USING DIGITAL TECHNOLOGIES FOR EFFECTIVE ENERGY AND EMISSION MANAGEMENT AND OPTIMIZATION

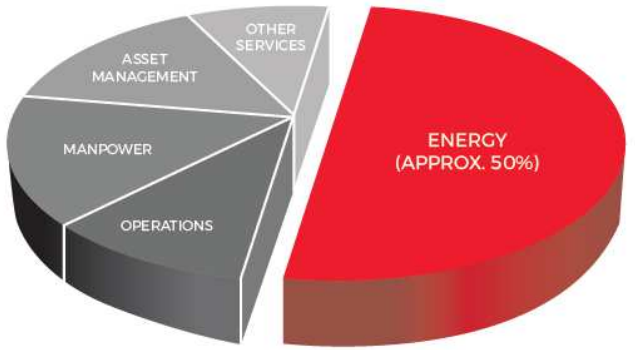
KBC (A Yokogawa Company)
Sharon Zhou

CONTENT

1. Industrial Requirement and KBC Background
2. Energy and Emissions Management and Optimization System
3. Case Study Results
4. Conclusions

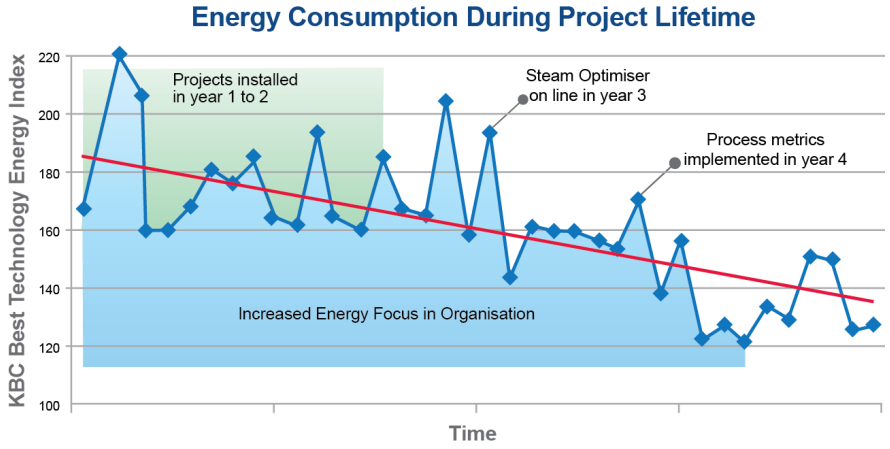
WHY FOCUS ON ENERGY?

- Energy is the largest controllable operating cost on most sites
- Even leading performers see 10-15% energy cost savings and improved margins by up to 20%
- Associated emissions reductions align with corporate and/or legislative commitments
- Saving energy is the most reliable way to reduce operating costs in a volatile market - It always saves money and always will
- Energy is undergoing a global and local transition with complex decarbonization issues
- Energy optimization cuts through the uncertainty



KBC ENERGY OPTIMIZATION

Energy Savings Now…



Supported by energy, process and subject matter experts with over 20 years experience using KBC's superior tools and proprietary leading technologies our client saw a 20% reduction in energy index over 4 years, resulting in them becoming a top quartile performer

… And in the Future

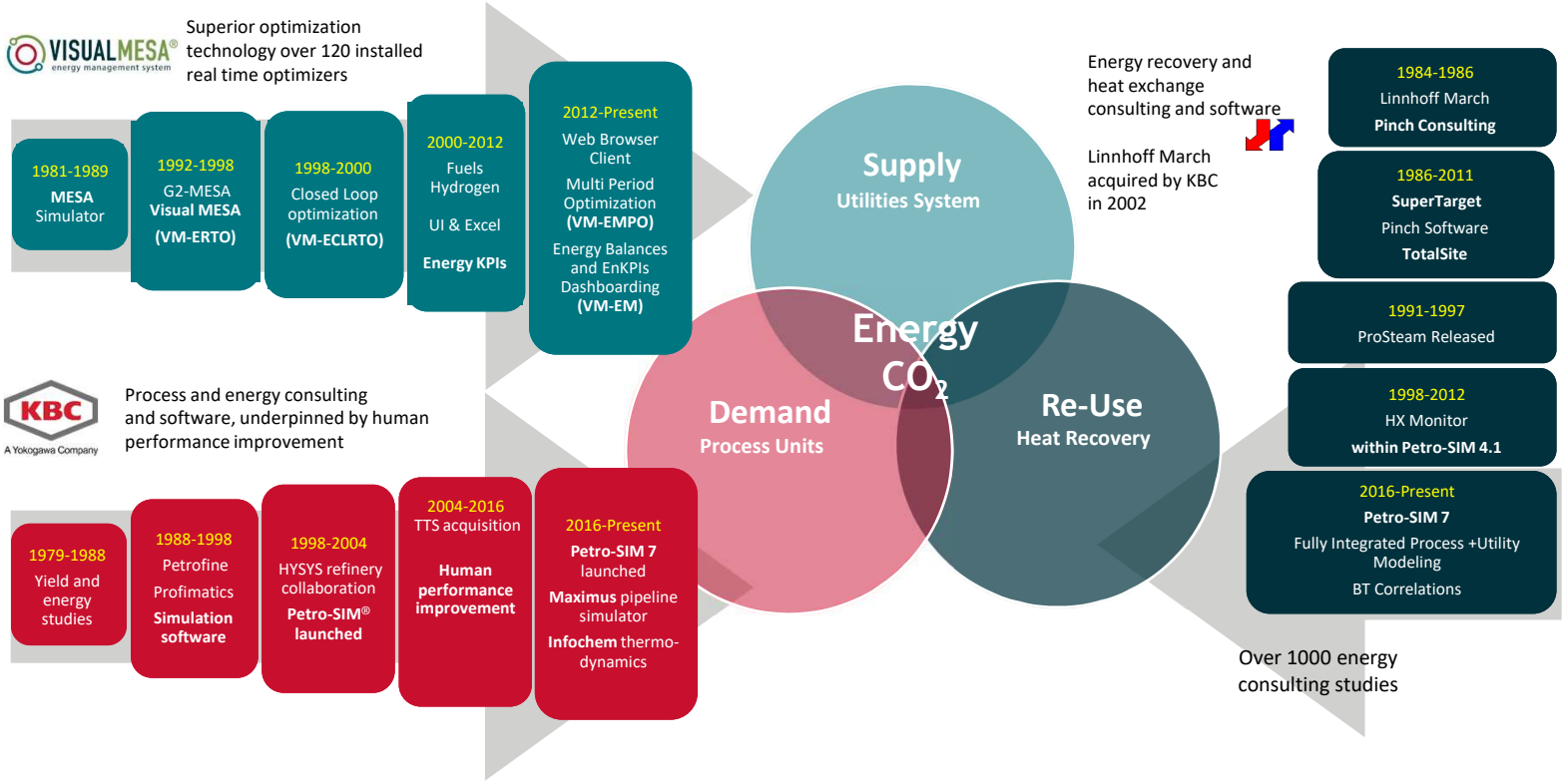
Future-proof method to reduce operating costs and emissions regardless of carbon price

Critical first step towards decarbonization in the energy transition

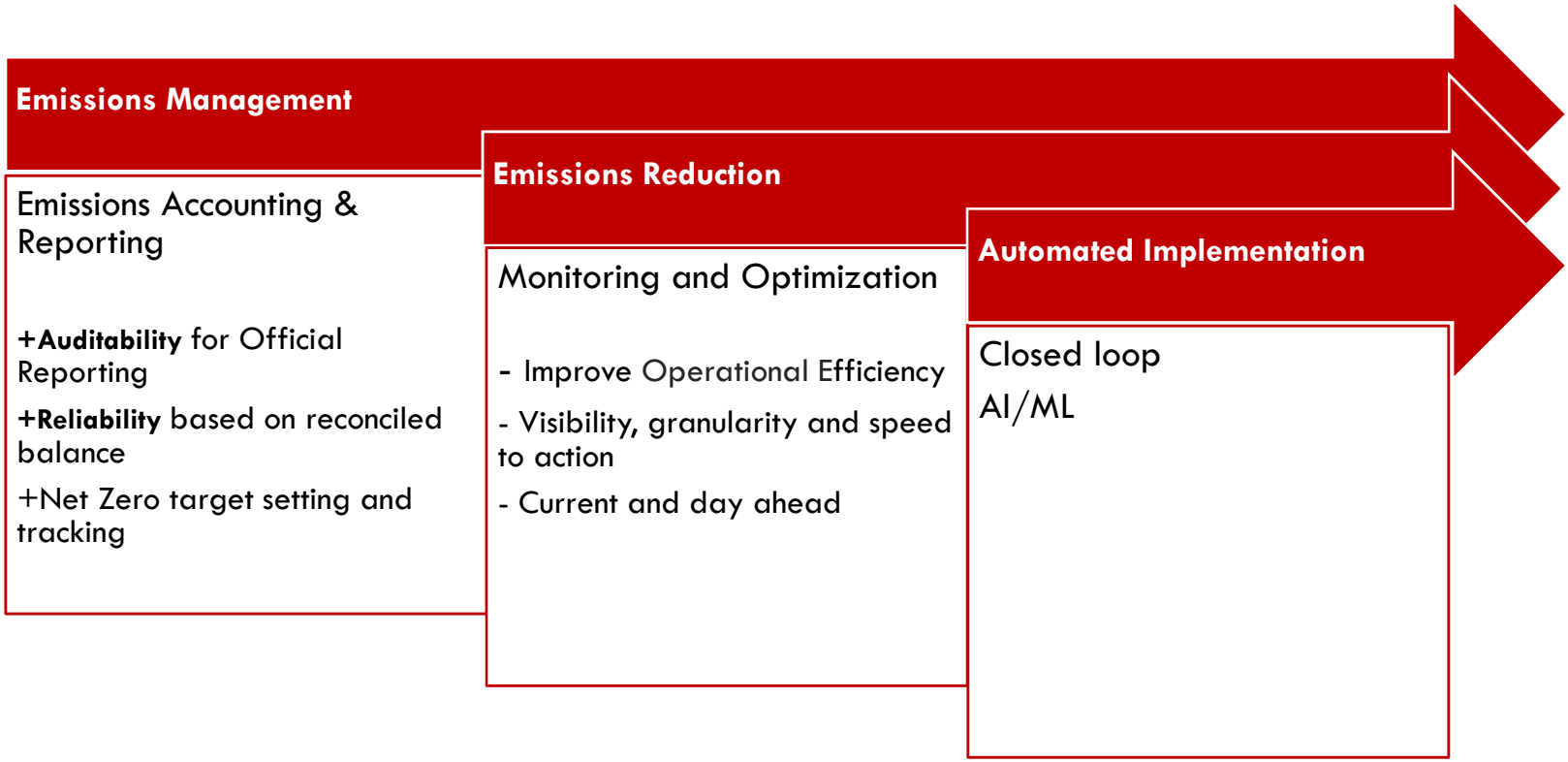
Reduces future expenditure for strategies such as electrification or carbon capture

THE A-Z OF ENERGY MANAGEMENT

KBC UNITES THE WORLD LEADERS IN ENERGY SUPPLY, DEMAND AND RE-USE TO PROVIDE A COMPLETE SOLUTION



KBC GHG REDUCTION DIGITAL PATHWAY



WE ACHIEVE THE DIGITAL PATHWAY WITH OUR DIGITAL TWIN TECHNOLOGIES

Digital Twin concept is based on the idea that a digital informational construct about a physical system could be created as an entity on its own [1]

- This digital information would be a "twin" of the information that was embedded within the physical system itself and be linked with that physical system through the entire lifecycle of the system

KBC/Yokogawa digital twins:

- Petro-SIM® (Process Digital Twin)
- Visual MESA® Energy Management System (Energy Digital Twin)

Petro-SIM®

VISUALMESA® energy management system

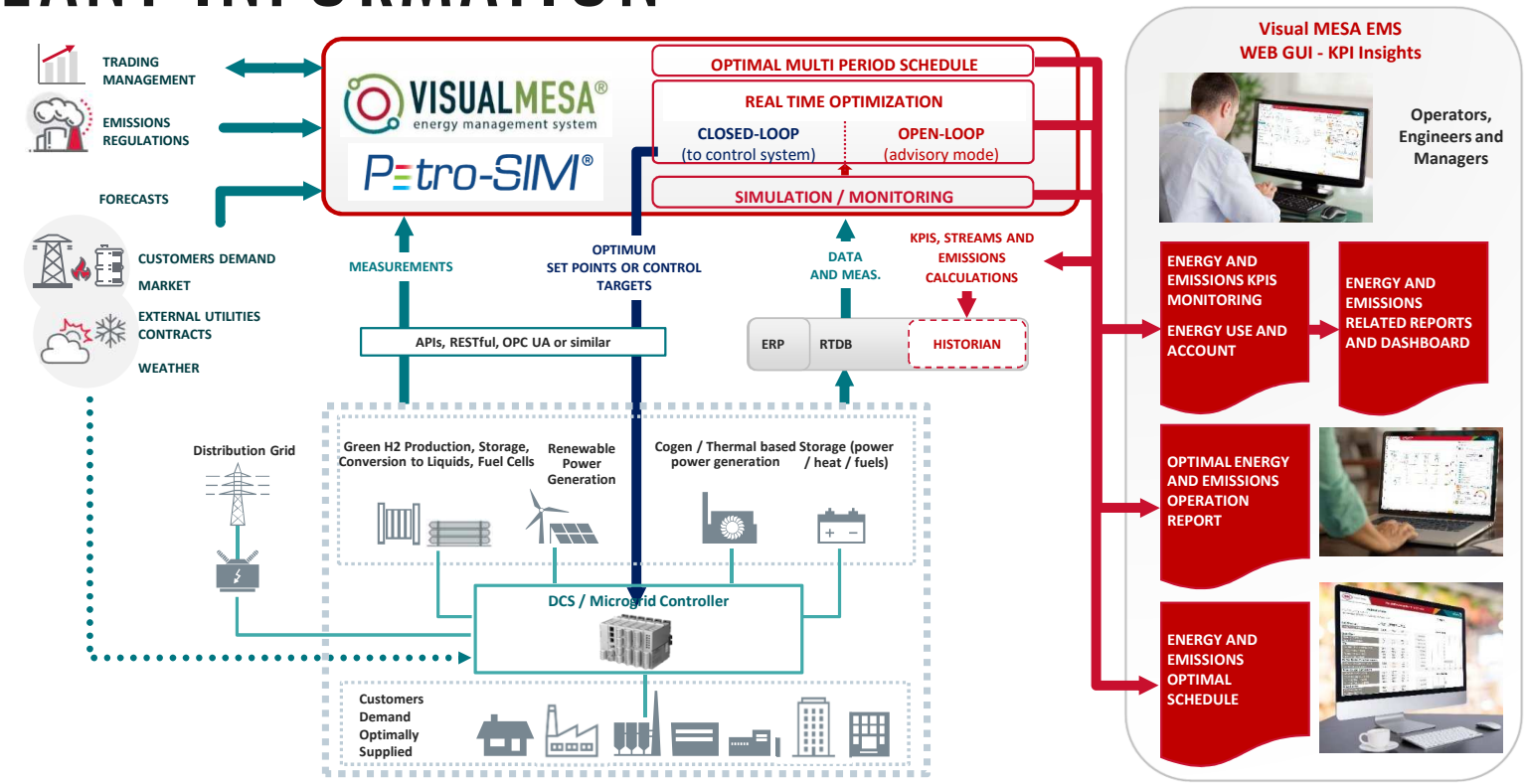
References:

(1) *Origins of the Digital Twin Concept, 2016, M. Grieves and J. Vickers, https://www.researchgate.net/publication/307509727_Origins_of_the_Digital_Twin_Concept*

INTEGRATED SOFTWARE PLATFORM: VISUAL MESA AND PETRO-SIM DIGITAL TWINS

Plus KBC's Process Energy and Emissions Consulting

INTEGRATING DIGITAL MANAGEMENT WITH YOUR PLANT INFORMATION



VISUAL MESA ENERGY MANAGEMENT SYSTEM

It is a computer program based on first principles

It is designed to model, optimize and monitor energy systems

- Fuels, power, steam, water, condensates and hydrogen
- Emissions
- External utilities contracts

It runs with live plant data

It can be operated in Open Loop or in Closed Loop

- Optimum set points are sent to DCS in closed loop mode

It is also used to optimize scheduling of energy system operation

It is considered an Energy Digital Twin

ARE YOU MANAGING ENERGY KPI'S EFFECTIVELY?

Most high level metrics (KPI) are straightforward to define

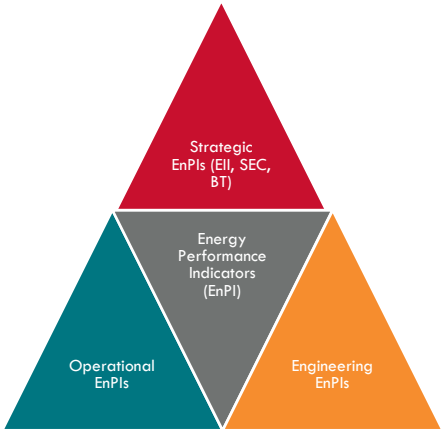
- Example: Specific consumption, efficiency

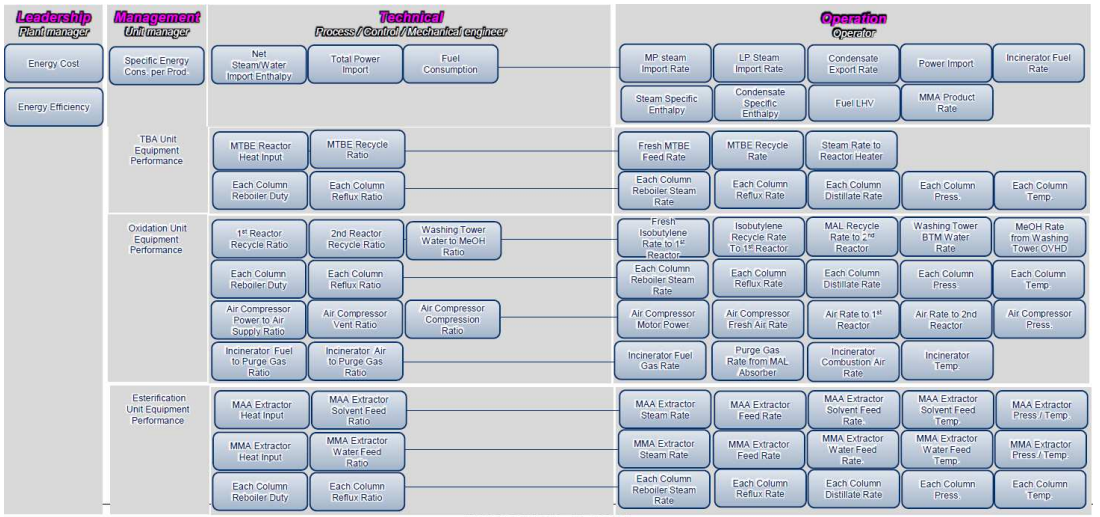
Energy Influencing Variables (EIV) are challenging to correlate to KPI

- Need process simulation (Petro-SIM) in some cases
- Need Deep Process/Energy Knowledge

Lost opportunity calculation $/h – Key driver to include in any monitoring system

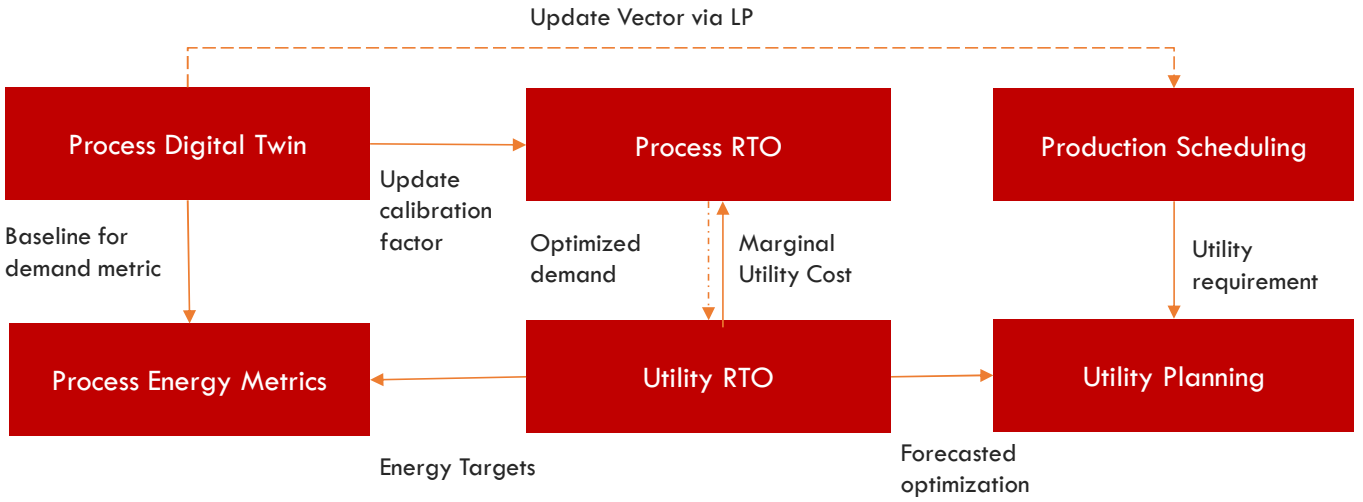
Petro-SIM Process Model derived target setting for optimum energy use while meeting quality requirements





OPTIMIZING THE SITE AS A WHOLE

Supply Side Optimization need to work hand in hand with Demand Side Energy Management to provide full benefit of Cost and Emission Reduction for the complex



CONCLUSION

A digital twin based energy management system is required to manage the complex process/energy interactions in a hydrocarbon processing plant

Energy Management needs to take care of both the energy supply and energy demand optimization, and bridge the gap between the Environmental team and Energy Improvement team.

The KBC solution enables you to:

- Uncover deeper savings faster
- Achieve “true” site wide operational energy efficiency across demand/supply
- Bring engineering analysis to consistent operators’ action
- Improve engineers’ productivity
- Create a platform for Industry 4.0 technologies to thrive

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