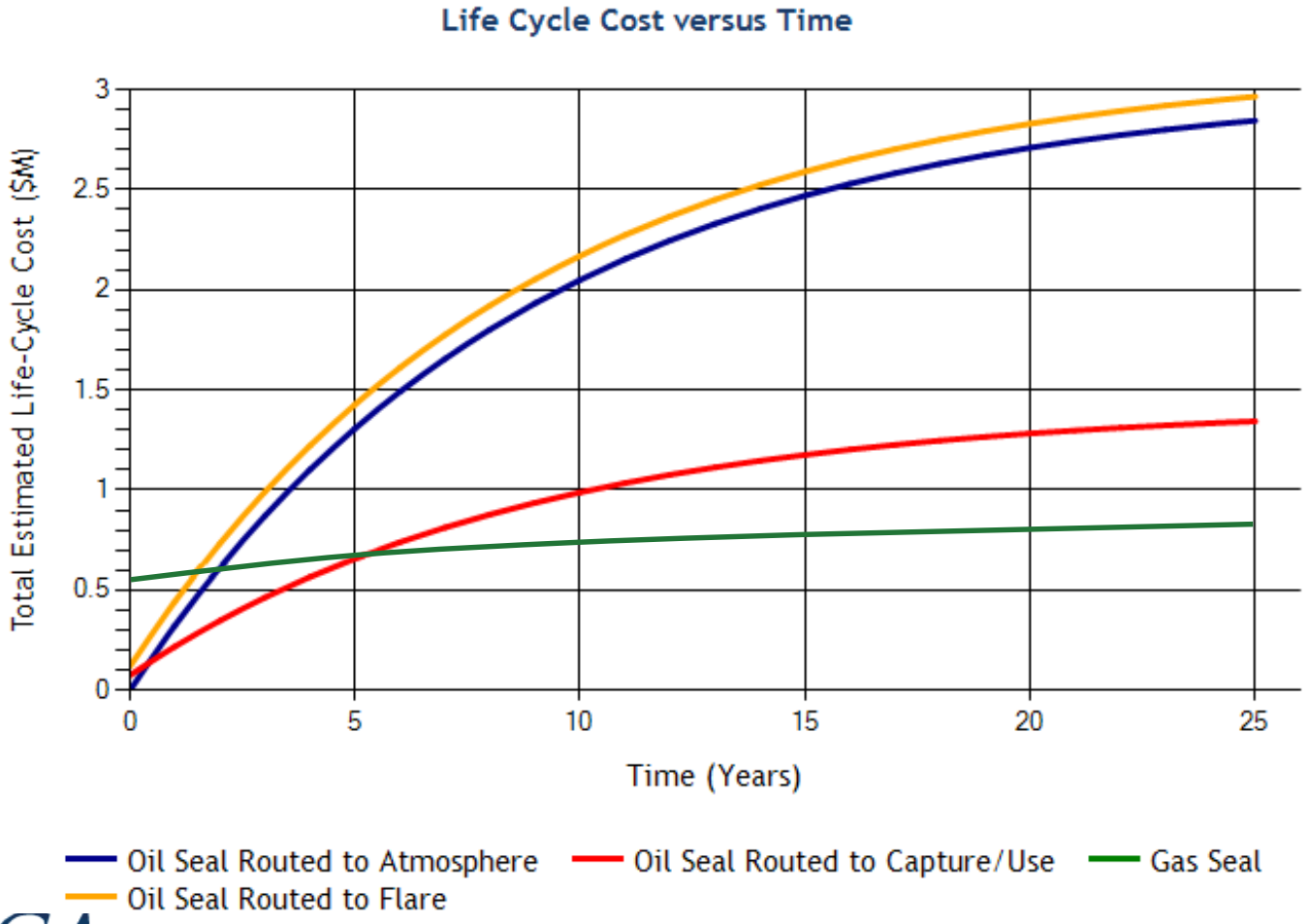
Illustration Outputs



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Concluding Comments

…The Lifecycle Cost Calculator provides decision support that is:

Insightful

Comprehensive

Customizable

Specific

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Further Information

Accessing the Gas Compressor Lifecycle Cost Calculator is free

www.fsaknowledgebase.org

(Requires free user account to access)

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Further Information

Fluid Sealing Association

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