COCIR SELF REGULATORY INITIATIVE FOR MEDICAL IMAGING DEVICES

COCIR member companies are committed to contributing to the challenges for a greener and more sustainable world economy by developing new environmentally performing technologies and concepts, while at the same time ensuring cutting edge performance with improved clinical value of medical imaging devices.

COCIR companies proactively committed to the European Commission to develop a Self-Regulatory Initiative under the Ecodesign Directive to reduce the environmental impact of medical imaging equipment.

In November 2012, the European Commission acknowledged the initiative recognising the benefits for society and healthcare.

COCIR COMPANY MEMBERS:

ACCURAY · AGFA HealthCare · Alcon · alert · BAYER · Canon · Carestream · ELEKTA · EOS imaging · esaote · FUJIFILM · GE · HITACHI Inspire the Next · HOLOGIC The Science of Sure · iba · IBM · IMS Since 1965 · INTERSYSTEMS · 强生(中国)医疗器材有限公司 Johnson & Johnson Medical (China) Ltd. · KONICA MINOLTA · McKESSON · nova motum · orange · PHILIPS · QUALCOMM · SAMSUNG · SHIMADZU Solutions for Science since 1875 · SIEMENS · T · Theraclion THE SOUND THERAPY · TOSHIBA Leading Innovation · VARIAN medical systems

NATIONAL TRADE ASSOCIATIONS MEMBERS:

AGORIA no future without technology	FiHTA	snitem creating the tools for medical progress	bvitg	SPECTARIS German Industry Association for Optical, Medical and Mechatronical Technologies
BELGIUM	FINLAND	FRANCE	GERMANY	GERMANY
ZVEI	ETOSZ ASSOCIATION OF HEALTH TECHNOLOGY SUPPLIERS AND MEDICAL DEVICE MANUFACTURERS	ASSOBIOMEDICA Federazione nazionale per le tecnologie biomediche, diagnostiche, apparecchiature medicali e servizi, telemedicina	FHI MEDICAL TECHNOLOGY	
GERMANY	HUNGARY	ITALY	THE NETHERLANDS	
Holland HealthTech	federación española de empresas de TECNOLOGÍA SANITARIA	Medtech	TIP GÖR DER	AXrEM
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COCIR GUIDELINES FOR USERS ON SAVING ENERGY

GOOD ENVIRONMENTAL PRACTICE

MRI

MAY 2015

The goal of this publication is to raise awareness of operators, users and health care professionals and inform them about good environmental practices to operate MRI equipment to lower the environmental impact by reducing unnecessary energy consumption.
COCIR strongly believes that the greatest gains can be realised when industry, regulators and healthcare providers partner to optimise the use of technology.

MAGNETIC RESONANCE (MRI)

MRI is a medical imaging technique used in radiology to investigate the anatomy and function of the body in both health and disease since 1977. MRI scanners use strong magnetic fields and radio-waves to form images of the body.

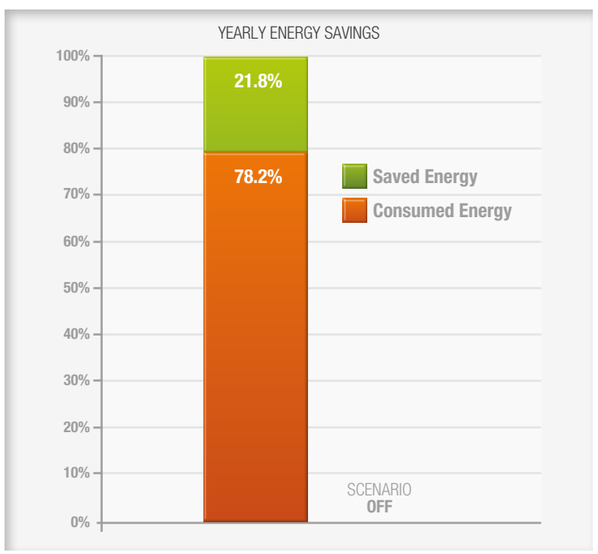
ENERGY CONSUMPTION IN HOSPITALS

Healthcare equipment represents 19% of a hospital's energy demand[1] and medical imaging equipment is a class of high-energy consuming products widely used today in hospitals, imaging centres and radiological practices.
Energy-efficient medical devices play a key role in reducing environmental impacts, but achieving higher rates of energy efficiency also requires better management of devices when they are not in use.
MRIs are also used in imaging centres and radiological practices. There the contribution of the energy consumption of imaging equipment is much larger than 19%.

ENVIRONMENTAL GOOD PRACTICE: SAVING ENERGY

Cylindrical MRI scanners generate a powerful magnetic field through a cryo-cooled superconductive magnet which has to operate 24h/d and cannot be turned off (only for emergency reasons). Therefore MRI scanners consume energy even when switched to off-mode to maintain the liquid helium at the temperature of 4 Kelvin.
Nonetheless good environmental use behaviour, such as switching the MRI scanner to off mode during night hours, can significantly reduce the yearly energy consumption by up to 21,8%, as determined by the COCIR study on MRI (www.cocir.org). The graph represents daily energy consumption and savings of a MRI scanner compared to a situation where the scanner is left in ready-to-scan mode for all 24 hours.

ON AVERAGE, 30 MWH PER YEAR, WHICH CORRESPONDS TO AROUND 3600€, CAN BE SAVED FOR A TYPICAL MRI SCANNER.



SCAN SPEED AND PATIENT THROUGHPUT

COCIR studies and field measurements showed a direct relationship between the ability of an MRI scanner to perform many examinations per day (scan speed) and the energy consumption. The higher the examination speed of an MRI model or the number of examinations per day, the higher the energy consumption on average. However in general the energy consumption per examination decreases.

On the other end, given a certain number of examinations per day, faster examinations can reduce the energy consumption.

AIR CONDITIONING

MRI scanners are usually water cooled therefore they do not release excessive heat in the examination room. However air conditioning is necessary because MRI is a very sensitive technology that needs stable temperature conditions. When the MRI is switched to off-mode during the 12 hours night or weekends, energy savings can be achieved by regulating the air conditioning system of the examination room, as it is not necessary.

COCIR Study on MRI potential for improvement (2012). Energy consumption and possible savings.

1. Danish Energy Saving Trust "Energy Efficiency in Hospitals and Laboratories"

COCIR RECOMMENDATIONS FOR MRI USERS

DURING PURCHASE EVALUATION

- Ask for energy consumption data according to typical use scenarios and standardized methodologies as defined by the COCIR established measurement methodology.
- Choose equipment with energy and environmental documentation according to the latest version of the COCIR self-regulatory initiative.
- Verify the availability of information on the good environmental use of the equipment to maximise energy savings.
- Seek equipment with low-power features.
- Ask the manufacturer to provide technical advice on proper settings and configuration to reduce energy consumption.
- Consider your typical usage scenario (how many examinations per day) and choose a suited MRI scanner. Over performing scanners consume more energy.

DURING SETUP AND USE

- Train staff on the use of low-power features, benefits and energy savings.
- Switch the system off or activate low-power modes during off hours, when system is not in use, considering possible clinical limitations.
- Regularly consult with the manufacturer to ensure the MRI scanner is configured for optimal performance and minimum energy consumption according to real-use scenarios.
- Ensure proper maintenance is performed by qualified personnel to maintain clinical and environmental performance over time.
- Regulate the room air-conditioning system when the MRI is in off mode

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POTENTIAL FOR IMPROVEMENT

COCIR Members are committed to improve the energy efficiency of magnetic resonance equipment through technical improvements, as documented in the COCIR Self-Regulatory Initiative (SRI) on Ecodesign. A 2012 study by COCIR shows that the improvement potential for MRI is low and mostly in non-scanning modes, as MRI is a mature technology.

Moreover the development of new functionalities and improved performances bringing additional benefits to patients is expected to increase the energy usage.

COCIR Members are working to keep the trend under control: improving performances and functionalities without increasing the energy consumption.

The findings of the COCIR SRI highlights that the highest potential for energy saving lies in user behaviour. A good environmental practice can save up to 21,8% of the annual energy consumption.

MODE	AVERAGE DISTRIBUTION OF DAILY ENERGY CONSUMPTION %
OFF	34
READY-TO-SCAN	34
SCAN	32

MEASURING ENERGY CONSUMPTION

COCIR developed a methodology to measure the energy consumption of MRI systems as there are no existing recognized standards as of today. The methodology defines use scenarios, protocols, parameters and measurement procedures (available for download at the COCIR website) to allow comparison of measurements between different MRIs.

The COCIR methodology, which has been used since 2011, has been included by the European Commission in the EU Green Public Procurement guidelines for medical devices.

The methodology defines the following functioning modes: Off, Ready-to-scan, Scan mode and Low power mode.

The following scenarios, which are used for declaring the MRI annual energy consumption are also defined:

- SCENARIO **OFF**:
  the MRI is switched to off mode overnight and during weekends.
- SCENARIO **READY**:
  the MRI is always switched to ready-to-scan mode.

The difference of the energy usage in the two scenarios gives a clear indication of the savings which can be achieved by a proper environmental-friendly usage of the MRI scanner.

The COCIR methodology allows the comparison of the energy consumption of MRI systems. Nonetheless measurements should be used with care by purchasers or healthcare providers as they refer to a typical use scenario with numerous assumptions which may not reflect the specific usage patterns.

USER DEFINED SCENARIOS

To help purchasers to estimate the energy consumption of MRIs according to their specific usage, the COCIR methodology for the calculation of energy consumption has been simplified and adapted to user defined scenarios.

Such simplified formula to calculate the energy consumption and running costs of MRI equipment has been introduced in the EU Green public procurement criteria for medical devices.

Given the information provided by manufacturers, the daily energy consumption can be calculated according to the following formulas (in green values to be determined by the purchaser, in black declared by the tenderer)

kWh/d =

$$P_{off} \times \mathbf{T_{off}} + P_{low} \times \mathbf{T_{low}} + \mathbf{N._{scan}} \times E_{scan} + P_{ready} \times (24h - \mathbf{T_{off}} - \mathbf{T_{Low}} - \mathbf{N._{scan}} \times T_{scan})$$

Where:

$N._{scan}$:
is the number of scan for each body region

E_{scan}:
is the typical energy of scan per body region

$\mathbf{N._{scan}} \times T_{scan} =$

$$\mathbf{N_{head}} \times T_{head} + \mathbf{N_{abdomen}} \times T_{abdomen} + \mathbf{N_{spine}} \times T_{spine} + \mathbf{N_{knee}} \times T_{knee} + \mathbf{N_{angio}} \times T_{angio}.$$

$T_{low,off}$:
is time in hours per day for each mode.

T_{scan}:
is duration for each scan.

User defined scenarios use more assumptions and simplifications than the COCIR methodology, therefore results can be used for estimating running costs but not for comparing different equipment. Please be aware that the energy demand of examinations is highly dependent on scan parameters. Therefore the actual energy consumption may deviate from the estimated value.

A good environmental practice saves about 30 MWh which corresponds to around 3600€ per year for a typical MRI scanner. The longer the time in off mode, the higher the energy savings.