COCIR

Sustainable Competence
in Advancing Healthcare

SRI FOR MEDICAL IMAGING EQUIPMENT and GPP

16 August 2011

Erlangen

AGENDA

	Time	Agenda Point
1.	11.00	Welcome and Introduction
2.	11.15	The GPP project and the preliminary report
3.	12.00	*Lunch*
4.	13.15	COCIR ongoing and past activities related to the GPP project
5.	13.45	*Tour at Siemens manufacturing facility*
6.	14.30	Discussion
7.	16.30	End of the meeting

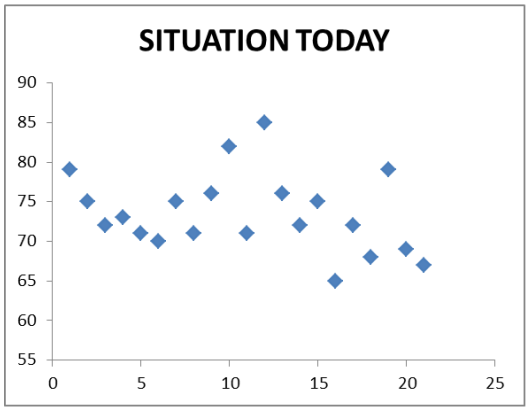
MARKET of MEDICAL IMAGING EQUIPMENT

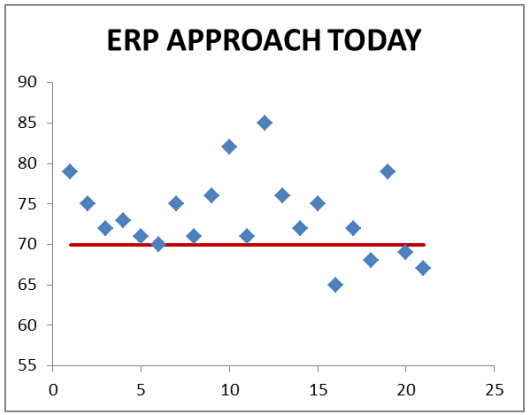
Modality		2009 Market Value	2010 Market Value	Estimated EU Market Coverage
Computer Tomography (CT)		581 M€	566 M€	98 %
Magnetic Resonance Imaging (MRI)		708 M€	777 M€	96%
Nuclear Medicine (SPECT, PET)		244 M€	240 M€	98%
Ultrasound		801 M€	814 M€	82 %
X-ray	Cardio (45%)	377 M€	380 M€	92 %
	Others (55%)	204 M€	186 M€	65 %

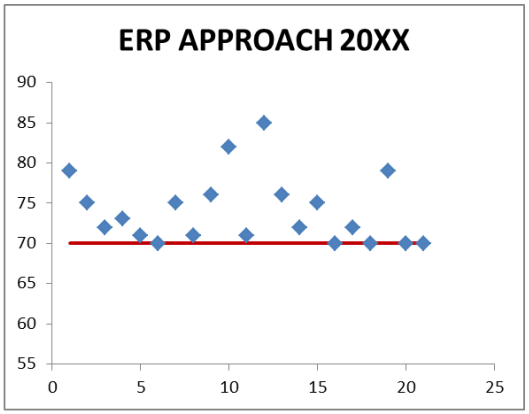
THE FLEET APPROACH

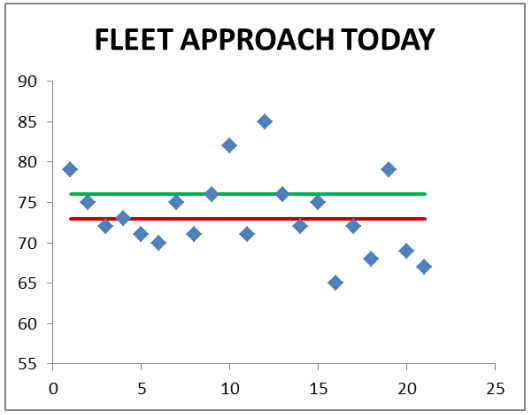
- The SRI for Medical Imaging Equipment is based on the so called “fleet approach” not on the traditional approach used so far by Implementing Measures under the Ecodesign Directive.
- The fleet approach has been deeply discussed and explored during the preparation of the draft proposal of the EuP Directive, approved in 2005.
- Targets are set at the level of the whole Medical Industry (participating in the Initiative) and calculated as the average performance of the products placed on the market by participating companies.
- The methodology also provides for specific company targets that need to be reached by each company to ensure that the industry target is achieved.

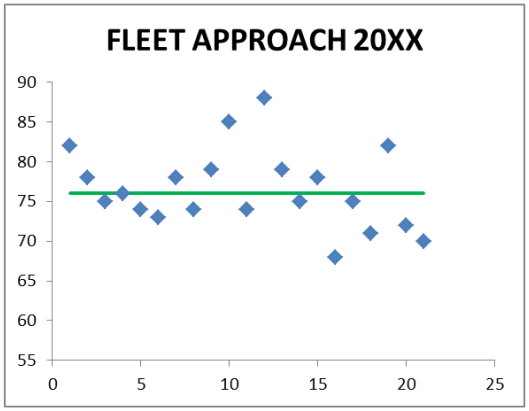
THE FLEET APPROACH











TARGET SETTING

To determine the target, 3 different scenarios are defined according to different assumptions based on expert judgement.

- **Business as usual scenario (BAU):** the basic assumption is that given the situation today, during the innovation cycle all the competitors will invest in research to match the best performing players on the market. This assumption is very strong, especially in a sector where environmental performances are not the main driver for purchase choices of hospitals, public authorities or healthcare institutions. Nonetheless such assumption will ensure that ambitious targets will be set.
- **Best not yet available technology scenario (BnyAT):** each company provides a reasoned reduction value, based on the "best not yet available technology" (technology not yet available but still in the research and development phase) that could be achieved during the innovation cycle. The scenario is based on the assumption that all the companies could reach a reduction equal to the provided reduction values.
- **Beyond as usual scenario (Beyond BAU):** This scenario is based on the assumption that in the innovation cycle all the players will improve their products according to the average reduction of the BnyAT, except the best performing company that will improve the performance according to its own prediction, as improvements for the top runner are more difficult to obtain. The average value obtained from this scenario is chosen as the target for the next innovation cycle.

ULTRASOUND EQUIPMENT PILOT PROJECT

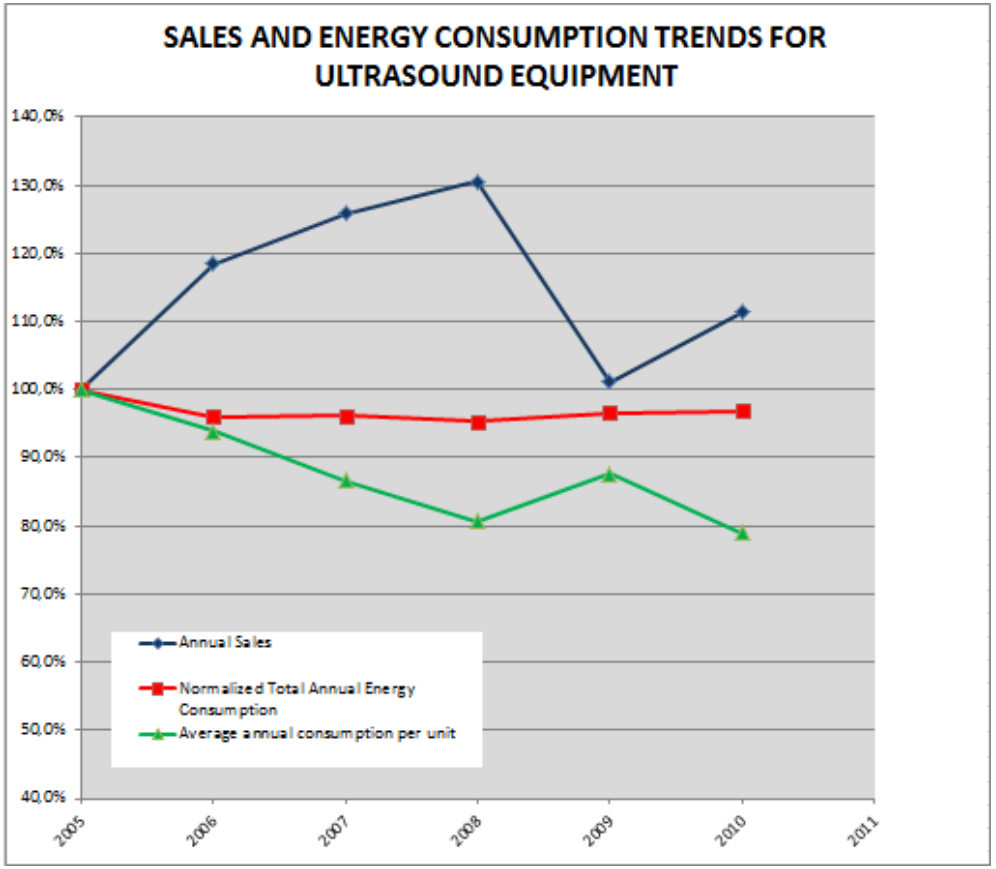
ULTRASOUND PILOT PROJECT

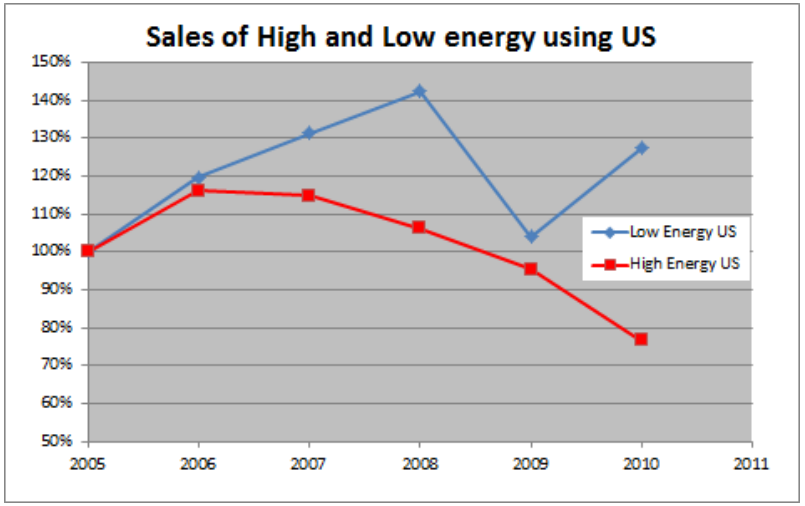
- The Ultrasound pilot project was launched in 2009 as a pilot to gather experience for developing the SRI methodology.
- Ultrasound equipment was chosen because of the relative simplicity, the companies in the SRI producing it (7 out of 11) and the already well established ecodesign practices. The lessons learnt from the US pilot helped to develop the SRIv2.
- The Steering Committee decided not to apply the new methodology SRIv2 to Ultrasound, not to loose the achievements obtained in 2010, but to start in 2010 with MRI.
- The ultrasound pilot project committed participating companies to achieve by 2012 a reduction of 25% in energy consumption of sold products compared to 2005 baseline (14,5% compared with 2009 level).
- The new methodology will be applied to ultrasound starting from 2014/2015.

ULTRASOUND PILOT PROJECT

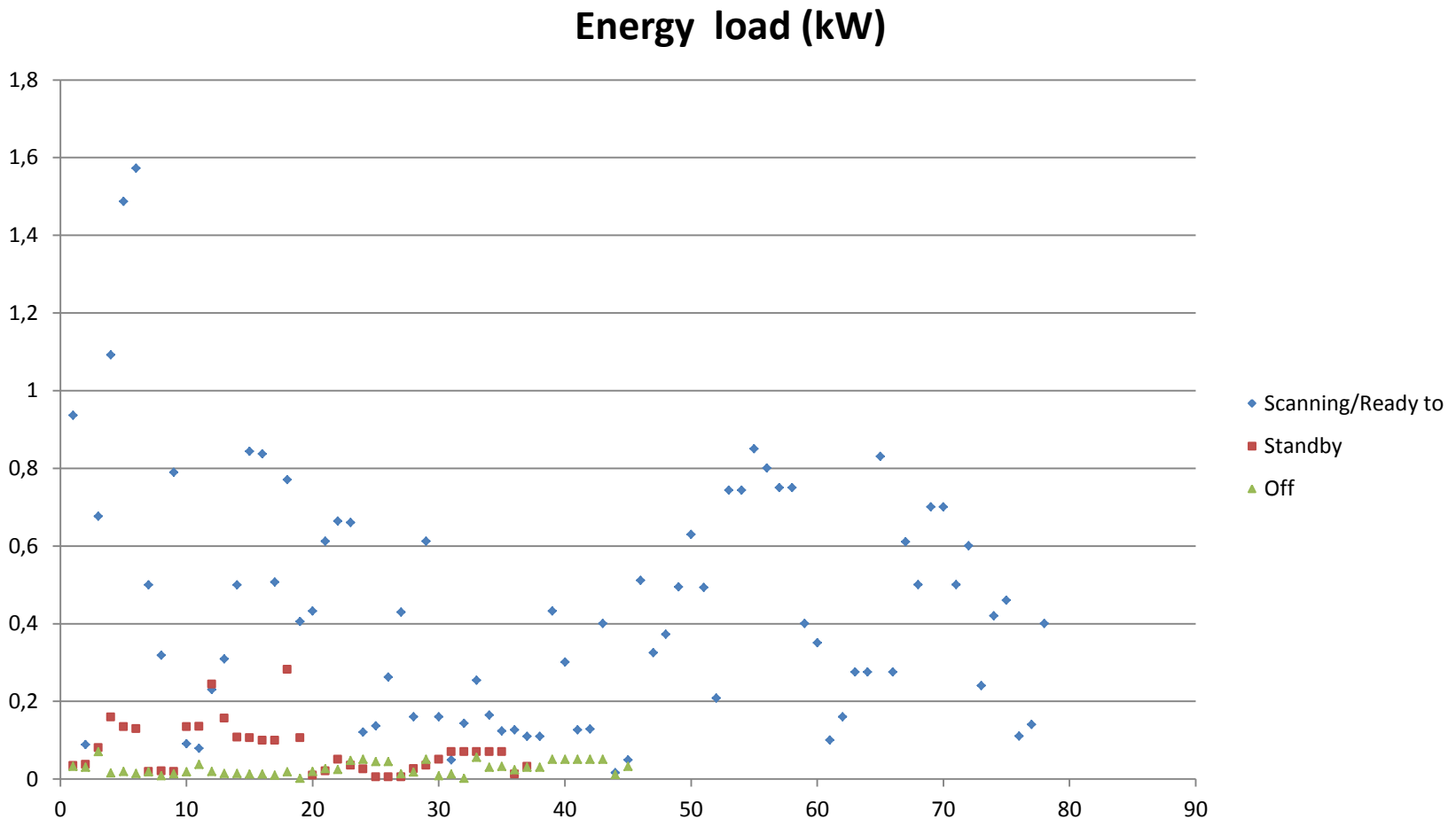
Year	Total annual sales	Total annual sales as a % of 2005 annual sales	Total annual energy consumption of all new products sold	Total annual energy consumption of all new products as a % of 2005 annual energy consumption	Actual average annual energy consumption of all new products sold in kWh (per unit and year)	Actual average annual energy consumption of all new products compared to 2005	Predicted average annual energy consumption of all new products sold	Predicted annual energy consumption of all new products compared to 2005
	Units		kWh		kWh/unit year		kWh/unit year	
2005	17099	100%	15.757.081	100,00%	922	100,00%	-	
2006	20260	118%	17.536.665	111,29%	866	93,93%	-	
2007	21526	126%	17.193.377	109,12%	799	86,67%	-	
2008	22316	130%	16.606.597	105,39%	744	80,75%	-	
2009	17295	101%	13.977.060	88,70%	808	87,70%		
2010	19030	111%	13.858.605	87,95%	728	79,03%	769	83,5%
2011							730	79,2%
2012							**691**	75,0%

ULTRASOUND PILOT PROJECT

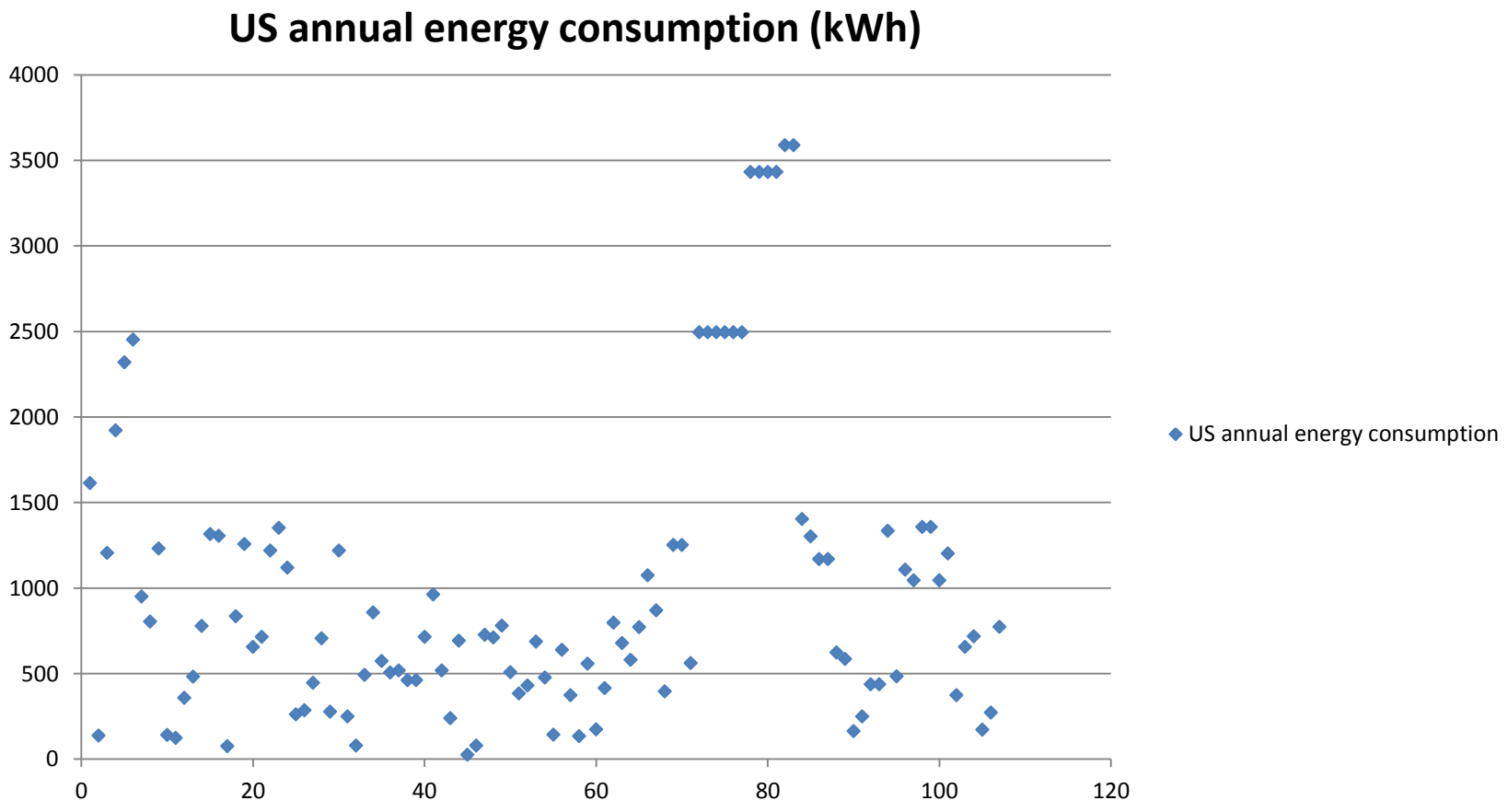




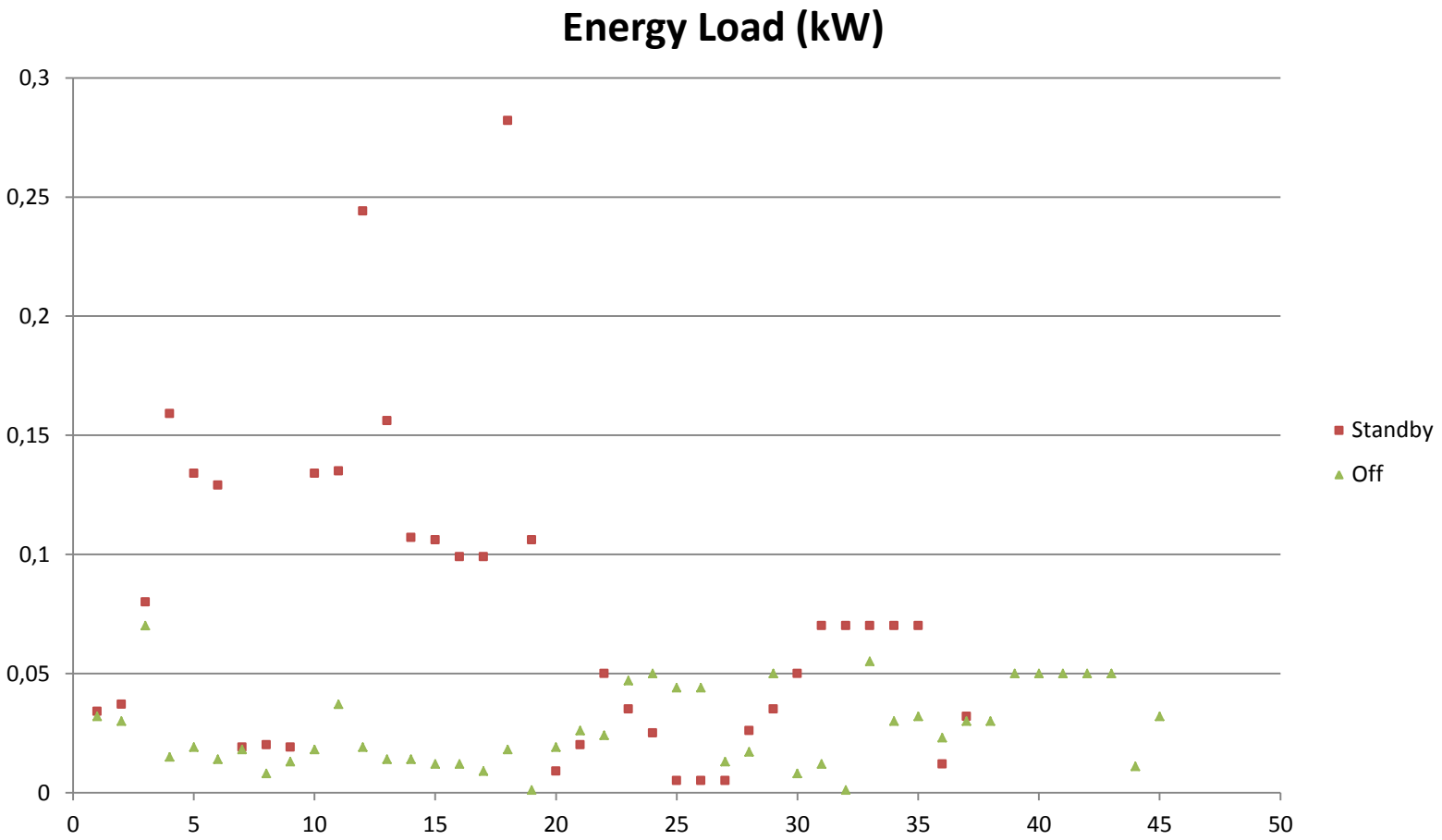
READY TO SCAN/STANDBY/OFF MODE



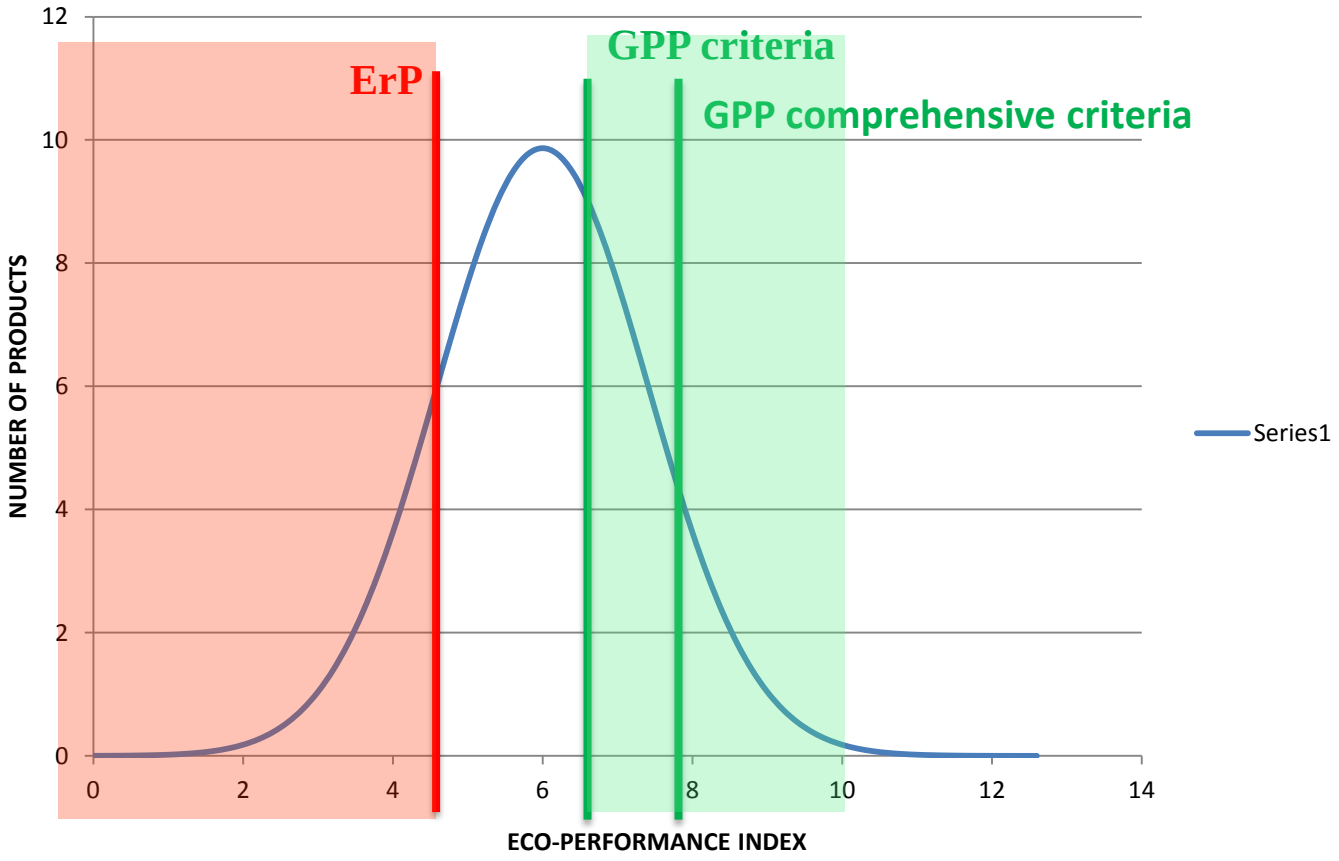
ANNUAL ENERGY CONSUMPTION



READY TO SCAN/STANDBY/OFF MODE



STANDARD ErP/GPP APPROACH



ONE MODALITY PER YEAR

- The SRI for Medical Imaging Equipment applies to the following modalities:
  - Magnetic Resonance
  - Computer Tomography
  - X-ray
  - Nuclear Medicine
  - Ultrasound
- Listed modalities are completely different technologies, used for different applications.
- Under the MEEUP they could not be considered as a single product group but have to be considered as separate and independent product groups, each one subject to its own "preparatory" study.
- For each modality expert groups need to develop common definitions for system boundaries, functional units, categorizations, use scenarios and most important a test procedure to measure the energy consumption. The process is harmonized for all modalities, except the test standard that have to be customized for each modality.
- For this reason Participating Companies commits to apply the methodology to one new modality per year.

	2011	2012	2013	2014	2015
MRI	✓				
CT		✓			
X-Ray			✓		
Nuclear Medicine				✓	
Ultrasound					✓

METHODOLOGY APPLIED ALREADY IN 2010

- Even before the official endorsement by the EC, participating companies started to apply the methodology to Medical Imaging Equipment
- In 2010 the SRI Steering Committee applied Step 1 and 2 of the Methodology to all the modalities in scope.
  - LCA data gathering
  - Prioritizations of modalities according to their environmental impact.
- Magnetic resonance equipment resulted as the modality with the highest environmental impact.
- Computer tomography has been selected as second modality to undergo the methodology.
- In November 2010 a group of MRI experts started to work to apply Step 3 and Step 4 to MRI:
  - Step 3: identification and prioritization of the most significant environmental aspects.
  - Step 4: definition of MRI equipment, use scenario, energy consumption standard test procedure, target setting.

MEASUREMENT OF ENERGY CONSUMPTION

- To define a procedure to measure the energy consumption of equipment which allows comparability and repeatability of results the following elements needs to be defined:
- Systems boundaries
- Definitions (i.e. operating modes)
- Product categories
- Use scenario (typical examination)
- Ranges for parameters and configurations
- Procedure workflow

MAGNETIC RESONANCE IMAGING

- Step 4 of the methodology has already defined:
- System boundaries
  - **In Scope:** All system-critical items needed to perform a basic scan, e.g. gradient amplifiers, RF unit, reconstruction engine(s), required electronics such power supplies, controllers, console/computer, cryogen compressor, water heat exchanger (facility cooled water is provided), patient table, magnet, helium-conservation equipment.
  - **Out of scope:** Any equipment and accessories beyond basic product offering and not required for a basic scan, or customer-provided equipment, e.g. surface coils, patient vital signs accessories, facility-provided cooling water equipment and hardware for advanced medical applications.

MAGNETIC RESONANCE IMAGING

- Product Categorization
  - Member companies have recognized that MRI equipment has different design intents, for specific clinical applications.

General information on categories included	- matrix columns represent key differentiation characteristics that contribute to the energy consumption of a system - each characteristic results in a designated amount of points - total score of all characteristics will determine the overall category that a system belongs to			
Key characteristics	Field strength	1.5T	50	points
		3.0 T	100	points
	bore size	< 60 cm	10	points
		60 - 70 cm	20	points
		>70 cm	30	points
	Maximum Gradient Amplitude per axis	< 35 mT/m	40	points
		≥35 mT/m - ≤60 mT/m	60	points
		> 60 mT/m	80	points
	Maximum Slewrate per axis	< 100 mT/m/s	20	points
		100 mT/m/s - 150 mT/m/s	30	points
		> 150 mT/m/s	40	points
	patient table	fixed table	10	points
		mobile table	20	points
	maximum channels	> 16 channels	15	points
		16-64 channels	35	points
		>64 channels	45	points
	Useable FOV cm²	<40	25	points
		40 - 50 cm	35	points
		> 50 cm	45	points

MAGNETIC RESONANCE IMAGING

- Use scenario

Mode	Description	Typical time in mode per day (hours)	Estimate of % Energy over Life
Off mode	Lowest power state; requires interaction to make system ready; system circuit breakers on.	12	45
Standby mode	System on, ready to scan, gradient system quiescent.	7 (varies)*	30
Scanning mode	System is activating gradient system and capturing image data.	5 (varies)*	25

Diagnostic Application	IMV © Market Distribution	Normalized Distribution
Spine	26%	33%
Brain	25%	31%
Lower and Upper extremities	20%	25%
Vascular	9%	11%

MAGNETIC RESONANCE IMAGING

Ranges for key parameters that could influence the results have been defined to allow full comparability.

HEAD	Slices	FoV / mm x mm			Slice thickness / mm			Resolution / mm			Bandwidth / Hz/Px		Sequence duration	Leitlinien BAEK 2000.pdf	
	S/P	BÄK	Max	Min	BÄK	Max	Min	BÄK	Max	Min	Max	Min	BÄK	Table	Subtopic
localizer	1		280x280	240		8	6		1,1	0,6	83,3	290			
t2_tirm_tra_dark-fluid_320	28	≤ 250	230 x 200	220x220	≤ 6	5	5	≤ 1	0,8	0,7	31,3	191	< 00:05:00	Tabelle 2	Schädel
t2_tse_sag_512	27	200..250	250 x 225	220x220	5..6	5	5	≤ 1	0,5	0,5	195	31,3	< 00:05:00	Tabelle 1a	
ep2d_diff_3scan_trace_p2	23	≤ 250	240	210		5	5	≤ 1	1,9	1,2	1305	250,0	< 00:05:00	Tabelle 2	MRA
t1_se_tra_320	28	200..250	230 x 230	220x220	5..6	5	5	≤ 1	0,9	0,4	163	25	< 00:05:00	Tabelle 1a	
t1_se_tra_320	28	200..250	230 x 230	220x220	5..6	5	5	≤ 1	0,9	0,4	163	25	< 00:05:00	Tabelle 1a	
t1_se_cor_320	32	200..250	230 x 230	220x220	5..6	5	5	≤ 1	0,9	0,4	163	25	< 00:05:00	Tabelle 1a	

SPINE	Slices	FoV / mm x mm			Slice thickness / mm			Resolution / mm			Bandwidth / Hz/Px		Sequence duration	Leitlinien BAEK 2000.pdf	
	S/P	BÄK	Max	Min	BÄK	Max	Min	BÄK	Max	Min	Max	Min	BÄK	Table	Subtopic
localizer	5		450x450	240		8	8		1,8	0,6	290	83,3			
t2_tse_sag_512	16	≤ 350	300x300	260	≤ 4	4	3	≤ 1	0,8	0,5	244	41,67	< 00:05:00	Tabelle 2	BWS/LWS
t1_tse_sag_512	15	≤ 350	300x300	260	≤ 4	4	3	≤ 1	0,8	0,5	250	62,5	< 00:05:00	Tabelle 2	BWS/LWS
t2_tse_tra_512	20	≤ 350	230 x 230	150x150	≤ 4	4	4	≤ 1	0,7	0,4	195	250	< 00:05:00	Tabelle 2	BWS/LWS
t1_tse_tra_448	20	≤ 350	230 x 230	150x150	≤ 4	5	4	≤ 1	0,7	0,4	228	25	< 00:05:00	Tabelle 2	BWS/LWS

ABDOMEN	Slices	FoV / mm x mm			Slice thickness / mm			Resolution / mm			Bandwidth / Hz/Px		Sequence duration	Leitlinien BAEK 2000.pdf	
	S/P	BÄK	Max	Min	BÄK	Max	Min	BÄK	Max	Min	Max	Min	BÄK	Table	Subtopic
localizer	5		500x500	380		8	6,0	1,7	2,0	0,989583	450	83,3			
t1_fl2d_opp-in_tra_p2_mbh	30	300..400	380	330x350	≤ 6	8	6	≤ 2	1,5	1,1875	977	83,3	< 00:00:45	Tabelle 1b	
t2_trufi_cor_p2_bh	25	300..400	420	350x300	≤ 6	10	5	≤ 2	1,4	1,0	651	125	< 00:05:00	Tabelle 1b	
t2_tse_tra_p2_mbh_320	30	300..400	380	330x350	≤ 6	8	5	≤ 2	1,2	1,1	651	62,5	< 00:05:00	Tabelle 1b	
t1_vibe_fs_tra_p2_320_bh_pre	64	300..400	400	330x350	≤ 6	4	3	≤ 2	1,25	1,1	488	166,7	< 00:00:45	Tabelle 1b	
t1_vibe_fs_tra_p2_320_bh_arterial	64	300..400	400	330x350	≤ 6	4	3	≤ 2	1,25	1,1	488	166,7	< 00:00:45	Tabelle 1b	
t1_vibe_fs_tra_p2_320_bh_venous	64	300..400	400	330x350	≤ 6	4	3	≤ 2	1,25	1,1	488	166,7	< 00:00:45	Tabelle 1b	
t1_vibe_fs_tra_p2_320_bh_delayed	64	300..400	400	330x350	≤ 6	4	3	≤ 2	1,25	1,1	488	166,7	< 00:00:45	Tabelle 1b	
t1_vibe_fs_cor_p2_bh_288_post	128	300..400	400 x 345	350x315	≤ 6	4	1,6	≤ 2	1,4	1,1	600	166,7	< 00:00:45	Tabelle 1b	

KNEE	Slices	FoV / mm x mm			Slice thickness / mm			Resolution / mm			Bandwidth / Hz/Px		Sequence duration	Leitlinien BAEK 2000.pdf	
	S/P	BÄK	Max	Min	BÄK	Max	Min	BÄK	Max	Min	Max	Min	BÄK	Table	Subtopic
localizer_tra	3		500x500	280		8	5		2,0	0,7	250	83,3			
localizer_sag+cor+tra	3		350	215x231		8	5		1,4	0,7	250	83,3			
t1_se_sag_512	32	≤ 250	160 x 160	160x160	3,0	4	3	≤ 0,5	0,5	0,3	244	31,25	< 00:07:00	Tabelle 2	Kniegelenk
t2_tse_fs_sag_320	30	≤ 250	160 x 160	160x160	3,0	4	3	≤ 0,5	0,5	0,5	244	41,67	< 00:07:00	Tabelle 2	Kniegelenk
pd_tse_fs_cor_p2_512	30	≤ 250	160 x 160	140	3,0	4	3	≤ 0,5	0,5	0,3	195	41,67	< 00:07:00	Tabelle 2	Kniegelenk

ANGIO	Slices	FoV / mm x mm			Slice thickness / mm			Resolution / mm			Bandwidth / Hz/Px		Sequence duration	Leitlinien BAEK 2000.pdf	
	S/P	BÄK	Max	Min	BÄK	Max	Min	BÄK	Max	Min	Max	Min	BÄK	Table	Subtopic
I_Localizer_feet	7		500x500	400 x 400		8,0	7		2,0	1,6	558	244			
II_Localizer_legs	7		500x500	400 x 400		8,0	7		2,0	1,6	558	244			
III_Localizer_upper_legs	7		500x500	400 x 400		8,0	7		2,0	1,6	558	244			
IV_Localizer_abdomen	7		500x500	400 x 400		8,0	7		2,0	1,6	558	244			
IV_Angio3D_abdomen_pre	96	≤ 400	400 x 350	330x350		2,6	1,3	≤ 2	1,4	1,1	680	488	< 00:05:00	Tabelle 2	V. cava
III_Angio3D_upper_legs_pre	96	≤ 500	400 x 350	330x350		2,6	1,3	≤ 2	1,4	1,1	680	488	< 00:05:00	Tabelle 2	Extremitätengefäße
II_Angio3D_legs_pre	88	≤ 500	400 x 350	330x350		2,2	1,1	≤ 2	1,3	1,0	690	488	< 00:05:00	Tabelle 2	Extremitätengefäße
I_Angio3D_feet_pre	96	≤ 500	400 x 350	330x350		2	0,9	≤ 2	1,3	0,9	490	488	< 00:05:00	Tabelle 2	Extremitätengefäße
IV_Care_bolus	1		450 x 365	330x350		20,0			1,8		400				
IV_Angio3D_abdomen	96	≤ 400	400 x 350	330x350		2,6	1,3	≤ 2	1,4	1,1	680	488	< 00:01:00	Tabelle 2	V. cava
III_Angio3D_upper_legs	96	≤ 500	400 x 350	330x350		2,6	1,3	≤ 2	1,4	1,1	680	488	< 00:01:00	Tabelle 2	Extremitätengefäße
II_Angio3D_legs	88	≤ 500	400 x 350	330x350		2,6	1,1	≤ 2	1,3	1,0	690	488	< 00:01:00	Tabelle 2	Extremitätengefäße
I_Angio3D_feet	96	≤ 500	400 x 350	330x350		2	0,9	≤ 2	1,3	0,9	490	488	< 00:01:00	Tabelle 2	Extremitätengefäße

MAGNETIC RESONANCE IMAGING

- Energy measurement test procedure

Test measurements typical head measurement

Starttime	Action	Endtime	Sequence duration	Power / kW	Time / h	Energy / kWh/sequence
9:00:00	Recorded start time					
	stand-by: patient preparation and positioning; patient data entry					
	localizer		00:00:10	60,00	0,0028	0,17
	stand-by: start new sequence					
	t2_tirm_tra_dark-fluid_320		00:04:32	60,00	0,0756	4,53
	stand-by: start new sequence					
	t2_tse_sag_512		00:03:45	60,00	0,0625	3,75
	stand-by: start new sequence					
	ep2d_diff_3scan_trace_p2		00:01:39	60,00	0,0275	1,65
	stand-by: start new sequence					
	t1_se_tra_320		00:02:53	60,00	0,0481	2,88
	stand-by: contrast agent injection / start new sequence					
	t1_se_tra_320		00:02:53	60,00	0,0481	2,88
	stand-by: start new sequence					
	t1_se_cor_320		00:02:25	60,00	0,0403	2,42
	stand-by: patient out and data archiving					
	Recorded end time	9:33:00				

Start	Action	End	Total time			
9:00:00	average head examination total	9:33:00	0:33:00	kW	Time	kWh
	sum scan time		0:18:17			18,28
	sum stand-by		0:14:43	15,00	0,25	3,68
	control calculation		0:33:00		**Total**	**21,96**

MAGNETIC RESONANCE IMAGING

Once defined the test procedure for MRI will be prepared and made available to stakeholders.

Companies are now running test measurements on all the equipment models placed on the market in 2010/2011.

An external consultant is working with participating companies to define a realistic and ambitious reduction target.