PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Dr. Constantin Herrmann

1st Annual Forum on COCIR SRI

Example of the SRI at Work: Study on potential improvements - Magnetic resonance equipment

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Study on potential improvements - Magnetic resonance equipment

- Introduction
- Methodology
- Potential for Improvement - Results

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Study on potential improvements - Magnetic resonance equipment

- Introduction
- Methodology
- Potential for Improvement - Results

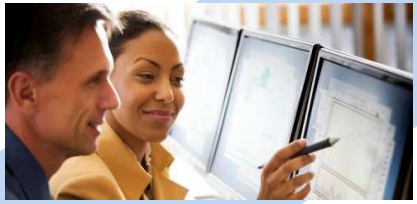
PE INTERNATIONAL
Helps Customers Improve Sustainability Performance

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Understand the Impact of Sustainability on their Business

Strategise the best actions on basis of facts to maximise Sustainibility Performance

Improve Product and Corporate Sustainability Performance



Succeed! Enhanced corporate & environmental performance

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Proactive Initiative Taking the Lead in Environmental Improvment of Complex Products with Multiple Functions

Goal

- participating companies commit to improve environmental performances of medical imaging equipment
  - through transparent and open process
  - with the involvement of the EC and stakeholders

Actions done

- Identification and quantification of significant environmental aspects
- Development of specific methodology to measure and evaluate the improvement potentials
- Communication to the EC and to stakeholders

Learning from first pilot

- first pilot project on Ultrasound presented to the CF in 2009
- comments received during and after the meeting → used to refine the proposal
- document submitted to the EC for official endorsement end of Jan 2012

Goal & Scope of the Study

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Public	• Definition of a Business as Usual (BAU) scenario for year 2017 based on the current and expected trend in the MRI technology and market
Public	• Estimation of the maximum potential for improvement for MRI based on best available technologies (BAT) and technologies currently under development (best not yet available technologies - BNAT)
Confidential	• Realistic estimation of the potential for improvement per company required by COCIR SRI for the target setting process

Challenges at MRI

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Functional unit	• Reference: single image, investigation of one patient, investigations during one standard day at hospital, quality of image, quality of diagnosis
Modulari-sation MRI	• Definition of the most important parts/ components/ sub-systems of the MRI • Contribution (ranking, allocation, order of magnitude) of each module in each operating mode
Energy consumption in use	• Energy consumption and operating duration per module and mode • Interdependencies between modules • Typical properties/aspects/behaviour per module in off/ ready to scan/ scan mode

Specific Methodology Required for MRI – Efficiency

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Decrease of power consumption/ Increase of efficiency

- **Numerous individual modules** and functional devices
- Separate individual, **highly complex sub-products**
- **Total efficiency factor not applicable**
- **Average efficiency factor not feasible:** Devices do not follow a general efficiency pattern, such as computing, power transforming, converting, inverting, cooling, moving, magnetising etc.

Examples for which single efficiency factors work:
external power supply units, electric motors, transformers, TV sets. Though watching TV is not a single functional unit - aspects such as screen size, quality of picture, number of pixels, contrast range are influencing the efficiency but are difficult to get reflected quantitatively

Specific Methodology Required for MRI – Time

Faster examination (even with increased energy per day)

→ **less power** per examination

- time is important, but not the only performance factor
- **value is detail of information** given to medical experts
- Imaging depends on type, quality, perspective, resolution, static or dynamic visuals, material and concentration and many aspects more
- Impossible to compare and track timing of the **numerous options possible and numerous combinations**

Examples for increased performance resulting into shorter times:
functional unit is **clearly quantified** such as dishwashers, washing machines or dryers; the faster function is provided the less energy is consumed

Specific Methodology Required for MRI – Synergies

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Combination of existing functions / adding new functions into one product avoiding several independent devices (MFD)

- MRIs increase functions providing images constantly by
  - new developments
  - innovations
  - combination with other medical examination disciplines
- Complex set of performance requirements and new, non-comparable functions
- Identifying synergies quantitatively by allocation is not possible with MRI, because of missing clear boundary conditions or system boundaries for applying allocation

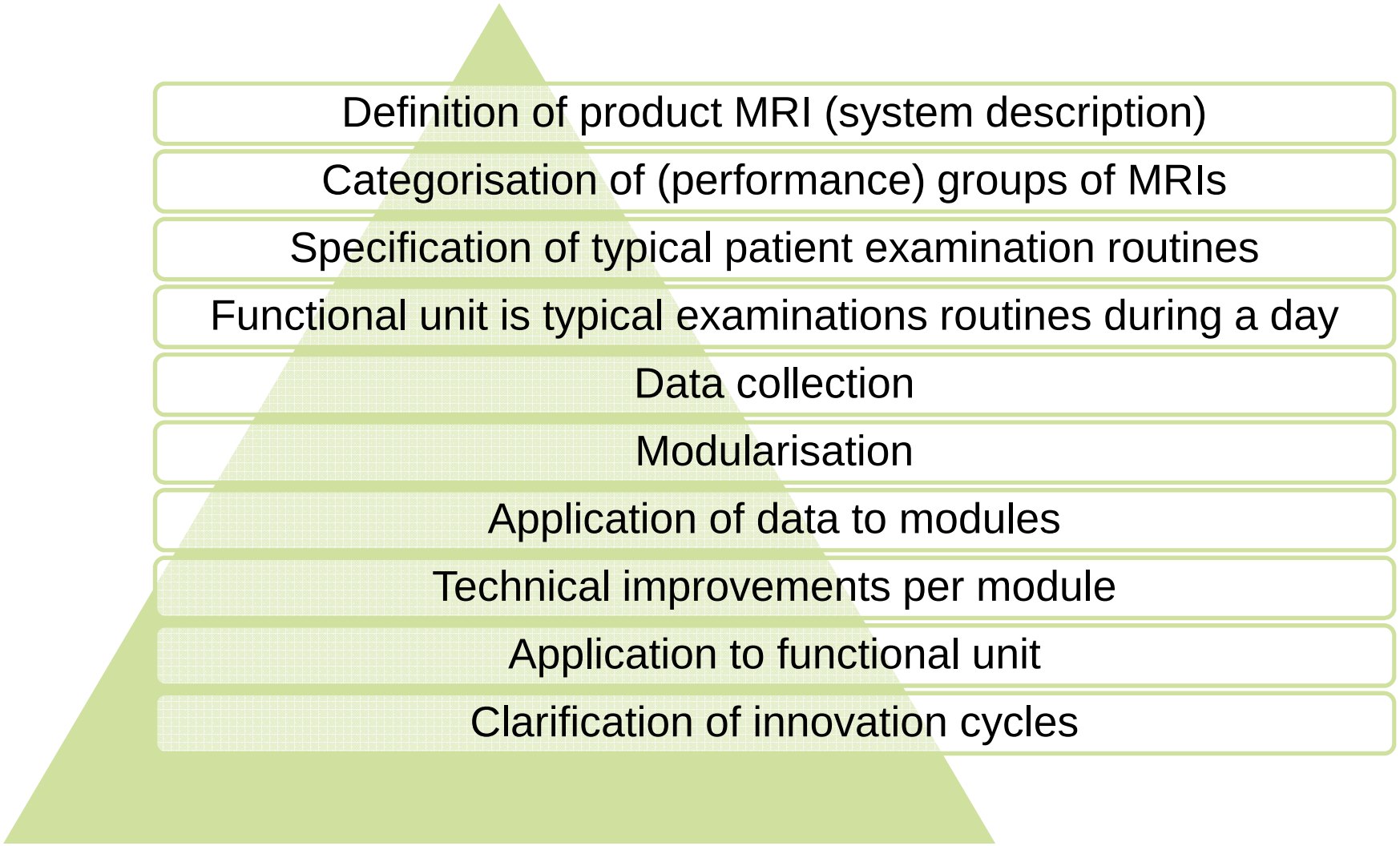
Examples of combination of functions having synergies:
multi-function devices (MFD) e.g. printing and imaging.
Combination of clearly identifiable functions such as printing, faxing and scanning, for which discrete products also exist.
Comparison and allocation can take place

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Study on potential improvements - Magnetic resonance equipment

- Introduction
- Methodology
- Potential for Improvement - Results

Methodology

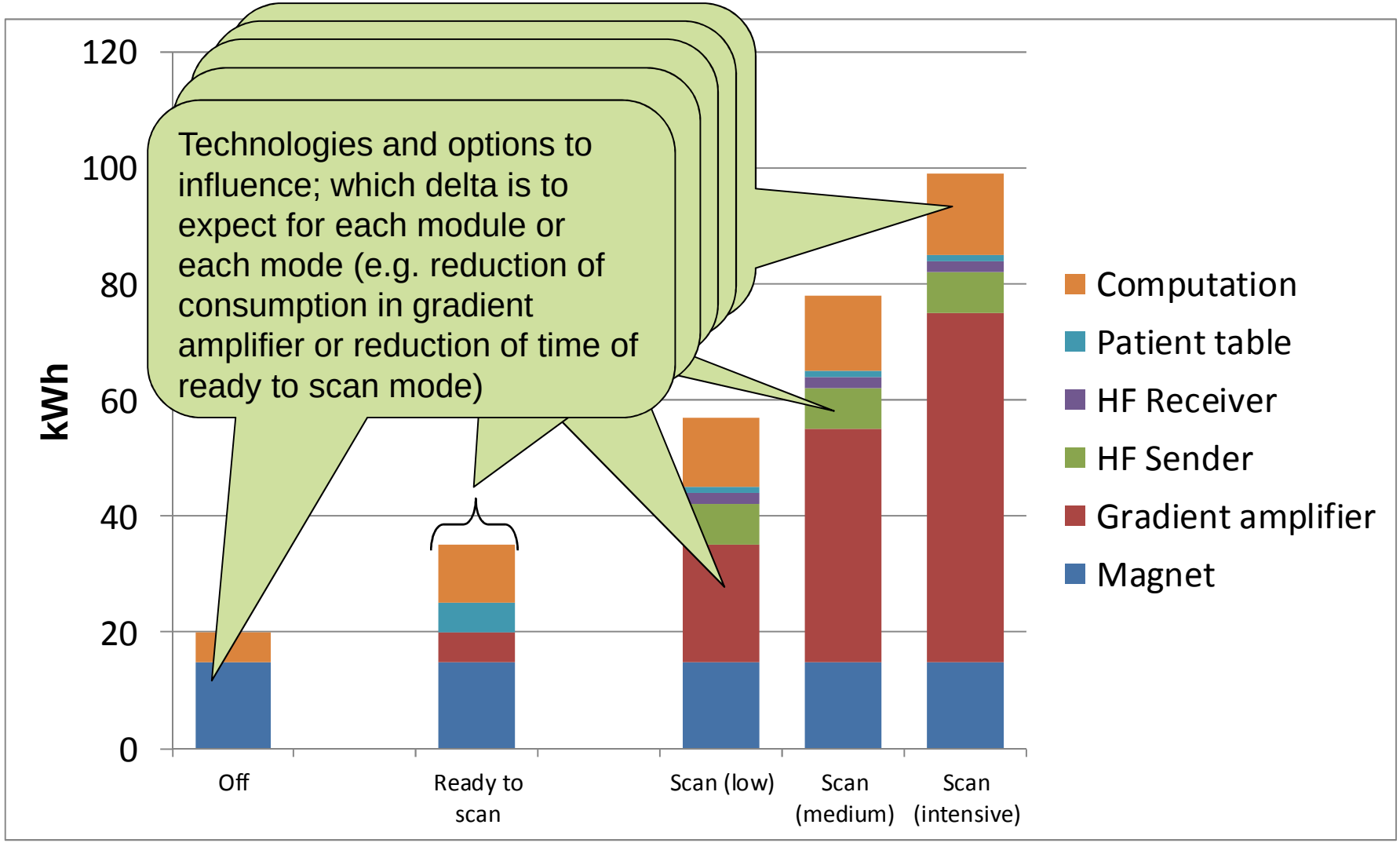


2. Goal of the data collection and Interviews of PE INTERNATIONAL

Required information

Understanding the product	• Function(s) • Variety of products • Technical aspects (top level) • Main modules
Focus on energy consumption	• kWh per module • kWh per mode
Improvements planned and long term perspective	• Technical measures • Gained delta per module (level of improvement) • BAU, BAT and BNAT

Idea of energy consumption per mode and module



Advantages

- Complexity of products regarded, by categorisation and modularisation
- Functional unit quantified as much as possible
- Quantitative base for reference and comparison created
- Market importance identified and scope reduced to significant aspects
- Communication about ecodesign motivated and established at partners
- Moderation as objective third party enabling open discussion about improvements
- Improvement potentials identified and quantified
- Incentives in each organisation to implement improvement potentials into the company design processes
- Provide profound base for calculating the SRI target

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Study on potential improvements - Magnetic resonance equipment

- Introduction
- Methodology
- Potential for Improvement - Results

Modes and Modules

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

3 modes

- Off
- Ready to scan
- Scan mode

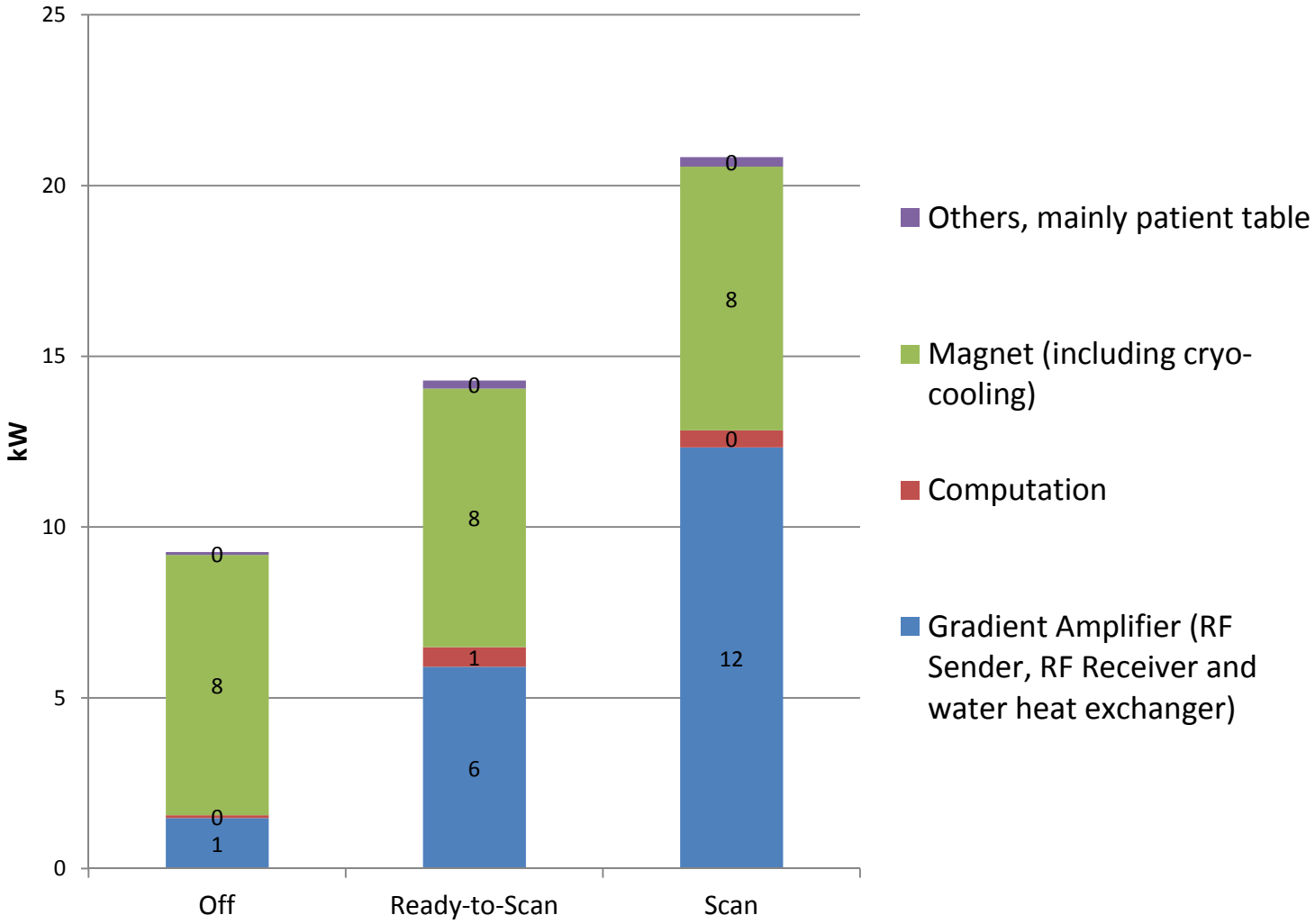
4 modules

- Gradient amplifier, RF Sender, RF Receiver, Water heat exchanger as one module
- Computation
- Magnet (including cryo-cooler)
- Patient table

Measured Consumption

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

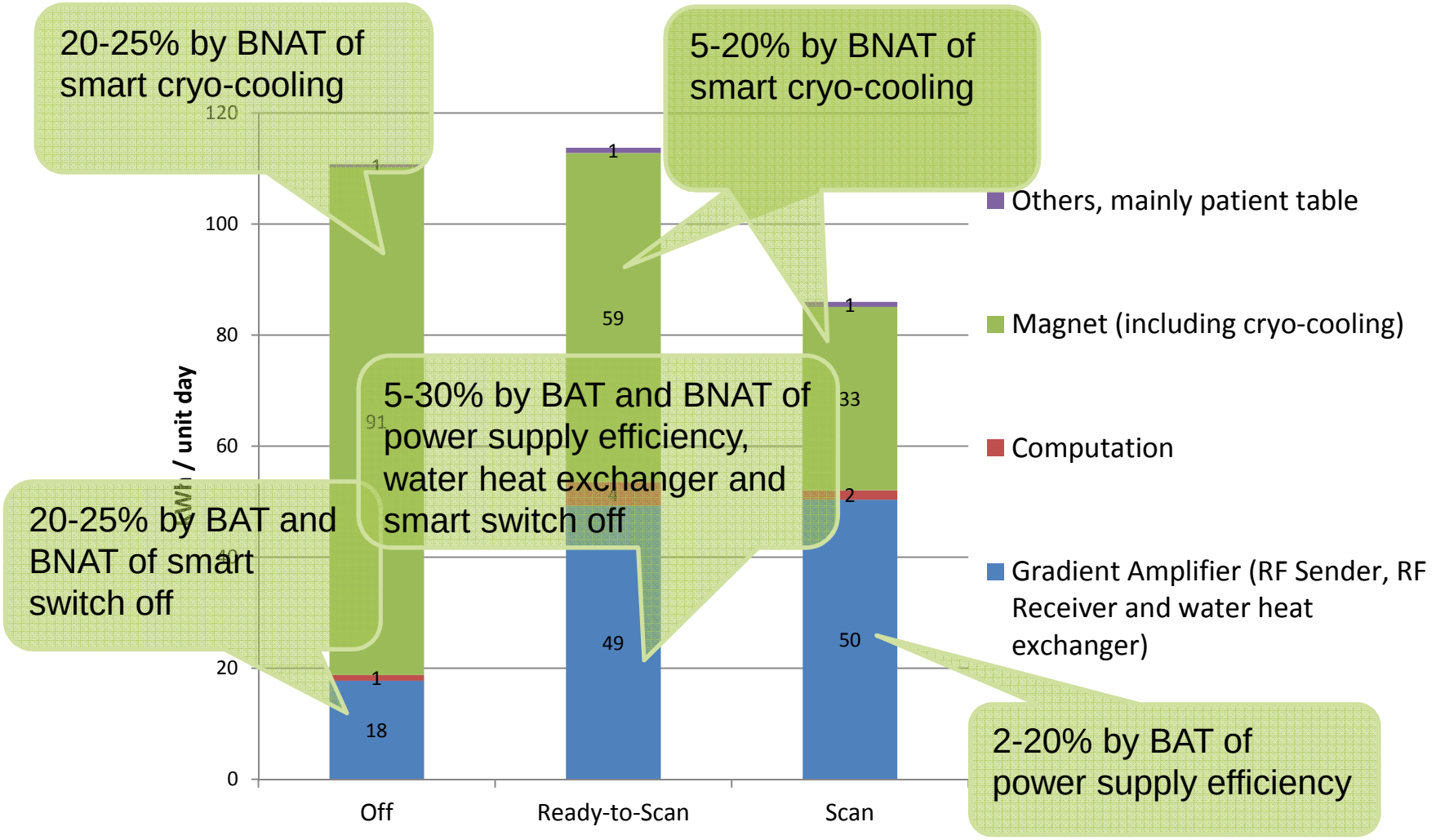
Power consumption per module and mode (in kW)



Measured Values, Calculated per Day

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

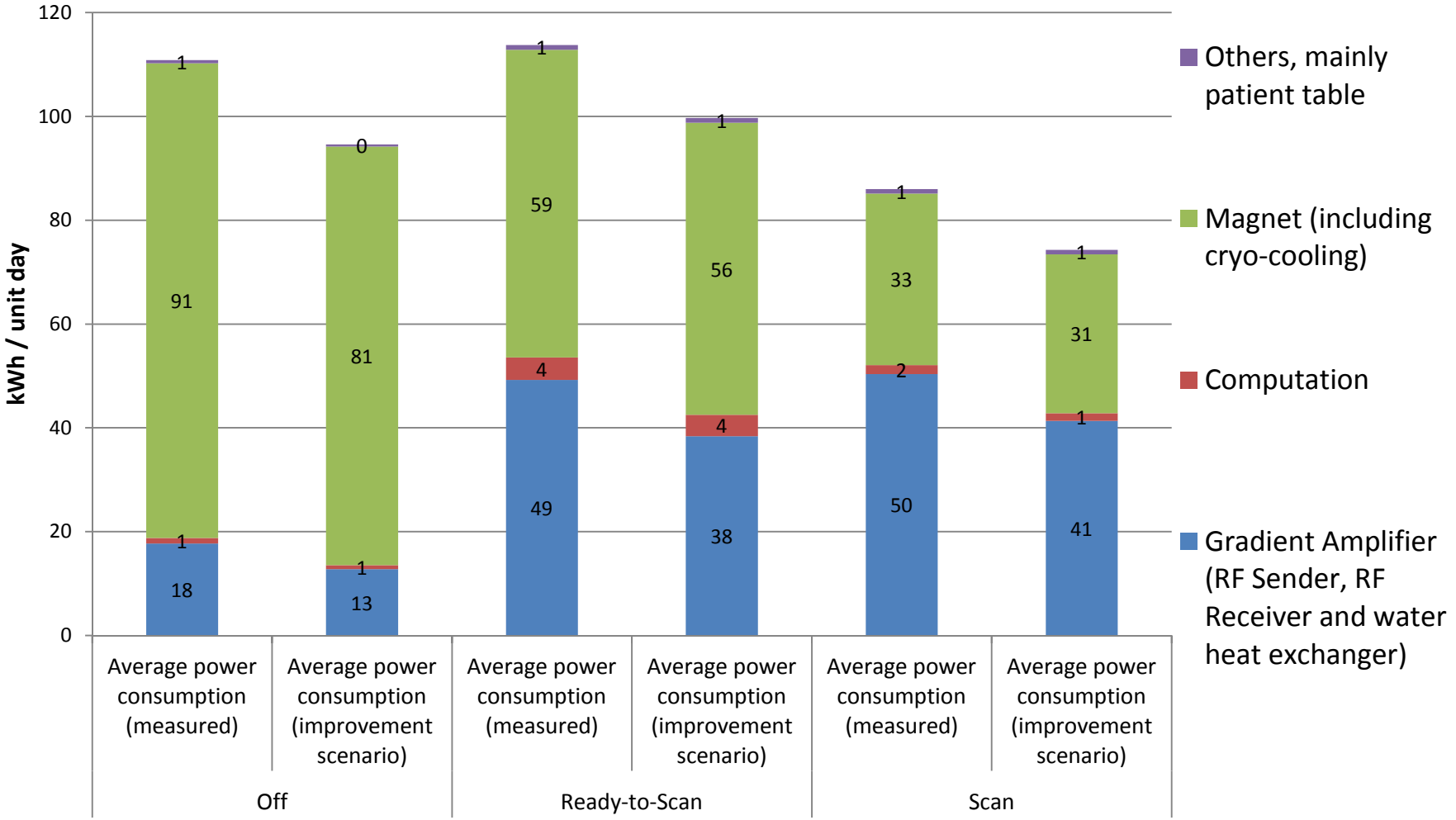
Average power consumption per module and mode (Cat. B)



Consumption and max. Improvement Potentials

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

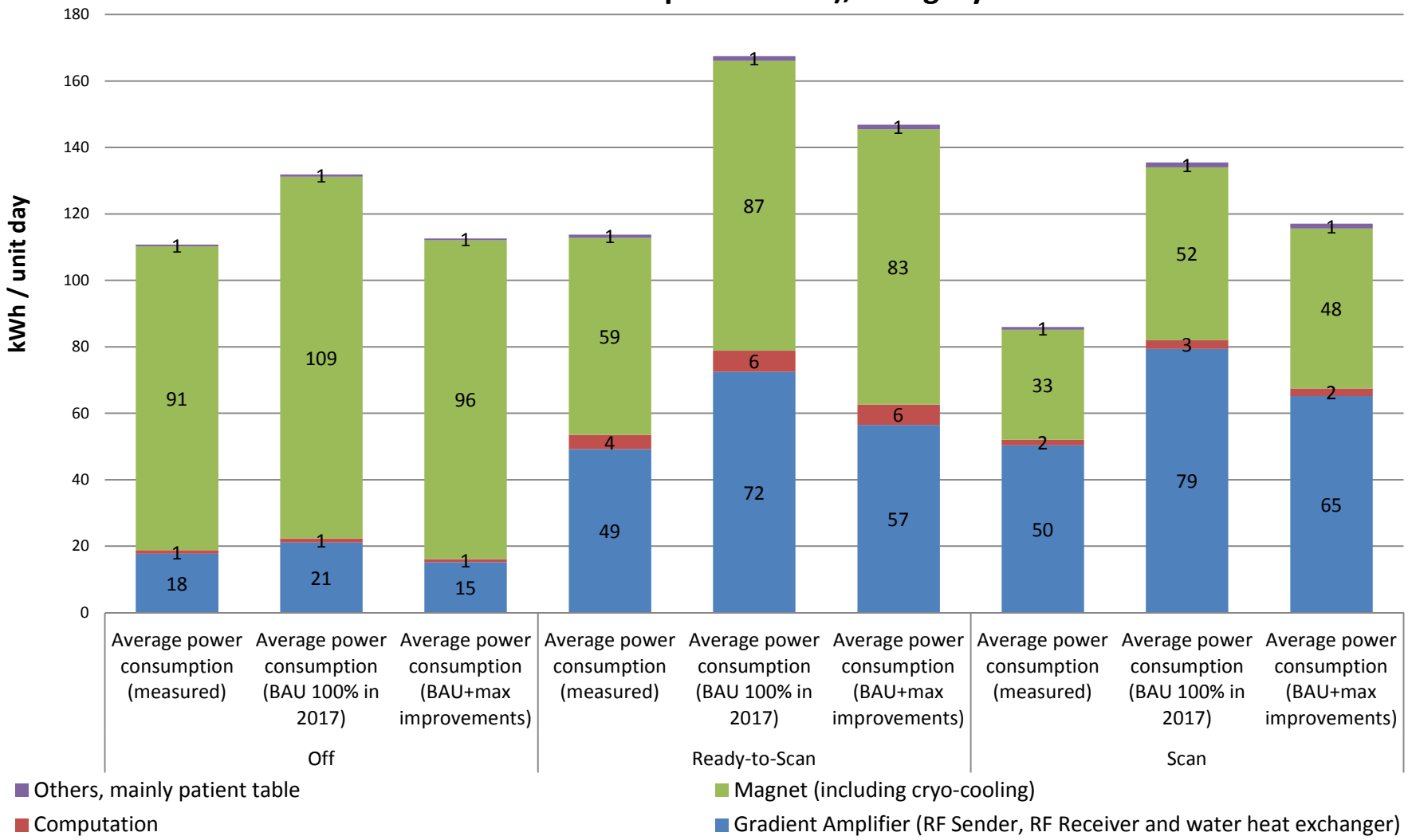
Average power consumption per module and mode with maximum improvements (Cat. B)



Today and Future 2017:
Scenario BAU 100% increase towards Cat. C

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

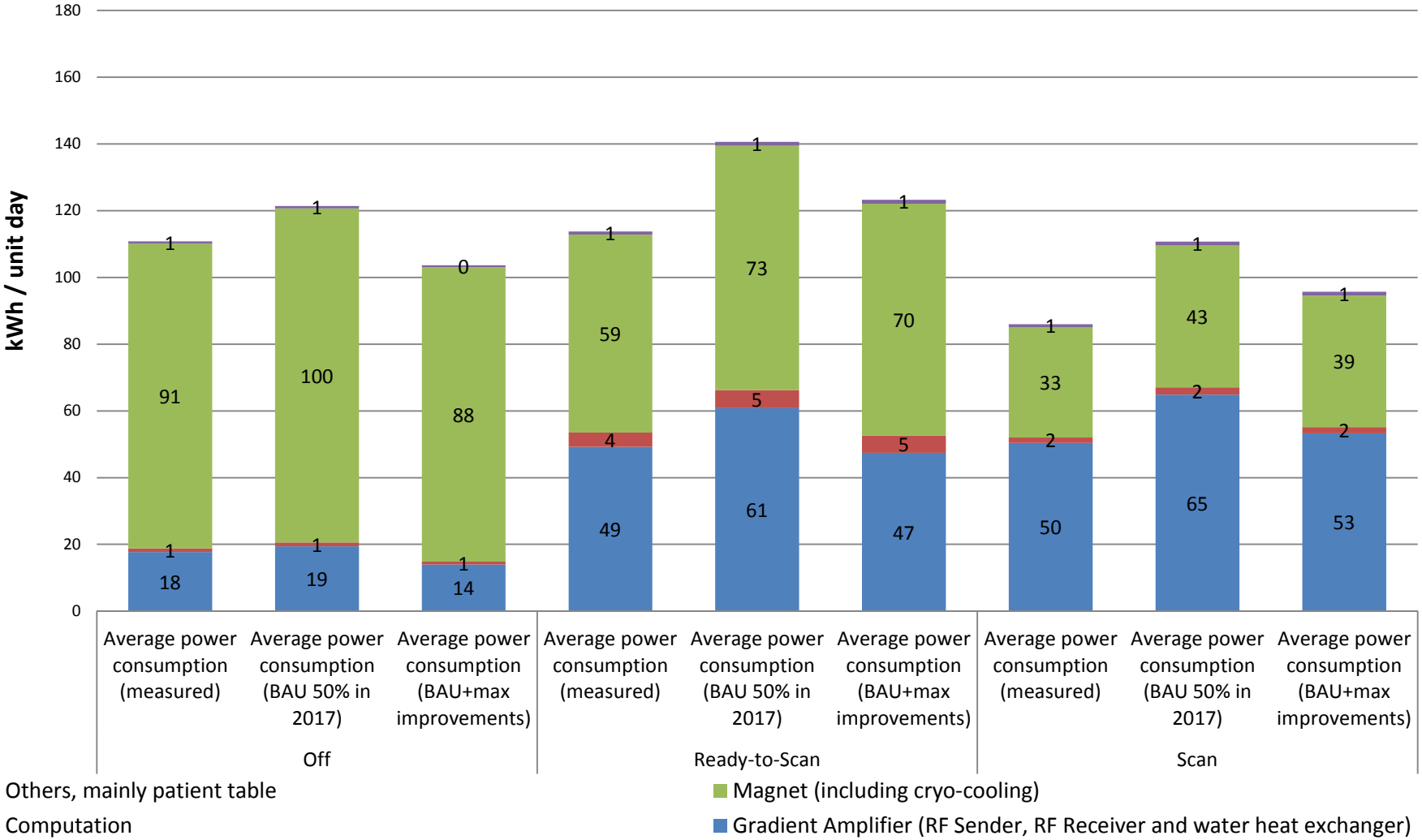
Power consumption per module and mode (today, BAU 100% in 2017 and BAU with maximum improvements), Category B



Today and Future 2017:
Scenario BAU 50% increase towards Cat. C

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

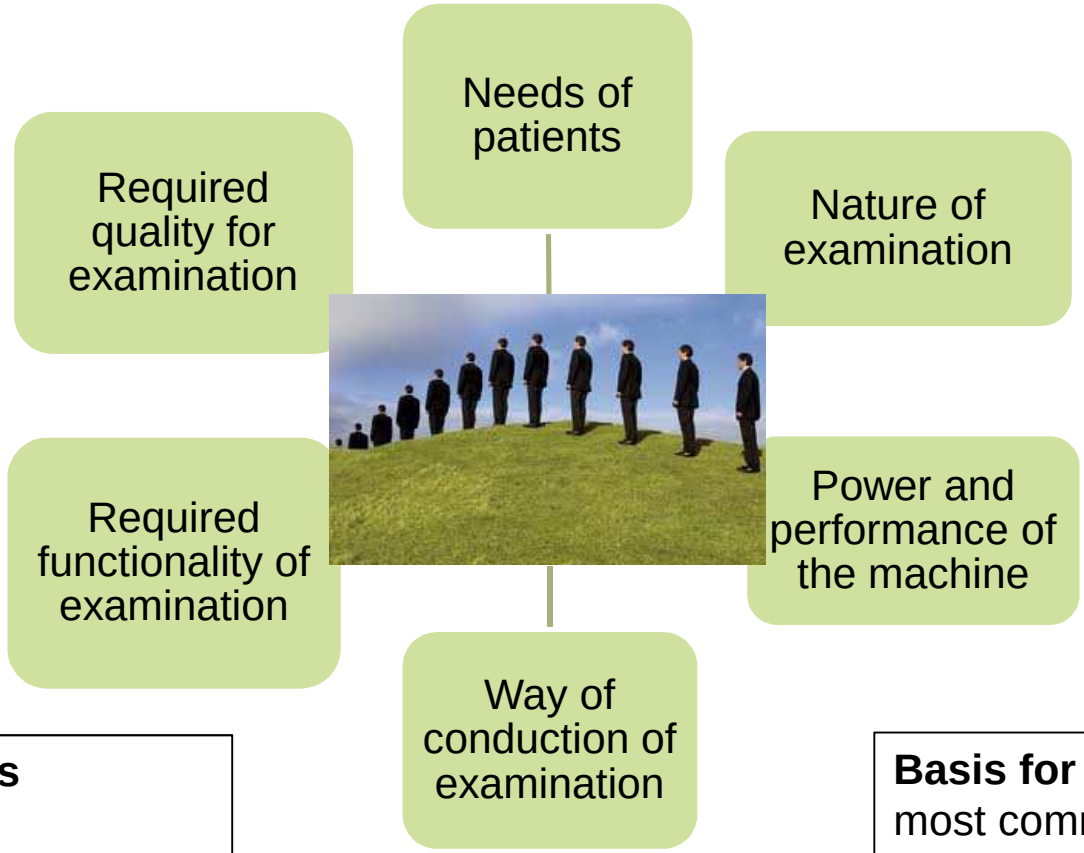
Power consumption per module and mode (today, BAU 50% in 2017 and BAU with maximum improvements), Category B



Investigations per Day

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

FUNCTIONAL UNIT: <u>Number of patients per day can range from 15 to 25</u>



Number of patients examined per day:
work time in a hospital/ number of examinations as denominator

Basis for functional unit:
most common examinations and sequences for each examination

Data source of the picture: http://www.computerworld.ch/management/karriere/artikel/personalentwicklung-im-21-jahrhundert-55214

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Dr. Constantin Herrmann
c.herrmann@pe-international.com
Phone:+49 711 34181755