Energy Planning

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Towards an International Energy Management Standard – ISO50001

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Introduction

- Detailed look at the planning part of an EnMS
- This is the setting up of the main part of your system
- Remember the purpose is to improve energy performance, i.e. to save energy

A few words on Policy

- The first step is to develop a policy
  - It can be revised once more information is available
- Defines what the EnMS is supposed to achieve
- It is key responsibility of the top management to define the energy policy and ensure adequate resources to achieve set objectives and targets
- The direct involvement of top management in setting an organization's energy policy is a prerequisite for the success of the energy management system

Integrated Environmental Policy

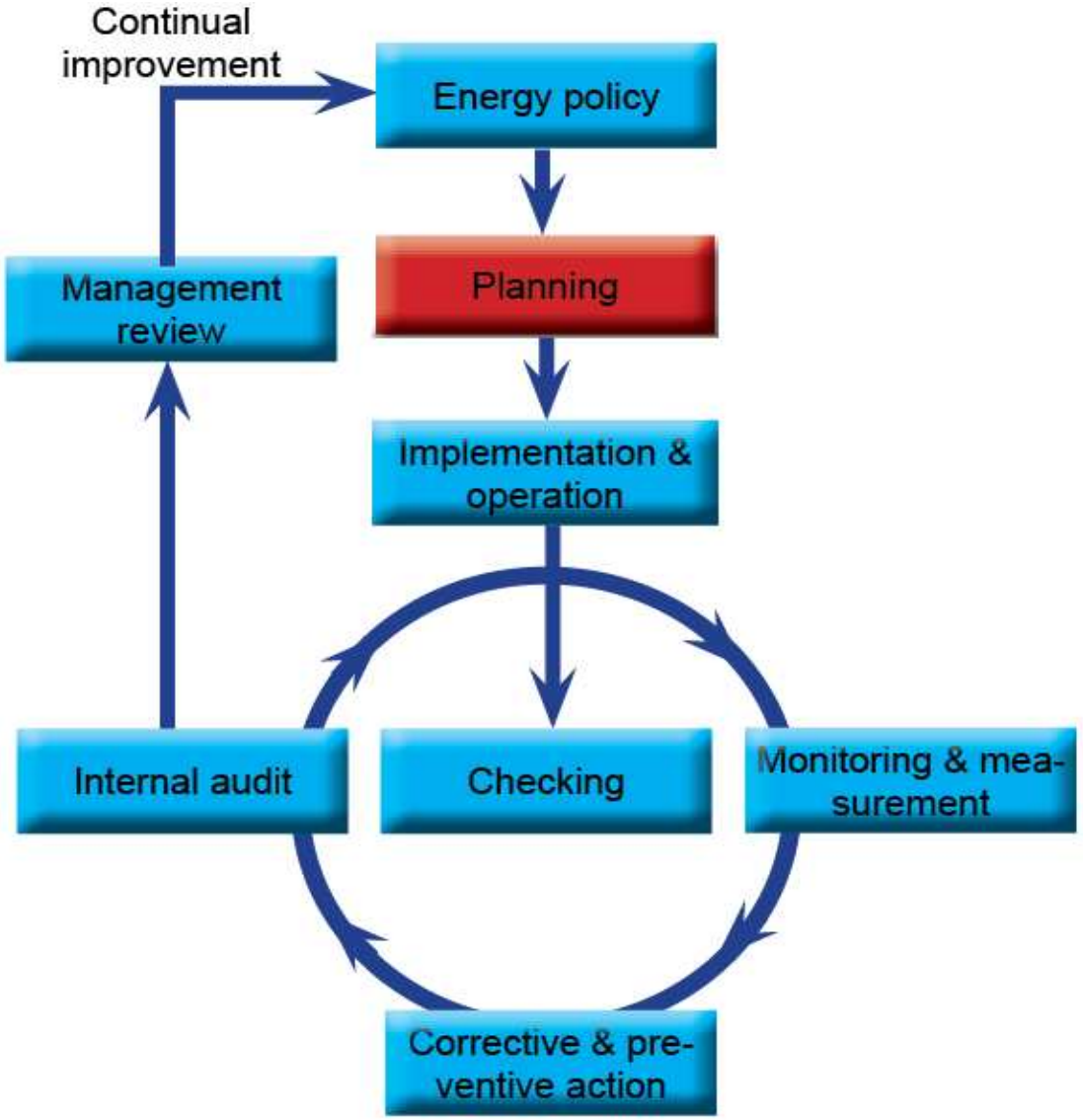
Intel Ireland Environmental Policy 2008

Intel Ireland Limited comprises of the semiconductor integrated circuit manufacturing facilities – Ireland Fab Operations (IFO) and Fab24.
Intel Ireland is committed to achieving a high standard of environmental performance. To fulfil this commitment, Intel will:

- Comply, as a minimum, with all applicable regulatory requirements.
- Maintain focus on our ISO14001 Environmental Management System (EMS) and our IS393 Energy Management System and continually improve our environmental and energy performance by regular auditing of our systems and by working towards the Objectives and Targets set down in our Environmental Management Plan (EMP).
- Promote pollution prevention technology to conserve natural resources and minimise emission loads to air, land and water.
- Proactively engage in early research and development to incorporate energy efficiency, materials elimination, substitution, minimisation and to continue reducing our waste by maximising recycling on site.
- Ensure that the operational controls we have in place to manage our environmental and energy systems are safe, effective and robust and, by minimisation of energy use, reduce greenhouse gas emissions in line with Intel's Climate Change Policy.
- Develop environmental responsibility across all levels of our organisation through awareness and training programs, and encourage all our employees to act as advocates for Intel Ireland's commitment to the environment and energy efficiency.
- Require contractors, sub-contractors, designers and suppliers engaged with Intel to apply environmental and energy standards compatible with our own.
- Work with regulatory agencies, the local community and our employees to ensure that we identify and address emerging areas of environmental concern.
- Allow this policy to be readily available to customers and to members of the public.

Jim OHara	Eamonn Sinnott	Joe Foley	Ann Kelleher	Shane Maccarvill
General Manager Intel Irl IFO Plant Manager & Vice President TMG	F24 Plant Manager	IFO Factory Manager	F24 Factory Manager	Corporate Services Manager

Caring for our Environment — Environmental Department



Planning - PLAN

- How much energy am I using?
- Where am I using it?
- Who is influencing use
- Which are significant?
- What is driving it?
- Legal requirements?
- Develop baseline(s)
- Develop indicators
- Objectives
- Targets
- Action Plan

Energy performance improvements from EnMS

- Identify and focus on significant users
- Identify and focus on significant people
  - Training
- Focus on data and numerical methods
- Energy Performance Indicators (EnPIs)
- Integrated approach
  - People
  - Departments
  - Budgets
- It is all about saving energy!

Note

- Once significant energy users are identified they become a major focus for all other activity:
  - EnPIs
  - People and training
  - Targets and action plans
  - Monitoring
  - Operating parameters
  - Instrumentation and measurement
  - Internal audit

What is planning?

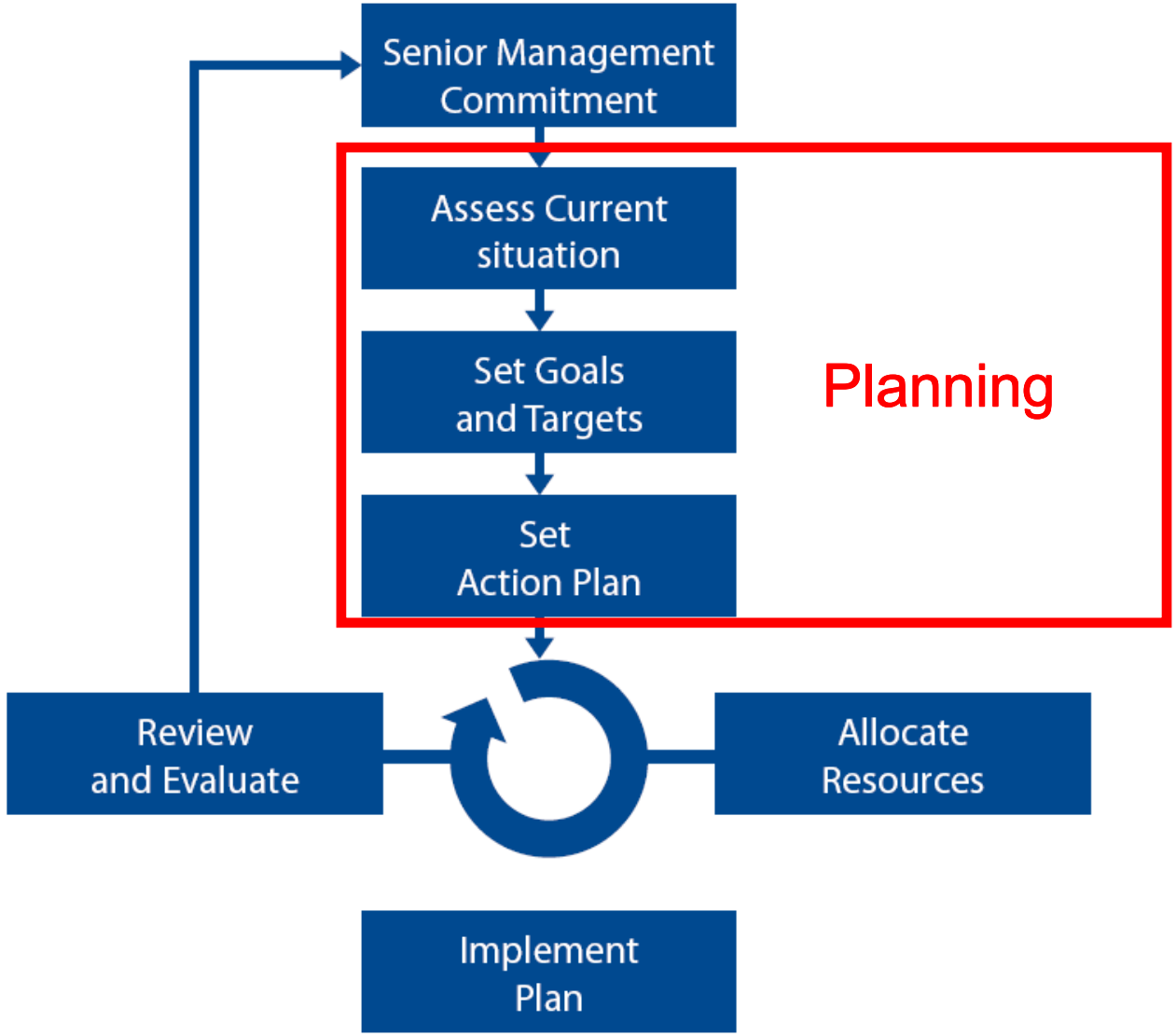
We have a policy with management support, resources, strategic direction and committed team members

We now want to translate this policy into an

action plan

for improved energy performance

Another View

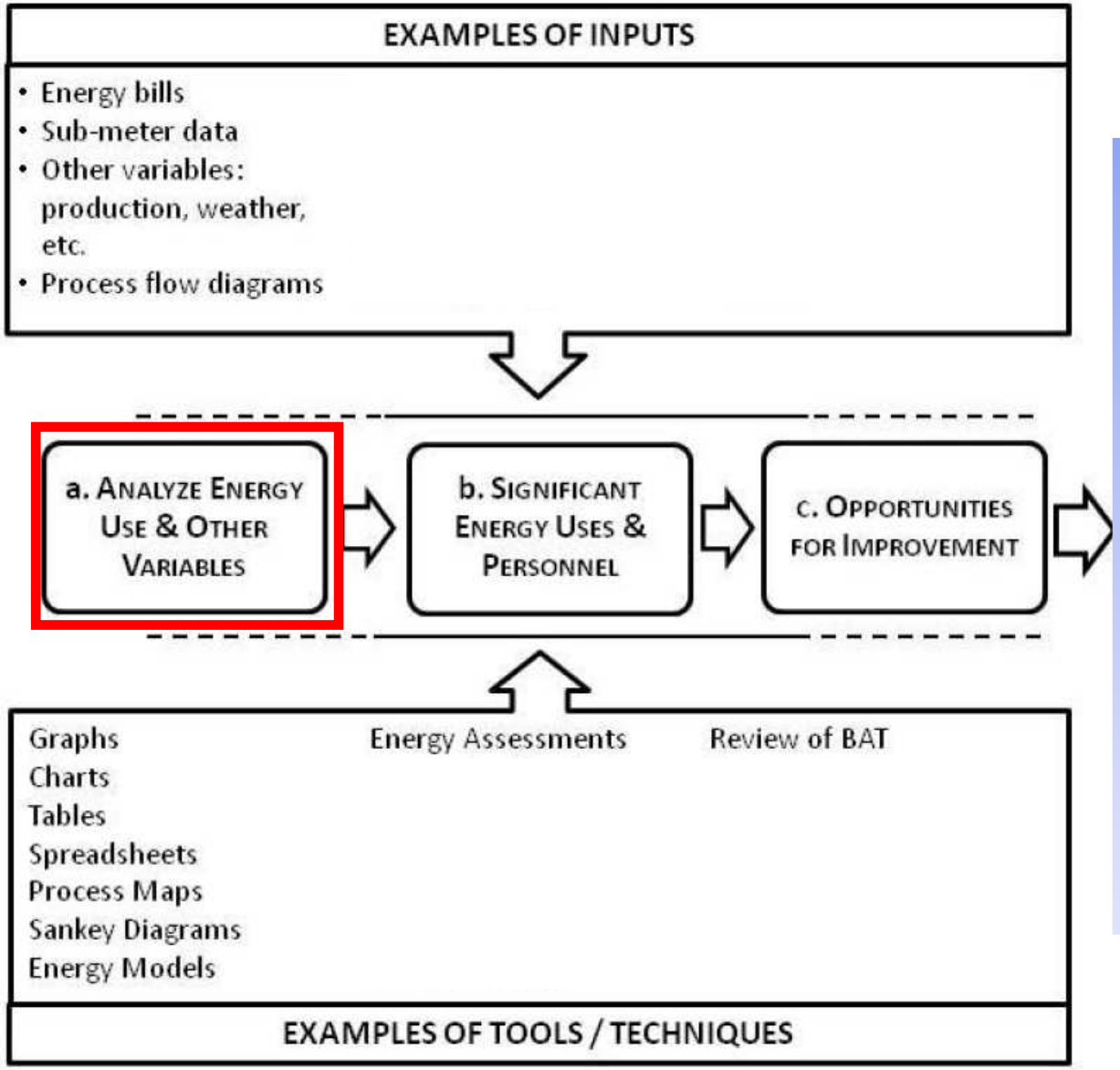


- Planning is the transformation of policy into an action plan
- The major part of planning will typically occur annually
- It does not need to be a huge effort
  - It can typically be completed in a few days or less even for a large organisation
  - More detailed Identification of opportunities (system approach) can take additional time/resources
- Some parts will be updated continuously
- Overarching purpose of EnMS is to improve performance
  - EnPIs will have to be established to demonstrate improvement or lack thereof
- Planning steps
  - Energy Review, Baseline, EnPIs, Objectives, targets and action plan

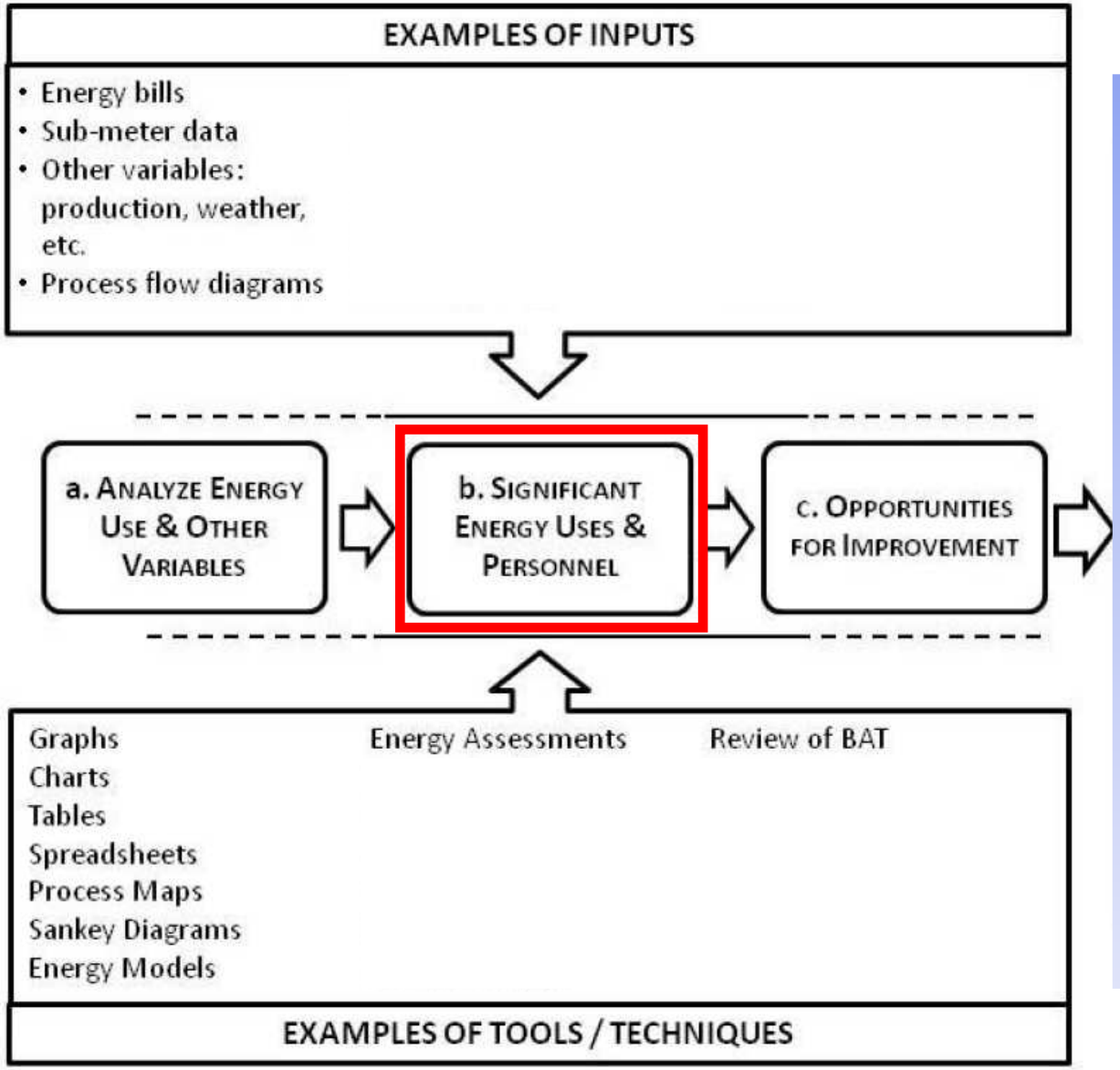
Legal and other requirements

- Regional, National or local laws or directives
- Corporate requirements
- Agreements programmes
- Customer requirements
- Emissions trading requirements

- Analyse requirements and plan compliance



- **Identify current sources**
- **Evaluate past and present use**
- **Estimate future use**



- **Identify significant energy users (SEU)**
  - Equipment
  - People
- **Identify relevant variables affecting energy use**
- **Determine current performance of each SEU**

EXAMPLES OF INPUTS

- Energy bills
- Sub-meter data
- Other variables: production, weather, etc.
- Process flow diagrams

a. ANALYZE ENERGY USE & OTHER VARIABLES → b. SIGNIFICANT ENERGY USES & PERSONNEL → c. OPPORTUNITIES FOR IMPROVEMENT

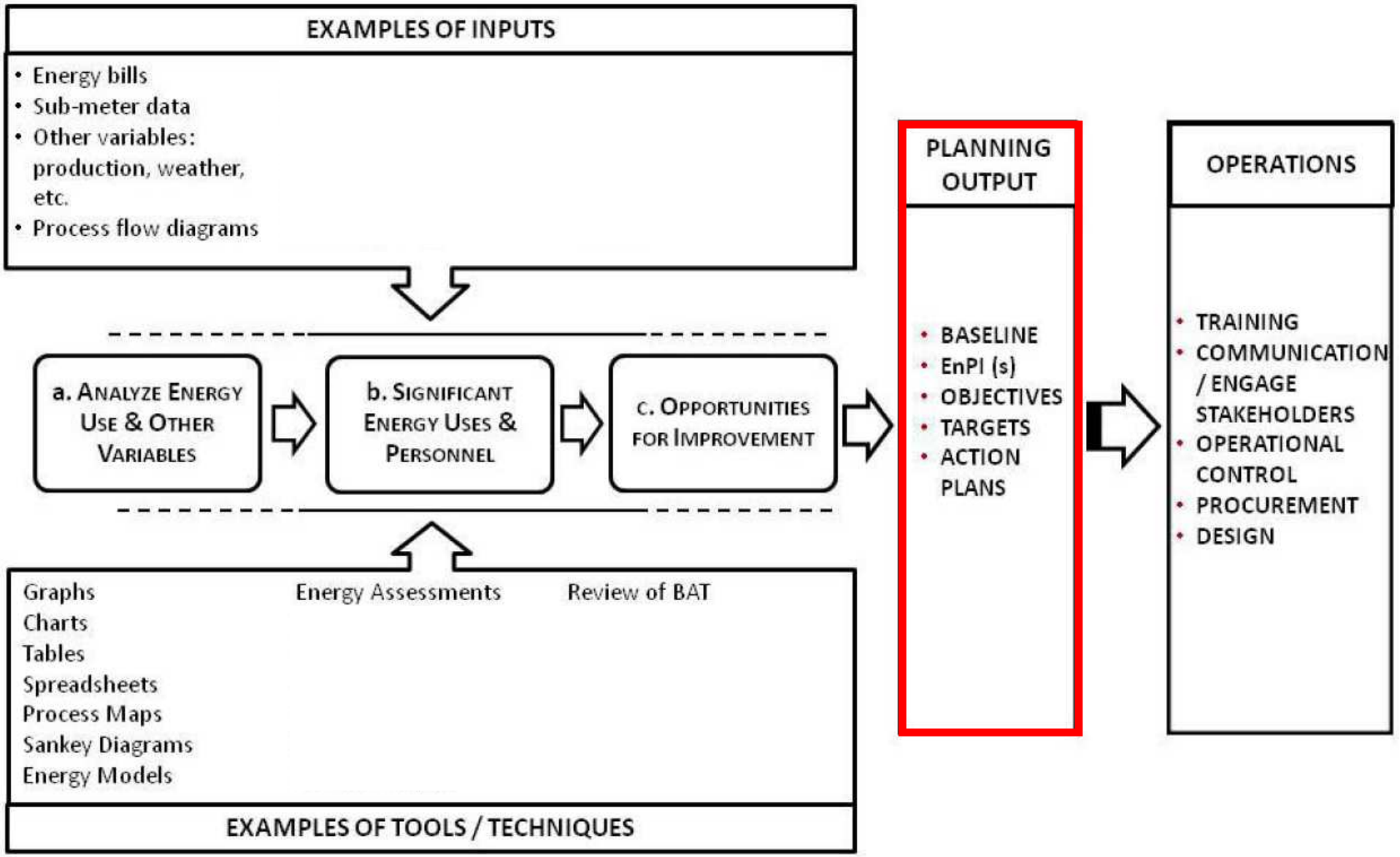
Graphs
Charts
Tables
Spreadsheets
Process Maps
Sankey Diagrams
Energy Models

Energy Assessments

Review of BAT

EXAMPLES OF TOOLS / TECHNIQUES

- **Identify**
- **Prioritise**
- **Record**
- **Where applicable:**
  - **Sources**
  - **Renewables**
  - **Alternative energy**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• Energy bills
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• Process flow diagrams
a. ANALYZE ENERGY USE & OTHER VARIABLES
b. SIGNIFICANT ENERGY USES & PERSONNEL
c. OPPORTUNITIES FOR IMPROVEMENT
PLANNING OUTPUT
• BASELINE
• EnPI (s)
• OBJECTIVES
• TARGETS
• ACTION PLANS
OPERATIONS
• TRAINING
• COMMUNICATION / ENGAGE STAKEHOLDERS
• OPERATIONAL CONTROL
• PROCUREMENT
• DESIGN
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Review of BAT
EXAMPLES OF TOOLS / TECHNIQUES

Significant users

- Try to account for at least 80% of energy use
  - Boilers
  - Refrigeration
  - Heating, Ventilation and Air Conditioning
  - Compressed Air
  - Pumping
- Focus most attention on these areas
- Don’t ignore easy savings in non-significant users

Significant people

- Utility Operators
- External service company technicians
- Internal maintenance staff
- Security
- Cleaners
- Fire and safety officers
- Managers, supervisors, leaders

Energy Baseline

- *"Quantitative reference as a basis for comparison"*
- They can either be in absolute terms e.g. GWh p.a. or relative e.g. kWh/$
- Baselines may need updating periodically
- EnMS is not a project with an initial baseline and a final success or failure
  - It is a continuous process

Energy Performance Indicators

- More detail in Checking
- We need a method to verify that we are actually improving performance
- Remember: What is energy performance?
- Beware of SEC, EE, EI, etc.

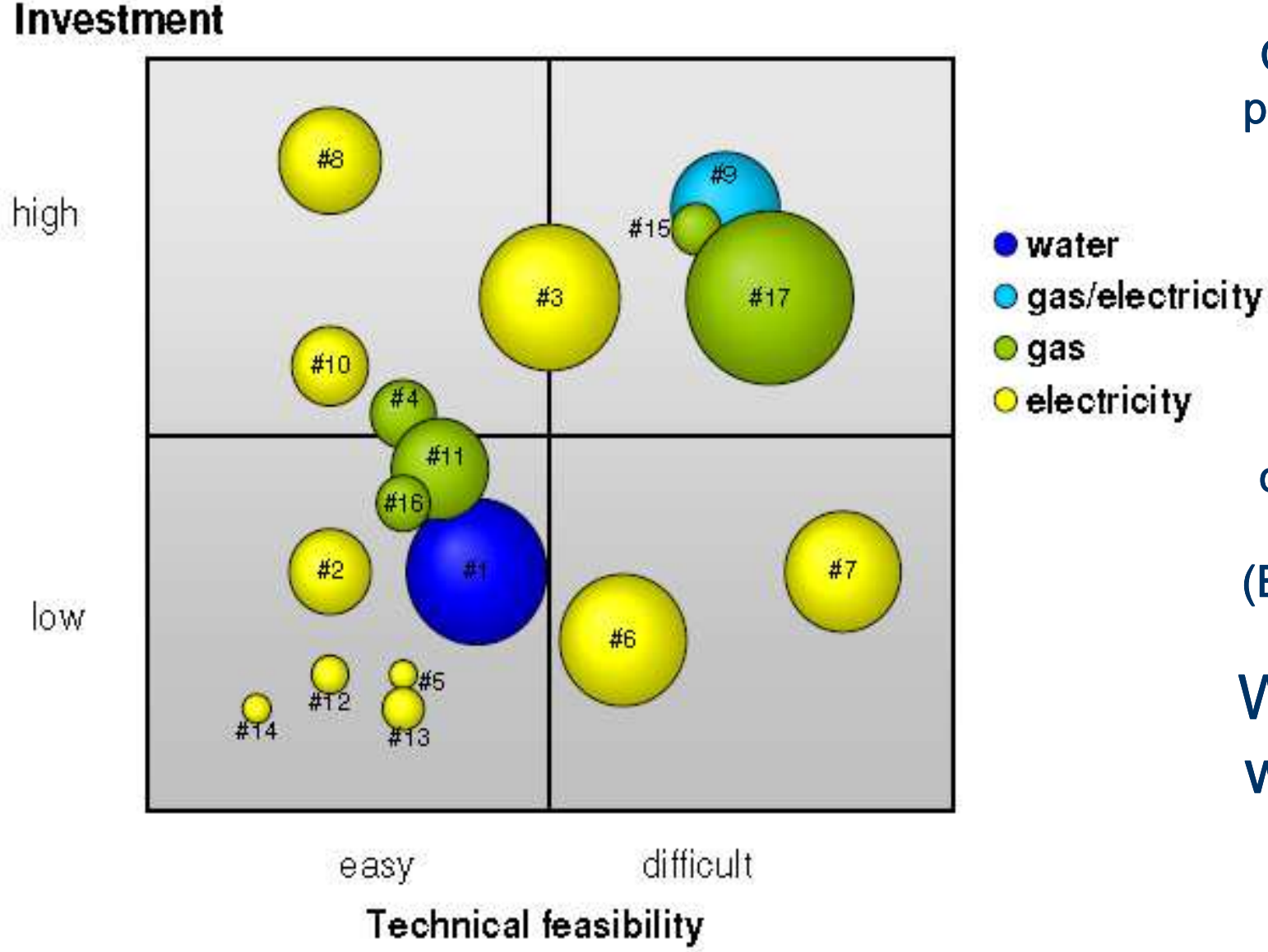
  - SEC = Specific Energy Consumption
  - EE = Energy Intensity
  - EI = Energy Intensity

Objectives

- We now know our organisation from an energy use point of view
- We need to set objectives for say, the next 3 years
- Focus on SEUs
- Objectives tend to be longer term
- Need not be absolutely specific
- Consistent with the energy policy
- Example: Deliver relevant energy training to all employees over the next two years

Targets (should be SMART)

- Specific
- Measurable
- Achievable
- Relevant
- Timed
- These are how the objectives will be achieved
- Example 1: Increase condensate return rate to 90% by the end of February
- Example 2: Complete 3 training modules for all boiler operators by the end of July



Circle size is proportional to financial savings in $ p.a.

is from energy conservation opportunity (ECO) register

Which one would you do first?

Possible higher priorities

- No cost with no technical, safety, quality or other risk
- Low cost (payback less than one year)
- High profile items which increase awareness (e.g. lighting) or demonstrate significant improvement
- Legal or other requirement

- Always based on the organisations normal work and investment criteria

Action Plan

ID	Description	Resp	Due	Status	Saving (kWh)	Saving ($)	Saving (CO2)
12	Fit VSD to boiler 1 FD fan	JB	01 December 2009	Idea			
17	Repair condensate leaks in operations building	BG	01 October 2009	Complete			
25	Train operators in condensate energy	BG	01 January 2010	In progress			
64	Reuse RO water for cooling tower make up	RT	15 November 2009	Idea			
68	Train refrigeration service company in our EnMS and their role	BG	01 October 2009	Overdue			
72	Complete annual corporate energy report	JB	31 December 2009	Idea			

Critical operating parameters

ID	System	Parameter	Limit	UOM
1	Refrigeration	Temperature lift	<40	^{o}C
2	Refrigeration	Distribution delta T	>3	^{o}C
3	Steam	Boiler TDS	3000 to 3500	ppm
4	Steam	Condensate return rate	>90%	%
5	Compressed Air	Distribution pressure	6 to 6.5	barg

Outputs

- Identified significant energy using systems
- Significant people
- Baseline
- EnPIs to track improvements and highlight issues
- Critical operating parameters
- Objectives, Targets and Action Plan
- Method to verify the results of the action plan
- Training Plan
- Predicted energy use for the coming period (year)

Notes

- In subsequent years you can go into more detail
  - You don’t have to be perfect in year 1

Thank you for your attention

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