

Energy Management: Competence & Implementation

Presented By

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1st Energy Management Conference - Bahrain

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Introduction

- What is Energy Management ?
- Why Do It ?
- Implementation
- Competence
- Other Issues
- Framework for Success
- Questions

What is Energy Management ?

- Planned and Implemented Measures
 - Use minimum possible energy while meeting the true needs of facility;
- To save and/or make efficient use of energy through:
 - Energy Conservation
 - Energy Recovery
 - Energy Substitution.

Why do Energy Management ?

- Reduce Costs,
 - Utility Costs
 - Non-Energy Related Costs (i.e. O&M)
- Improve Revenues;
 - Improved Plant Utilisation
 - “Re-invest” Savings in New Processes
- Control Risks.
 - Control of Emissions / Reduce CO₂
 - Reduce Exposure to Market Volatility

Financial Impact

\$1 Saved = \$1 Operating Profit

Example:

Unit/Product Price = \$50

Profit Margin = 10%

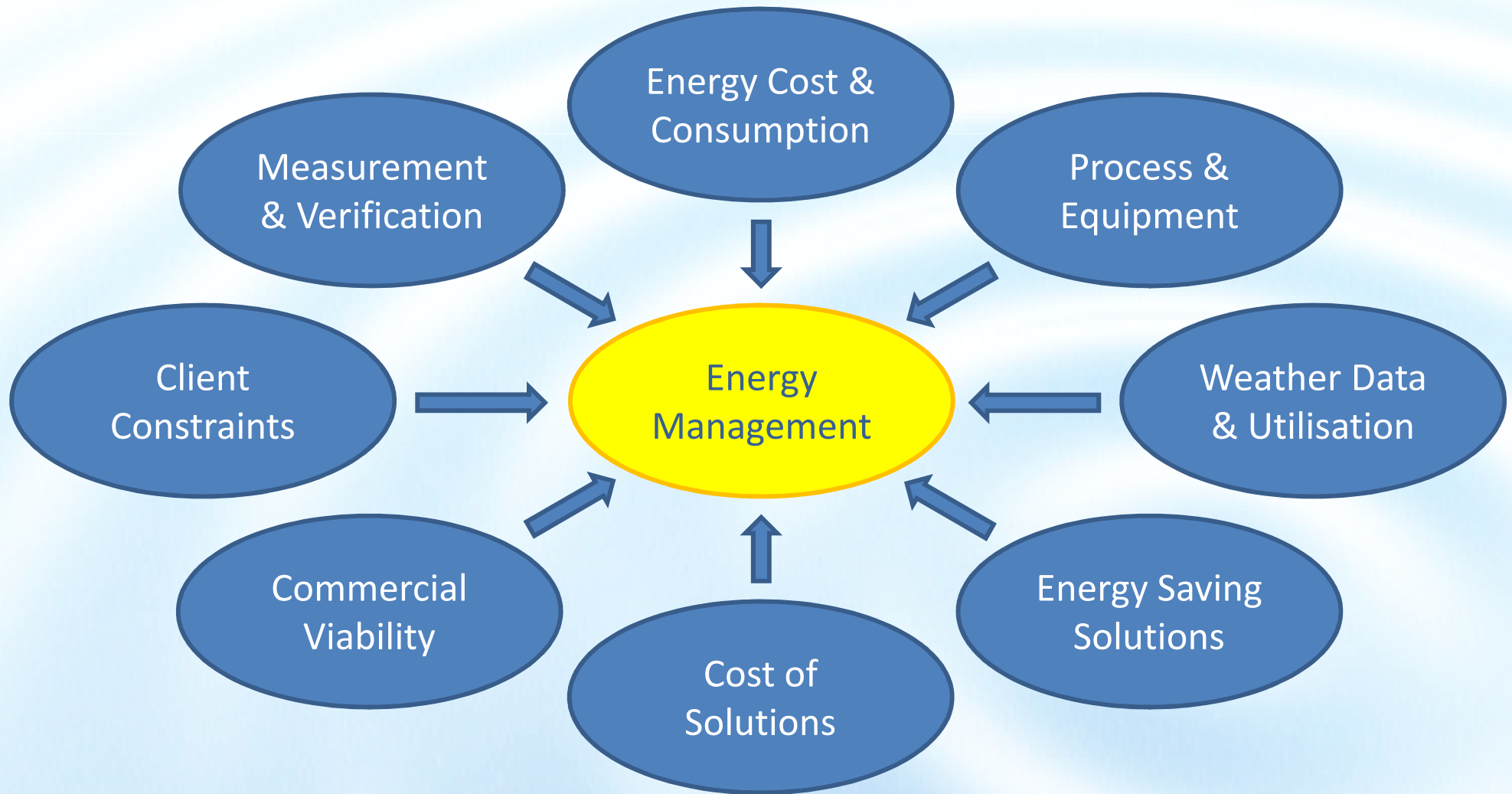
If Energy Saving = \$100,000 then:

$$\frac{\$100,000}{10\%} = \$1,000,000 \text{ Revenue Equivalent}$$

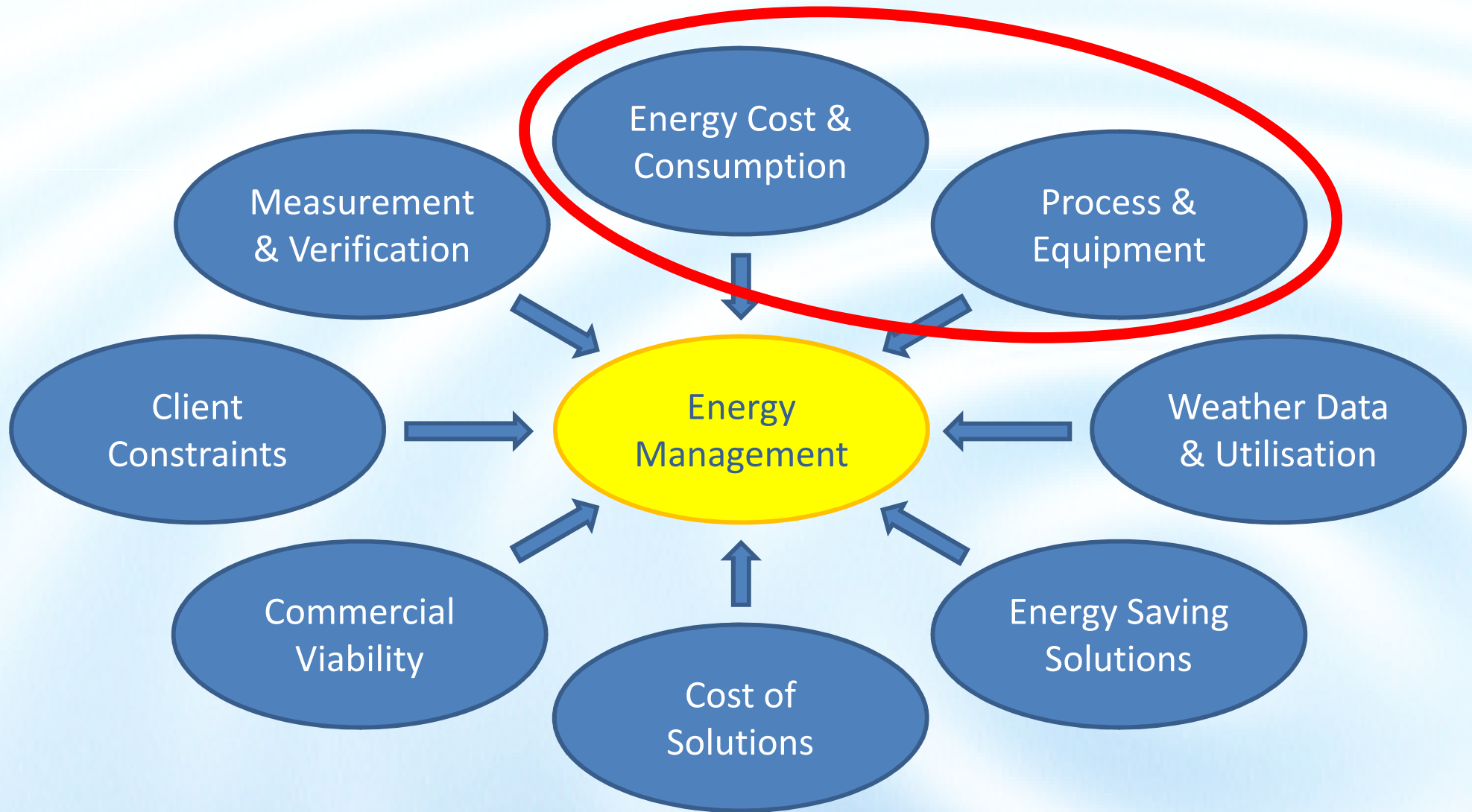
**Saving \$100,000 has the same impact
as selling 20,000 more units.**

Implementation

Key Considerations



Key Considerations



Cost, Consumption & Process

- Energy Costs
 - Cost/kWh
 - Higher unit cost = Greater possible savings
- Energy Consumption
 - Identify how much of each being used
 - Identify when being used
- Process & Equipment.
 - Identify where being used
 - Identify how being used

Typical Systems



Dwellings

- Lighting
- Cooling (Splits)
- Water Heaters
- Dom. Appliances
- Insulation/Fabric
- Glazing
- Heating (N-Hemi)



Commercial

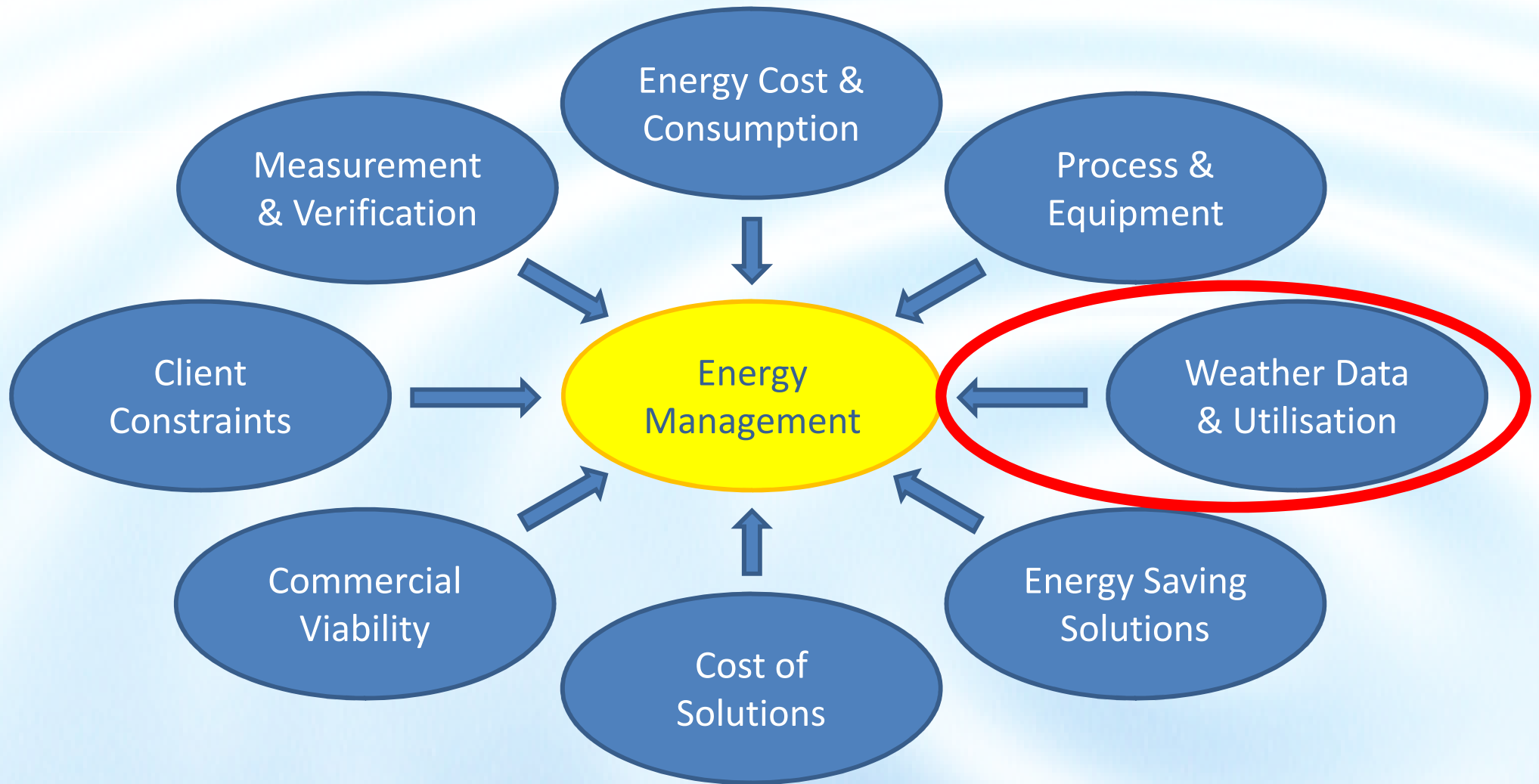
- Lighting
- AHUs & Ventilation
- Cooling / Chillers
- Hot Water Services
- Lifts / Escalators
- Office Equipment
- IT / Server Centre
- Controls / BMS
- Facade
- Heating (N-Hemi)



Industrial

- Lighting
- HVAC Systems
- Process Chillers
- Process Steam/Heat
- Compressed Air
- HWS
- Generators
- Controls / PMS
- Process Machinery
- Heating (N-Hemi)

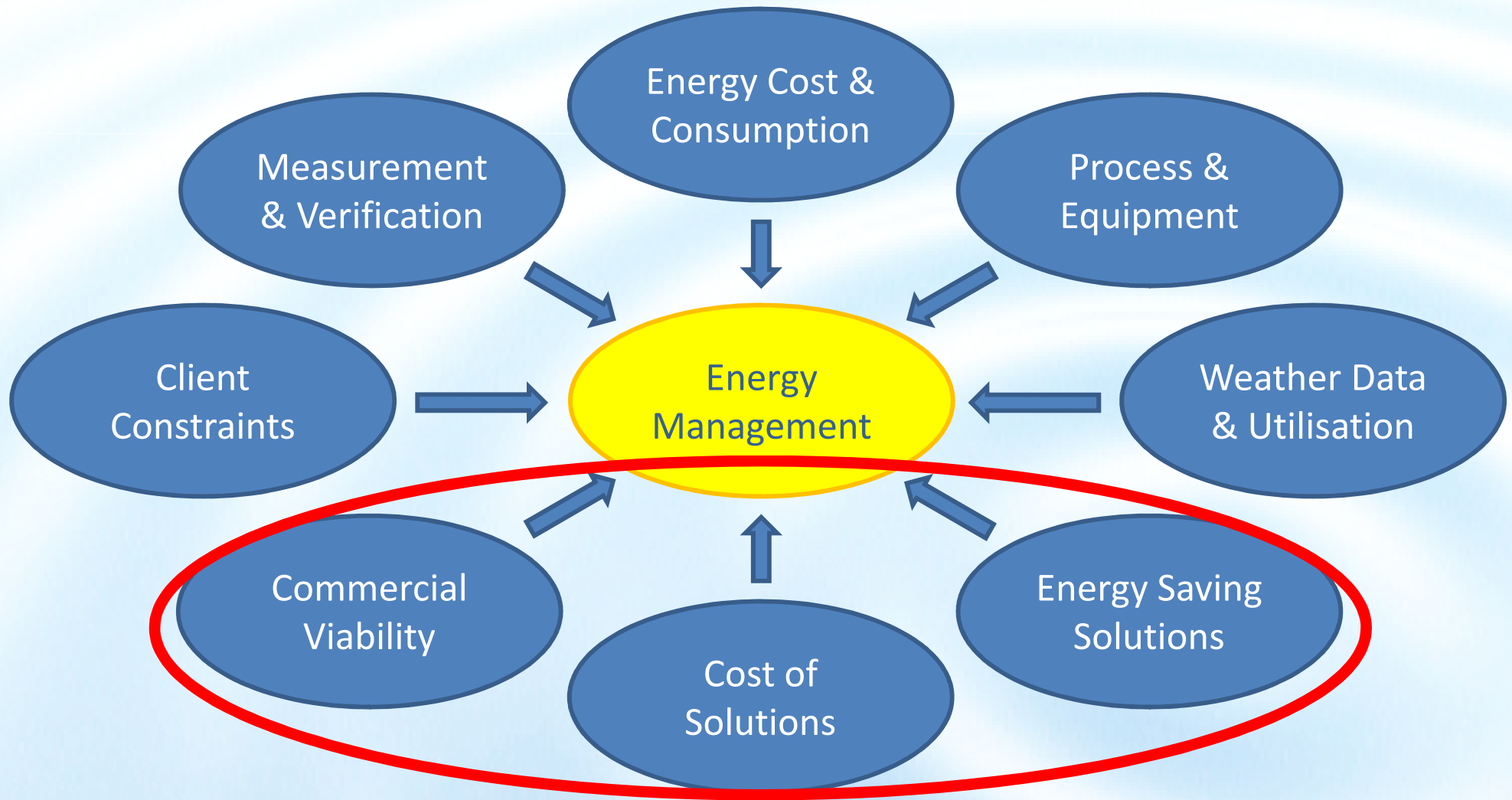
Key Considerations



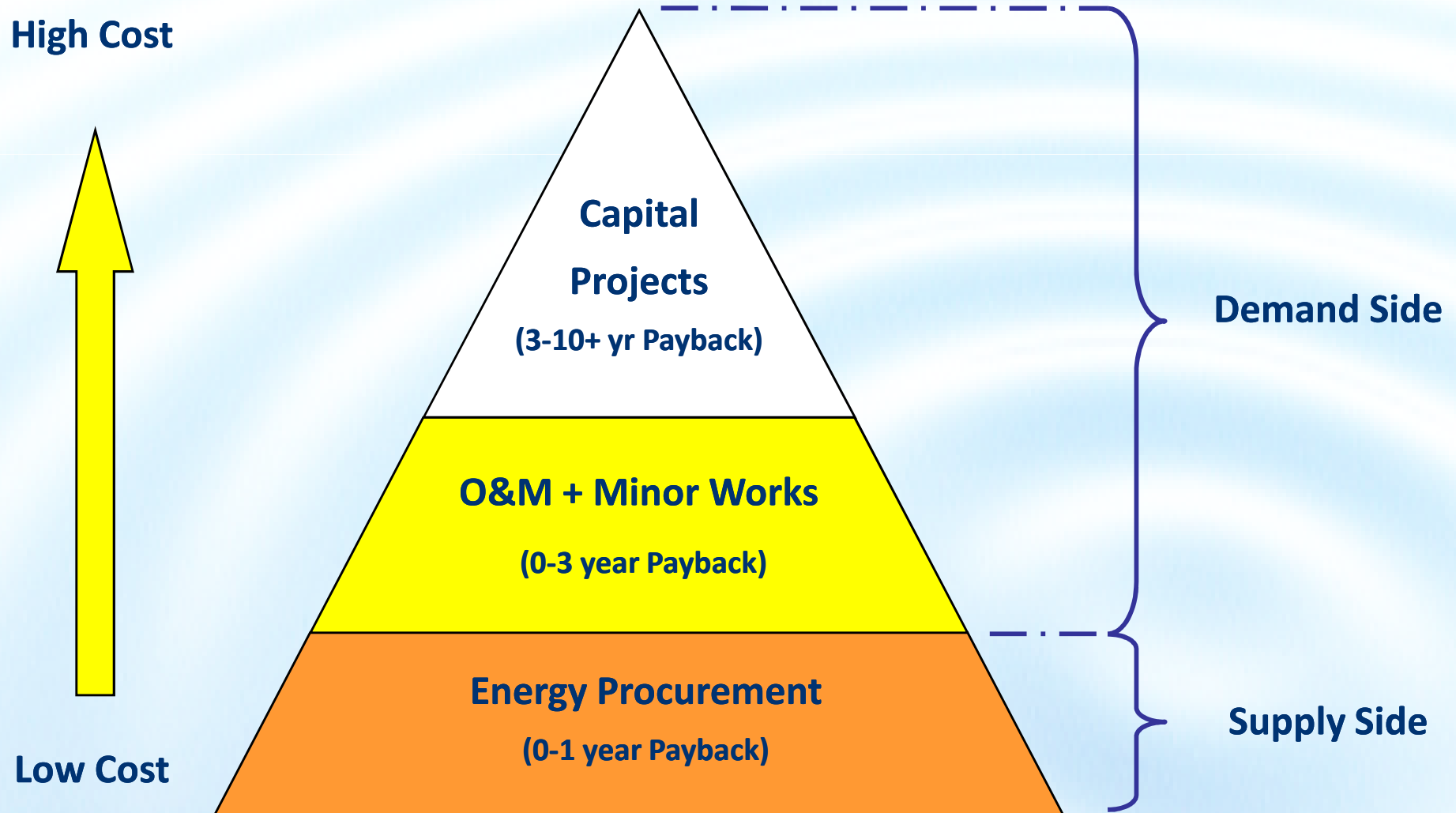
Developing a Baseline

- Degree Days
 - Typically @ 22°C (but can make own base temp.)
 - Readily available on internet (most locations)
- Solar Data
 - Major impact on Energy Consumption
 - Not readily available (for GCC)
- Industrial / Production.
 - Utilities Consumption
 - Production Output

Key Considerations



Cost Benefit Ratio



Energy Saving Solutions

- No / Insignificant Cost,
 - Review Energy Supply Contracts
 - Energy Usage & Reduction Awareness Programme
 - Perform Energy Survey
 - Review Design & Operation Parameters
- Low Cost (*Requiring Little or No Design Change*),
 - Consumables Replacement
 - Optimisation of Plant & Equipment
 - Energy Usage Monitoring & Targeting
- Medium Cost (*Requiring Some Investment and/or Design Change*);
 - Energy Recovery Systems and Plant Optimisation
- High Cost (*Requiring Significant Investment and/or Design Change*).
 - Plant & Equipment Renewal and/or New Installation

Solution Examples

- Low Cost,
 - Use Low-Energy Light-fittings when Replacing Lamps
 - Re-commission and Set-up Systems (i.e. Hydraulic Balancing of HVAC)
 - Install Motion Sensors to Lighting Control or Time Clocks for External Lights
 - Installation of Variable Speed Drives on Motors
- Medium Cost;
 - Building Management or Plant Management System Installation
 - Thermal Recovery Wheels on Air-conditioning Systems
 - Heat Recovery/Run Around Coils etc. (i.e. AHUs, Compressed Air etc.)
 - Boiler Economisers, Condensing Economiser
- High Cost.
 - Check/Replace/Update Building Fabric (Cladding, Windows etc...) Installations
 - Co-generation Plant Installation
 - Renewable Energy Plant Installation (i.e. Bio-gas, Wood, Solar etc...)
 - Overnight Cooling /Ice Storage

Viability Example

Medium Cost Project

Cost = \$400,000

Saving = \$200,000

Payback = 2 years

High Cost Project

Cost = \$3,000,000

Saving = \$1,000,000

Payback = 3 years

Commercial Viability

Payback & Internal Rates of Return		DO the Project if your cost of borrowing is lower than this IRR					
Simple Payback (Years)	8						0%
	5					0%	12%
	4				0%	8%	13%
	3			0%	13%	20%	29%
	2		0%	23%	35%	41%	48%
	1	0%	62%	85%	93%	97%	100%
Equipment Life, or Project Timescales (Years)		1	2	3	4	5	8

SOURCE: U.S. EPA: "Putting Energy into Profits"

Assuming 5 year Period

Medium Cost Project

Cost = \$400,000

Saving = \$200,000

Payback = 2 years

Return = 41%

Total Saving = \$1m

High Cost Project

Cost = \$3,000,000

Saving = \$1,000,000

Payback = 3 years

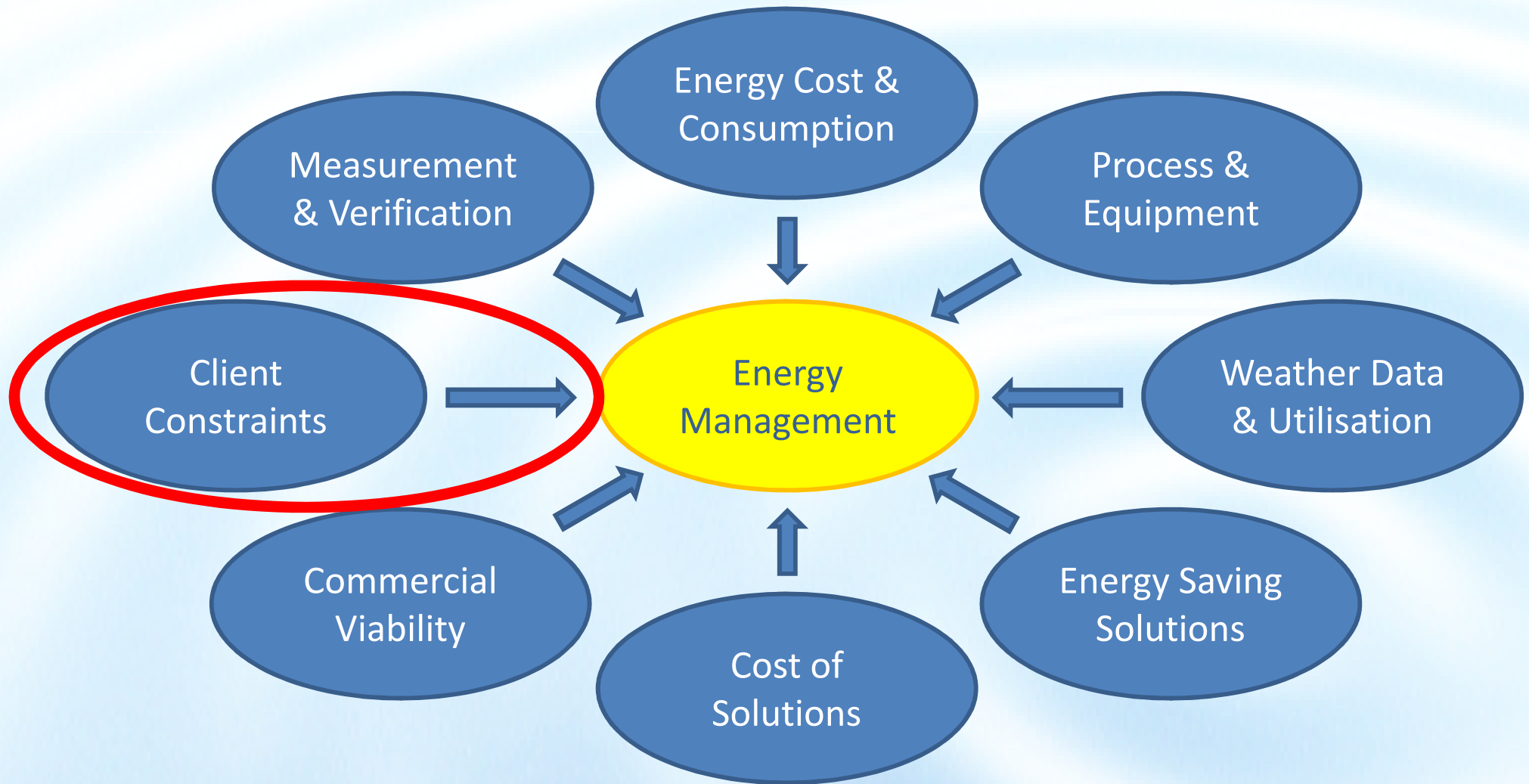
Return = 20%

Total Saving = \$5m

Selecting Solutions

- Implement 'No Cost' Options First
- Select Optimum Combination of Actions
- Multiple Action Savings are NOT always added
- Cumulative Savings on inter-dependent actions must be assessed CAREFULLY...!!
- Do NOT prioritise from 'Low Cost' to 'High Cost'

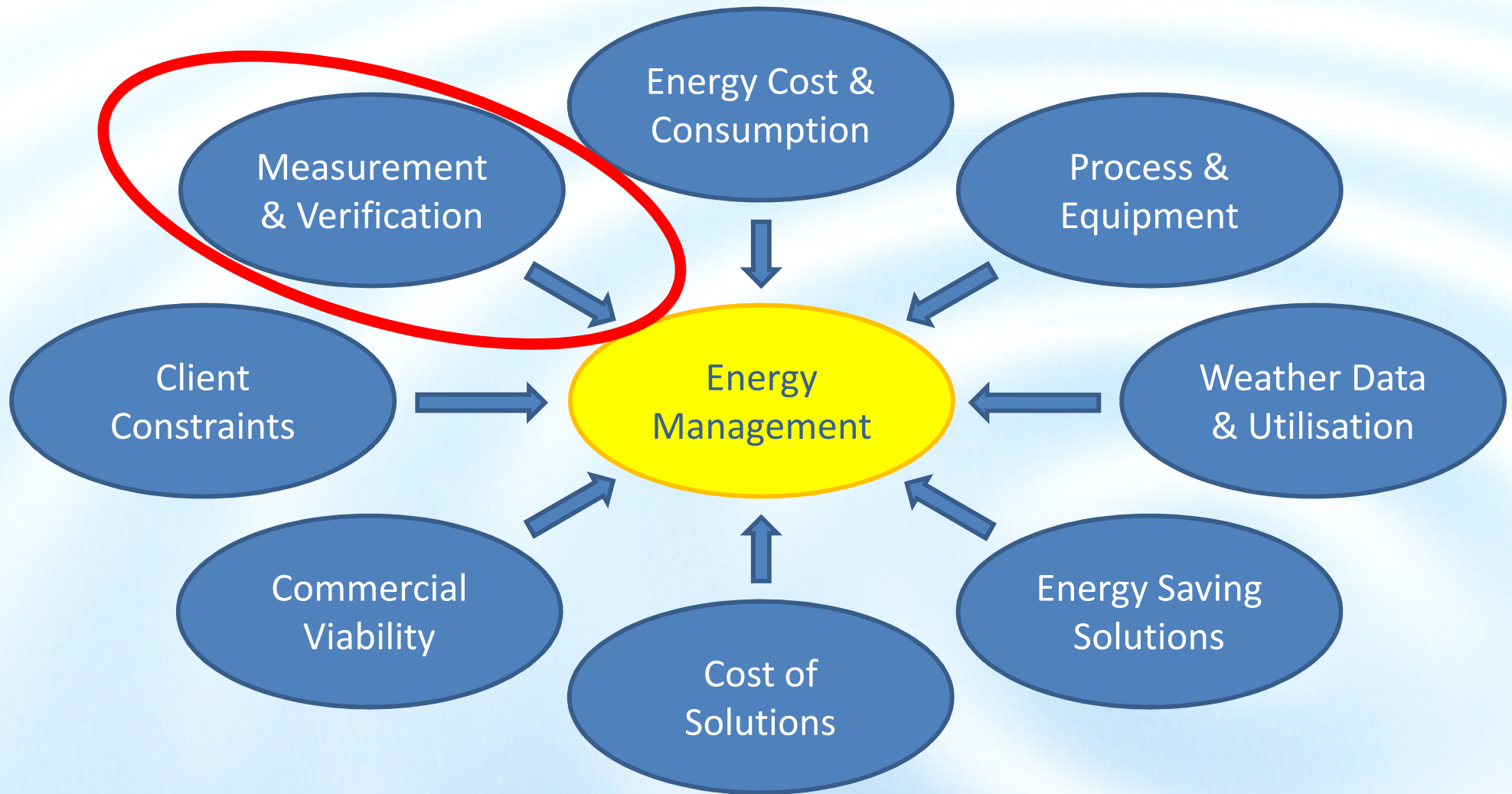
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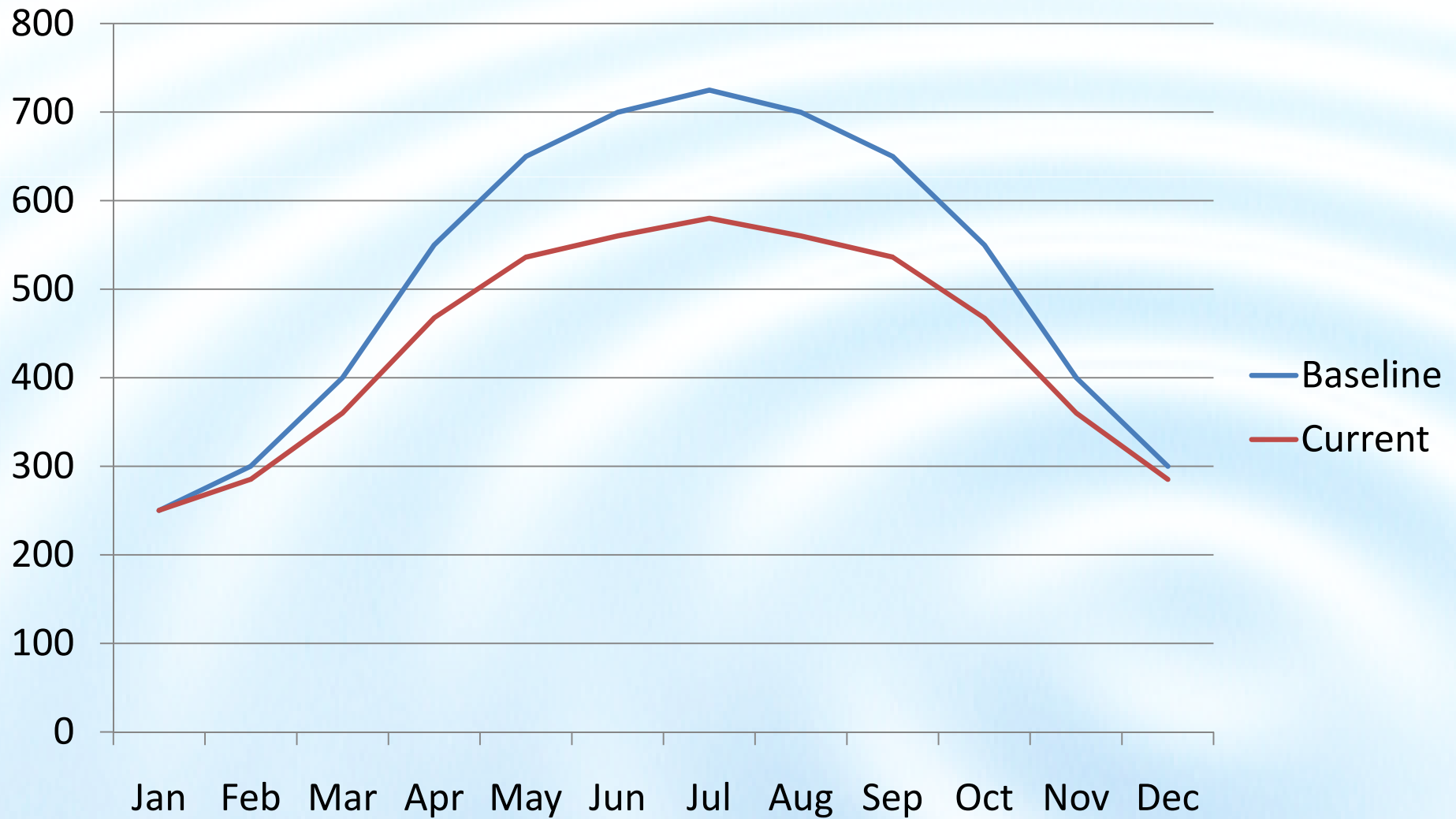
Client Framework

- What is our Future at this location?
- What are the limitations of the facility?
- Are there any legal/technical restrictions?
 - Specific Business Objectives / Issues
 - Are we allowed to generate our own electricity?
 - Is there an open Electricity Market ? ... etc.
- What Energies do we use & how do we buy?
- What are our investment & borrowing criterion?

Key Considerations



Measurement & Verification



Measurement & Verification

- Measure “Current” Against “Baseline”
 - Check against any Sub-Metering,
 - Check against Utility Bills;
- Correct “Current” for:
 - Outdoor Weather Conditions (Solar, Degree Days etc.)
 - Internal Usage (Change in Occupancy, Equipment etc.)
 - Changes in Production (Output, Machinery etc.).
- Key Importance:
 - Measuring Performance / Results
 - Return on Investment
 - Sharing Savings

Competence

Developing the Strategy

$$\text{STRATEGY} = \text{TECHNICAL} + \text{COMMERCIAL}$$

- Technical:
 - Energy Usage & Cost
 - Systems & Efficiencies
 - Baseline Calculations
 - Prospective Solutions & Savings
- Commercial:
 - Client Requirements/Limitations
 - Investment & Borrowing
 - Future Projection/Business Plans
 - Solution Selection & Mix

Skill Sets Required

- Technical,
 - Energy Consumption Modelling
 - Developing Solutions, Costs & Savings
 - Develop Scope of Works
 - Installation / Project Management
 - Measurement & Verification
- Commercial.
 - Define Client Requirements
 - Select Optimum Solution(s)
 - Select Delivery Methods (ESCO, In-house, etc.)
 - Tender and/or Contract Documents

Professional Expertise

- Professional Engineers,
 - Chartered Energy Manager (Energy Institute)
 - Certified Energy Manager (AEE)
- Developing Engineers.
 - Degree/Masters in Energy /Energy Management
 - Training & Experience
 - Continuous Professional Development
 - Development Path to Professional Engineer

Other Issues

- Expertise in GCC Market,
- Solar Data (& Degree Days Data),
- Contractual Issues,
 - Consultancy Fee
 - Shared Savings
- ESCOs,
- Contract Energy Management;
- Impact of O&M of Facility.

Framework for Success

- Energy Managers/ESCO Register,
 - Set minimum standards for Consultants & ESCOs
- Model Contracts,
 - Consultancy, Shared Savings etc.
- Data & Resources;
 - Standardised Solar/Degree Day Data
 - Benchmarks
- Develop Client Competence.
 - Selecting Partners / Consultant
 - Implementing Contracts
 - Reviewing Recommended Solutions / Projects
 - Measuring Performance
 - Benchmarking & Reporting

Questions ?

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