MORE
RESOURCE EFFICIENCY FOR EUROPE

REAL-TIME MONITORING AND OPTIMIZATION OF RESOURCE EFFICIENCY IN INTEGRATED PROCESSING PLANTS

Improving resource efficiency – a step by step guide

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Motivation behind the guidebook

- Summarize the best practice for REI identification and implementation based on the lessons learned during the working process

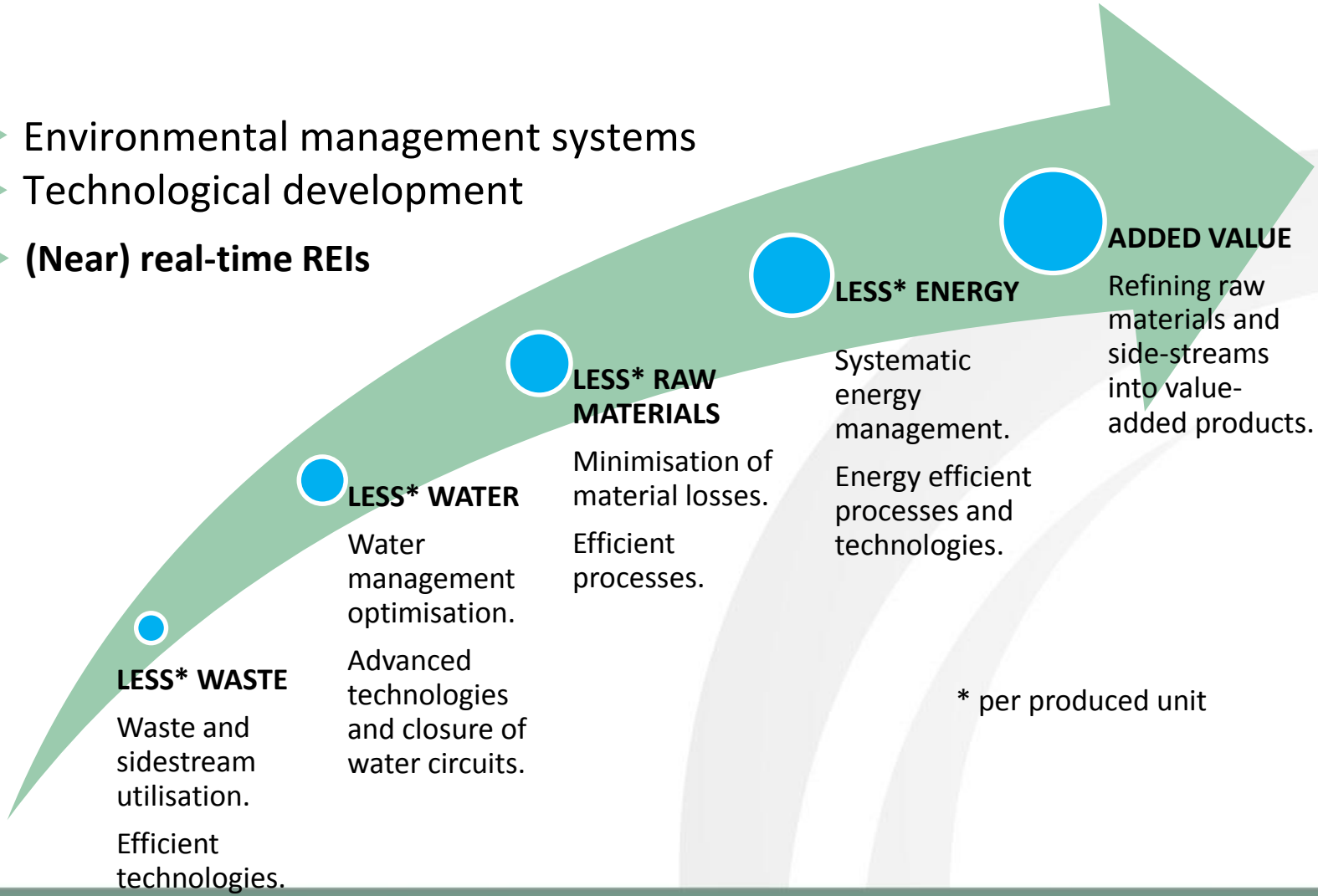
  → A systematic concept for a successful selection process of REIs
- Enable successful implementation in other sectors

To whom?

- Management
  - Selection of the site
  - Commitment to support the process
- Technical experts, operators
  - Identification and selection of relevant units with potential for improvements and monitoring
- External advisors
  - Facilitation of workshops
  - Resource efficiency /modelling expertise

Improving resource efficiency

→ Environmental management systems
→ Technological development
→ **(Near) real-time REIs**



* per produced unit

Stages of identification and implementation of REIs

Part 1

Selection and definition of the plants and units under consideration

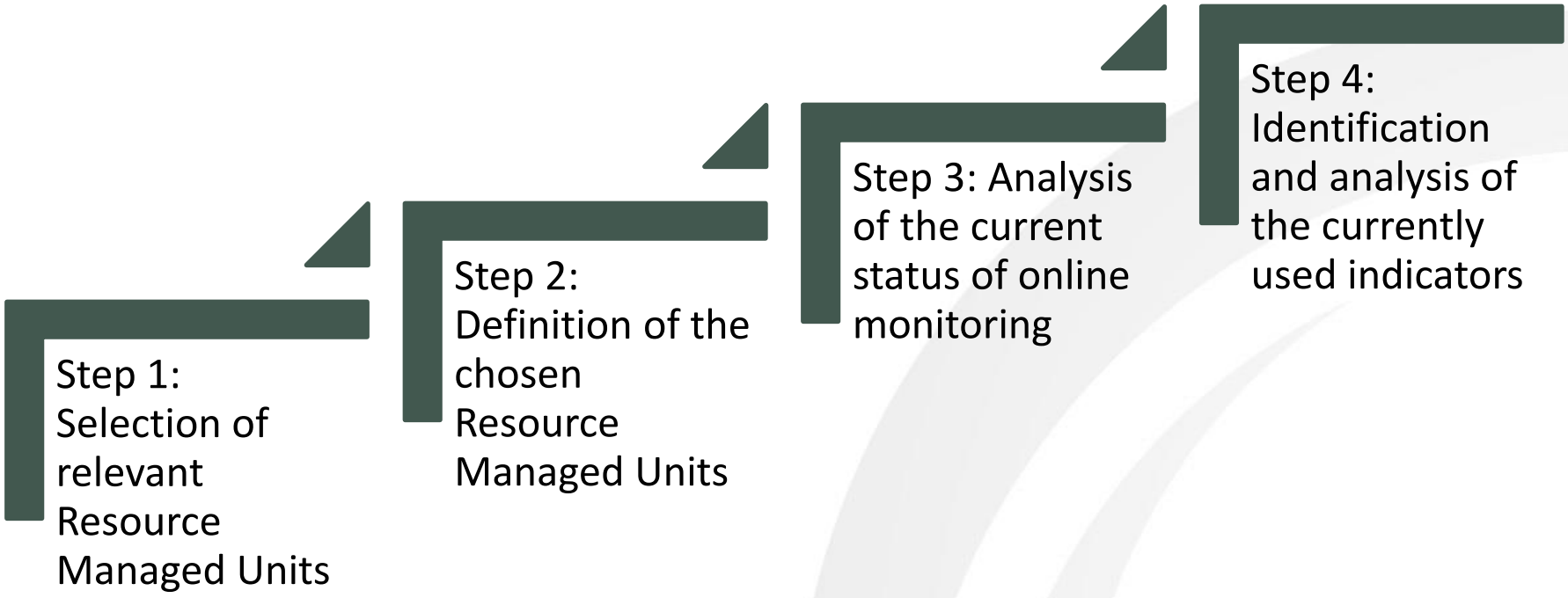
Part 2

Identification and selection of potential REIs

Part 3:

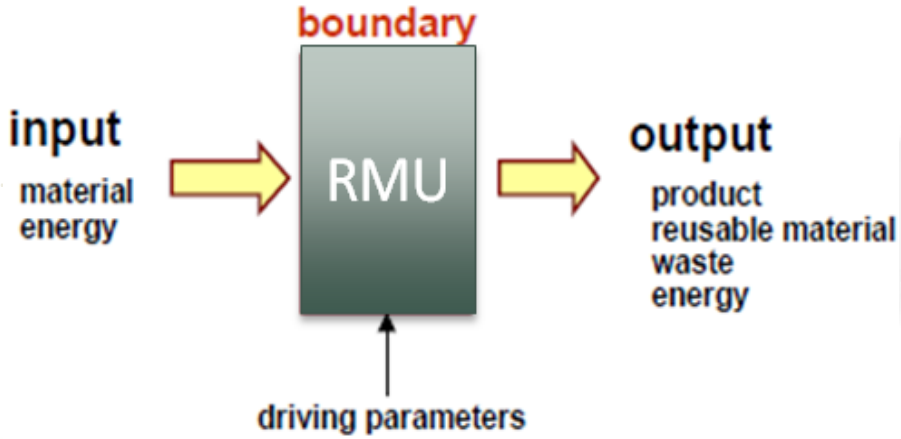
Implementation of the selected real-time REIs

Part 1: Selection and definition of the plants and units under consideration



Part 1: Selection and definition of the plants and units under consideration

- Selection process by company management and plant managers
- Energy and material flow analyses (EFA/MFA) →
  - significant resource consumption (raw materials, chemicals, electricity, heat, water)
  - potential for improvements (material or energy losses)



Part 2: Identification and selection of potential REIs

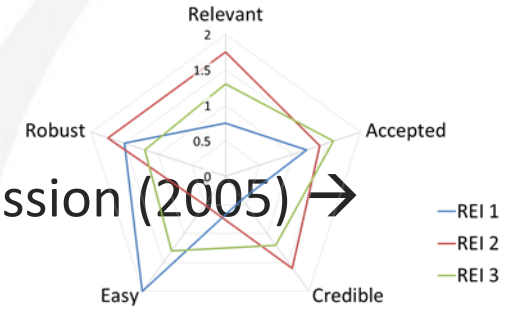
Step 5: Identification of potential REIs

Step 6: Assessment of the available and lacking online measurements

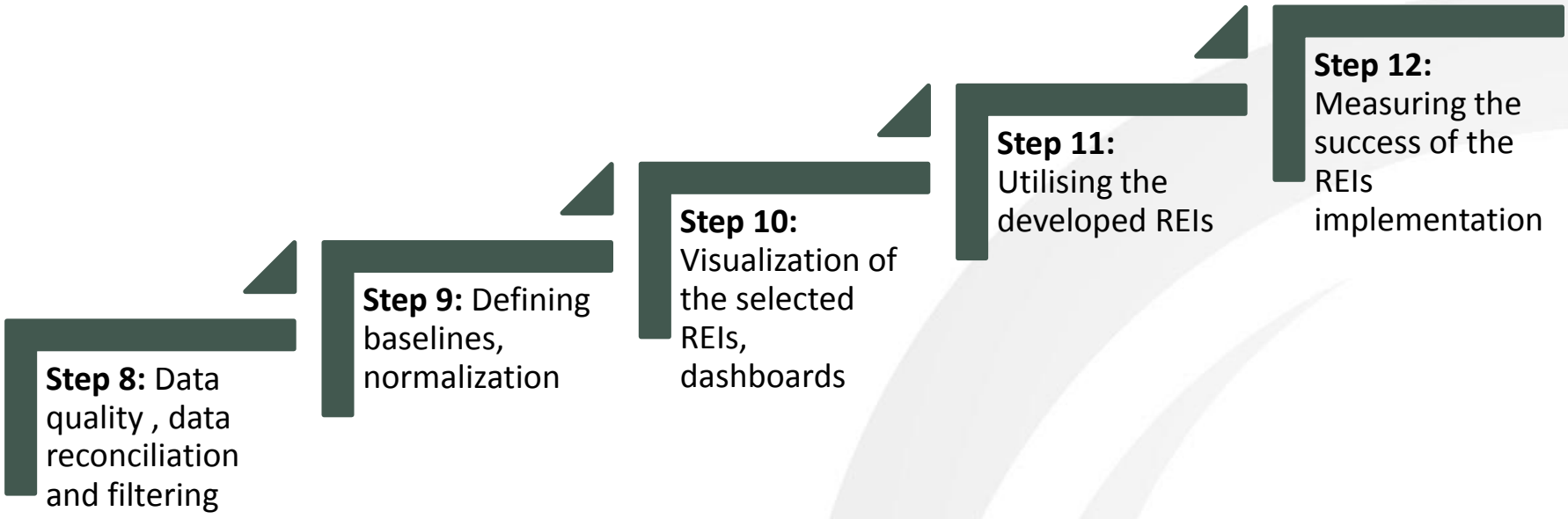
Step 7: RACER evaluation of the identified REIs

Part 2: Identification and selection of potential REIs

- Workshops involving relevant personnel and experts: Plant manager, energy manager, sustainability manager, shift chiefs, operators, technical engineer, environmental engineer, external experts…
- Open mind
  - Useful indicators:
    - Reflect changes in performance in real-time
    - Are based on measured or computed data
    - Give clear information
    - Are influenced by decision making (operators)
- Evaluation
  - RACER methodology by the European Commission (2005) → MORE-RACER by Kalliski et al. 2015



Part 3: Implementation of the selected real-time REIs



Part 3: Implementation of the selected real-time REIs

Impact assessment: Questionnaires, interviews, balance sheets, statistics, Life cycle assessment (LCA)

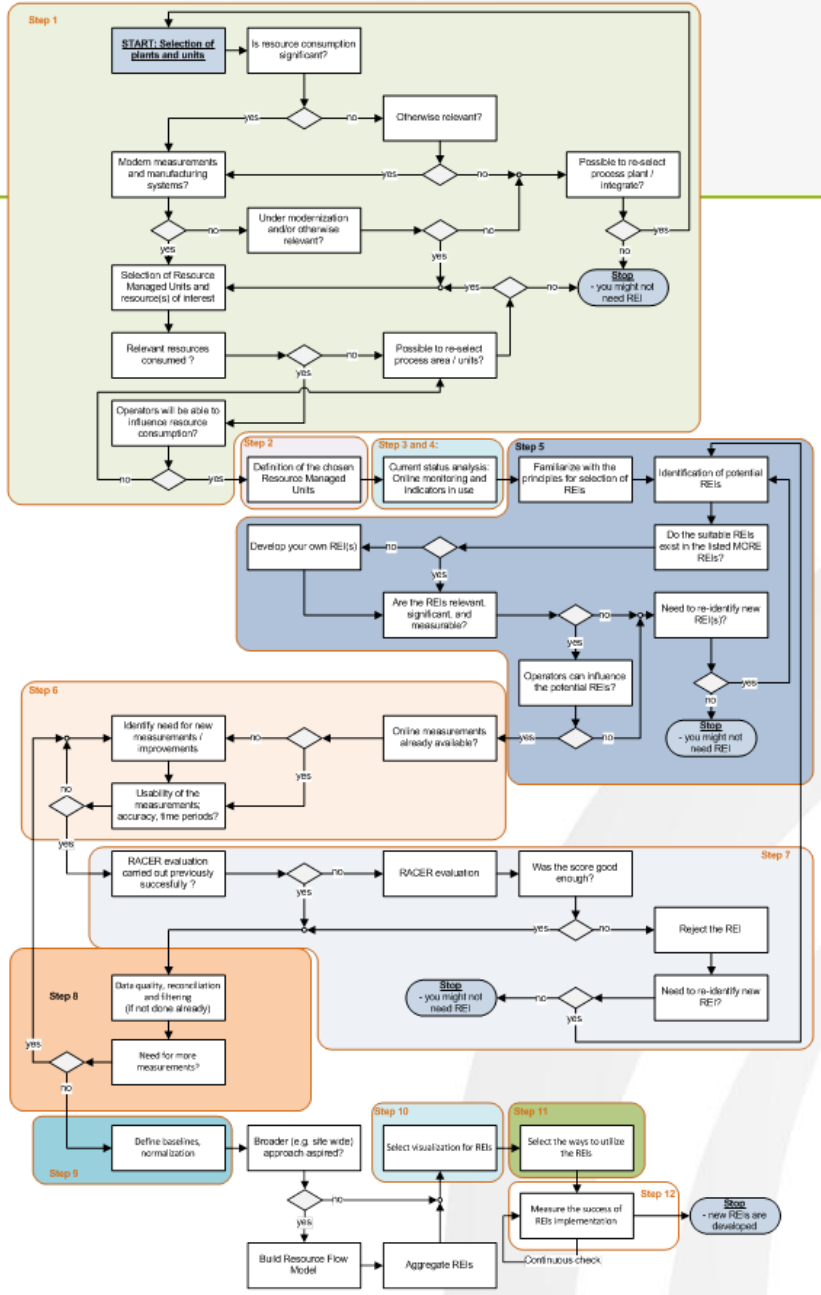
- The set of indicators may have to be modified

Benefits

- Knowledge will increase (transparency)
- Personnel will be more interested and motivated in improving resource efficiency
- Direct and indirect emissions will be decreased
- Cost savings through improved yields and decreased raw material and energy consumption
- Improved resource efficiency without major technological investments

Concluding remarks

- Existing Key Performance indicators (KPIs) can rarely support daily decision making processes in plant operations
  - With real-time REIs the effect of technical improvements and operational policies can be measured and actions can be derived for (near) real-time plant performance improvements
- Step-by-step guidebook has been developed to support the European process industry in gaining better knowledge of the production processes, leading to improvements in resource efficiency
- Step-by-step procedure helps the user to identify and implement (near) real-time resource efficiency indicators
  - suitable for monitoring plant operations and guiding managers and operators towards improved resource efficiency
- Guidebook focuses on the generic aspects of the definition, calculation, visualization and use of REIs for decision support and real-time optimization


Step 1
START: Selection of plants and units
Is resource consumption significant?
yes
no
Otherwise relevant?
Modern measurements and manufacturing systems?
yes
no
Possible to re-select process plant / integrate?
yes
no
Under modernization and/or otherwise relevant?
yes
no
yes
no
Stop
- you might not need REI
Selection of Resource Managed Units and resource(s) of interest
yes
no
Relevant resources consumed ?
yes
no
Possible to re-select process area / units?
Operators will be able to influence resource consumption?
no
yes
Step 2
Definition of the chosen Resource Managed Units
Step 3 and 4:
Current status analysis: Online monitoring and Indicators in use
Step 5
Familiarize with the principles for selection of REIs
Identification of potential REIs
Do the suitable REIs exist in the listed MORE REIs?
Develop your own REI(s)
no
yes
Are the REIs relevant, significant, and measurable?
no
yes
Need to re-identify new REI(s)?
yes
no
Operators can influence the potential REIs?
yes
no
Stop
- you might not need REI
Step 6
Identify need for new measurements / improvements
no
yes
Online measurements already available?
no
yes
Usability of the measurements; accuracy, time periods?
no
yes
Step 7
RACER evaluation carried out previously succesfully ?
yes
no
RACER evaluation
Was the score good enough?
yes
no
Reject the REI
Need to re-identify new REI?
no
yes
Stop
- you might not need REI
Step 8
Data quality, reconciliation and filtering (if not done already)
Need for more measurements?
yes
no
Step 9
Define baselines, normalization
Broader (e.g. site wide) approach aspired?
yes
no
Build Resource Flow Model
Aggregate REIs
Step 10
Select visualization for REIs
Step 11
Select the ways to utilize the REIs
Step 12
Measure the success of REIs implementation
Continuous check
Stop
- new REIs are developed

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Thank you for your interest!

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