COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK

STRATEGIC SHO ASSET MANAGEMENT PLANS INTEGRATING THE 20% OBJECTIVES IN 2020

Co-funded by the Intelligent Energy Europe
Programme of the European Union

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SUMMARY

ASSET MANAGEMENT PLANS

INTRODUCTION

ASSET MANAGEMENT PLANS

The objective for this deliverables aims at highlighting the impacts of the pilot Energy Saving Measures tested during the AFTER project at a longer term.

These measures are reported and integrated in the strategic asset management and in the planning of the investments up to 2020 in order to evaluate the objective of decrease by 20% of energy consumptions. The final objectives is to present 6 Strategic Asset Management Planning in the 6 different participating Social Housing Organizations integrating the 20% reduction objectives in 2020.

One of the main part of this document will detail the general strategies implemented by the participating Social Housing Companies regarding their energy performance. It will be an opportunity to identify the barriers and the mains objectves that are building the management context for our participating companies.

In order to implement this approach, 6 different Social Housing Organizations have answered to the following approach. The document is dividied (for every Social Housing Organization in 6 main parts) :

Introduction to strategic asset and facility management plan

Describe shortly your company in relation to the existing building stock, for example by specifying the building ages, construction dates, refurbishment state and average demand for final or primary energy.

Estimate how many or what percentage of your housing stocks of your housing company have been already renovated in recent years?

Is there a CSR report integrating environmental data or a specific report focusing on the energy efficiency of your housing stocks? Please describe it shortly.

What does your company do even more in terms of environmental protection in addition to the renovation of buildings for example economic liquidation, green energy, etc..?

For the future – do you think there will be a rising or decreasing demand for dwellings in your region and what are the consequences for the management of your housing stocks with a special focus on its energy efficiency and energy policy as well its financing and fiscal support policy (e.g. a weaker demand could lead to a higher vacancy rate or lower rent price consequently less financial support or capital sources for the renovation of the existing building stocks or for the new energy efficiency construction)?

Energy efficiency objectives of asset and facility management plan

Are there strategic plan and / or asset and facility management plan integrating energy efficiency objectives of your housing stocks (e.g. renovation or something similar) in your company?

Please also describe your strategy how decisions on projects are made:

- Does a portfolio and / or a facility management system exist in you company?
- Is there a midterm plan (e.g. 5-year plan) or something similar regarding the investments to improve the performances of the existing building stocks?
- Which major issues and how are addressed in your management plan, for example, façade restoration, boiler replacement, etc…
- Do you face some requirements from the Board of the real estates' owner(s), city council or other stakeholders (e.g. state policy regarding the energy efficiency to process the building stocks with the worst energy performances)?
- How high is the annual investment in the existing building stocks in your company?

What is "20-20-20"?

In 2008 the European Union has agreed on a package which focuses on emissions cuts, renewable and energy efficiency and aims to ensure the European Union meets its ambitious climate and energy targets for 2020.
Accordingly, valid until the year 2020 the following European standards:
• A 20% reduction of greenhouse gas emissions from 1990 levels;
• A 20% increase of the share of energy consumption produced from renewable resources;
• A 20% improvement of energy efficiency
So we have 20-20 20-goals!
For the reduction of greenhouse gas emissions all Member States carry with differentiated national targets.

Please describe shortly what targets do you have in your company and how AFTER ESMs shall or can contribute to achieving these objectives?

General impacts of AFTER pilot ESMs on your asset and/or facility management plans

If you want to exploit some identified ESMs optimized through the AFTER project in the housing stocks in your company- what would be the potential of energy saving in the future for your company?

A simulation tool has been created in order to present the forthcoming operations concerning all the AFTER WPs that will be implemented in your housing stock (or that are already planned). This simulation tool will allow the participating Social Housing Organization to identify what are the next interventions that may be directly linked with the outputs highlighted in the AFTER Project.
The Matrix propose dis also a tool to calculate (according the main AFTER findings of the participating partners) what should be the potential savings obtained thanks to these measures.

The main conclusions of this Excell table will allow the partners to identify what may be the potential impacts of AFTER measures concerning the running maintenance and the operating management of the housing stock in the energy strategies implemented by 6 European paticipating Social Housing Organizations.

Last question : As a result, if the AFTER project will affect the work of other departments in your company? – Describe these impacts. Are there some synergy effects?

			BEFORE					AFTER			
Type of ESM	Total of m²		Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions		Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM
WP3	-		#DIV/0!	#DIV/0!	-	-		#DIV/0!	#DIV/0!	-	-
WP4											
WP5											
WP6											
WP7											
TOTALS		2014									

Example of the synthesis Excel developed as a simulation tool (Synthesis part of the report)

ESM WP3					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress or Housing stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs

Example of the synthesis Excel developed as a simulation tool (Synthesis part of the report)

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FRANCE

Auvergne Habitat
Sa mission, avec passion
Action Logement

INTRODUCTION

AUVERGNE HABITAT

I. INTRODUCTION TO STRATEGIC ASSET AND FACILITY MANAGEMENT PLAN

Auvergne Habitat is a private social housing company which manages 12.000 dwellings (around 800.000 m²) located in the French "département" of "Le Puy-de-Dome in the Auvergne region. The main part of its housing stock is located on the territory of the Clermond-Ferrand City and its suburban area.

Since 2012, the housing company practices the Corporate Social Responsibility (C.S.R.) and promotes a technical and service policy which aims at keeping as long as possible the elderly at home. This last mentioned policy is implemented within the Label Housing Senior Services developed by DELPHIS.

By law (2003) in France, all the social housing companies must elaborate a strategic asset management plan for a period of ten years, a copy of this plan is given to the state public administration in charge of the regulation of the social housing policy which controls regularly the implementation, the adaptations and the achievement of the objectives mentioned in the plan.

The Clermond-Ferrand City is an old industrial city ("Michelin city"). Despite the decline of this industry, the city preserves its attractiveness and remains dynamic from an economic point of view. The vacancy rate is below 2%, the company builds yearly an average of 200-250 new dwellings (35 million of) and invests in the renovation of its existing stock an average of 8-10 million of each year.

In 2003, Auvergne Habitat has conceived its first strategic asset management plan which covered the period 2004-2013. The first plan mainly focused on the urban renewal of large prefabricated estates areas located in the northern part of the Clermond-Ferrand suburban area according to the French national plan of urban renewal which co-financed it.
In 2014, the company is working on its second strategic asset management plan for the period 2015-2024. This new version should integrate the will of the company to translate into its strategic objectives two dimensions:

1. THE ENERGETIC AND ENVIRONMENTAL ISSUE.

The region has a cold climate. Nevertheless, the actual average energy consumption of the stock is comprised between 150-155 kwh/m²/year which is a relatively good performance compared with other social housing companies located in the same region. The objective for the next ten years is to decrease it up to 120 kwh/m²/year according to the 20/20/20 European objectives but also to the French national policy for the social housing which provides the corresponding financing to the companies with specific loans having a duration of 15 years with interest rates below 1% (The so-called "eco-prêt" financed by the "Caisse des Dépôts et Consignations"). These actions targeting energy efficiency may also be co-financed with EU structural funds if the region authorities agree with.

2. THE AGEING OF THE POPULATION.

The percentage of elderly (tenants > 60 years) living in the stock represents already in 2014, 28% of the persons holding the tenancy agreement. Up to 2032, the population of baby-boomers being retired will increase. So it's also a strategic objective to implement at the level of the company a policy to promote the accessibility and the adaptability of the stock.

As an ageing population requires a higher indoor temperature (20-21 degree C°) and is more impacted by fuel poverty due to its low incomes, it's obvious that these two new strategic objectives are strongly interrelated.

The next strategic asset management plan will have to achieve the following objectives:

On the existing stock,

- To improve the attractiveness of the stock through an adapted maintenance and renovation policy.
- To precise the strategies of the companies in terms of selling and demolition.
- To classify and segment the residences according to their Quality of Service and their market value. It includes the analysis of the practiced rents, the identification of the margins and the potentials of rent increase according to the tenants' incomes.

On the developments,

- To define the housing products, to quantify the potential of the territories targeted by the future developments, to specify the profile of the end-consumers, the tenants according to the different types of rents and housing (from the very low incomes families to middle social classes).
- To quantify the level of the new production in order to avoid vacancy both in the new developments and in the existing stock.

On the financial impacts,

- To detail yearly the investment expenses and their financing.
- To evaluate the financial feasibility and the impacts on the management and financial ratios (gross operating profit, debt ratio, treasury ratio, operating costs, net cash flow.

II. ENERGY EFFICIENCY OBJECTIVES OF ASSET AND FACILITY MANAGEMENT PLAN

Apart of its Strategic Asset Management Plan, Auvergne Habitat practices a five years maintenance plans which details residence by residence the actions of running maintenance, maintenance and extraordinary maintenance on the existing stock to be implemented by the company.
As above mentioned the objectives of the company consist in by the end of its second ten years strategic asset management plan to decrease the average performance of its stock to 120kwh/m²/year. It corresponds to the objectives defined both by the European Union and the French National Authorities.

The Auvergne Habitat housing stock can be divided into three parts:

1. 42% of the stock is represented by multi-storey buildings with collective heating.
2. 43 % of the stock is represented by multi-storey buildings with individual boilers or electric heating.
3. 15% of the stock is represented by blocks of single family houses.

Following the studies and tests led in the frame of the project AFTER, Auvergne Habitat intends to apply on each part of its housing stock expenses and investments which covers the AFTER WP3, WP4, WP5 and WP6, from the improvement of the existing contracts with the heating and energy suppliers (WP3) to the whole renovation of residences (WP6).
As a direct consequence of the AFTER project, the first part of the housing stock has been processed in details to define the type of relevant ESM to apply

Auvergne Habitat		WP3	WP4	WP5	WP6
Nber of dwelling	11 395	4 801	4 801	714	476
Total m² Liv.Surf	797 650	336 070	336 070	49 980	33 320
		100%	100%	15%	10%

The impacts have also been evaluated (see below

AFTER							
Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Cumulated Energy savings after ESM	Cumulated CO^2 emissions savings after ESM	% of energy savings	% of CO^2 Savings	Economic Costs	Economic Analysis (Euro / saved kwh)
147	103	1 795 399	1 256 779	26,60%	22,84%	1 212 692,35 €	0,45
150	26	879 853	615 897	13,03%	11,19%		
115	80	1 091 592	764 115	16,17%	13,88%	781 582,00 €	0,72
123	86	2 983 213	2 866 517	44,20%	52,09%	14 280 000,00 €	4,79

By the end of 2019, its represents in terms of performance,

JANUARY 2020 PERFORMANCE	
% of Energy savings	13,16%
% of CO_2 reduction	15,33%

PERSPECTIVE OF 20/20/20

AUVERGNE HABITAT

I. WHAT DOES IN MEAN: FEASIBILITY OF THE 2020 OBJECTIVES

For Auvergne Habitat, the financing of the investments to improve the energy efficiency of the stock is provided by three main sources:

- Subsidies (local authorities, national states, EU structural funds)
- Loans (State Caisse des Dépôts et Consignations)
- Cash flow (Auvergne Habitat)

Due to budget constraints related to the economic crisis, the local authorities and the French State have stopped their subsidies. It means that the feasibility of the 20-20-20 objectives depends on the rents paid by the tenants which are used by the company to reimburse the loans but also on the other side, on the overall economic efficiency of the company itself which generates the cash-flow.

As rent prices in the social housing stock are strictly regulated by the French State, it's not realistic to wait for their increase in the coming years (an average of 1.3% in the last decade) even for the energy efficiency. The tenants' population living in the social housing stock is poorer and poorer, and some difficulties to control the level of unpaid rents already appear.

By the end, the annual rhythm of the achievement of the extraordinary maintenance and renovation is mainly influenced by the Auvergne Habitat cash-flow. So, the percentage of the stock which can be processed each year is (see the excel file attached which addresses the 42% of the housing stock using a collective heating):
WP3 improvement of the operating management: 100%.
WP4 optimisation of the running maintenance: 20%.
WP5 replacement of systems (boilers): 4%
WP6 renovation and refurbishment of buildings: 2%

Up to the end of 2019, the WP3 and WP4 ESM represent 40% of the energy savings and CO^2 reductions, the WP5 and WP6 ESM 60%. **But after 2019, it's possible to consider that all the potential savings depending on WP3 and WP4 ESM will be achieved so, the main objective will be to maintain the same quality of service in the operating management and the running maintenance**. It means that in 2020 to reach the 20/20/20 objectives will depend totally on the replacement of systems (WP5) and global refurbishment of the shell of the buildings (WP6) ESM. There will be a need for significant financial investments attached with, especially if we consider the 15% of the stock consisting in single family houses which will cost a minimum of 35.000 /unit to renovate it.

As these last amounts of investments in WP5 and WP6 ESM depend for their co-financing on the capacity of Auvergne Habitat to preserve its cash-flow at the same level, it is feasible for Auvergne Habitat to reach the 20/20/20 objectives in 2024.

II. GENERAL IMPACTS OF AFTER PILOT ESMs ON YOUR ASSET AND/OR FACILITY MANAGEMENT PLANS

The main impacts of the project AFTER for Auvergne Habitat have consisted in

1. A new attention paid to **operating management and running maintenance (WP3 and WP4) which must be considered as a whole** as there is a strong relation between the performance of the operating management and all the types of measures decided to improve the running maintenance.

2. Exchanges of practices with the other housing companies partners in the After project which led to significant improvements regarding the WP6 and WP7 practices.

WP3 – OPERATING MANAGEMENT

The improvement of the contracts with the heating and energy suppliers targeted a better hydraulic balancing of the heating and hot water systems through a more active control and monitoring. This is why in the sheet of the excel file attached with the WP4, the hydraulic balancing is considered as a 0% gain, this gain being already taking into account in the sheet of the WP3. Of course, these improvements have marginal costs but in economic terms, it represents the best R.O.I.

WP4 - Running maintenance

In the frame of the project AFTER, Auvergne Habitat has made a total review of all WP4 ESM which can improve significantly the energy efficiency of its stock. Starting from actual energy consumptions and individual diagnosis, the potential savings have been estimated residence by residence, so the corresponding costs.

The following range of energy saving measures has been identified and planned up to 2019:

- Modernization of the existing balancing of the heating systems with a remote monitoring.
- Control and monitoring of the ventilation (if possible to replace classic mechanical ventilation by hybrid ventilation as tested in Bergson).
- To equip all boilers with a remote monitoring
- Pre-heating of the domestic hot water.
- Replacement of one tube radiators
- Replacement of old thermostatic valves
- Solar panels equipment

Up to 2020, all the stock will be covered by these measures. It represents a total cost of 1.030.907 , 0,39 per saved kwh/m². **Due to this last ratio, these types of measures should be considered has a priority by all social housing companies all over Europe.**

WP5 – REPLACEMENT OF SYSTEMS

The measures planned in the frame of the WP5 target the replacement of existing collective boilers mainly by low condensation boilers. Up to 2020, it will impact 914 dwelling, 19-20% of the stock using collective heating. It represents an estimated potential of savings of 16% and a total cost of 963.367 , 0,88 per saved kwh/m².

WORK PACKAGE 6 - RECENTLY REFURBISHED BUILDINGS

Global refurbishments

The rhythm of these refurbishments slows dawn as the routines to withdraw asbestos are each year more expensive due to the legal environment. It's a significant technical and financial brake. Auvergne Habitat has studied the MRA pilot ESM#3 consisting in a global refurbishment of the building optimised with the thermography measurement to prevent air leaks or failures in the external thermal insulation. The company has decided to systematically implement thermography measurement before, during and after the building works when it's feasible.

The average estimated cost to refurbish a dwelling is 30.000 /unit. Up to 2020, 10% of the stock using collective heating will be processed. For the selected residences which have the worst energy performance, it represents an estimated potential of energy savings of 40-45 % for a total investment of 14,2 million of , 4,79 EUR per saved kwh/m².

Conclusion:

The AFTER project has contributed significantly to define the strategy asset management plan to adopt by Auvergne Habitat to reach the 20/20/20 objectives in its housing stock. This strategy will be based upon a mix of energy saving measures and led into two steps. Up to 2020, it represents a total of 16,2 millions of for the part of the stock using collective heating and 41 millions of for the 12.000 dwellings.

During this first phase, the energy saving measures related to the operating management and the running maintenance will be particularly cost efficient. Due to financial constraints, there will be a need for an another period 2020-2024 to achieve totally the 20/20/20 objectives and reach an average performance of 120 kwh/m²/year. During this second phase, the replacement of systems and global refurbishment operations will be the main drivers, it will represent an additional investments of 35 million of for the whole housing stock.

III. INTEGRATION OF THE AFTER ESMs IN THE 2020-ENERGY STRATEGY OF AUVERGNE HABITAT

Synthesis

			BEFORE						AFTER			
Type of ESM	Total of m² concerned		Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions			Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM
WP3	336 070		153	107	51 297 119	35 907 983			147	103	49 501 720	34 651 204
WP4	336 070		153	107	51 297 119	35 907 983			150	26	50 417 266	35 292 086
WP5	63 980		107	-	6 822 452	4 775 716			90	63	5 730 859	4 011 602
WP6	33 320		212	149	7 078 237	4 954 766			123	86	4 095 024	2 866 517
WP7	-		-	-	-							
TOTALS	336 070	2014	153	106,85	51 297 119	35 907 983		2 020		90	44 547 061	30 404 675

representing 42% of the housing stock

			AFTER							
Type of ESM	Total of m² concerned		Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Cumulated Energy savings after ESM	Cumulated CO^2 emissions savings after ESM	% of energy savings	% of CO^2 Savings	Economic Costs	Economic Analysis (Euro / saved kwh)
WP3	336 070		147	103	1 795 399	1 256 779	26,60%	22,84%	1 030 907,35	0,39
WP4	336 070		150	26	879 853	615 897	13,03%	11,19%		
WP5	63 980		90	63	1 091 592	764 115	16,17%	13,88%	963 367,00 €	0,88
WP6	33 320		123	86	2 983 213	2 866 517	44,20%	52,09%	14 280 000,00 €	4,79
WP7	-		-	-	-	-				
TOTALS	336 070	2020		16	6 750 057	5 503 308				
					Total Energy consumption after ESM	Total CO^2 emissions after ESM			Total costs	
					44 547 061	30 404 675			16 274 274,35	

2020 PERFORMANCE	
% of Energy savings	13,16%
% of CO_2 reduction	15,33%

WP3 investments: General investments concerning operating management

ESM WP3					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress or Housing stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
0	New heating contract with the facility management and heating suppliers companies / NB	As it 's based mainly on the balancing of the heating system, it's calcluated as 0% in the sheet ESM WP4 to avoid an overlap.	Yes	3,50%	100%	Patrimoine collectif chauffage collectif	336 070	2015	153	107	51 297 119	35 907 983	147	103	49501720	34651204	Marginal costs
						TOTAL	409 436		154	49	63 053 144	19 861 740	146	46	59900486,8	18868653,34	

WP4 investments: General investments concerning running maintenance

ESM WP4						CONCERNED HOUSING STOCK				PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized AFTER ESM	Internal classification	ESM Potential of Energy savings	N° of the Résidence	Name of the Résidence and or % of the stock impacted by the ESM	Number of dwellings	Average Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO² performance (CO²/m²/year)	Total Energy consumption	Total CO² Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO² Performance after ESM (CO²/m²/year)	Total Energy consumption after ESM	Total CO² Emissions after ESM	Estimated Costs
1	Monitoring of the heating syst / remote control			P3	1,0%	0004	Pailloux 1	16	1120		203	142,1	227357	159150	201	141	225083	157558	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0008	Les Horizons	86	6020		143	99,9	858805	601163	141	99	850217	595152	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0008	Les Horizons	86	6020		143	99,9	859000	601300	137	96	824640	577248	14 004,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0010	Vigenaud	48	3360		139	97,6	468486	327940	137	96	459116	321381	7 200,00 €
3	Hydraulic balancing of the heating system	Optimization provided by the WP3 action on the improvement of the contract with the heating supplier		P5	0,0%	0010	Vigenaud	48	3360		139	97,5	468000	327600	139	98	468000	327600	3 840,00 €
4	Regulation of the ventilation		Yes	P5	1,0%	0014	St Jean	132	9240		134	93,7	1236195	865337	132	93	1223833	856683	11 400,00 €
3	Hydraulic balancing of the heating system	Optimization provided by the WP3 action on the improvement of the contract with the heating supplier		P5	0,0%	0014	St Jean	132	9240		134	93,7	1236195	865337	134	94	1236195	865337	10 560,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0014	St Jean	132	9240		134	93,7	1236195	865337	132	93	1223833	856683	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0015	Le Cheix	136	9520		178	124,6	1694928	1186450	174	122	1661029	1162721	7 200,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0016	Champeil	16	1120		181	126,6	202557	141790	179	125	200532	140372	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0016	Champeil	16	1120		181	126,6	202557	141790	174	122	194455	136118	2 523,75 €
5	Mise en Place télesurveillance régulation N 2			P3	1,0%	0020	Glacière 1	80	5600		151	105,4	843413	590389	149	104	834979	584485	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0021	Glacière 2	217	15190		171	119,6	2596335	1817435	168	117	2544409	1781086	7 200,00 €
5	Mise en Place télesurveillance régulation N 2			P3	1,0%	0022	Glacière 3	70	4900		147	103,0	720866	504606	146	102	713657	499560	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0024	Le Breuil	293	20510		150	105,0	3075837	2153086	147	103	3014320	2110024	7 200,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson		P5	4,0%	0024	Le Breuil	293	20510		150	105,0	3075837	2153086	144	101	2952803	2066962	29 408,40 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0025	Les Hauts de Ville	20	1400		217	152,1	304174	212922	215	151	301133	210793	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0026	Le Parc	189	13230		230	160,8	3038359	2126852	225	158	2977592	2084315	7 200,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0026	Le Parc	189	13230		230	160,8	3038359	2126852	230	161	3038359	2126852	15 120,00 €
2	Equipement débit variable	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	0,0%	0026	Le Parc	189	13230		230	160,8	3038359	2126852	230	161	3038359	2126852	0,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	3,8%	0026	Le Parc	189	13230		230	160,8	3038359	2126852	221	155	2922902	2046031	34 142,40 €
	Installation of tanks for the pre-heating of the DHW			P5	30,0%	26.1	Le Parc ECS	189	13230		0	0,0	180	126	0	0	126	88	6 243,75 €
	Etude Raccordement Au réseau Chaleur Clermont Nord			P5	0,0%	0027	Verlaine	140	9800		136	94,9	1328177	929724	136	95	1328177	929724	0,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0032	Pont St Jacques	70	4900		126	88,1	616608	431626	123	86	604276	422993	7 200,00 €
5	Mise en Place télesurveillance régulation N 2			P3	1,0%	0033	Les Landais	72	5040		154	107,5	773737	541616	152	106	766000	536200	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0033	Les Landais	72	5040		154	107,5	773737	541616	147	103	742788	519952	7 002,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0034	Neufs Soleil	96	6720		127	88,7	851773	596241	125	88	843255	590278	5 625,00 €
5	Remote control régulation N 2			P3	1,0%	0035	Jouve 1	120	8400		151	105,4	1264231	884962	149	104	1251589	876112	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,2%	0035	Jouve 1	120	8400		151	105,4	1264231	884962	144	101	1211134	847794	16 804,80 €
5	Remote control régulation N 2			P3	1,0%	0035	Jouve 2	40	2800		130	90,7	362726	253909	128	90	359099	251369	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0035	Jouve 2	40	2800		130	90,7	362726	253909	124	87	348217	243752	0,00 €
5	Mise en Place PAC GAZ			P5	20,0%	0035	Jouve 2	40	2800		130	90,7	362726	253909	104	73	290181	203127	69 552,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0036	Croix Blanche	171	11970		154	107,5	1838247	1286773	150	105	1801482	1261037	7 200,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0036	Croix Blanche	171	11970		154	107,5	1838247	1286773	154	107	1838247	1286773	13 680,00 €
1	Remplacement régulation/télésurveillance			P3	1,0%	0039	Jarousses	48	3360		190	133,3	639988	447992	189	132	633588	443512	5 625,00 €
	Mise en Place télesurveillance régulation N 3			P3	2,0%	0040	Bergson	153	10710		112	78,6	1201981	841387	110	77	1177942	824559	7 200,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0041	Pasteur	48	3360		180	125,9	604544	423181	178	125	598499	418949	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0042	Les Rameaux	70	4900		119	83,6	585176	409623	118	83	579324	405527	5 625,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0042	Les Rameaux	70	4900		119	83,6	585176	409623	119	84	585176	409623	5 600,00 €
	Equipement Pompe débit variable			P5	0,0%	0042	Les Rameaux	70	4900		119	83,6	585176	409623	119	84	585176	409623	0,00 €

1	Monitoring of the heating syst / remote control			P3	2,0%	0043	Les Chapelles	217	15190		201	140,8	3055910	2139137	197	138	2994792	2096354	7 200,00 €
2	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	3,8%	0043	Les Chapelles	217	15190		201	140,8	3055910	2139137	194	135	2939786	2057850	37 810,80 €
3	Hydraulic balancing of the heating system			P5	0,0%	0043	Les Chapelles	217	15190		201	140,8	3055910	2139137	201	141	3055910	2139137	17 360,00 €
5	Mise en Place télesurveillance régulation N 2			P3	1,0%	0047	Rivaly	200	14000		144	100,6	2011431	1408001	142	100	1991316	1393921	5 625,00 €
2	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	3,5%	0047	Rivaly	200	14000		144	100,6	2011431	1408001	139	97	1941031	1358721	2 917,50 €
5	Implementation of the remote control régulation N 2			P3	2,0%	0049	Lavoisier	216	15120		151	105,7	2282917	1598042	148	104	2237258	1566081	7 200,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0049	Lavoisier	216	15120		151	105,7	2282917	1598042	151	106	2282917	1598042	34 142,40 €
1	Replacement of the monotubes by radiators					0050	Les Jodonnes	151	10570		165	115,4	1742588	1219812	165	115	1742588	1219812	
1	Remplacement régulation/télésurveillance			P3	2,0%	0051	Les Dômes	58	4060		164	114,6	664646	465252	160	112	651353	455947	7 200,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0051	Les Dômes	58	4060		164	114,6	664646	465252	164	115	664646	465252	4 640,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0052	Les Dores	100	7000		166	116,3	1163185	814230	165	115	1151554	806087	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,2%	0052	Les Dores	100	7000		166	116,3	1163185	814230	159	111	1114332	780032	14 004,00 €
	Replacement of 300 thermostatic valves			P5	2,0%	0052	Les Dores	100	7000		166	116,3	1163185	814230	163	114	1139922	797945	19 500,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0053	Le Limousin	24	1680		167	116,7	280006	196004	165	116	277206	194044	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,5%	0053	Le Limousin	24	1680		167	116,7	280006	196004	159	111	267405	187184	5 835,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0054	Mont-Mouchet	54	3780		200	140,1	756611	529628	198	139	749045	524331	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0054	Mont-Mouchet	54	3780		200	140,1	756611	529628	192	135	726347	508443	12 603,60 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0058	Bouchauds 1	19	1330		143	100,3	190642	133450	142	99	188736	132115	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	3,5%	0058	Bouchauds 1	19	1330		143	100,3	190642	133450	138	97	183970	128779	2 087,50 €
1	Remplacement régulation/télésurveillance			P3	2,0%	0060	Le Grenouillet	80	5600		99	69,3	554670	388269	97	68	543577	380504	7 200,00 €
												0,0		0		0		0	
1	Monitoring of the heating syst / remote control			P3	2,0%	0062	Lac-Ouest	135	9450		113	79,1	1067645	747351	111	78	1046292	732404	7 200,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0056	Lac-Sud	270	18900		104	72,9	1967748	1377423	102	71	1928393	1349875	7 200,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0056	Lac-Sud	270	18900		102	71,4	1928393	1349875	102	71	1928393	1349875	21 600,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0056	Lac-Sud	270	18900		102	71,4	1928393	1349875	98	69	1851257	1295880	33 609,60 €

1	Monitoring of the heating syst / remote control			P3	1,0%	0069	Grand Champ	48	3360		155	108,6	521287	364901	154	108	516074	361252	5 625,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0071	Les Loubatières	82	5740		197	138,0	1131502	792051	193	135	1108872	776210	7 200,00 €
1	Monitoring of the heating syst / remote control			P3	2,0%	0072	Gargailles	129	9030		163	114,2	1473778	1031645	160	112	1444303	1011012	7 200,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0072	Gargailles	129	9030		163	114,2	1473778	1031645	163	114	1473778	1031645	10 320,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	0073	Beausite	38	2660		182	127,2	483438	338407	182	127	483438	338407	3 040,00 €
	Solar panels for DHW			P5	0,0%	0073	Beausite	38	2660		182	127,2	483438	338407	182	127	483438	338407	40 932,00 €
4	Régulation of the ventialtion			P5	5,0%	0075	TDC Blanzat Est	46	3220		183	128,2	589799	412859	174	122	560309	392216	5 837,50 €
3	Hydraulic balancing of the heating system			P5	0,0%	0075	TDC Blanzat Est	46	3220		183	128,2	589799	412859	183	128	589799	412859	3 680,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0075	TDC Blanzat Est	46	3220		183	128,2	589799	412859	181	127	583901	408731	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0075	TDC Blanzat Ouest	28	1960		151	105,9	296480	207536	145	102	284621	199235	2 917,50 €
3	Hydraulic balancing of the heating system			P5	0,0%	0075	TDC Blanzat Ouest	28	1960		151	105,9	296480	207536	151	106	296480	207536	2 240,00 €
	Pre-heating of the DHW			P5	0,0%	0075	TDC Blanzat Ouest	28	1960		151	105,9	296480	207536	151	106	296480	207536	0,00 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0075	TDC Blanzat Ouest	28	1960		151	105,9	296480	207536	150	105	293515	205461	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0080	Pré-Rond 1	169	11830		142	99,2	1675746	1173023	136	95	1608717	1126102	5 835,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0083	Gandaillat	111	7770		153	107,1	1189106	832374	147	103	1141541	799079	9 802,80 €
1	Monitoring of the heating syst / remote control			P3	1,0%	0084	Bouchauds 2	20	1400		143	100,0	199941	139959	141	99	197941	138559	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0084	Bouchauds 2	20	1400		143	100,0	199941	139959	137	96	191943	134360	2 917,50 €
5	Mise en Place télesurveillance régulation N 2			P3	1,0%	0102	Chasseur Alpins	32	2240		121	84,4	270000	189000	119	84	267300	187110	5 625,00 €
	Biomass Power plant			P5		0102	Chasseur Alpins	32	2240		121	84,4	270000	189000	121	84	270000	189000	187 285,00 €
5	Mise en Place télesurveillance régulation N 2			P3	1,0%	0135	Rochefeuille	26	1820		95	66,5	172867	121007	94	66	171138	119797	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	0135	Rochefeuille	26	1820		95	66,5	172867	121007	91	64	165952	116166	1 458,75 €
1	Monitoring of the heating syst / remote control			P3	2,0%	13.1	Champradet 1	156	10920		153	107,0	1669598	1168718	150	105	1636206	1145344	7 200,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,0%	13.1	Champradet 1	156	10920		153	107,0	1669598	1168718	147	103	1602814	1121970	16 804,80 €
3	Hydraulic balancing of the heating system			P5	0,0%	13.1	Champradet 1	156	10920		153	107,0	1669598	1168718	153	107	1669598	1168718	12 480,00 €
5	Intallation of a remote control system régulation N 2			P3	1,0%	13.2	Champradet 2	61	4270		129	90,3	551075	385752	128	89	545564	381895	5 625,00 €
4	Regulation of the ventilation	Implementation of the hybrid ventilation tested in Bergson	Yes	P5	4,5%	13.2	Champradet 2	61	4270		129	90,3	551075	385752	123	86	526277	368394	5 835,00 €
3	Hydraulic balancing of the heating system			P5	0,0%	13.2	Champradet 2	61	4270		129	90,3	551075	385752	129	90	551075	385752	4 880,00 €

							TOTAL	4 801	336 070	Average energy performance	153	107	51 297 119	35 907 983	150	26	50 417 266	35 292 086	1 030 907,35 €

WP5 investments: Future replacement of systems

ESM WP5						CONCERNED HOUSING STOCK				PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized AFTER ESM	Internal classification	ESM Potential of Energy savings	N° of the Résidence	Name of the Résidence	Number of dwellings	Average Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs of the ESM
6	Replacement of the boiler	To select boilers based upon the low condensation and renewable sources of energy. To practice the Retrocommissioning during the first heating season.	Yes	P5	16,0%	0020	Glacière 1	80	5600	2019	151	105,4	843413	590389	127	89	708467	495927	110 064,00 €
6	Replacement of the boiler	To select boilers based upon the low condensation and renewable sources of energy. To practice the Retrocommissioning during the first heating season	Yes	P5	16,0%	0041	Pasteur	48	3360	2018	180	125,9	604544	423181	151	106	507817	355472	95 625,00 €
6	Replacement of the boiler	To select boilers based upon the low condensation and renewable sources of energy. To practice the Retrocommisssioning during the first heating season	Yes	P5	16,0%	0049	Lavoisier	216	15120	2015	151	105,7	2282917	1598042	127	89	1917650	1342355	201 986,00 €
6	Replacement of the boiler	To select boilers based upon the low condensation and renewable sources of energy. To practice the Retrocommisssioning during the first heating season	Yes	P5	16,0%	0052	Les Dores	100	7000	2016	166	116,3	1163185	814230	140	98	977076	683953	159 875,00 €
6	Replacement of the boiler	To select boilers based upon the low condensation and renewable sources of energy. To practice the Retrocommisssioning during the first heating season	Yes	P5	16,0%	0056	Lac-Sud	270	18900	2017	102	71,4	1928393	1349875	86	60	1619850	1133895	214 032,00 €
	Replacement of the boiler	To select boilers based upon the low condensation and renewable sources of energy. To practice the Retrocommisssioning during the first heating season	Yes	P5	16,0%	0047	Rivaly	200	14000		144	100,6	2011431	1408001	121	84	1689602	1182721	181 785,00 €
							TOTAL	914	63 980		107	97	6 822 452	4 775 716	90	63	5 730 859	4 011 602	963 367,00 €
								% of the stock	19,04%										

WP6 investments: Future refurbishments

ESM WP6						CONCERNED HOUSING STOCK				PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized AFTER ESM	Internal classification	ESM Potential of Energy savings	N° of the Résidence	Name of the Résidence and or % of the stock impacted by the ESM	Number of dwellings	Average Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
7	Whole renovation of the envelope of the building	Implementation of the thermography during the building works	Yes	Extraordinary Maintenance	40,0%	0004	Pailloux 1	16	1120	2019	203	142,1	227357	159150	122	85	136414	95490	480 000
7	Whole renovation of the envelope of the building	Implementation of the thermography during the building works	Yes	Extraordinary Maintenance	45,0%	0026	Le Parc	189	13230	2017	230	160,8	3038359	2126852	126	88	1671098	1169768	5 670 000
7	Whole renovation of the envelope of the building	Implementation of the thermography during the building works	Yes	Extraordinary Maintenance	40,0%	0043	Les Chapelles	217	15190	2015	201	140,8	3055910	2139137	121	84	1833546	1283482	6 510 000
7	Whole renovation of the envelope of the building	Implementation of the thermography during the building works	Yes	Extraordinary Maintenance	40,0%	0054	Mont-Mouchet	54	3780	2018	200	140,1	756611	529628	120	84	453967	317777	1 620 000
							TOTAL	476	33 320		212	149	7 078 237	4 954 766	122,9	86,0	4095024,4	2866517	14 280 000

WP7 investments: no future low energy buildings

ESM WP7					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Address	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs

COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK

STRATEGIC SHO ASSET MANAGEMENT PLANS INTEGRATING THE 20% OBJECTIVES IN 2020

CZECH REPUBLIC

MRA®

INTRODUCTION

MRA sro.

I. INTRODUCTION TO STRATEGIC ASSET AND FACILITY MANAGEMENT PLAN

The pursuit of far-reaching goals are supposed to be based on reasonable and rational planning for the optimized facility management plans and up to date strategic asset plans which can ensure an effective and efficient utilization of capital as well guide the investment allocation in the social housing company. It is supposed to be integrated not only the technical part about energy efficiency but also a focus on the energy policy and the relevant financing and fiscal support policy (e.g. a weak demand could lead to a higher vacancy rate or lower rent price consequently less financial support or capital sources for the renovation of the existing building stocks or for the new energy efficiency construction etc.), and if a CSR report can integrate environmental data or a specific report on the energy efficiency of the housing building stocks in the pilot country / city.

The city of Haví ov is the youngest town in the Czech Republic. The city was founded in 1955. The city is located in the north-eastern part of the Czech Republic close to the Polish border. It has about 77 449 citizens (state on 1.1. 2014).

The city of Haví ov was built as new settlement on a green open space. About 90.4% houses in Haví ov area were built after the year 1945. The city was originally built to provide accommodation for the miners working in the near mines of the Ostrava-Karvina coal mining and for heavy industry workers. After the Second World War coal mining and heavy industry were rapidly developed in the region. These mining companies and steel factories needed to obtain and make stable a lot of employees. Important factor for obtaining many workers was sufficient number of dwellings for miners and their families. Construction of housing estates started in 1947 on a green open space.

Construction of the city is divided into three periods.

- After 1946 was built 90.4% of the housing stock:
- 1946 – 70 was built 55% of HS
- 1971 – 90 27.6% of HS

Firstly the city centre and main street have been constructed for example After city district Podlesí and After city district Šumbark. The city centre has been constructed in 50th in the style of socialistic realism, in other words Sorela and this part creates a preserved zone. Sorela are buildings and blocks of flats built of bricks and facades of these buildings are decorated with frescos and decorations in socialist realism style. But the other parts of the town that were built later are marked by the later fast building programme where the flats are made of prefabricated panels with simple facades.

MRA Havirov is Municipal Real Estate Agency that was founded in 1995 for management and maintenance of the municipal housing stock and is 100% owned by the Municipality of Havirov. MRA is charged with facility management of about 7634 municipal rental dwellings and 490 commercial spaces on the basis of mandate contract concluded with the Municipality of Havirov. MRA manages about 22% of all dwellings of the city of Havirov. MRA has established three subsidiaries in three districts of the city Havirov to bring its services closer to clients. MRA deals with realisation of inve

stment actions and legal affairs regarding apartments such as rentals, exchanges and sale of apartments.

The housing stock of the municipality Haví ov managed by MRA has been constructed in years 1950 – 1998 mainly with panel technology.

Approximate composition of the housing stock managed by MRA in terms of national building typologies

NATIONAL TYPOLOGY OF BUILDINGS	YEAR OF CONSTRUCTION	PORTION IN THE MUNICIPALITY HOUSING STOCK
T02B	1960-1965	23%
T03B	1960-1972	16%
OP1.11	1983-1992	17%
BP70	1974-1979	9%
G57	1959-1962	7%
T13 (SORELA)	1956	3%
T16 (SORELA)	1959-1960	4%
OP1.13	1988	7%
T15	1959	1%
Brick houses	Before 1950	2%
T06B	1975	6%
GOS	1962	2%
VOS	1968	2%
T08B	1965	1%
Atypical		2%

Housing stock managed by MRA from refurbishment point of view on 1.4. 2014

NUMBER OF BUILDINGS (BUILDING SECTIONS) MANAGED BY MRA. OUT OF IT:	444	100%
Number of refurbished buildings	131	29,5%
Number of buildings with replaced windows	105	23,7%
Number of building without any refurbishment or windows replacement	208	46,8%

The total heated area of housing stock managed by MRA is 409 436 m2 and total consumption for heating was 227 138 GJ (3494 degree days) in year 2012.

There is no CSR report or an energy report.

In the frame of global refurbishment MRA always implements other energy saving measures for example energy saving lighting in the common parts of the building with movement sensors.

The housing stock managed by MRA is owned by the municipality of Haví ov that has elaborated and realized efficient household waste collection and separation (paper, glass, plastics, collection points for batteries and rejected electrical appliances etc.) and ecological waste disposal by professional company.

In our region there is decline of mining activities at the present time. The demand for dwellings decreases and it influences rentals of dwelling of bigger area. These apartments are rebuilt into smaller apartments where it is possible. MRA also starts process of demolition of multifamily buildings in which it is significantly low interest due to poor technical state, locality and to improve its state is not economically bearable. The situation depends on new investment partners who would decrease unemployment in the region.

II. ENERGY EFFICIENCY OBJECTIVES OF ASSET AND FACILITY MANAGEMENT PLAN

Energy saving is especially emphasized in AFTER project. Pilot site can draw up the development programs to strengthen the market competitiveness. During the process of strategy generation social housing company could have to face some requirements from different departments like the board of real estates' owner(s), city council or other stakeholders (e.g. state policy regarding the energy efficiency to process the building stocks with the worst energy performances etc.). A strategic long/short-range planning or something similar regarding the investments to improve the performance of the existing building stocks is proposed to be introduced which is based on its portfolio and/or facility management system, so as to guide the development of future for company. In addition, the annual investment in the existing building stocks, above all the investments related to energy efficiency objectives of the housing stocks (e.g. renovation or something similar) shall be also an assessment indicator for the company.

There is no strategic or long-term plan for energy efficiency or refurbishments in MRA Havirov. There is a yearly financial plan of repairs, maintenance and investments in the housing stock managed by MRA that is elaborated in September for the next year. The priority is the technical state of the houses. Available financial resources are in priority invested in the emergency repairs of the buildings.

All financial resources obtained from rents were always re-invested back in the housing stock and in its operational and housing needs. In years 2000-2008 the municipality invested additional 340 million Czech crowns (about 14 mil. EUR) from its own financial resources. As until 2008 the rents were regulated and **did not cover even basic maintenance of the housing stock.** Long term plan supposed return of these invested financial resources in the past to the owner within next 10 years.

There are two accounts for financing renewal of the housing stock.

From the first account it is paid running maintenance and repairs of the housing stock. The major items are running maintenance costs, repairs of vacant apartments, general repairs of gas distributions, replacement of windows and financial reward to the management housing company MRA Havířov.

The second account (called Fund of rental housing) serves to finance investments in refurbishments of the houses, reconstructions of flats, buildings and other investments.

In the coming years the yearly income from rents should be about 280 mil.CZK (11.6 mil. EUR). From this amount about 120 million of CZK are invested in running maintenance and repairs and about 35 mil.CZK is yearly reward to MRA for its operating costs. There is yearly about 60 mil.CZK repayments of bank credits and minimum balance is 15 mil.CZK at the end of every year.

Future yearly available financial sources for investments will be about 50 mil. CZK (about 2.1 mil. EUR).

OVERVIEW OF BUILDING REFURBISHMENTS IN THE HOUSING STOCK MANAGED BY MRA IN YEARS 2009-2015

YEAR	BUILDINGS ADDRESS	HEATED AREA IN M^2	COSTS IN CZK INCLUDING VAT
2009	J.Jabůrkové 1,3,5 Moskevská 1e	4817	45 186 333
2010	Mládežnická 7/1562 Krajní 2/1569 Astronautů 9/1094 Dlouhá 91/1144 Česká 1-11	14833	116 947 034
2011	Jarošova 31B * H.Malířové 2,4,6 * Tolstého 1,3,5 Sukova 2 e.Destinnové 14,16 *	11441	78 642 360
2012	E.Destinnové 1a,b,c *	3447	18 504 365
2013	Lidická 52a,b * Pujmanové 20,22,24 *	5772	23 546 195
2014	Mládí 9,11,16,18,20,22*	6356	59 212 057
2015	M.Pujmanove 4,6,8,14*	2619	27 957 090
Total		**49285**	**369 995 434**
			(= 13.500.000 Euros)

* These houses (located in the city district Haví ov-Šumbark II) have been refurbished with financial grant from EU funds in the frame of Integrated Plan of the City Development. In the municipality of Havirov there is an Integrated Plan of Development of the city Haví ov (IPRM). This plan has been defined for the years 2010 - 2015. In the frame of the plan several buildings were renovated. Integrated plan of the city development is group of actions that are realised in the selected part of the city focussed on revitalization of public, green areas and refurbishment of apartment buildings. It can include also projects focussed on solving Romany communities endangered with social exclusion. The plan has been realised in part of the city Šumbark II Za Teslou. Actions realised in the frame of the plan were financially supported with financial grants from EU funds.

Refurbishment is aimed primarily at removing defects, to improve technical state of the building and to stretch out the lifetime period of the houses. The refurbishment is done always

complex which means it solves both the technical defects and the energy side - performance of the building.

MRA distinguishes price per m2 of rented apartment according to technical state of the building. Monthly rent is 55 CZK/m2 (2 / m²) after global refurbishment. In residences that have new windows the monthly rent is 52.5 CZK/m2 (1,91 / m²) . Monthly rent is 50.02 CZK/m2 (1,82 / m²) in units that were not refurbished and have not replaced windows. Flats with barrier-free adjustments and without central heating system have rent 45 CZK/m2 (1,64 / m²) . In the past there was a waiting list for the assignation of apartments but this list was cancelled in 2013. Now there are individual offers of vacant flats advertised in public media. The offer can include discounts if there is low interest for the flat, a less attractive localisation, poor technical stated of the building

etc.

OVERVIEW OF WINDOWS REPLACEMENTS IN THE HOUSING STOCK MANAGED BY MRA IN YEARS 2009-2013

YEAR	BUILDING ADDRESS	HEATED AREA IN M2	COSTS IN CZK
2009	Mánesova 50-54, Uzavřená 7-11	4401	8 266 451
2010	Švabinského 1,3,5, Moskevská 1-7	5063	9 011 591
2011	A.Staška 1,3,5, Mozartova 1,3,5	4041	6 754 431
2012	Bludovická 1-5, Bezručova 9,11, K.V.Raise 2,4,6	7860	16 299 193
2013**	Gen Svobody 19,21, Havířov – Šumbark, Horymírova 2-6, Havířov-Město, Jaselská 2, 2a, Havířov-Město, P. Bezruče 5,7, Havířov-Podlesí, Mládežnická 10,12, Havířov-Podlesí Školní 32, Havířov-Šumbark Školní 39, Havířov-Šumbark V.K.Klicpery 1, Havířov-Šumbark V.K.Klicpery 3, Havířov-Šumbark V.K.Klicpery 2,4, Havířov-Šumbark Gen. Svobody 26, Havířov-Šumbark Gen. Svobody 15, Havířov-Šumbark Náměstí Republiky 2, Havířov-Město Gagarinova 30, Havířov-Podlesí Zednická 2,4,6,8, Komenského 1,3,5,7, Stavbařská 1,3, Příčná 4, Stavbařská 5,7, Tesařská 4, Tesařská 3, Stavbařská 9, Stavbařská 8, U Lesa 1,1a,3, 3a, E. Urxe 1,3,5, Komenského 15, Dvořákova 15, Svornosti 7,	94995	118 189 391

	V Parku 8,10,12, Dělnická 18, Husova 5, Sv.Čecha 4, Dlouhá 59,61, Havířov-Město, Slovanská 3-7, Havířov-Město, Slovanská 2-6, Havířov-Město Lipová 17,19; Na Nábřeží 103-109, Havířov-Město, 17.listopadu 2-14, Havířov-Podlesí J. Gagarina 22-28, Havířov-Podlesí Turgeněvova 2-6, Havířov-Město J.Hory 2,4,6, Dlouhá 73-79, Havířov-Podlesí, Komunardů 2-6 Havířov-Město, Mánesova 30,32,34, Konzumní 14, 16, 18, 20, Dlouhá třída 17, Sukova 6, 8 a 1, Národní třída 4-12, Dlouhá třída 49, K.V.Raise 8, 10,12,14		
Total		116 360	158 521 057 CZK
			5.750.000 Euros

** In 2013 the municipality of Haví ov took a credit of 150 million CZK from bank to finance a massive replacement of windows in 2013. The credit taken by the municipality Havirov will be paid for a period of five years in yearly payments of 30 mil. CZK plus interests. It will be paid from collected rents.

OVERVIEW OF HYDRAULIC BALANCING OF THE HEATING SYSTEMS IN THE HOUSING STOCK MANAGED BY MRA IN YEARS 2009-2013

YEAR	BUILDING ADDRESS	HEATED AREA IN M2	COSTS IN CZK
2009	Moravská 1, Moravská 3, Moravská 5, Nákupní 12, Nákupní 10, Nákupní 8, Nákupní 6, Nákupní 3, Nákupní 1, Opletalova 4, Moravská 23, Moravská 25, Moravská 27, Akátová 1, Akátová 3, Hakenova 5, Hakenova 3, Hakenova 1, Lipová 7, Lipová 5,Lipová 3	24 247	2 892 628
2010	Lipová 14, Lipová 16, Lipová 18, Na Nábřeží 95,	14 113	1 674 387

	Bieblova 7, Bieblova 5, Radniční 13, Radniční 11, Radniční 9, Národní 2, Národní 4, Národní 6, Národní 8, Národní 10, Národní 12, Pavlovová 2, Pavlovová 4, Pavlovová 6, Pavlovová 10		
2011	Příčná 4, Stavbařská 3, Stavbařská 1, Komenského 7, Komenského 5, Komenského 3, Komenského 1, Zednická 2, Zednická 4, Zednická 6, Zednická 8, Stavbařská 9, Tesařská 3, Tesařská 4, Stavbařská 7, Stavbařská 5, Tolstého 5, Tolstého 3, Tolstého 1, Dvořáková 15, V Parku 12, Svornosti 7, V Parku 8, V Parku 10, Stavbařská 8, U Lesa 3, U Lesa 1, Klidná – SVJ 5, Klidná 3, Klidná 1, Sukova – SVJ 4, Sukova 6, Sukova 8	12 128	2 030 023
2012	Makarenková 6, Makarenková 4, Makarenková 2, Mánesová 16, Mánesová 14, Mánesová 12, Dlouhá 23, Dlouhá 25, Dlouhá 27, Dlouhá 29, Dlouhá 31, Dlouhá 33, Na nábřeží 109, Na Nábřeží 107, Na Nábřeží 105, Na Nábřeží103	12 408	1 885 852
2013	Na Nábřeží 141, Na Nábřeží 139, Na Nábřeží 137, Na Nábřeží 135, Bludovická 5, Bludovická 3, Bludovická 1, Na nábřeží 133, Na Nábřeží 131, Na Nábřeží 129, Uzavřená 2, Uzavřená 4, Uzavřená 6, Lašská 7, Lašská 9, Lašská 11, Lašská 13, Lašská 15, Lašská 17.	13 846	2 274 218
Total		76 742	10 757 108 CZK (385.000 Euros)

PERSPECTIVE OF 20/20/20

MRA sro

I. WHAT DOES IN MEAN: FEASIBILITY OF THE 2020 OBJECTIVES

In 2008 the European Union has agreed on a package which focuses on emissions cuts, renewable and energy efficiency and aims to ensure the European Union meets its ambitious climate and energy targets for 2020.
Accordingly, valid until the year 2020 the following European standards:

- A 20% reduction of greenhouse gas emissions from 1990 levels;
- A 20% increase of the share of energy consumption produced from renewable resources;
- A 20% improvement of energy efficiency

So we have 20-20 20-goals!
For the reduction of greenhouse gas emissions all Member States carry with differentiated national targets. The pursuit targets in housing company are expected to be near close or achieved through AFTER project.

For the housing stock managed by MRA long-term maintenance depends totally on its main financial resource; the rents paid by the tenants. In a context of low demand, risk of increasing vacancy and low rent, the objectives of the maintenance must be financially realistic and adapted. They focus on the total replacement of windows in all housing units and external insulation of the façades for all units where it is technically possible (monument protected zone) in the horizon of the 15 next years. The yearly rhythm of the maintenance is totally influenced by the growth of the MRA incomes which are based upon the rents paid by the tenants living in the housing stock.

Within the project AFTER MRA has had three pilot ESMs: web portal for increase tenants´ awareness about their consumption of heating energy and water consumption (WP3), hydraulic balancing of the heating system (WP4) and global refurbishment (WP6).

1. Individual metering of heating energy consumption per apartment and billing according to individual consumption depends on the approval by the Czech Parliament of the regulation stipulating obligation of individual metering according to the E.U. directives.

2. Optimised hydraulic balancing of the heating system will be extended to the whole housing stock managed by MRA in the coming years.

3. The project AFTER will influence the acceptance process of the finished global refurbishments from subcontractors (building companies). The technical supervisor will have thermography camera to check works of subcontractors and to point out defects and air leaks. Requirement of submission of thermography report will be included in future contracts with subcontractors of global refurbishments.

II. GENERAL IMPACTS OF AFTER PILOT ESMs ON YOUR ASSET AND/OR FACILITY MANAGEMENT PLANS

Whether the identified ESMs optimized through the AFTER project in the social housing stocks are worth to be exploited for the future development in the housing company and how the AFTER project will affect the work of other departments in the housing company, are the focuses of the attention which tells the potential of energy saving for the pilot site (city and /or country). It involves on the one hand the economical aspect (e.g. how much energy cost can be spared for the tenants which also

depends on their living behavior; how much operation/maintenance cost can be saved in the housing company etc.), on the other hand the ecological side (e.g. how does the CO2 emission is supposed to be reduced?) as well the social side (e.g. if the living satisfaction has been enhanced which directly affects the housing occupancy rates or vacancy rates.). All the factors to be considered are cross impact during the entire planning and operation even outlook process of the company.

You may use the excel file to calculate and show the potential results of AFTER ESMs. It's a simulation tool.

The plan until 2020 contains the below mentioned energy saving measures and assumptions.

The major measures that are realized by MRA to improve energy efficiency of the housing stock are global refurbishments, replacement of windows and hydraulic balancing of the heating system.

The heating energy costs per building are distributed to the tenants according to area of individual apartments. The change of the heating energy costs billing system to base billing on individual consumption rather than on surface can bring energy savings about 5%. The change of the heating energy costs billing system depends on change of legislation, on approval of regulation stipulating obligation of individual metering. The plan until 2020 forecast the change of legislation and billing system partly based on individual consumption of heating energy.

WP3 – OPERATING MANAGEMENT

Heating energy costs billing system

The plan forecasts change of billing system of heating energy costs per building when it will be based partly on consumption measured per individual apartment. Costs of heat costs allocators placed in flats and connecting costs are paid by tenants. It supposed that ESM can bring savings about 5% and will be implemented in whole housing stock. Total heated area of the housing stock is 409 436 m2. Total consumption was 227 138 GJ/years in 2012. The average energy performance of the housing stock is 154 kwh/m2/year.

WP4 - RUNNING MAINTENANCE

Hydraulic balancing of the heating system

The ESM#2 includes the hydraulic balancing of the heating system. In MRA housing stock all radiators are equipped with thermostatic valves and all buildings have regulation in connecting points.

In the second phase MRA has gradually installed new thermostatic valves and new regulation in connecting point and on individual vertical pipelines.

In MRA housing stock there are about 29 045 radiators and out of it 9705 radiators need to be equipped with new TRVs and newly regulated in the following years. It is about 183 building sections (heated area 139 198 m2). Heating energy consumption of not-newly regulated houses is 82 369 GJ. The average energy performance of not-newly regulated houses is 164kwh/m2/year. Costs of the ESM are about 140 CZK/m2 of heated area. Estimated yearly available financial resources for this activity are 2mil.CZK/year. It is supposed that new hydraulic balancing will bring savings about 2,5%.

WORK PACKAGE 6 - RECENTLY REFURBISHED BUILDINGS

Global refurbishments

The MRA pilot ESM#3 consists in global refurbishment of the building. The ESM has been optimised with the thermography measurement to prevent air leaks caused by poorly installed window sills and insufficiently foamed joints.

As stated in the previous chapter it is supposed that yearly available financial sources for refurbishments will be about 50 mil. CZK until 2020 (if no grants or no new credits obtained).

In 2015 MRA knows that available financial sources for refurbishments are 50mil.CZK. In 2015 the house on the street M.Pujmanove 14,4,6,8 will be refurbished for 28mil.CZK. 6mil.CZK will be used for demolition of determined houses. There is 16mil.CZK available for other refurbishments in 2015. The houses to be refurbished were not selected yet.

According to costs of global refurbishments in years 2009-2015 the average cost of refurbishment per m2 of heated area is about 7500 CZK/m2. It means that about 6600 m2 heated area can be refurbished from available yearly financial resources (50mil.CZK/year). Heated area of buildings without replaced windows and insulation is 160 194 m2. The energy performance of the houses without refurbishment and replaced windows is 99 931 GJ/year (consumption of the buildings in 2012). It means energy performance 173kwh/m2/year. If we supposed savings about 30% the energy performance after implementation of ESM will be 121kwh/m2/year.

WINDOWS REPLACEMENT

It is supposed that annually it will be spent about 10mil.CZK for windows replacements between 2015 and 2019. The estimated costs of ESM per m2 of heated area is about 1 400,- CZK calculated on the basis of costs in previous five years. So MRA can affect with the ESM about 7143 m2/year. The expected savings are about 15%.

CO2 EMISSIONS

As for CO2 emissions MRA housing stock is heated with district heating system. The heat is produced by heating company Dalkia. They use black coal from local mines located in the city of Karvina. The calorific value of black coal is 24.5 MJ/kg which is 6.81 kWh/kg. CO2 emissions are 2.149 kg of CO2/1kg of black coal (0.3157 t CO2/MWh). Source of information is Dalkia Czech Republic.

IMPACT UNTIL 2020

With regard to expected available financial resources MRA can decrease energy performance of the housing stock by about 9.17% until 2020 after implementation of the assumed energy saving measures see the excel attachment for details. The process of refurbishment of the housing stock can be accelerated with subsidies from EU funds.

III. INTEGRATION OF THE AFTER ESMs IN THE 2020-ENERGY STRATEGY OF MRA sro

Synthesis

			BEFORE					
Type of ESM	Total of m²		Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions		Average Ernergy performance after ESM (kwh/m²/year)
WP3	409 436		154	49	63 053 144	19 861 740		146,30
WP4	71 430		164	52	11 714 520	3 690 074		159,90
WP5	-		-	-	-	-		-
WP6	66 864		195	61	13 027 144	4 103 550		136,03
WP7	-		-	-	-			
TOTALS	547 730	2014	160	50,49	87 794 808	27 655 365		147

2020 PERFORMANCE	
% of Energy savings	-9,17%
% of CO_2 reduction	-9,17%

WP3 investments: General investments concerning operating management

ESM WP3					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress or Housing stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
1	Billing system of heating energy costs based	Billing system of heating energy costs based partly on	Yes	5,00%	100%	100%	409 436	2015	154	49	63 053 144	19 861 740	146	46	59900487	18868653	paid by tenant
						TOTAL	409 436		154	49	63 053 144	19 861 740	146	46	59900486,8	18868653,34	

WP4 investments: Future actions concerning running maintenance

ESM WP4					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO^2 performance (CO^2/m²/year)	Total Energy consumption	Total CO^2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO^2 Performance after ESM (CO^2/m²/year)	Total Energy consumption after ESM	Total CO^2 Emissions after ESM	Estimated Costs
1	Hydraulic balancing of the heating system	Installation of the new TRVs and new regulation of the heating system	Yes	2,50%	3%	Buildings to be determined	14 286	2015	164	52	2 342 904	738 015	159,9	50,3685	2284331,4	719564,391	82907
2	Hydraulic balancing of the heating system	Installation of the new TRVs and new regulation of the heating system	Yes	2,50%	3%	Buildings to be determined	14 286	2016	164	52	2 342 904	738 015	159,9	50,3685	2284331,4	719564,391	82907
3	Hydraulic balancing of the heating system	Installation of the new TRVs and new regulation of the heating system	Yes	2,50%	3%	Buildings to be determined	14 286	2017	164	52	2 342 904	738 015	159,9	50,3685	2284331,4	719564,391	82907
4	Hydraulic balancing of the heating system	Installation of the new TRVs and new regulation of the heating system	Yes	2,50%	3%	Buildings to be determined	14 286	2018	164	52	2 342 904	738 015	159,9	50,3685	2284331,4	719564,391	82907
5	Hydraulic balancing of the heating system	Installation of the new TRVs and new regulation of the heating system	Yes	2,50%	3%	Buildings to be determined	14 286	2019	164	52	2 342 904	738 015	159,9	50,3685	2284331,4	719564,391	82907
						TOTAL	71 430		164	52	11 714 520	3 690 074	160	50	11421657	3597822	414533

WP5 investments: Future replacement of systems

ESM WP5					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock managed by the company	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs of the ESM

No replacement as MRA is not responsible of the substations owned by the district heating network manager.

WP6 investments: Future refurbishments

ESM WP6					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress and /or Stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
1	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows and other needy repairs	Yes	30,00%	1%	M. Pujmanove 14,4,6,8, Havířov-Šumbark	2 619	2015	212	67	555 228	174 897	148	47	388 660	122 428	814 231
2	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows and other needy repairs	Yes	30,00%	1%	Buildings to be determined according to technical state	2 130	2015	173	54	1 726 021	543 697	121	38	257 943	81 252	662 204
3	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows and other needy repairs	Yes	30,00%	2%	Buildings to be determined according to technical state	6 600	2016	173	54	1 141 800	359 667	121	38	799 260	251 767	2 051 899
4	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows and other needy repairs	Yes	30,00%	2%	Buildings to be determined according to technical state	6 600	2017	173	54	1 141 800	359 667	121	38	799 260	251 767	2 051 899
5	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows and other needy repairs	Yes	30,00%	2%	Buildings to be determined according to technical state	6 600	2018	173	54	1 141 800	359 667	121	38	799 260	251 767	2 051 899
6	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows and other needy repairs	Yes	30,00%	2%	Buildings to be determined according to technical state	6 600	2019	173	54	1 141 800	359 667	121	38	799 260	251 767	2 051 899
7	Windows replacement	Windows replacement		15,00%	1,74%	Buildings to be determined according to technical state	7 143	2015	173	54	1235739	389258	147	46	1 050 378	330 869	414533
8	Windows replacement	Windows replacement		15,00%	1,74%	Buildings to be determined according to technical state	7 143	2016	173	54	1235739	389258	147	46	1 050 378	330 869	414533
9	Windows replacement	Windows replacement		15,00%	1,74%	Buildings to be determined according to technical state	7 143	2017	173	54	1235739	389258	147	46	1 050 378	330 869	414533
10	Windows replacement	Windows replacement		15,00%	1,74%	Buildings to be determined according to technical state	7 143	2018	173	54	1235739	389258	147	46	1 050 378	330 869	414533
11	Windows replacement	Windows replacement		15,00%	1,74%	Buildings to be determined according to technical state	7 143	2018	173	54	1235739	389258	147	46	1 050 378	330 869	414533
					16%	TOTAL	66 864		195	61	13 027 144	4 103 550	136,0	42,8	9095533,4	2865093,0	11 756 695

WP7 investments: Future low-energy buildings

ESM WP7					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Address	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs

No low-energy building construction expected for Mra sro in its 2020-energy objectives.

COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK

STRATEGIC SHO ASSET MANAGEMENT PLANS INTEGRATING THE 20% OBJECTIVES IN 2020

SLOVENIA

SPEKTER d. o. o.
poslovanje z nepremičninami

INTRODUCTION

SPEKTER

I. INTRODUCTION TO STRATEGIC ASSET AND FACILITY MANAGEMENT PLAN

The pursuit of far-reaching goals are supposed to be based on reasonable and rational planning for the optimized facility management plans and up to date strategic asset plans which can ensure an effective and efficient utilization of capital as well guide the investment allocation in the social housing company. It is supposed to be integrated not only the technical part about energy efficiency but also a focus on the energy policy and the relevant financing and fiscal support policy (e.g. a weak demand could lead to a higher vacancy rate or lower rent price consequently less financial support or capital sources for the renovation of the existing building stocks or for the new energy efficiency construction etc.), and if a CSR report can integrate environmental data or a specific report on the energy efficiency of the housing building stocks in the pilot country / city.

City of Trbovlje was established in 1952, however the region was inhabited long before, according to findings way back in the year 1265. Trbovlje are 9th largest city in Slovenia with about 17.000 citizens.

A lot of workers from abroad came to Trbovlje with first railway construction. Beginnings of mining started in 1804, first mine was established in 1847. Another big industry started in 1876 when cement company was built in Trbovlje. City prospered in the middle of the 20th century due to the heavy industry located in the valley of Trbovlje.

Housing stock in Trbovlje is mostly from the middle of 20th century. Some bigger multi-apartment complexes were also built from 70s to the 90s, and these buildings were also quite progressive at that time.

Establishment of the company dates back to the early years of independence of Slovenia and coincides with the beginning of housing policy reforms, with the adoption of the Housing Act.

The founders of the company were Slovenian brown coal mines, which as an initial capital invested 3.154 apartments in several residential building in municipalities of Trbovlje and Zagorje ob Savi.

The purpose of establishment of the company was maintaining its own housing stock in optimum shape, creating jobs with priority of re-employment of mine workers and maintain commercially attractive investment for the time when mining company could use the proceeds of the sales for purpose of their own operation.

Since 1994, SPEKTER became the sole supply carrier with rental housing in Trbovlje and Zagorje. As a multi-apartment building investor, SPEKTER built over 200 new non-profit apartments. In addition, the company purchased over 300 apartments on the market to satisfy the needs of citizens for non-profit rental apartments.

In October 2012 SPEKTER merged with a sister company Domex, d.o.o. from Hrastnik.

In year 2013, SPEKTER had over 60% market share of managed multi-apartment buildings in Trbovlje, while in neighboring municipality of Hrastnik SPEKTER's share was 45%. Altogether, 302 buildings with 3.977 apartments were managed by SPEKTER, of which 2.270 apartments were also in SPEKTER's ownership. In municipality of Zagorje ob Savi, SPEKTER also owns 550 apartments, for which Stanovanjsko podjetje Zagorje ob Savi, d.o.o. is a contractual service provider on SPEKTER's behalf. In some other municipalities, a smaller number of apartments are also owned by SPEKTER.

Total area of apartments owned by SPEKTER is ~117.375 m2 (area of average apartment 51,71 m2)

Ownership structure of multi-apartment buildings in Trbovlje is complex, majority of buildings is owned by condominium owners. Condominium owners Board decides on investments into refurbishments of every multi-apartment building with shared ownership. In the recent years, there was 12 refurbishments of the multi-apartment buildings throughout the municipality of Trbovlje, however in the forthcoming future refurbishments of multi-apartment buildings will eventually become more frequent as energy price is rising, condominium owners are becoming more aware of energy taking a big share of their costs as well as they want to take benefit of non-refundable subsidies of the Eco

Fund, Slovenian Environmental Public Fund. Also district heating provider is constantly maintaining its district heating system according to annual maintenance plan which is leading to lower energy use.

There is no CSR report integrating environmental data or a specific report focusing on the energy efficiency of SPEKTER's housing stock.

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Currently, a process of coal mine closure is being conducted for several years. As coal mining was one of the main industries in the region, closure as well as the consequences of long-term mining rendered Trbovlje to one of the most degraded regions in the country and therefore the demand for dwellings is decreasing in the region

II. ENERGY EFFICIENCY OBJECTIVES OF ASSET AND FACILITY MANAGEMENT PLAN

Energy saving is especially emphasized in AFTER project. Pilot site can draw up the development programs to strengthen the market competitiveness. During the process of strategy generation social housing company could have to face some requirements from different departments like the board of real estates' owner(s), city council or other stakeholders (e.g. state policy regarding the energy efficiency to process the building stocks with the worst energy performances etc.). A strategic long/short-range planning or something similar regarding the investments to improve the performance of the existing building stocks is proposed to be introduced which is based on its portfolio and/or facility management system, so as to guide the development of future for company. In addition, the annual investment in the existing building stocks, above all the investments related to energy efficiency objectives of the housing stocks (e.g. renovation or something similar) shall be also an assessment indicator for the company.

There is no strategic plan or asset management plan integrating energy efficiency objectives of SPEKTER's housing stock.

There are individual short-to-long-term (up to 5-year) maintenance plans for every multi-apartment building managed by SPEKTER, which cover predicted repairs, refurbishments and other investments of particular individual multi-apartment buildings. These individual maintenance plans are validated by condominium owners and can be changed on annual basis.

Unfavourable age structure of SPEKTER's housing stock causes relatively low income (mainly non-profit rent) while on the other hand causes high maintenance costs. Partial solving of this problem is sale of over 50 years old and poorly maintained apartments, mostly to inhabitants of the apartments, which reflects in significant reduction of the cost side, given the relatively small decrease in revenue from rents.

In 2013, SPEKTER invested 731.773 EUR into increasing of own property value, e.g. replacement of windows, installations, thermal insulation etc.; 1.173.525 EUR was invested into a new multi-apartment building with 14 apartments.

In line with current trends of energy consumption reduction and reduction of heat loss in residential buildings SPEKTER intends to participate in refurbishments of multi-apartment buildings along with condominium owners.

PERSPECTIVE OF 20/20/20

SPEKTER

I. WHAT DOES IN MEAN: FEASIBILITY OF THE 2020 OBJECTIVES

SPEKTER's long-term vision for the development of the company is based on the following strategic objectives:

- The integrity and quality of services provided,
- Increasing return on equity,
- Increasing the number of quality jobs,
- Increasing the quality of its own housing stock,
- Meeting the needs for supporting housing services,
- The leading role in development of new projects and property management in the region.

Increasing the quality of own housing stock is ensured by measures such as investments to increase value of apartments, common parts of the buildings and equipment, as well as comprehensive refurbishments of buildings (WP6). SPEKTER also tends to gradually renovate degraded residential complexes substantially owned by SPEKTER and municipalities. When carrying out investment projects in combination with building housing stock for market it is necessary to take into account energy aspects of new buildings (WP7).

Also, district heating providers in municipalities with SPEKTER's housing stock are constantly carrying out maintenance works according to their annual maintenance plans with running maintenance of the system (WP4) and replacement of equipment (WP5) which help reduce energy consumption of SPEKTER's housing stock.

Within project AFTER SPEKTER tested pilot ESMs of hydraulic balancing of the heating system (WP4), external thermal insulation of the building (WP6) and recent low energy building (WP7).

Common outcomes of project AFTER will influence heating energy consumption of housing stock; aside from tested pilot ESMs, SPEKTER will introduce individual billing based on heat cost allocators to entire housing stock.

SPEKTER will also outline a webpage with energy and water consumption, with local and global comparison and including saving tips.

Gradually, optimisation of hydraulically balanced systems will be optimised to low temperature regulation, which was tested in the frame of project AFTER.

Refurbishments of multi-apartment buildings will still be inviting for condominium owners, requirement of thermography review can be included in future contracts with subcontractors of global refurbishments.

Any new multi-apartment buildings in will follow Rules on efficient use of energy in buildings, where all implemented optimisations of fellow companies from project AFTER will come in handy in the phase of designing as well as operating the new building

II. GENERAL IMPACTS OF AFTER PILOT ESMs ON YOUR ASSET AND/OR FACILITY MANAGEMENT PLANS

SPEKTER's plan until year 2020 contains aforementioned energy saving measures and assumptions.

Major ESMs implemented by SPEKTER to reduce energy consumption of the housing stock are thermal insulation of buildings' shell, replacements of windows and global refurbishments. Organisationally, SPEKTER will also try to raise

energy use awareness in its entire housing stock. Also, since October 1st 2011 individual billing for heating energy based on heat cost allocators became mandatory in Slovenia according to Rules on methodology of sharing and consumption-based billing of heating in residential and other buildings of several parts, SPEKTER will continue to convert area based heating costs billing where it's still used to individual billing for heating energy based on actual energy consumption.

Total area of apartments owned by SPEKTER is ~117.375 m2 (area of average apartment 51,71 m2) with a total of approximately 13 GWh of heating energy consumption per heating season. Average energy consumption of housing stock is 110 kWh/m2a.

Performance and energy saving of planned ESMs mentioned below can be found in the simulation table.

WP3 – OPERATING MANAGEMENT

Heat cost allocators

SPEKTER plans to enforce the individual heating energy billing based on heat cost allocators according to Rules on methodology of sharing and consumption-based billing of heating in residential and other buildings of several parts. It is estimated that about 30% of housing stock still uses billing system based on heated area as condominium owners didn't agree on individual billing method. Costs of heat cost allocators implementation are paid by condominium owners. It is estimated that this ESM can save even over 20% of heating energy, however for the calculation 10% of energy saving performance was used. It is planned that the remaining 30% of housing stock will be converted to individual billing system.

Tenant awareness campaign

Results of pilot sites show that raising tenant awareness on appropriate energy use and ventilation can make a huge impact on building's heating energy consumption as inhabitants tend to overheat their apartments. SPEKTER plans to raise tenant awareness with different approaches, however due to a quite costly and time consuming method implemented on pilot sites, the focus of this ESM will be on informational leaflets with occasional energy consulting or personal coaching. For the calculation of impact an estimation of an overall 10% of energy saving impact was used, which means roughly 1,5° C of internal temperature drop in the apartments in 5 years' time.

WP4 - RUNNING MAINTENANCE

Hydraulic balancing of the heating system

Hydraulic balancing of the heating system including the tested optimisation of low temperature regulation (ESM #1) is estimated to be implemented throughout the municipal housing stock of Trbovlje, connected to district heating system. District heating provider is maintaining its system according to the annual maintenance plan, which includes hydraulic balancing of multi-apartment buildings connected to individual district heating stations or substations. It is estimated that yearly 1 to 3 such buildings will be hydraulically balanced.

Change of temperature regulation

Buildings with hydraulic balancing of the heating system already carried out or buildings with specific characteristics (e.g. multi-apartment buildings with oversized one-pipe systems, buildings with smaller number of apartments / floors / radiators…) will be subject to optimisation of heating system regulation accordingly. It is estimated that in 5 years one quarter of housing stock will have their heating system optimised.

WP5 – SYSTEM REPLACEMENT

Replacement of district heating station or substation

Replacement of districts heating station or substation is estimated to be implemented throughout the municipal housing stock of Trbovlje, connected to district heating system. District heating provider is maintaining its system according to the annual maintenance plan, which includes replacement of old or worn out district heating stations or substations. It is estimated that yearly district heating stations or substations providing heat to buildings of about 3.500 m2 will be replaced by district heating provider.

WORK PACKAGE 6 - RECENTLY REFURBISHED BUILDINGS

As condominium owners are more aware of energy consumption as well as rising heating energy price, SPEKTER plans to co-invest into global or partial refurbishments of multiapartment buildings. In owned apartments with old energy inefficient windows, SPEKTER also invests into replacement of windows regularly.

It is planned to implement refurbishments together with thermography review to avoid any possible unprofessional implementation or thermal bridges.

CO2 EMISSIONS

SPEKTER's housing stock is provided with district heating energy. Estimated CO2 emission for district heating 0,33 kgCO2/kWh.

IMPACT UNTIL 2020

It is estimated that the combination of all implemented energy saving measures can decrease energy consumption and CO2 emissions by 20% until 2020 within SPEKTER's financial resources. Realisation of the plan depends not only on SPEKTER but also on condominium owners and district heating provider which are also co-investors. Impact of ESMs that were not tested in frame of project AFTER is merely an assumed estimation and can differ from actual impact. Also, due to complex ownership structure of multi-apartment buildings it is not in SPEKTER's power to Impact of planned energy saving measures. For details please see the simulation table.

III. INTEGRATION OF THE AFTER ESMs IN THE 2020-ENERGY STRATEGY OF SPEKTER

Synthesis

			BEFORE					AFTER			
Type of ESM	Total of m²		Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption (kwh)	Total CO_2 Emissions (kg)		Average energy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM (kwh)	Total CO_2 Emissions after ESM (kg)
WP3	117 375		110	36	12 911 250	4 260 713		96	32	11 232 788	3 706 820
WP4	41 081		110	36	12 911 250	4 260 713		107	35	12 575 558	4 149 934
WP5	17 606		110	36	12 911 250	4 260 713		108	36	12 717 581	4 196 802
WP6	18 780		110	36	12 911 250	4 260 713		106	35	12 439 989	4 105 196
WP7	-				-	-				-	-
TOTALS		2014	110	36	**12 911 250**	**4 260 713**		87	29	**10 232 166**	**3 376 615**

2020 PERFORMANCE	
% of Energy savings	20,75%
% of CO_2 reduction	20,75%

WP3 investments: General investments concerning operating management

ESM WP3					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress or Housing stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Energy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
	Tenant education about energy efficiency - Tenants are educated	Handbook for tenants - how to handle the ventilation system and how to live in a passive	no	2,00%	5%	Darmstadt, Elisabeth-Selbert-Straße 6-8	3 690 m²	2010	No data detected								750
	Tenant education about energy efficiency - Tenants are educated through a campaign, handbook or events	Handbook for tenants to handle the ventilation system and how to live in a low energy house after refurbishment	no	2,00%	60%	Darmstadt, Büdinger Straße 27-37	3 484 m²	2008	No data detected								750
	Tenant education about energy efficiency - Tenants are educated through a campaign, handbook or events	Handbook for tenants to handle the ventilation system and how to live in a low energy building with a high insulation and a new heating system after a refurbishment	no	2,00%	60%	Darmstadt, Holzhofallee 18-20	941 m²	2008	No data detected								750
	Monitoring of the heating system	Installtion of the adaptherm modul to controll and adapt the supply temperature of the heating system	Yes	4,00%	60%	Darmstadt, Schiebelhuthweg 19-25	2 530 m²	2010	97	24	245 343	60 471	94,31936759	22,94551779	238628	58052,16	1500
	Monitoring of the heating system	Installtion of the adaptherm modul to controll and adapt the supply temperature of the heating system	Yes	4,00%	60%	Darmstadt, Kaupstraße 30	574 m²	2010	142	35	81 508	20 090	136,32	33,6	78247,68	19286,4	1500
	Monitoring of the heating system	Installtion of the adaptherm modul to controll and adapt the supply temperature of the heating system	Yes	4,00%	30%	Darmstadt, Kasinostraße 81	526 m²	2010	174	49	91 524	25 774	167,04	47,04	87863,04	24743,04	1500
	Energy monitoring - Heating check	Energy monitorimng to get a better efficiency of the heating system	Yes	4,00%	60%	Darmstadt, Bessunger Straße 182-188	1 541 m²	2008	261	65	402 201	100 165	250,56	62,4	386112,96	96158,4	1500
						TOTAL	622 088		110	36	68 429 625	22 581 776	107	35	66 751 163	22 027 884	98 031

WP4 investments: Future actions concerning running maintenance

ESM WP4					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO² performance (CO²/m²/year)	Total Energy consumption	Total CO² Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO² Performance after ESM (CO²/m²/year)	Total Energy consumption after ESM	Total CO² Emissions after ESM	Estimated Costs
1	Hydraulic balancing of the system	Installation of necessary mechanic gear with new regulation of the heating system	Yes	11,00%	2%	According to DHP annual plan	2 348	2015	110	36	258 225	85 214	97,9	32,307	229 820	75 841	12 000
2	Hydraulic balancing of the system	Installation of necessary mechanic gear with new regulation of the heating system	Yes	11,00%	2%	According to DHP annual plan	2 348	2016	110	36	258 225	85 214	97,9	32,307	229 820	75 841	12 000
3	Hydraulic balancing of the system	Installation of necessary mechanic gear with new regulation of the heating system	Yes	11,00%	2%	According to DHP annual plan	2 348	2017	110	36	258 225	85 214	97,9	32,307	229 820	75 841	12 000
4	Hydraulic balancing of the system	Installation of necessary mechanic gear with new regulation of the heating system	Yes	11,00%	2%	According to DHP annual plan	2 348	2018	110	36	258 225	85 214	97,9	32,307	229 820	75 841	12 000
5	Hydraulic balancing of the system	Installation of necessary mechanic gear with new regulation of the heating system	Yes	11,00%	2%	According to DHP annual plan	2 348	2019	110	36	258 225	85 214	97,9	32,307	229 820	75 841	12 000
6	Change of temperature regulation	Change of temperature regulation of building's heating system	Yes	6,00%	5%	To be determined	5 869	2015	110	36	645 563	213 036	103,4	34,122	606 829	200 253	2 000
7	Change of temperature regulation	Change of temperature regulation of building's heating system	Yes	6,00%	5%	To be determined	5 869	2016	110	36	645 563	213 036	103,4	34,122	606 829	200 253	2 000
8	Change of temperature regulation	Change of temperature regulation of building's heating system	Yes	6,00%	5%	To be determined	5 869	2017	110	36	645 563	213 036	103,4	34,122	606 829	200 253	2 000
9	Change of temperature regulation	Change of temperature regulation of building's heating system	Yes	6,00%	5%	To be determined	5 869	2018	110	36	645 563	213 036	103,4	34,122	606 829	200 253	2 000
10	Change of temperature regulation	Change of temperature regulation of building's heating system	Yes	6,00%	5%	To be determined	5 869	2019	110	36	645 563	213 036	103,4	34,122	606 829	200 253	2 000
						TOTAL	41 081		110	36	4 518 938	1 491 249	102	34	4 183 245	1 380 471	70 000

WP5 investments: Future replacement of systems

ESM WP5					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock managed by the company	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs of the ESM
1	District heating station replacement	Replacement of district heating station's mechanic equipment (Old heating sub/station was removed, new heating sub/station was installed (regulations, pumps, calorimetres, accumulators, electrical installation, safety...)according to district heating provider's annual maintenance plan	No	10,00%	3%	According to DHP annual plan	3 521	2015	110	36	387 338	127 821	99	32,67	348 604	115 039	30 000
2	District heating station replacement	Replacement of district heating station's mechanic equipment (Old heating sub/station was removed, new heating sub/station was installed (regulations, pumps, calorimetres, accumulators, electrical installation, safety...)according to district heating provider's annual maintenance plan	No	10,00%	3%	According to DHP annual plan	3 521	2016	110	36	387 338	127 821	99	32,67	348 604	115 039	30 000
3	District heating station replacement	Replacement of district heating station's mechanic equipment (Old heating sub/station was removed, new heating sub/station was installed (regulations, pumps, calorimetres, accumulators, electrical installation, safety...)according to district heating provider's annual maintenance plan	No	10,00%	3%	According to DHP annual plan	3 521	2017	110	36	387 338	127 821	99	32,67	348 604	115 039	30 000
4	District heating station replacement	Replacement of district heating station's mechanic equipment (Old heating sub/station was removed, new heating sub/station was installed (regulations, pumps, calorimetres, accumulators, electrical installation, safety...)according to district heating provider's annual maintenance plan	No	10,00%	3%	According to DHP annual plan	3 521	2018	110	36	387 338	127 821	99	32,67	348 604	115 039	30 000
5	District heating station replacement	Replacement of district heating station's mechanic equipment (Old heating sub/station was removed, new heating sub/station was installed (regulations, pumps, calorimetres, accumulators, electrical installation, safety...)according to district heating provider's annual maintenance plan	No	10,00%	3%	According to DHP annual plan	3 521	2019	110	36	387 338	127 821	99	32,67	348 604	115 039	30 000
				TOTAL 20/20/20:		TOTAL	17 606		110	36	1 936 688	639 107	99	33	1 743 019	575 196	150 000

WP6 investments: Future refurbishments

ESM WP6					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress and /or Stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
1	Global refurbishment	Global refurbishment - insulation of the building envelope, roof, basement, replacement of windows	Yes	40,00%	1%	Trg revolucije 26	1 174	2015	110	36	129 113	42 607	66	21,78	77 468	25 564	120 000
2	External thermal insulation	External thermal insulation of building's shell, roof, basement	Yes	25,00%	1%	To be determined, according to individual maintenance plans of buildings in housing stock	1 174	2015	110	36	129 113	42 607	82,5	27,225	96 834	31 955	60 000
3	External thermal insulation	External thermal insulation of building's shell, roof, basement	Yes	25,00%	1,5%	To be determined, according to individual maintenance plans of buildings in housing stock	1 761	2016	110	36	193 669	63 911	82,5	27,225	145 252	47 933	90 000
4	External thermal insulation	External thermal insulation of building's shell, roof, basement	Yes	25,00%	2%	To be determined, according to individual maintenance plans of buildings in housing stock	2 348	2017	110	36	258 225	85 214	82,5	27,225	193 669	63 911	120 000
5	External thermal insulation	External thermal insulation of building's shell, roof, basement	Yes	25,00%	2,5%	To be determined, according to individual maintenance plans of buildings in housing stock	2 934	2018	110	36	322 781	106 518	82,5	27,225	242 086	79 888	150 000
6	External thermal insulation	External thermal insulation of building's shell, roof, basement	Yes	25,00%	3%	To be determined, according to individual maintenance plans of buildings in housing stock	3 521	2019	110	36	387 338	127 821	82,5	27,225	290 503	95 866	180 000
7	Replacement of windows	Replacement of old windows in apartments in ownership of SHO	No	15,00%	1%	To be determined, based on technical state of windows	1 174	2015	110	36	129 113	42 607	93,5	30,855	109 746	36 216	35 213
8	Replacement of windows	Replacement of old windows in apartments in ownership of SHO	No	15,00%	1%	To be determined, based on technical state of windows	1 174	2016	110	36	129 113	42 607	93,5	30,855	109 746	36 216	35 213
9	Replacement of windows	Replacement of old windows in apartments in ownership of SHO	No	15,00%	1%	To be determined, based on technical state of windows	1 174	2017	110	36	129 113	42 607	93,5	30,855	109 746	36 216	35 213
10	Replacement of windows	Replacement of old windows in apartments in ownership of SHO	No	15,00%	1%	To be determined, based on technical state of windows	1 174	2018	110	36	129 113	42 607	93,5	30,855	109 746	36 216	35 213
11	Replacement of windows	Replacement of old windows in apartments in ownership of SHO	No	15,00%	1%	To be determined, based on technical state of windows	1 174	2019	110	36	129 113	42 607	93,5	30,855	109 746	36 216	35 213
						TOTAL	18 780		110	36	2 065 800	681 714	85	28	1 594 539	526 198	896 063

WP7 investments: Future low-energy buildings

ESM WP7					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Address	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs

No low-energy building construction expected for Mra sro in its 2020-energy objectives.

COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK

STRATEGIC SHO ASSET MANAGEMENT PLANS INTEGRATING THE 20% OBJECTIVES IN 2020

GERMANY

bauverein AG
darmstadt

INTRODUCTION

Bauverein AG

I. INTRODUCTION TO STRATEGIC ASSET AND FACILITY MANAGEMENT PLAN

bauverein AG is a modern real estate service that combines the classic role of the housing company for broad sections of the population with offers for upscale housing needs and the creation of homeownership. Both the flat primary cares as well as the complementary offerings require a promising based on sustained infrastructure that is operated oriented to the customer and the service.

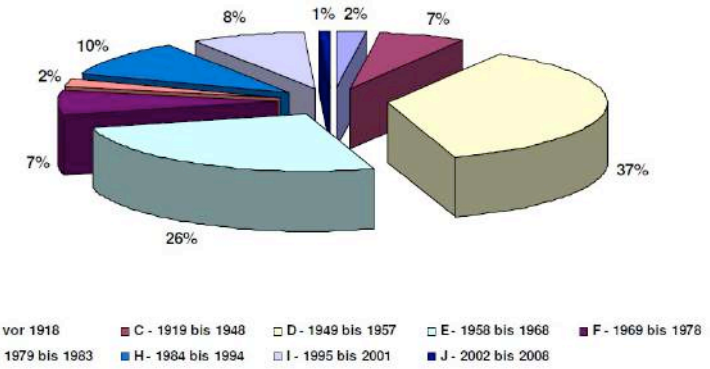
bauverein AG is active in addition under municipal objectives as a developer of new construction, conversion or development areas in the field of generation and renting of municipal or privately used commercial buildings. Here are the support of local development processes, the local primary care and the combination of residential and commercial use in the foreground.

The objectives of the bauverein AG are committed to the common good and the supply. You must be achieved in terms of generating profits and to produce reasonable yields and the safeguarding of jobs and benefits at the bauverein AG. In implementing the objectives, a pioneering role with regard to technical innovation, social orientation and ecological future potential is desirable.

For this reason, bauverein AG has the greatest interest to participate in projects with research character. Especially EU-funded projects provide the opportunity to improve innovative approaches and to integrate within the company. bauverein AG co-founded the network EURHONET because of your innovative approach and has been active in the various working groups.

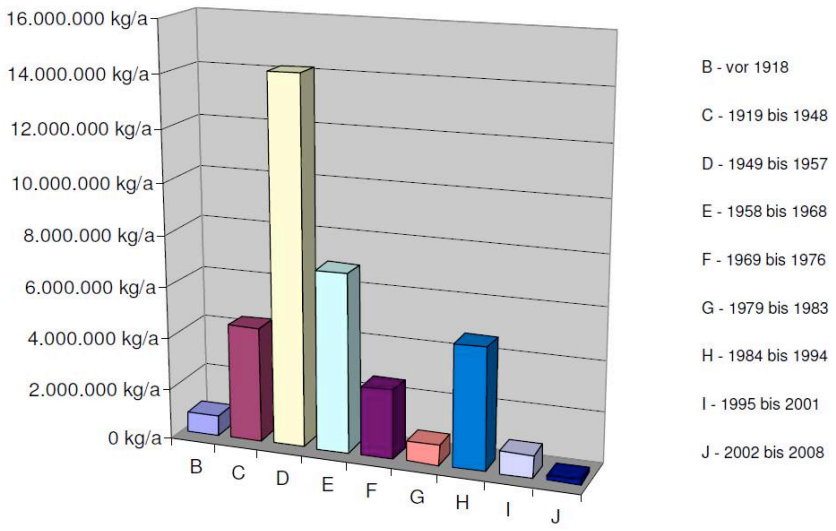
Bauverein AG is a municipal housing company with approximately 20,000 apartments in its portfolio. The housing stock is dominated by post-war buildings from the 50s and 60s to me a simple but very functional architecture. These buildings typically have no insulation and are predominantly supplied with decentralized heat.

The following graph shows the percentage distribution of the building stock by different construction dates. Thus, a total of 63% of the buildings fall within the period of post-war and thus determine the total portfoli



Percentage distribution of building stocks built in different years

Taking into account that the buildings from the post-war period had no heat engineering claim **therefore it came the** results in the following distribution of CO2 emissions.



CO2 emissions in building stocks built in different years

This results in the need for action for future strategies, **which** again finds its focus in the repair of apartments from the period 1949-1968.

Anzahl Wohnungen / durchschnittliche Fläche je Wohnungstyp						
Gesamtbestand	**2012**	**Ø 2012**	**2011**	**Ø 2011**	**2010**	**Ø 2010**
Anzahl Wohnungen	17.225		17.425		17.555	
1-Zimmer-Wohnung	47.714 m²	39 m²	47.906 m²	39 m²	47.324 m²	39 m²
2-Zimmer-Wohnung	423.533 m²	55 m²	429.761 m²	55 m²	431.923 m²	55 m²
3-Zimmer-Wohnung	460.489 m²	72 m²	465.936 m²	72 m²	472.324 m²	72 m²
4-Zimmer-Wohnung	157.121 m²	90 m²	157.409 m²	90 m²	159.512 m²	90 m²
5-Zimmer-Wohnung	14.013 m²	109 m²	14.212 m²	108 m²	14.401 m²	109 m²
Einfamilien-Häuser	5.584 m²	112 m²	6.158 m²	114 m²	4.546 m²	108 m²
SUMME	**1.108.453 m²**	**64 m²**	**1.121.381 m²**	**64 m²**	**1.130.031 m²**	**79 m²**
Davon frei finanziert	**2012**	**Ø 2012**	**2011**	**Ø 2011**	**2010**	**Ø 2010**
Anzahl Wohnungen	9.976		10.049		10.100	
1-Zimmer-Wohnung	28.902 m²	37 m²	29.376 m²	37 m²	29.108 m²	38 m²
2-Zimmer-Wohnung	244.462 m²	55 m²	250.359 m²	55 m²	249.887 m²	55 m²
3-Zimmer-Wohnung	265.959 m²	70 m²	264.234 m²	70 m²	268.128 m²	70 m²
4-Zimmer-Wohnung	74.757 m²	92 m²	71.956 m²	93 m²	73.444 m²	93 m²
5-Zimmer-Wohnung	7.701 m²	115 m²	7.900 m²	115 m²	8.195 m²	115 m²
Einfamilien-Häuser	5.584 m²	112 m²	6.158 m²	114 m²	4.546 m²	108 m²
SUMME	**627.365 m²**	**63 m²**	**629.983 m²**	**63 m²**	**633.308 m²**	**80 m²**
Davon gefördert	**2012**	**Ø 2012**	**2011**	**Ø 2011**	**2010**	**Ø 2010**
Anzahl Wohnungen	7.246		7.376		7.458	
1-Zimmer-Wohnung	18.811 m²	42 m²	18.530 m²	42 m²	18.216 m²	43 m²
2-Zimmer-Wohnung	179.072 m²	56 m²	179.402 m²	56 m²	182.036 m²	56 m²
3-Zimmer-Wohnung	194.530 m²	74 m²	201.701 m²	74 m²	204.196 m²	74 m²
4-Zimmer-Wohnung	82.363 m²	88 m²	85.452 m²	88 m²	86.068 m²	88 m²
5-Zimmer-Wohnung	6.312 m²	102 m²	6.312 m²	102 m²	6.207 m²	102 m²
SUMME	**481.089 m²**	**66 m²**	**491.398 m²**	**67 m²**	**496.723 m²**	**73 m²**

Building stocks with different dwelling structure and average dwelling area

The core of the bauverein AG and is located in Darmstadt and is distributed throughout the city as follows.

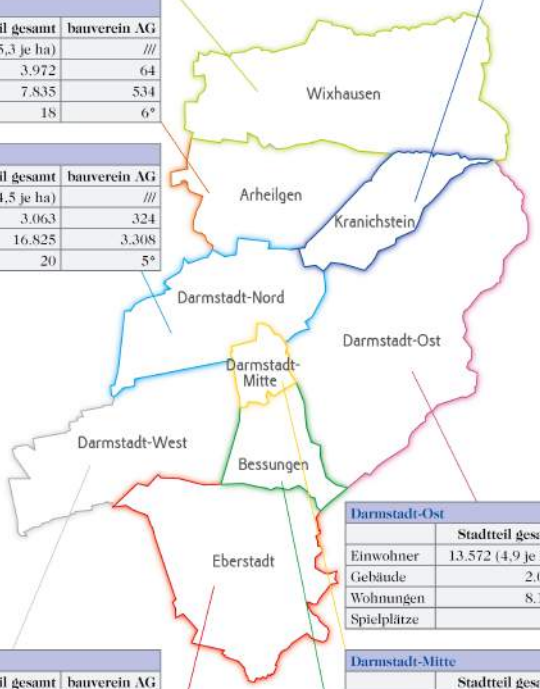
Quartiersstruktur der bauverein AG in Darmstadt 2012

Wixhausen	Stadtteil gesamt	bauverein AG
Einwohner	5.916 (2,5 je ha)	///
Gebäude	1.343	4
Wohnungen	2.833	58
Spielplätze	7	2*

Kranichstein	Stadtteil gesamt	bauverein AG
Einwohner	11.394 (17,4 je ha)	///
Gebäude	1.120	72
Wohnungen	4.675	679
Spielplätze	5	7*

Arheilgen	Stadtteil gesamt	bauverein AG
Einwohner	17.199 (15,3 je ha)	///
Gebäude	3.972	64
Wohnungen	7.835	534
Spielplätze	18	6*

Darmstadt-Nord	Stadtteil gesamt	bauverein AG
Einwohner	30.169 (24,5 je ha)	///
Gebäude	3.063	324
Wohnungen	16.825	3.308
Spielplätze	20	5*



Darmstadt-Ost	Stadtteil gesamt	bauverein AG
Einwohner	13.572 (4,9 je ha)	///
Gebäude	2.048	161
Wohnungen	8.128	1.336
Spielplätze	8	6*

Darmstadt-West	Stadtteil gesamt	bauverein AG
Einwohner	16.842 (11,1 je ha)	///
Gebäude	2.835	237
Wohnungen	8.534	1.619
Spielplätze	9	6*

Darmstadt-Mitte	Stadtteil gesamt	bauverein AG
Einwohner	19.073 (81,9 je ha)	///
Gebäude	1.544	184
Wohnungen	11.130	1.321
Spielplätze	7	10*

Eberstadt	Stadtteil gesamt	bauverein AG
Einwohner	22.686 (12,5 je ha)	///
Gebäude	4.503	159
Wohnungen	11.052	1.922
Spielplätze	21	12*

Bessungen	Stadtteil gesamt	bauverein AG
Einwohner	13.304 (24,1 je ha)	///
Gebäude	2.229	42
Wohnungen	7.685	397
Spielplätze	8	6*

Investments structure of the quarters of Darmstadt by bauverein AG in 2012

II. ENERGY EFFICIENCY OBJECTIVES OF ASSET AND FACILITY MANAGEMENT PLAN

With the software EPIQR the building stock bauverein AG was acquired technology and energy. This resulted in a long-term planning for maintenance and modernization measures results depending on the technical condition of the building of the energy performance and the economic development of the property.

The focus is reflected in the insulation of the opaque envelope and the replacement of windows. Similarly, the heating system will be replaced and, if possible, coupled with renewable energy.

The following table shows the development of the energy rite due to renovations in stock.

Energieverbrauch und CO_2-Emisson des Gesamtbestandes und der Neubauten der letzten fünf Jahre						
Energieverbrauchsklassen	2012		2011		2010	
	Ges.bes.	Neubau	Ges.bes.	Neubau	Ges.bes.	Neubau
A: zwischen 0 und 50 kWh/m²/Jahr	3%	14%	4%	10%	4%	10%
B: zwischen 51 und 90 kWh/m²/Jahr	3%	57%	2%	40%	2%	40%
C: zwischen 91 und 150 kWh/m²/Jahr	10%	29%	10%	50%	10%	50%
D: zwischen 151 und 230 kWh/m²/Jahr	27%	0%	25%	0%	24%	0%
E: zwischen 231 und 330 kWh/m²/Jahr	42%	0%	44%	0%	44%	0%
F: zwischen 331 und 450 kWh/m²/Jahr	12%	0%	12%	0%	13%	0%
G: zwischen 451 kWh/m²/Jahr und mehr	3%	0%	3%	0%	3%	0%
Durchschnittsverbrauch:	**222 kWh/m²/Jahr (176/51 kWh/m²/Jahr)***		**224 kWh/m²/Jahr (178/52 kWh/m²/Jahr)***		**232 kWh/m²/Jahr**	
Median-Verbrauch:	**226 kWh/m²/Jahr (182/56 kWh/m²/Jahr)***		**233 kWh/m²/Jahr (186/58 kWh/m²/Jahr)***		**234 kWh/m²/Jahr**	
CO_2-Emissionen	2012		2011		2010	
	Ges.bes.	Neubau	Ges.bes.	Neubau	Ges.bes.	Neubau
Zwischen 0 und 5 kg CO_2/m²/Jahr	0%	14%	0%	10%	0%	10%
Zwischen 6 und 10 kg CO_2/m²/Jahr	0%	29%	0%	10%	0%	10%
Zwischen 11 und 20 kg CO_2/m²/Jahr	3%	57%	3%	40%	3%	40%
Zwischen 21 und 35 kg CO_2/m²/Jahr	13%	40%	12%	40%	12%	40%
Zwischen 36 und 55 kg CO_2/m²/Jahr	34%	0%	32%	0%	31%	0%
Zwischen 56 und 80 kg CO_2/m²/Jahr	40%	0%	43%	0%	44%	0%
Zwischen 81 kg CO_2/m²/Jahr und mehr	10%	0%	10%	0%	10%	0%
Durchschnittsemission:	**53 kg CO_2/m²/Jahr (39/12 kg CO_2/m²/Jahr)***		**54 kg CO_2/m²/Jahr (40/13 kg CO_2/m²/Jahr)***		**55 kg CO_2/m²/Jahr**	
Energetisch saniert	2012		2011			
	sanierter Bestand		sanierter Bestand			
Zwischen 0 und 5 kg CO_2/m²/Jahr	1%		1%			
Zwischen 6 und 10 kg CO_2/m²/Jahr	2%		2%			
Zwischen 11 und 20 kg CO_2/m²/Jahr	42%		41%			
Zwischen 21 und 35 kg CO_2/m²/Jahr	39%		39%			
Zwischen 36 und 55 kg CO_2/m²/Jahr	16%		17%			
Zwischen 56 und 80 kg CO_2/m²/Jahr	0%		0%			
Zwischen 81 kg CO_2/m²/Jahr und mehr	0%		0%			
Durchschnittsemission:	**26 kg CO_2/m²/Jahr**		**26 kg CO_2/m²/Jahr**			

* Ergebnisse ohne Warmwasser getrennt nach Bestand und Neubau

Energy consumption and CO2 emissions in existing and new buildings in last five years

Overall bauverein invested in about 8,000,000, - per year in energy major modernization measures. This can be completely rehabilitated per year, approximately 5 to 7 buildings. Saving energy starts in the building stock. On average, a multi-family building age of the 1950/1960 uses up to 300 kWh / m². 75% of the buildings in Germany have been built before the first heat protection regulation. Within this stock until 28% of the wall and 62% of the roofs are equipped with a previously insulation. Also the building stock bauverein AG is characterized by a high proportion of older existing buildings. Through energy upgrades or corresponding modernization measures as they can perform bauverein AG, the energy demand of residential buildings can be reduced by up to 70%. This will also benefit the tenants, driving down their operating costs. Continuous investment in improving the energy efficiency of older existing buildings are from the perspective of bauverein AG therefore essential to fulfill the company's mission to provide the population in Darmstadt affordable housing. Not least, the investment in the housing stock from the perspective of bauverein AG helps influence the local climate in Darmstadt positive: with each energetic renovation successfully completed also reduce emissions of carbon dioxide (CO2). Saving energy is thus the best climate.

The focus is reflected in the insulation of the opaque envelope and the replacement of windows. Similarly, the heating system will be replaced and, if possible, coupled with renewable energy. The following table shows the development of the energy rite due to renovations in stock.

Excerpt from the reorganization plan of bauverein AG Darmstadt:

Asset-Managment-Plan Global Refurbishment 2013 - 2020

WE	ort	str	Standort-qualität	Invest (epiqr)	Invest (VOFI - inkl. E-Mod´s, ohne möglichen Dachausbau)	Vorschlag Portfolio
15	Darmstadt	Soderstraße 103-111 / Inselstraße 14-16	69,59	1.240.045 €		2013
169	Darmstadt	Gutenbergstraße 26 / Lichtenbergstraße 22	69,19	636.870 €		2013
215	Darmstadt	Bismarckstraße 17 A	68,03	289.455 €		2013
249	Darmstadt	Brüder-Knauß-Str. 4 / Sandbergstraße 16-20	72,39	1.369.650 €		2013
184	Darmstadt	Robert-Schneider-Straße 68	60,11	239.890 €		2013
107	Darmstadt	Mathildenstraße 54	83,49	314.985 €		2013
81	Darmstadt	Mathildenstraße 48	76,10	362.365 €		2013
98	Darmstadt	Mathildenstraße 42	76,10	362.020 €		2013
89	Darmstadt	Lucasweg 3	86,71	198.720 €		2013
118	Darmstadt	Darmstraße 33	83,31	177.215 €		2013
5180	Darmstadt	Annastraße 12	66,93	412.275 €		2014
5590	Darmstadt	Annastraße 8	65,44	768.200 €		2014
1690	Darmstadt	Grüner Weg 10				2014
1190	Darmstadt	Goethestraße 28-34	66,14	1.269.600 €		2014
132	Darmstadt	Weyprechtstraße 1	83,09	419.520 €	594.100 €	2014
73	Darmstadt	Wilhelminenplatz 15-17, Hölgesstraße 21	78,72	1.492.125 €		2018
301	Darmstadt	Alexandraweg 3	78,89	565.915 €		2018
43	Darmstadt	Mathildenstraße 28	69,44	274.735 €		2018
24	Darmstadt	Bessunger Straße 176	68,17	2.335.420 €		2018
185	Darmstadt	An der Sanddüne 2	69,01	337.180 €		2018
5880	Darmstadt	Gervinusstraße 66	70,56	1.606.435 €		2018
5840	Darmstadt	Beckstraße 66	68,37	1.221.760 €		2018
157	Darmstadt	Bessunger Straße 162	61,03	542.455 €		2018
94	Darmstadt	Gutenbergstraße 18	67,73	559.475 €		2019
188	Darmstadt	Gutenbergstraße 27	67,24	540.615 €		2019
5050	Rüsselsheim	Uhlandstraße 6	67,46	1.191.745 €		2019
279	Darmstadt	Heinrichstraße 105	67,94	451.605 €		2019
96	Darmstadt	Riedlinger Straße 39	67,86	496.685 €		2019
195	Darmstadt	Nieder-Ramstädter-Straße 67	67,85	372.830 €		2019
2020	Darmstadt	Roßdörfer Straße 32	67,56	564.995 €		2019
1900	Darmstadt	Nieder-Ramstädter-Straße 54	66,86	856.405 €		2019
103	Darmstadt	Kiesstraße 95	66,80	686.550 €		2019
34	Darmstadt	Heinrichstraße 101	66,58	386.860 €		2019
461	Darmstadt	Marktplatz 14	72,91	496.225 €		2020
126	Darmstadt	Hoffmannstraße 3	66,06	837.200 €		2020
64	Darmstadt	Dieburger Straße 40	66,50	2.600.725 €		2020
5540	Darmstadt	Kiesstraße 125	66,17	786.715 €		2020
149	Darmstadt	Kiesstraße 29	66,08	1.921.305 €		2020

PERSPECTIVE OF 20/20/20

Bauverein AG

I. WHAT DOES IN MEAN: FEASIBILITY OF THE 2020 OBJECTIVES

The population is in Darmstadt in 2020 to grow to 160,000 residents, as there will be an increase in jobs. Darmstadt is a prosperous town in the Rhine Main area due to the university, the college, global companies and the proximity to the airport. The housing market will continue to be strained by an increased demand, as we climb the demanded quality of living space, this touches also energy-aware and technically distinct apartments.

For the properties of bauverein AG it will come due to the continuation of the continuous structural renovations to a further decline, in particular the heating demand. In the region of the stream it is also, however, slight declines. Two thirds of the building bauverein AG in Darmstadt will be rehabilitated by 2025.

The continually progressive energy renovation of buildings will lead to a decrease in energy demand per m² of living space per capita for space heating, although need for comfort and living space per capita to increase. For new construction, the passive house standard will have 2020 fully enforced. In contrast, the consumption of electricity in certain circumstances even a slight increase can be observed, because the technical equipment of households, despite higher energy efficiency of the individual devices continues to increase, thus driving the total demand for electricity in the air. Because of the high primary energy factor is just the development of electricity consumption suggests strongly reflected in the CO2 balance. The savings will be promoted by the conditions on the part of the federal government, such as development and implementation of the Energy Saving Ordinance also in stock, continuous KfW promotional programs and increases in energy prices. The energetic renovation rate rises yet. Number of individual combustion plants which are fired with wood, take to grow and reduce the reported CO2 emissions even further off. The target values of the Renewable Energy Act, heat (14%) come to fruition.

Basically it can be considered from two development scenarios for the housing industry.

SCENARIO 1 - MAXIMUM ENERGY EFFICIENCY

The properties of bauverein AG are rapidly restructured, with the passive house standard for general purification standard. During the construction of this standard is even exceeded, because the newest buildings are planned as energy-plus houses and implemented. In addition, intelligent and highly energy-efficient building technologies are also considered to be carried out.

The intensification of the public relations, develop a network to energy consulting, implementation of campaigns and model rehabilitation, special economic incentives and subsidies the energy efficiency ratio is significantly increased by two to three times, and also exceeds the energetic modernization standard the previous average, in general, the energy requirement for space heating not only on average up to 60%, but even up to 70% reduced. This applies to housing companies and for private owners. The application of new heating technologies (near-surface geothermal, solar thermal heating support) and the use of small and micro-CHP improve the CO2 balance in addition. Also, the increase in power consumption is not only stopped by an enhanced public relations, for example by intensifying consumer advice and promotions for the purchase of highly energy-efficient household, working appliances and lighting systems, but there is even reductions of around 5% of electricity consumption per household . Since the electricity mix also changed further in the direction of renewable energy, it is - just because of the strong effect of the upstream processes in power - to reduce CO2 emissions.

SCENARIO 2 - MAXIMUM USE OF RENEWABLE ENERGIES

The power consumption is not reduced, however, a large area photovoltaic systems and solar thermal systems will be installed for heating support. In new buildings, the facades with the help of PV systems for electricity generation serve. Here significant surpluses with the own requirements are achieved.

Since no additional efforts to promote energy efficiency are being made, the heat energy requirements developed in accordance with the trends, it is perhaps even slightly below trend because sufficient renewable energies for the use of electric heating can be used. For this reason, there is an increased change in current heating system heaters. Additionally, the number of solar thermal systems for heating support is increased by a factor of 10. The power consumption in private households continues to increase, as enough power is available in the city and own electricity use. The proportion of PV systems for self-generation and utilization increases abruptly by tenfol

II. GENERAL IMPACTS OF AFTER PILOT ESMs ON YOUR ASSET AND/OR FACILITY MANAGEMENT PLANS

Taking into account the individual ESMs a before / after analysis of each type is performed on ESM. The data come from the energy performance certificates, both before and after the implementation of the ESM.

Before the energy saving measures a total of 9.93 million kWh / year are needed and it emitted 2,963 to CO2.

			BEFORE			
Type of ESM	Total of m²		Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions
WP3	4.383		209	55	1.268.650	334.969
WP4	7.133		228	56	1.952.965	478.664
WP5	16.144		209	69	4.458.259	1.293.543
WP6	7.120		209	66	2.082.671	550.472
WP7	4.792		39	9	166.220	35.290
TOTALS		2014	179	51	9.928.764	2.692.937

Consumption and CO2 emissions before the optimization of ESMs

After the energy-saving measures the energy consumption has been reduced to 7,130,651 kWh / year and CO2 emissions to 1,894 tons per year. The biggest saving was achieved in WP6. Here there is a percentage savings of 70%. Consequently, the focus of future work will be in the area of major modernizations

		AFTER			
Type of ESM	Total of m²	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM
WP3	4.383	164	42	881.610	222.386
WP4	7.133	228	56	1.951.804	478.664
WP5	16.144	190	58	3.519.380	1.011.508
WP6	7.120	71	17	611.638	146.492
WP7	4.792	39	9	166.220	35.290
TOTALS		138	36	7.130.651	1.894.339

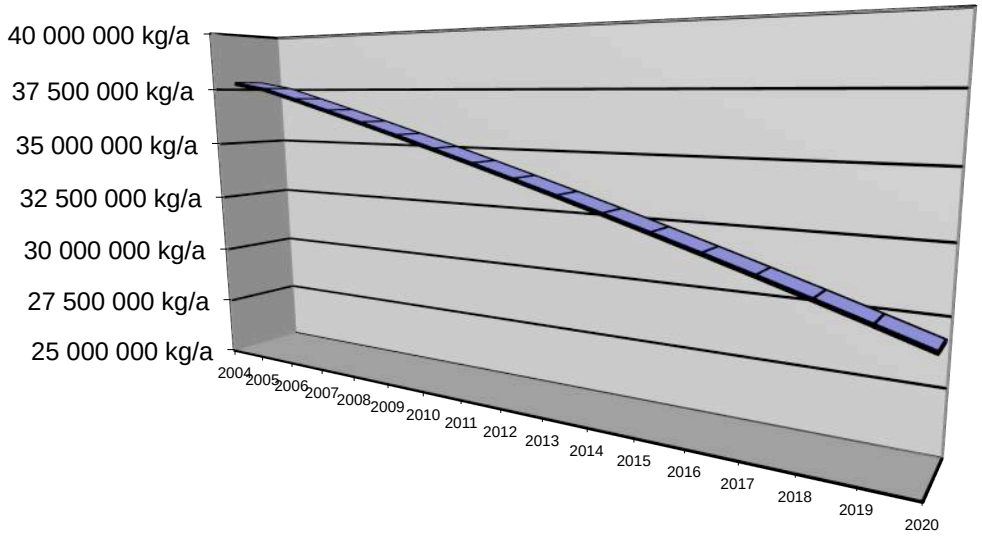
Energy consumption and CO2 emissions after the optimization of ESMs

The new measures are 39 kWh / m² a far below national requirements and give now a standard back is approximately found in passive houses.

2020 PERFORMANCE	
% of Energy sav	28%
% of CO_2 reducti	30%

Prognoses of energy saving and reduction of CO2 emissions by 2020

The evaluation of the major modernization work has shown that we can save approximately 30% of CO2 emissions by 2020, therefore, is our concept with the energy-saving objectives of the city of Darmstadt in line. The table shows the future CO2 savings for large modernization measures.



Trend of reduction of CO2 emissions until 2020

Currently, an empirical CO2 requirement for the properties of bauverein AG for 1990 determined to determine the existing buildings not only the climate protection targets of Darmstadt adapts, but also the requirements to meet the Kyoto Protocol. Unfortunately there are currently no results - it is to be expected that initial statements can be made with the end of the year.

III. INTEGRATION OF THE AFTER ESMs IN THE 2020-ENERGY STRATEGY OF bauverein AG

			BEFORE						AFTER			
Type of ESM	Total of m²		Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Type of ESM	Total of m²	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM
WP3	5 171		168	43	820 576	206 500	WP3	5 171	162	41	790 852	198 240
WP4	7 133		212	55	1 510 872	394 741	WP4	7 133	204	53	1 453 352	380 090
WP5	15 465		226	65	3 490 553	1 012 453	WP5	15 465	178	50	2 756 285	779 814
WP6	4 590		289	60	1 328 388	274 087	WP6	4 590	101	15	465 475	68 468
WP7	4 792		29	6	138 096	29 176	WP7	4 792	29	6	138 096	29 176
TOTALS		2014	185	46	7 288 485	1 916 957	TOTALS		135	33	5 604 060	1 455 788

2020 PERFORMANCE	
% of Energy saving	23%
% of CO_2 reduction	24%

WP3 investments: General investments concerning operating management

ESM WP3					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress or Housing stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
	Tenant education about energy efficiency - Tenants are educated	Handbook for tenants - how to handle the ventilation system and how to live in a passive	no	2,00%	5%	Darmstadt, Elisabeth-Selbert-Straße 6-8	3 690 m²	2010	No data detected								750
	Tenant education about energy efficiency - Tenants are educated through a campaign, handbook or events	Handbook for tenants to handle the ventilation system and how to live in a low energy house after refurbishment	no	2,00%	60%	Darmstadt, Büdinger Straße 27-37	3 484 m²	2008	No data detected								750
	Tenant education about energy efficiency - Tenants are educated through a campaign, handbook or events	Handbook for tenants to handle the ventilation system and how to live in a low energy building with a high insulation and a new heating system after a refurbishment	no	2,00%	60%	Darmstadt, Holzhofallee 18-20	941 m²	2008	No data detected								750
	Monitoring of the heating system	Installtion of the adaptherm modul to controll and adapt the supply temperature of the heating system	Yes	4,00%	60%	Darmstadt, Schiebelhuthweg 19-25	2 530 m²	2010	97	24	245 343	60 471	94,31936759	22,94551779	238628	58052,16	1500
	Monitoring of the heating system	Installtion of the adaptherm modul to controll and adapt the supply temperature of the heating system	Yes	4,00%	60%	Darmstadt, Kaupstraße 30	574 m²	2010	142	35	81 508	20 090	136,32	33,6	78247,68	19286,4	1500
	Monitoring of the heating system	Installtion of the adaptherm modul to controll and adapt the supply temperature of the heating system	Yes	4,00%	30%	Darmstadt, Kasinostraße 81	526 m²	2010	174	49	91 524	25 774	167,04	47,04	87863,04	24743,04	1500
	Energy monitoring - Heating check	Energy monitorimng to get a better efficiency of the heating system	Yes	4,00%	60%	Darmstadt, Bessunger Straße 182-188	1 541 m²	2008	261	65	402 201	100 165	250,56	62,4	386112,96	96158,4	1500
						TOTAL	5 171		168	43	820 576	206 500	162	41	790 852	198 240	

WP4 investments: General investments concerning running maintenance

ESM WP4					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO² performance (CO²/m²/year)	Total Energy consumption	Total CO² Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO² Performance after ESM (CO²/m²/year)	Total Energy consumption after ESM	Total CO² Emissions after ESM	Estimated Costs
	Running maintenance of the systems	Exchange of the district heating station and the hot water tank with a better insulation	no	2,00%	20	Darmstadt, Esselbornstraße 1-5	1 741 m²	2007	136	47	236 476	81 827	133,1111315	46,06	231746,48	80190,46	3250
	Running maintenance of the systems	Exchange of the district heating station and the hot water tank with a better insulation	no	2,00%	20	Darmstadt, Waltherstraße 7-17	2 574 m²	2007	206	50	530 244	128 700	201,88	49	519639,12	126126	3250
	Running maintenance of the systems	New torch for the natural gas heating system	no	8,00%	40	Dieburg, Albert-Lortzing-Straße 3-7	1 660 m²	2008	299	74	496 340	122 840	275,08	68,08	456632,8	113012,8	3148
	Running maintenance of the systems	Exchange of the circulation pumps including mixers and sliders	no	1,00%	35	Dieburg, Anton-Bruckner-Straße 10-12	1 158 m²	2007	214	53	247 812	61 374	211,86	52,47	245333,88	60760,26	12600
						TOTAL	7 133		212	55	1 510 872	394 741	204	53	1 453 352	380 090	

WP5 investments: General investments concerning replacement of systems

ESM WP5					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock managed by the company	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs of the ESM
	System replacement	System with a central standard boiler from 1982; new gas calorific value boiler and adaption of the performance	Yes	20,00%	40	Darmstadt, Heinheimer Straße 57-61	1 610 m²	2010	223	60	359 030	96 600	151	45	243110	72450	15400
	System replacement	System with a central standard boiler from 1982; new gas calorific value boiler and adaption of the performance	Yes	20,00%	40	Darmstadt, Heinheimer Straße 65	433 m²	2010	226	64	97 858	27 712	168	49	72744	21217	4500
	System replacement	System with two central standard boiler from 1990; new low temperature boiler and adaption of the performance	no	10,00%	20	Darmstadt, Kölner Straße 18-18C	2 326 m²	2009	201	58	467 526	134 908	181	45	421006	104670	74900
	System replacement	System with a central heating system; exchange of the hot water tank with a better insulation	no	5,00%	20	Darmstadt, Trierer Straße 2	3 354 m²	2006	204	59	684 216	197 886	163	40	546702	134160	9100
	System replacement	System with a central boiler from 1981only for heating; new low temperature boiler only for heating and adaption of the performance	no	15,00%	40	Darmstadt, Viktoriastraße 42	948 m²	2008	267	74	253 116	70 152	267	74	253116	70152	21539
	System replacement	System with a central heating system from 1986; new low temperature boiler (oil)	no	15,00%	10	Darmstadt, Waldmühlenweg 1	416 m²	2008	316	86	131 456	35 776	316	86	131456	35776	12376
	System replacement	System with a central heating system from 1982; new low temperature boiler	no	10,00%	40	Heppenheim, Moselstraße 1-3	1 103 m²	2007	257	76	283 471	83 828	173	65	190819	71695	10000
	System replacement	System with a central heating system from 1982; new low temperature boiler	no	10,00%	40	Heppenheim, Moselstraße 5-7	992 m²	2007	275	81	272 800	80 352	186	69	184512	68448	10000
	System replacement	System with a central heating system from 1982; new low temperature boiler	no	10,00%	40	Heppenheim, Moselstraße 9-11	1 022 m²	2007	269	79	274 918	80 738	196	72	200312	73584	11391
	System replacement	System with a central standard boiler from the 70th; new low temperature boiler	no	15,00%	20	Mühltal, Eberstädter Straße 28	1 401 m²	2006	202	61	283 002	85 461	168	42	235368	58842	14000
	System replacement	System with a central standard boiler from the 70th; new low temperature boiler	no	15,00%	20	Mühltal, Eberstädter Straße 30	1 860 m²	2006	206	64	383 160	119 040	149	37	277140	68820	14000
				TOTAL 20/20/20:		TOTAL	15 465		226	65	3 490 553	1 012 453	178	50	2 756 285	779 814	

WP6 investments: General investments concerning refurbished buildings

ESM WP6					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress and /or Stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
	Refurbished Buildings	Global Refurbishement with insulation on the roof, the facade, the cellar ceiling, new windows, new heating system and a power plant; ventilation system	Yes	50,00%	66%	Darmstadt, Beckstraße 81-85 / Roßdörfer Straße 55	1 648 m²	2006	253	52	417 094	85 696	133,9824029	12	220803	19776	850000
	Refurbished Buildings	Global Refurbishement with insulation on the roof, with a passive house facade, insulation on the cellar ceiling, new windows, new heating system and ventilation system	Yes	70,00%	66	Darmstadt, Holzhofallee 18-20	943 m²	2008	363	69	341 957	65 067	63,81760339	20	60180	18860	720000
	Refurbished Buildings	Global Refurbidhement with insulation on the roof, on the facade, the cellar ceiling, new windows, new heating system and ventilation system	Yes	70,00%	66	Darmstadt, Holzhofallee 24-24A	769 m²	2010	261	66	200 709	50 754	76	18	58444	13842	640000
	Refurbished Buildings	Global Refurbishement with insulation on the roof, on the facade, the cellar ceiling, new windows, new heating system and central ventilation system	Yes	60,00%	66	Darmstadt, Mathildenstraße 36-40	1 230 m²	2008	300	59	368 628	72 570	102,4780488	13	126048	15990	980000
						TOTAL	4 590		289	60	1 328 388	274 087	101	15	465 475	68 468	

WP7 investments: General investments concerning low energy buildings

ESM WP7					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Address	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
	Low Energy Building	New Construction with a energy performance under 30% of the german regulation	no	tandard New C	5%	Darmstadt, Holzhofallee 24c	1 112 m²	2010	58	13	64 496	14 456	58	13	64 496	14 456	1500000
	Low Energy Building	Certified passive house / New construction	Yes	tandrd New Co	2 Passive House Buildings of the whole stock	Darmstadt, Elisabeth-Selbert-Straße 6-8	3 680 m²	2010	20	4	73 600	14 720	20	4	73 600	14 720	3900000
						TOTAL	4 792		29	6	138 096	29 176	29	6	138 096	29 176	

COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK

STRATEGIC SHO ASSET MANAGEMENT PLANS INTEGRATING THE 20% OBJECTIVES IN 2020

ITALY

atc Torino

INTRODUCTION

ATC Torino

I. INTRODUCTION TO STRATEGIC ASSET AND FACILITY MANAGEMENT PLAN

ATC Torino building stock is widely heterogeneous for both building type and building age and distributed over a wide area comprising the entire Province of Turin.

The property managed by ATC Torino is represented by 1.737 buildings of circa 31.000 dwellings 18.637 of which are its own property, the other part being in the ownership of municipalities.

The common morphology of ATC the real estate is structured in multi-storey buildings mainly located in suburban areas developed after the Second World War up to the mid Ninety's; this creates a constant need for maintenance - especially with regards to the older stock - that rarely is demolished and replaced with new construction in order to meet the requirements of compliance with building regulation and energy saving.

In the last ten years ATC has renovated a consistent number of buildings replacing in many cases the electric gas and heating systems with the view of meeting health and safety regulation, to prevent accidents and hazards and to start a virtual process of energy saving.

The demand for social housing is progressively increasing and ATC is facing a big challenge in order to respond appropriately to this demand. At present and toward the future ATC has applied for public funding that allow to refurbish a great number of buildings. As ATC depends for its financing of the investments in the existing housing stock on public subsidies, consequently there is a great uncertainty regarding the precise calendar an planning of building works. This is why there are no strategic asset and facility management plans in the sense they are developed and implemented in France and Germany. Regarding the part of the stock owned by the municipalities and managed by ATC, the situation is rather similar to Czech AFTER partner M.R.A. Regarding the other potential source of funding represented by the rents paid by the tenants, the system which defines the price of the rent in accordance with the families' incomes (the lower the incomes are, the lower the rent is) without any existing system of personal allowances doesn't allow the renewal of the investments using this source of funding. The economic system of the social housing in Italy is not based upon an economic rent but upon public subsidies.

The refurbishment and retrofitting services that ATC provides every year can be divided in two main types:

- 1st type: Dwelling refurbishment (general wear and tear, asbestos removal, system refurbishment and ordinary maintenance);
- 2nd type: Building retrofitting.(the whole envelope of the building is processed)

The number of dwellings that ATC refurbishes every year according to the first type is more than thousand dwellings. The list of buildings which are waiting public financing for the second type concerns 75 buildings

II. ENERGY EFFICIENCY OBJECTIVES OF ASSET AND FACILITY MANAGEMENT PLAN

Since 2006, as a result of the new national and European policies on energy efficiency, ATC Torino has orientated its goals towards sustainability and energy saving developments. It aims at reducing energy consumption of a wide social housing real estate stock.

Several initiatives in this direction have been undertaken over the recent years including several programs focusing on energy efficiency and reduction of emissions produced by heating systems, one for the entire POR/FESR program that involves 8 big retrofitting projects aims at refurbishing 75 buildings comprising 1,394 dwellings in Turin and the suburban areas.

As a response to energy efficiency policies, ATC in 2004 has signed a cooperation agreement with Environment Park, a public body, to support projects to focus on retrofitting and management of energy. It aims at reducing consumptions striving for an economic gain for the most fragile part of the society.

Another example of ATC commitment toward energy saving is the success PoliCity Diogenes project developed within the VI Framework Programme Concerto that generated a substantial retrofitting of the via Arquata district in Turin a large district of social housing with heritage character, built at the beginning of the last Century.

For all the above it is apparent how ATC Torino focus on the sustainability also to provide an energy regeneration for the most degraded environmental complexes.

ATC Torino is managing at present a sum of around 18 Million Euro dedicated especially to resolve major issues such as thermal insulation of building envelopes and heating systems. 8 relevant projects where retrofitting measures verified with AFTER are implemented in the new projects. The effort was financed by POR/FESR, ATC and other local authorities' funds. The building site works started for the 8 projects in 2013 and are planned to finish in 2015 for most of the retrofitting.

Every year ATC draws up a plan related to the future interventions in the buildings, called Piano degli Investimenti (Investments Plan). These documents are official and are an important economic and strategic point of reference.

The Investment Plans are organized in the following sections:

- Address of the building and its main features (number of flats, company responsible for the management, etc.)
- Short description of the intervention in project
- Amount of funding allocated and source of the economic resources (regional funds, L. 179/92, income from sales etc.).

The interventions included in the Investments Plan are not only related to saving energy; a lot of the actions in project are aimed to environmental and economic sustainability (renovation and insulation of the roof, renovation of thermal plants, realization of the district heating, etc.)

For some of these interventions is possible to quantify energy and CO2 savings

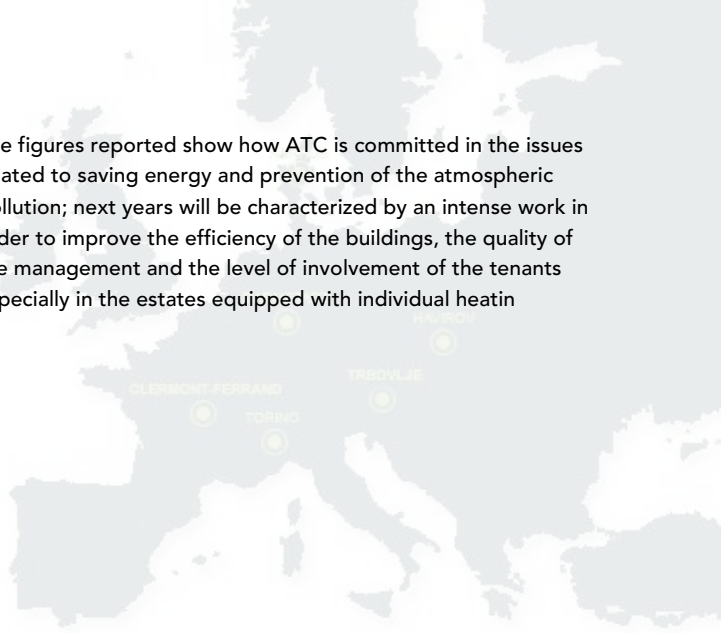
Address of the building	Description of the intervention	Energy savings expected (%)	CO2 savings expected (teq / year)	Cost of the investment
corso Vercelli 483 (Torino)	Several steps: construction of a pellet thermal power plant completely underground; realization of the district heating network; installation of the accounting system of individual heat consumption for each apartment; installation of thermostatic valves for each radiator; installation of a system of supervision and remote management with central control placed in ATC.	26,34% (heating) 13,77 % (DHW)	24,26 tCO2 eq/anno	1.658.770 euro
corso Vercelli 487 (Torino)		26,34% (heating) 13,77 % (DHW)	24,26 tCO2 eq/anno	
corso Vercelli 491 (Torino)		26,34% (heating) 13,77 % (DHW)	24,26 tCO2 eq/anno	
via Monte Ortigara 3/A,B,C Rivalta (Torino)	Renovation of the roof and substitution of coats and windows in order to increase the energy performance of the building.	15,50%	17 tCO2 eq/anno	1.244.000 euro
via Pacini 1 (Torino)	Insulation of the building and substitution of windows in order to increase the energy performance of the building.	40,38%	35,3 tCO2 eq/anno	1.500.000 euro
via Pacini 3 (Torino)		40,38%	35,3 tCO2 eq/anno	
via Pacini 5 (Torino)		40,38%	35,3 tCO2 eq/anno	
via Petrella 24-26-28 (Torino)	Several stages: insulation of the walls and the roof; replacing exterior windows; insulation of the attic; realization of a centralized system for heating and DHW.	72,14%	78,96 tCO2 eq/anno	2.500.000 euro
	Total	31% (average value)	274,64 tCO2 eq/ year	6.902.770 euro

Summary of energy and CO2 saving

To these interventions can be added the following actions:

- Via Passoni 16 and via Servais 173/177 (Torino): Intervention of transformation of heating system from autonomous system to centralized boiler with thermostatic valves in order to improve the quality of the system management and to obtain individual energy saving; cost expected for every building 310.260 euro.

The figures reported show how ATC is committed in the issues related to saving energy and prevention of the atmospheric pollution; next years will be characterized by an intense work in order to improve the efficiency of the buildings, the quality of the management and the level of involvement of the tenants especially in the estates equipped with individual heatin



PERSPECTIVE OF 20/20/20

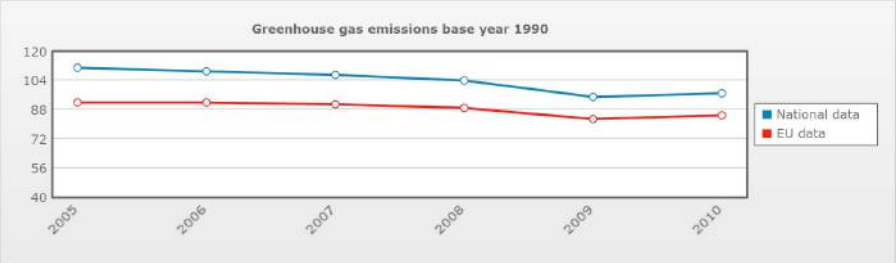
ATC Torino

I. WHAT DOES IN MEAN: FEASIBILITY OF THE 2020 OBJECTIVES

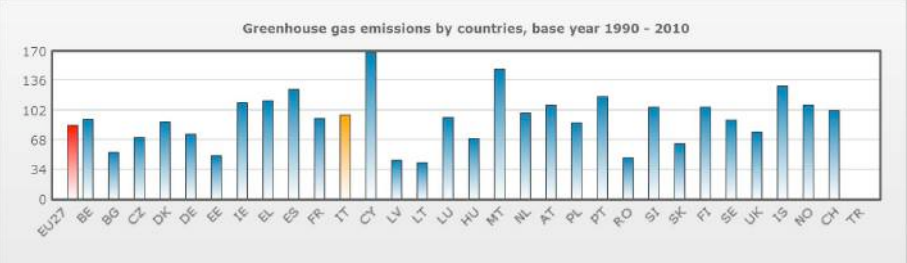
Italy: state of the art (*Source: http://ec.europa.eu/europe2020/europe-2020-in-your-country/italia/progress-towards-2020-targets/index_en.htm)*

GREENHOUSE GAS EMISSIONS

The national target on greenhouse gas emissions covers emission sources not already included in the European exchange system of emission quotas and use 2005 as reference year. The EU target (-20%) covers all emissions sources and use 1990 as reference year. The graph represents the evolution of total greenhouse gas emissions since 1990



Italian greenhouse gas emissions compared to EU's. National target: -13%, (base year 2005). European target: -20% (base year 1990).



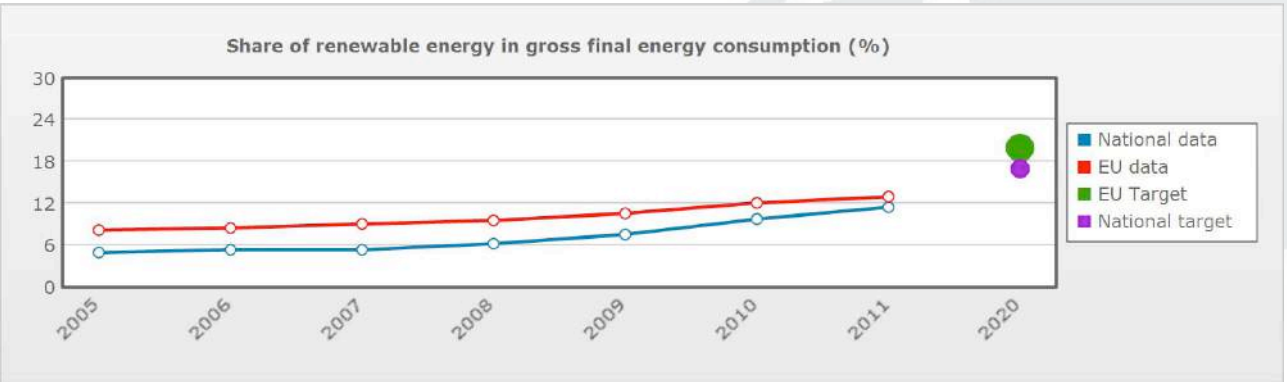
Greenhouse gas emissions, base year 1990 (Index 1990 = 100)

This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions The 'Kyoto basket' of greenhouse gases includes: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and the so-called F-gases (hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride, SF_6). These gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO_2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international aviation and international maritime transport.

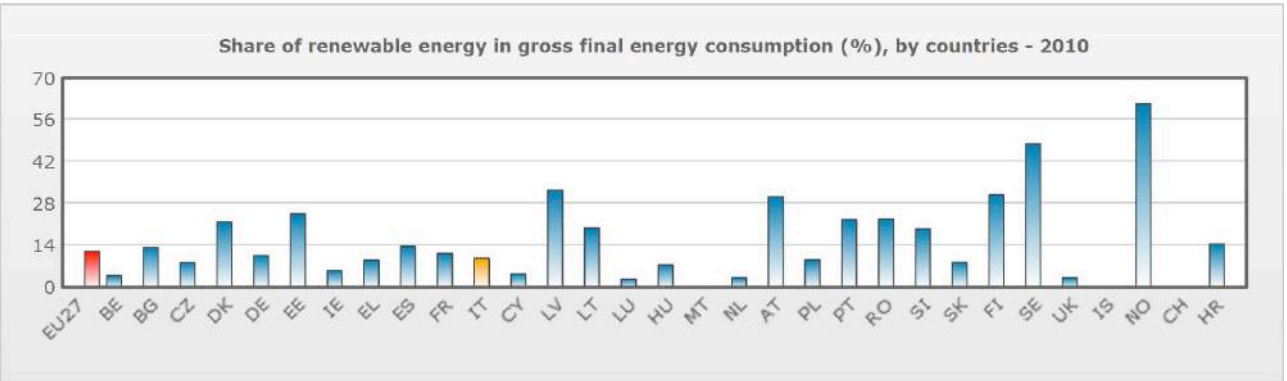
a. Renewable energy

This indicator is calculated on the basis of energy statistics covered by the Energy Statistics Regulation. It may be considered an estimate of the indicator described in Directive 2009/28/EC, as the statistical system for some renewable energy

technologies is not yet fully developed to meet the requirements of this Directive. However, the contribution of these technologies is rather marginal for the time being.



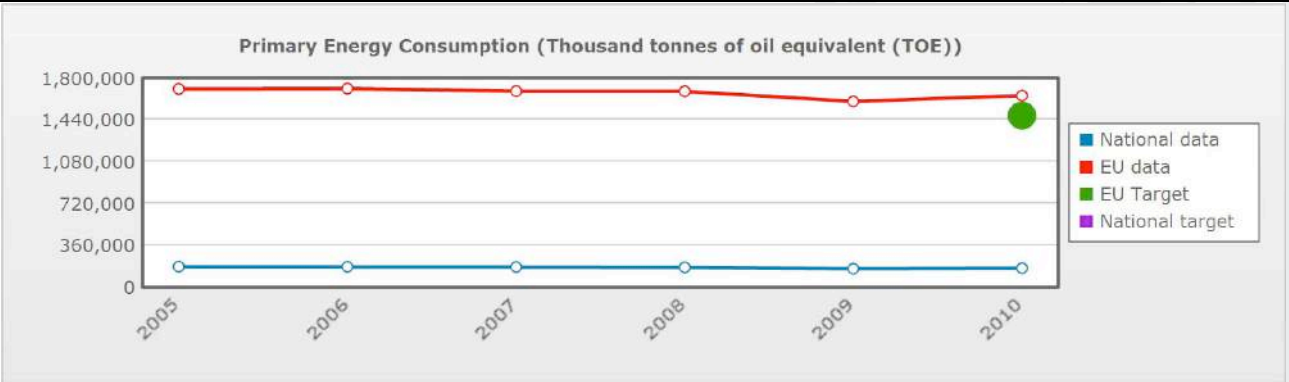
National target: 17 % of total energy consumption from renewable sources



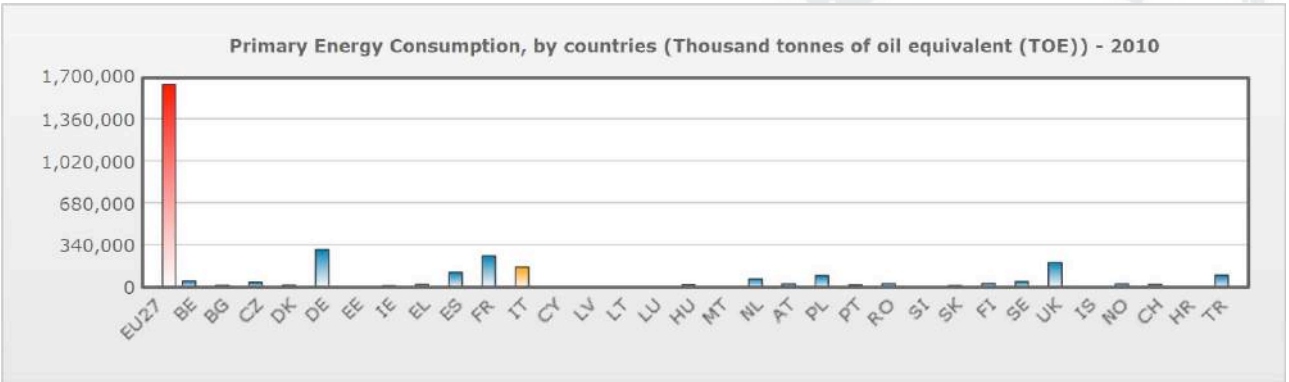
Renewable energy Share of renewable energy in gross final energy consumption %

PRIMARY ENERGY CONSUMPTION

Primary Energy Consumption is meant the Gross Inland Consumption excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). This quantity is relevant for measuring the true energy consumption and for comparing it to the Europe 2020 targets. The "Percentage of savings" is calculated using these values of 2005 and its forecast for 2020; the Europe 2020 target is reached when this value reaches the level of 20%.



Primary energy consumption: EU vs Italy



Primary energy consumption by countries

SUMMARY CHART OF NATIONAL 20-20-20 TARGETS FOR ITALY

INDICATOR	UNIT	REFERENCE PERIOD					TARGET
		2005	2009	2010	2011	2012	
Greenhouse gas emissions should be reduced by 20% compared to 1990 The share of renewable energy sources in final energy consumption should be increased to 20% Energy efficiency should improve by 20%							
Greenhouse gas emissions	Index 1990 = 100	111.55	95.53	97.45	95.3	(:)	(:)
Greenhouse gas emissions in non-ETS sectors	million tonnes of CO2 equivalent	340.32	303.7	306.51	296.53	283.16(e)	296.3
	Index ESD base year = 100(2)	99.93	89.18	90	87.07	83.15(e)	87.0
Share of renewable energy in gross final energy consumption	%	5.9	9.3	10.6	12.3	13.5	17

INDICATOR	UNIT	REFERENCE PERIOD					TARGET
		2005	2009	2010	2011	2012	
Primary energy consumption	million tonnes of oil equivalent (TOE)	178.9	160.4	165.0	162.6	155.2	(:)
	Index 2005 = 100	100.0	89.7	92.2	90.9	86.7	(:)
	% of savings	(:)	(:)	(:)	(:)	(:)	(:)
Final energy consumption	million tonnes of oil equivalent (TOE)	134.5	120.9	124.8	122.1	119.0	(:)
	Index 2005 = 100	100.0	89.9	92.7	90.7	88.5	(:)
	% of savings	(:)	(:)	(:)	(:)	(:)	(:)

Table 0-1 20-20-20 national targets for Italy

TURIN PROVINCE

The focus we made is on Turin Province because ATC manages social housing buildings all over Turin province.

TOTAL ENERGY CONSUMPTION IN TURIN PROVINCE

In 2011, in the province of Turin just over 5 Mtoe of energy has been consumed, 66% produced from natural gas, 24% from petroleum products and 10% from renewable sources. A share of this energy (namely 36%) is for energy transformation processes (production of electricity and heat) and a share is used directly and in different forms by end users. The trend of total energy consumption increased by 14% since 2000, but fell by 10% compared to five years ago. Excluding the energy used in the province to meet some not domestic needs (i.e. the surplus electrical balance between production and consumption of electricity), the total consumption falls below the threshold of 5 Mtoe, the lowest figure ever recorded since the Province performs this kind of detections

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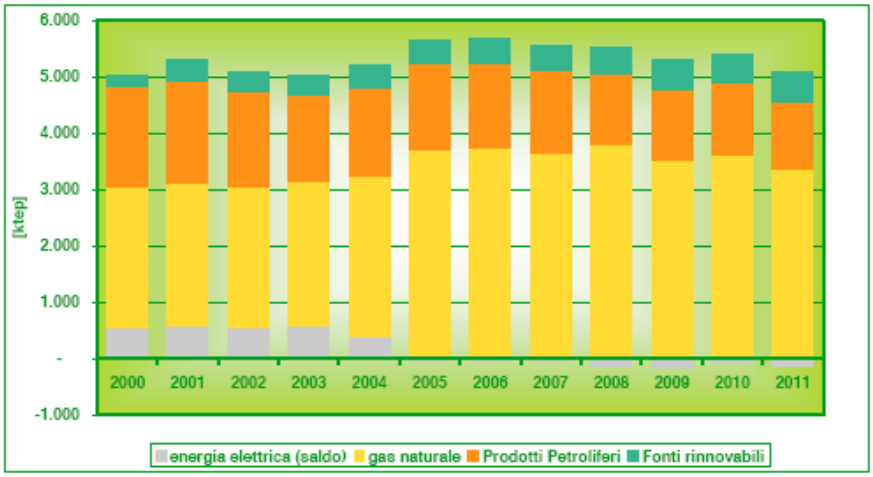
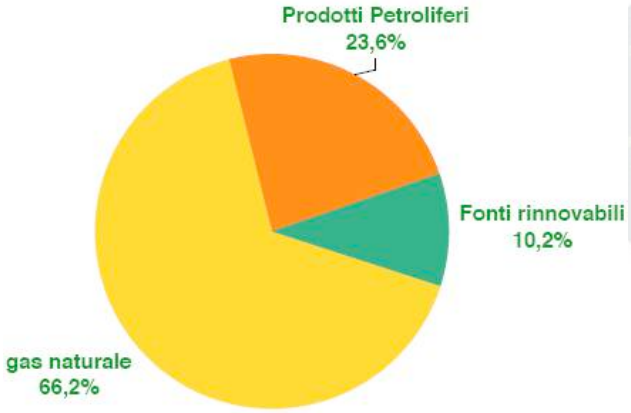


Trend of energy consumption in the province of Turin

In 2011 only 7% of total energy consumption comes from domestic energy production. This confirms the strong dependence of the provincial energy system _ from foreign countries (around 93%), both with respect to natural gas, accounting for 66%. Being our territory lacking of fossil energy reserves, the only way to limit the foreign supply and consumption of natural gas is to use more consistently renewable energy sources. Reducing the dependence on natural gas will

have to be driven by a combination of strategies, above all the reduction of consumption and of the needs of end users



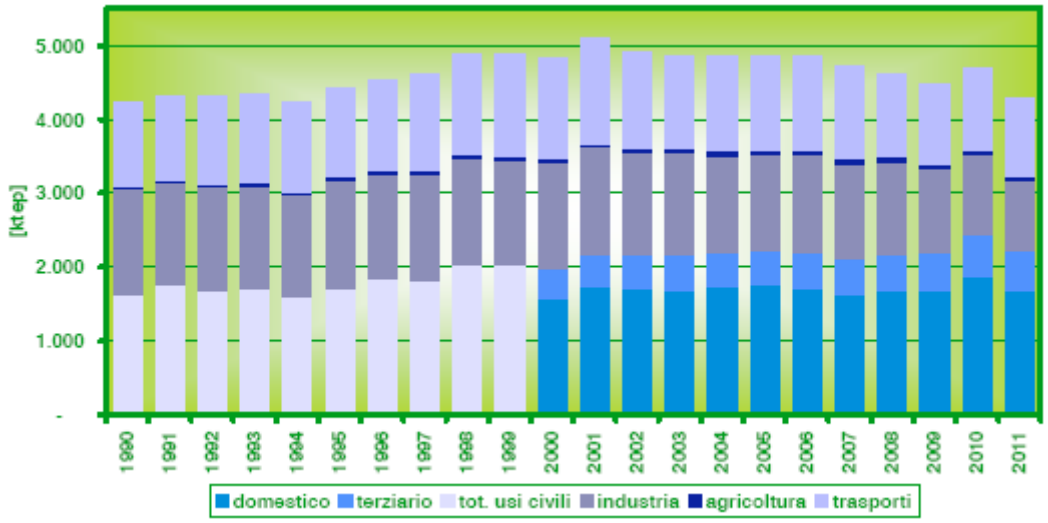
End uses (by carriers) - data in ktoe

Carriers	1990	1995	2000	2001	2005	2006	2007	2008	2009	2010	2011
electric energy	**783,0**	**837,7**	**888,7**	**917,5**	**859,0**	**914,1**	**913,9**	**918,9**	**839,6**	**868,2**	**877,9**
natural gas	**1.739,8**	**2.035,9**	**2.108,7**	**2.093,7**	**2.159,9**	**2.144,4**	**2.011,9**	**2.029,3**	**1.985,9**	**2.102,7**	**1.777,5**
fuel oil	180,6	91,9	40,0	65,9	67,1	44,9	54,5	39,9	47,0	53,0	47,3
liquefied petroleum gas	43,2	51,8	88,7	94,2	91,9	85,4	81,9	91,7	100,8	122,5	107,2
diesel	898,9	702,8	909,7	971,3	850,4	857,6	878,6	717,4	701,3	742,7	705,7
petrol	582,5	700,8	677,9	660,1	505,6	469,8	437,5	403,9	381,8	360,2	335,0
petroleum products	**1.705,2**	**1.547,4**	**1.716,2**	**1.791,5**	**1.515,1**	**1.457,8**	**1.452,6**	**1.252,9**	**1.231,0**	**1.278,4**	**1.195,3**
district heating or purchased heat	**7,9**	**13,7**	**120,8**	**133,7**	**156,4**	**156,8**	**163,0**	**217,0**	**227,2**	**255,0**	**233,1**
biomass	n.d.	n.d.	n.d.	164,7	176,2	183,7	186,7	189,4	194,0	197,2	201,2
solar thermal	n.d.	n.d.	0,5	0,5	1,1	1,4	2,1	3,0	3,9	5,1	6,0
geothermal	n.d.	n.d.	n.d.	0,1	0,6	1,0	1,4	2,0	2,4	3,2	3,7
renewable thermal	**n.d.**	**n.d.**	**0,5**	**165,3**	**177,9**	**186,1**	**190,2**	**194,4**	**200,3**	**205,5**	**210,9**

Table 0-2 End uses by energy carrier

In 2011, the civil sector (sum of domestic and tertiary) proved to be by far the largest single use in the province of Turin, with a share of 52%, amounting to 2.2 Mtoe. Within the industry, domestic uses (about 76% of the total in 2011) progressively lose weight in favour of the tertiary sector, the latter rising from 21% in 2000 to 24% in 2011. Among all sectors, however, only civilian uses show a non-decreasing trend. The industrial sector, in fact, suffered a slump in energy consumption between 2010 and 2011. In absolute terms, the reduction was greater than the already significant one recorded between 2009 and 2008. In fact

between the two years, the manufacturing sector has required almost 150 less ktoe. The figure for 2011 represents a decline of about 33% compared to 2000. Similarly, the energy consumption in the transport sector are in sharp decline, and in 2011 the lowest consumption value of the time series has been recorded. The decrease compared to 1990 is 5.5%, but compared with peaks of 2001 the decrease was 25%



Trends in energy demand in end uses (by sectors)

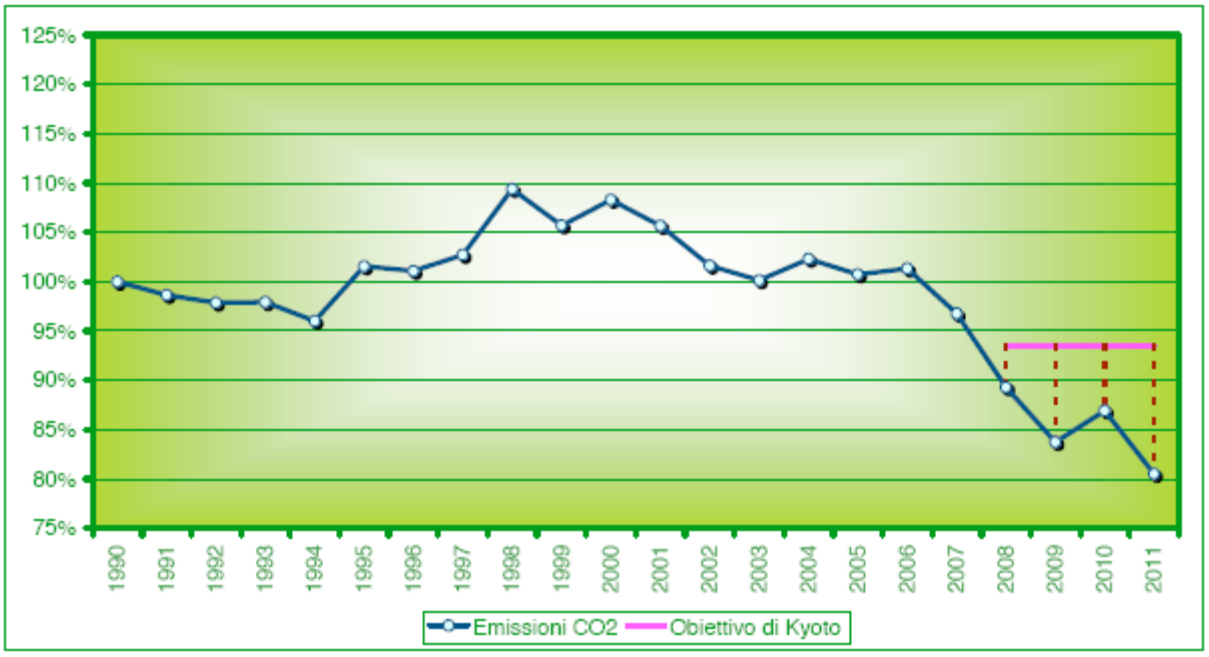
Sectors	1990	1995	2000	2001	2005	2006	2007	2008	2009	2010	2011
domestic			1.573,1	1.740,8	1.761,9	1.701,7	1.637,6	1.674,8	1.686,3	1.885,5	1.692,2
tertiary sector			420,5	442,6	479,7	502,7	492,6	493,9	510,4	555,9	531,9
total civilian uses	**1.642,2**	**1.716,8**	**1.993,7**	**2.183,5**	**2.241,6**	**2.204,4**	**2.130,3**	**2.168,7**	**2.196,6**	**2.441,4**	**2.224,1**
industry	1.421	1.469	1.418,4	1.454,2	1.298,4	1.326,4	1.277,2	1.267,0	1.141,4	1.097,7	950,1
farming	44,4	43,5	51,9	40,6	57,8	59,7	58,0	54,2	55,2	54,9	53,7
total productive uses	**1.465**	**1.513**	**1.470,2**	**1.494 ,8**	**1.356,2**	**1.386,1**	**1.335,2**	**1.321,2**	**1.196,6**	**1.152,7**	**1.003,8**
transportation	1.128,4	1.205,1	1.371,0	1.423,6	1.270,4	1.268,6	1.266,1	1.122,5	1.090,7	1.115,7	1.066,8

Energy demand in end uses (by sectors) - data in kto

CO2 EMISSIONS

In 2011, CO_2 emissions have fallen for the first time below 12 million metric tons, almost 20% less than in 1990. The average value of the Kyoto period is, to date, slightly more than 12.5 million metric tons , 14.9% less than the value of 1990 (14.7 million tons). The Kyoto target (-6.5% compared to 1990 levels in the period 2008-2012) in the province of Turin is, for the moment, more than doubled.

The contraction of specific data on CO_2 emissions compared to end-uses energy consumption for the period 2009-2011 amounted to about 2.75 ton / toe



Trend in CO2 emissions compared to 1990 and to the Kyoto targets

2020 ENERGY SCENARIOS

In 2020, assuming that the reduction target of 20% of total consumption is reached, it is assumed a final energy demand between 3.5 and 3.3 Mtoe, depending on the assumptions made. Scenario A is more optimistic and already takes into account the effects of the planned actions, while scenario B has been built as linear regression with regard to the performance of total consumption over the last 10 years.

The percentage of final consumption met by renewable sources will vary accordingly between 15.1% and 18.9%, in line with the objectives burden sharing assigned to the Region Piedmont. In fact, in 2020 a production by about 624 ktoe is expected from renewable sources, nearly equally divided between heat and electricity production.

The expected increase is about 40% compared to 2011

Value	Scenario A	Scenario B
Total Consumption (ktoe)	5.028,7	5.379,2
End uses (ktoe)	4.125,7	4.413,3
Total consumption (-20%)	4.023,0	4.303,4
End uses (with a reduction of 20% of total consumption)	3.300,6	3.530,7
Renewable sources addressed to end-use (ktoe)	623,7	623,7
Percentage of the end-use	15,1%	14,1%
Percentage of the end-use (with a reduction of 20% of total consumption)	18,9%	17,7%
CO_2 emissions on the end-use (kt)	10.889,2	
Reduction in CO_2 emissions compared to 1990	-26%	

Hypothetical scenarios for 2020

The Action Plan for the Sustainable Energy (PAES, Piano d'Azione per l'Energia Sostenibile) of Turin province

This analysis shows that the segment on which it is necessary to focus attention is the building sector, with particular reference to both the residential sector and the public buildings sector. The residential sector, because it is the one that requires the most energy of the provincial system; the public buildings sector for its strategic role of demonstration. This focus follows the strategic guidelines of the European Directives 2010/31/EU and 2012/27/UE, related to zero-energy buildings. These Directives point out the need to introduce mandatory and long-term energy improvement plans. In particular, Article 5 of the Directive requires an exemplary role of the public sector as part of this strategy, which led to an obligation to retrofit at least 30% of the total housing stock (over 500 sq. m.) of buildings of the central government. The same Article 5 suggests to Member States to give priority to the buildings with the worst energy performance, and suggests that the government, even at the local level, should develop a Plan for energy efficiency of public buildings, making it possible to:

- fix specific targets and actions for energy conservation and energy efficiency;
- adopt an energy management system, including energy audits;
- resorting to energy service companies (ESCOs) and energy performance contracting (EPC) to finance the renovations.

The province's energy strategy includes three key elements: sustainability, security of supply and competitiveness, and is consistent with the EU long-term decarbonisation scenarios pointing out a substantial increase in the share of renewable energy sources. There is also the need to ensure the development of a cost effective renewable energy potential, in line with the system stability needs and consistent with other EU policies, in particular the mitigation of climate change effects, the promotion of the internal market, international cooperation, research development and the protection of the environment, including biodiversity.

The actions are grouped into lines of activity as shown in the following table

.

Line of activity	Area of intervention
Monitor energy consumption and the methods of energy production at the provincial and local level	Observatory of energy Energy building cadaster
Support to local authorities in developing policies and projects in the field of energy	Local sustainable energy planning and promotion of the Smart Cities and Smart area of Sustainable Mobility Energy management Training and technical updating
Rational use of energy infrastructure	Natural gas District Heating
Promotion of energy saving and use of renewable energy sources by the end users	Promotion of proper maintenance of heating systems Information, training and education Support the implementation of interventions in private and in the industrial sector
Energy production	Authorizations
Property assets	Energy management system Rehabilitation of buildings and facilities

Lines of activity and areas of intervention

II. GENERAL IMPACTS OF AFTER PILOT ESMs ON YOUR ASSET AND/OR FACILITY MANAGEMENT PLANS

ASSESSMENT OF TRANSFERABILITY OF ESM #1

The retrofitting development that involved the 51 dwelling at Via Riesi in Orbassano gave ATC the possibility to put in action an innovative way of providing energy saving in social housing firstly by providing usable ICT-based services for Resource Management and Resource Awareness directly to tenants, secondly by providing effective ICT monitoring and controlling of heating consumption.

The application of a highly innovative system – ADAPTERM - showed a significant improvement of the energy saving and suggested the possibility of using the same control system in other developments in order to help reducing consumption peaks and optimise the timing of domestic consumption.

It is very relevant to underline that an optimised timing of consumption can reduce generation capacity requirements and, with appropriate tariffs, tenant costs.

The feasibility and efficiency of this type of retrofitting was part of the development of BECA project from a technical point of view and it was rightly evaluated through AFTER providing ATC Torino with a synergic image between application of retrofitting and consequently evaluation and monitoring of results.

This approach provides ATC Torino with a structured protocol allowing the future possibility to apply the correct retrofitting measure to a large part of the real estate granting cost reduction, efficiency and control, needless to add that the strategic approach of AFTER constitute an asset for ATC of great relevance for the future.

The new heating system based on three condensing boilers (Brand: Baltur - Model: Supergenio MC115, power: 115 kW each) and a smart metering system joined to the tenants awareness measures put in place with BECA project were selected in order to accomplish with the requirement of promoting energy efficiency in social housing that ATC Torino has been pursuing as a long term strategy.

The economic gain will be further demonstrated since tenants have the concrete possibility to properly monitor their consumption.

In order to fix a firm figure, it is already possible to demonstrate that starting from an initial investment of circa 120 Euro per dwelling the return is visible in terms of energy saving since the ADAPTERM was installed.

Comparing the consumption of gas for the winter seasons 2012-2013 and 2013-2014 there was a saving of 3,925.00 cubic metres, since the price for gas is around 0,610 Euro per cubic meter, the saving was 2.394,25 Euro the saving per dwelling has been around 25 Euro per dwelling per year.

The economic effect of the above is also quantifiable as tenants satisfaction and greater willingness of the residents to pay for their bills and their rent fees; this for ATC is to be considered as a significant gain for ATC aside with the indubitable fact that to maintain a well-run and up to date system is cost efficient also in terms of maintenance.

The energy saving management in Orbassano was accompanied by a tenant's awareness campaign and the implementation of dedicated software that allows the tenants to check daily for their consumption.

1. Energy Conservation potential through ESM #2

The initial proposal to be implemented at via Passoni case study was to obliterate completely the heat exchanger. This solution was not feasible due to warranty issues since ATC signed a 10 years contract with the supplier who grants the plant only if equipped with an heat exchanger which prevents problems and keeps the boiler in good condition.

The energy saving measure implemented as a consequence for the above, and considering that the heat exchanger is an element responsible for heat loss was to install an insulation cap for the heat exchanger.

This proposal was accepted and implemented as it was considered a good compromise between the need to keep the boiler warranty and the need to improve heating system efficiency.

The ESM introduced at via Passoni represents a cost efficient solution for energy saving that ATC will definitely use in similar situation in order to maximize energy saving with low expenses.

2. Energy Conservation potential through ESM #3

The Via Picco building was renovated between 2008 and 2010 providing a substantial substitution of the main part of the envelope.

An external wall insulation system was applied in order to provide thermal insulation and all windows were replaced to enhance even more the insulation performances of the building.

Reducing unintentional air leakage (that is, air sealing) through the walls, ceilings and foundations of the house is one of the most cost-effective ways to improve its energy performance and comfort in a long term perspective, although needs to be programmed in advance and initial funding have to be substantial.

In social housing it was proved that very good results can be achieved by educating tenants to energy saving and plant retrofitting (heating system, electricity etc.) and results are visible sooner.

Any retrofitting measure like ESM #3 at via Picco must be accompanied in to an education campaign in order to modify tenant's behaviours otherwise the efficiency might not be optimal.

3. Impacts on the 20-20-20 ATC strategy

ATC has indicated its typology of the interventions which aims at saving more energy and is supposed to be carried out in the future projects. Nevertheless, due to the Italian system for financing the renewal of the investments in the housing stock, there are some weaknesses, ATC intends to correct in order to

follow the E.U. directives and the need to introduce mandatory and long-term energy improvement plans.

The first step will consist for ATC in developing an investment plan which will be a step further compared with the existing one, which concerns only one part of the existing stock and which is a list of types of intervention confronted with the concerned stock. This new investment plan will have to define the global objectives in terms of energy efficiency and CO^2 reductions for the whole stock and to detail for each building the type of intervention but also service applicability and cost-benefit analysis for the tenants and ATC organization both.

I. INTEGRATION OF THE AFTER ESMs IN THE 2020-ENERGY STRATEGY OF ATC

WP4 investments: Future actions concerning running maintenance

ESM WP4					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
1	Centralized boiler	Intervention of transformation of heating system from autonomous system to centralized boiler with thermostatic valves in order to improve the quality of the system management and to obtain individual energy saving.	YES	no data	0,02	Via Passoni 16, Torino	856,26	2015	no data	no data	no data	no data	124,29 (heating system)	no data	190,10 m3 methane	379,36 kg	310 260
2 a)	Centralized boiler	Intervention of transformation of heating system from autonomous system to centralized boiler with thermostatic valves in order to improve the quality of the system management and to obtain individual energy saving.	YES	no data	0,03	via Servais 173	944,16	2015	no data	no data	no data	no data	no data	no data	no data	no data	310 260
2 b)	Centralized boiler	Intervention of transformation of heating system from autonomous system to centralized boiler with thermostatic valves in order to improve the quality of the system management and to obtain individual energy saving.	YES	no data	0,03	via Servais 177	956,76	2015	no data	no data	no data	no data	no data	no data	no data	no data	

WP5 investments: Future actions concerning the replacement of systems

ESM WP5					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock managed by the company	Adress	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs of the ESM
1 a)	Reorganization of the heating system	The intervention involves several stages: construction of a pellet thermal power plant completely underground; realization of the district heating network; installation of the accounting system of individual heat consumption for each apartment; installation of thermostatic valves for each radiator; installation of a system of supervision and remote management with central control placed in ATC.	YES	26,34% (heating) 13,77 % (DHW)	0,113	corso Vercelli 483 (Torino)	4452,34	2015	309,12 (heating system) 27,38 DHW	24,26 tCO2 eq/anno	methane consumption 72.131 Sm3/year total requirement 2019 tep/year	no data	227,69 (hetitng system) 23,61 DHW	0 tCO2 eq/anno	methane consumption 140.640 m3/year total requirement 1507,8 tep/year	no data	1 658 770
1 b)	Reorganization of the heating system	The intervention involves several stages: construction of a pellet thermal power plant completely underground; realization of the district heating network; installation of the accounting system of individual heat consumption for each apartment; installation of thermostatic valves for each radiator; installation of a system of supervision and remote management with central control placed in ATC.	YES	26,34% (heating) 13,77 % (DHW)	0,08	corso Vercelli 487 (Torino)	2739,68	2015	309,12 (heating system) 27,38 DHW	24,26 tCO2 eq/anno	methane consumption 48.347 Sm3/year total requirement 1.346 tep/year	no data	227,69 (hetitng system) 23,61 DHW	0 tCO2 eq/anno	methane consumption 93.760 m3/year total requirement 1005,2 tep/year	no data	
1 c)	Reorganization of the heating system	The intervention involves several stages: construction of a pellet thermal power plant completely underground; realization of the district heating network; installation of the accounting system of individual heat consumption for each apartment; installation of thermostatic valves for each radiator; installation of a system of supervision and remote management with central control placed in ATC.	YES	26,34% (heating) 13,77 % (DHW)	0,13	corso Vercelli 491 (Torino)	4423,59	2015	309,12 (heating system) 27,38 DHW	24,26 tCO2 eq/anno	methane consumption 81.800 Sm3/year total requirement 2019 tep/year	no data	227,69 (hetitng system) 23,61 DHW	0 tCO2 eq/anno	methane consumption 140.640 m3/year total requirement 1507,8 tep/year	no data	
				TOTAL 20/20/20		TOTAL	4 424		-	-							

WP6 investments: Future refurbishments

ESM WP6					CONCERNED HOUSING STOCK			PLANNING	BEFORE				AFTER				ECONOMIC
N°	ESM Name	Description and/or comments	Optimized	ESM Potential of Energy savings	Specific residences or part (%) of the housing stock impacted by the concerned ESM	Adress and /or Stock	Number of m²	year of the deployment of the ESM	Average energy performance (kwh/m²/year)	Average CO_2 performance (CO_2/m²/year)	Total Energy consumption	Total CO_2 Emissions	Average Ernergy performance after ESM (kwh/m²/year)	Average CO_2 Performance after ESM (CO_2/m²/year)	Total Energy consumption after ESM	Total CO_2 Emissions after ESM	Estimated Costs
1	External insulation	Renovation of the roof and substitution of coats and windows in order to increase the energy performance of the building.	YES	15,50%	0,04	via Monte Ortigara 3/A,B,C Rivalta (Torino)	1405,62	2015	121,298 (heating system) 18,17 DHW	25 tCO2 eq/anno	methane consumption 20493,441 Nm3/year total requirement 44,18 tep/year	no data	103,68 (heating system) 18,17 DHW	8 tCO2 eq/anno	methane consuption 17.905,01 Nm3/year total requirement 38,59 tep/year	no data	1 244 000
2 a)	External insulation	Insulation of the building and substitution of windows in order to increase the energy performance of the building.	YES	40,38%	0,1	via Pacini 1 (Torino)	3 225,60	2015	222 (heating system) 35,65 DHW	95,71 tCO2 eq/anno	methane consumption 48.407,36 Sm3/year total requirement 81,61 tep/year 1.224.049 m3 (Via Pacini 1) heating season 2013-2014 available monthly data	no data	132,35 (heating system) 35,65 DHW	62,41 tCO2 eq/anno	methane consumption 28.858,28 Sm3/year total requirement 53,21 tep/year	no data	1 500 000
2 b)	External insulation	Insulation of the building and substitution of windows in order to increase the energy performance of the building.	YES	40,38%	0,1	via Pacini 3 (Torino)	3 225,60	2015	222 (heating system) 35,65 DHW	95,71 tCO2 eq/anno	methane consumption 48.407,36 Sm3/anno total requirement 81,61 tep/year 1.178.871 m3 (Via Pacini 3) heating season 2013-2014 available monthly data	no data	132,35 (heating system) 35,65 DHW	62,41 tCO2 eq/anno	methane consumption 28.858,28 Sm3/year total requirement 53,21 tep/year	no data	
2 c)	External insulation	Insulation of the building and substitution of windows in order to increase the energy performance of the building.	YES	40,38%	0,1	via Pacini 5 (Torino)	3 225,60	2015	222 (heating system) 35,65 DHW	95,71 tCO2 eq/anno	methane consumption 48.407,36 Sm3/anno total requirement 81,61 tep/year 1.201.770(Via Pacini 3) m3 heating season 2013-2014 available monthly data	no data	132,35 (heating system) 35,65 DHW	62,41 tCO2 eq/anno	methane consumption 28.858,28 Sm3/year total requirement 53,21 tep/year	no data	
3	External insulaton and centralized system for heating and DHW	The intervention involves several stages: insulation of the walls and the roof; replacing exterior windows; insulation of the attic; realization of a centralized system for heating and DHW.	YES	72,14%	0,16	via Petrella 24-26-28 (Torino)	5 187,96	2015	176,89 (heating system) 35,65 DHW	78,96 tCO2 eq/anno	methane consumption 97698,0964 Sm3/year total requirement 67,32 tep/year	no data	49,29 (heating system) 35,44 DHW	0	total requirement 26,84 tep/year	no data	2 500 000
				TOTAL 20/20/20		TOTAL	16 270		-	-							

COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK

STRATEGIC SHO ASSET MANAGEMENT PLANS INTEGRATING THE 20% OBJECTIVES IN 2020

DENMARK

AARHUS KOMMUNE

INTRODUCTION

Aarhus Kommune

I. INTRODUCTION TO STRATEGIC ASSET AND FACILITY MANAGEMENT PLAN

The city of Aarhus lies roughly at the geographical centre of Denmark, on the peninsula of Jutland. As a consequence of the city's growth, forests reach from the Marselisborg Forests in the south, to within a kilometre (0.6 mi) of the city centre, while some forest areas are now completely surrounded by urban development, such as Riis Forest in the north. Aarhus is built mostly around the harbour, which has been essential for the development of the city since its foundation around the year 770 A.D

More than 300,000 people live within the city limits of Aarhus, the rest live in smaller village communities surrounding the city.

Aarhus Municipality, also commonly known by its older Danish spelling Århus Municipality, covers an area of 469 km2 and has a total population of 319,747 (January 2013)

In the coming 10 years the population is expected to increase with app. 39.000 people to app. 359.000 in the year 2023; representing an increase of 12,2 % while an additional 500,000 live in the surrounding local area of the East Jutland region. Aarhus is also a major part of the larger East Jutland metropolitan area with 1,200,000 inhabitants, which makes East Jutland the second most-populated area in Denmark, after the Copenhagen area.

The Municipality is divided into 6 minor administrative bodies which together constitute the Magistrate led by the mayor and the 5 elected councilmen as political and administrative directors. The 6 magistrate departments of the city are the "Mayor's Magistrate", "Social and Employment Magistrate", "Technology and Environment Magistrate", "Health and Care Magistrate", "Culture and Service Magistrate" and "Children and Youth Magistrate" and handle all the day-to-day operations of the city

"Health and Care Magistrate" manages 4.200 of the nearly 50.000 social housings in Aarhus. There is no Strategic asset management plan as it is conceived by the German and French After partners, nonetheless there is a global plan to refurbish and increase the energy efficiency of the buildings.

Including common areas these 4200 dwellings for elderly people (in general 65+ years) and disabled represents approximatively 470.000 m² .

The budget for operation and management plus maintenance and savings for future refurbishment is divided into 112 "housing associations" the largest with 132 dwellings and the smallest with 8 dwellings. The rent is entirely based on the economic costs. The tenants approve the budget each year. The municipality makes maintenance budgets/plans with a 16 year span; running cost + savings for future refurbishment. Energy saving measures are also suggested once a year to the tenants.

The individual maintenance plans for each of the 112 housing associations is followed by demand, that is, if a certain measure has to be performed according to the plan the actual demand for the measure is always assessed. If not performed, the budgeted sum is transferred to future savings for other planned measures.

In general the yearly maintenance budget for these dwellings varies from 10 – 13 /m2

The operation and management cost is approx. 150 /dwelling/year.

Beside its housing, the Magistrate also runs and manages app. 125.000 m² of local activity centres, health clinics, rehabilitation facilities, administration etc.

Year of construction or total refurbishment to current energy requirements.

- Before 78 4% of Total Building Stock (TBS) 595.000 m² (equals less than 200 dwellings)
- 1978 – 95 21 % of TBS
- 1995 - 2007 46 % of TBS
- 2007 - 29 % of TBS

The buildings refurbished before 1978 were mainly not parts of the resitential building stock.

II. ENERGY EFFICIENCY OBJECTIVES OF ASSET AND FACILITY MANAGEMENT PLAN

In the coming 3 years the Health and Care Magistrate will invest 60 million of Dkr. (0.8 mil.) in energy saving measures on the 125.000 m² of "non dwellings", the local activity centres, health clinics, etc. As above mentioned..

These investments will mainly aim at replacing or optimizing the HWAC systems (AFTER WP5).

The buildings concerned are selected through energy screening; comparing heat and electricity consumption pr. m² with buildings of similar age and in use in our own stock.

The next 5 years Health and Care will construct new buildings and refurbish the existing stock for app. 860 mi. Dkr. (115 mil. EUR) (WP6 + WP7).This plan includes 365 new dwellings and total refurbishment of 144 dwellings

Max. energy consumption for new residential buildings, kWh per. m2 per. year $= 30\ \mathrm{kWh/m^2} + \frac{1000\ \mathrm{kWh}}{\mathrm{Area\ m^2}}$

This requirement is by additional municipal standards and is 22.5 kWh / m² lower than normal national requirement.

When refurbishing, the individual construction elements must also meet requirements exceeding national standards. The following requirements have been decided by the municipality in 2012 but the market for buildings materials and components is closely watched and requirements will be adjusted accordingly to the building costs.

The minimum thermal insulation:

- Exterior wall: 0,1 W/m2K,
- Residential separation: 0,3 W/m2K,
- Ground floor: 0,08 W/m2K,
- Roof: 0,08 W/m2K,
- For windows energy supplement should not be less the -17 kWh pr. m2 per. year

PERSPECTIVE OF 20/20/20

Aarhus Kommune

I. WHAT DOES IN MEAN: FEASIBILITY OF THE 2020 OBJECTIVES

GENERAL TARGET

The City Council decided in 2008 that Aarhus would be CO2-neutral by 2030.
The Council also adopted Climate Heat Plan 2010, aimed at converting energy production from coal to non-fossil fuels such as straw and wood pellets by 2016.

WHY?

Aarhus is to be CO2-neutral by 2030 to:

- Improve the climate
- Improve supply security
- Reduce climate change
- Boost growth within green businesses

HOW?

The Council's Climate Secretariat is working on a range of strategic plans to ensure that the overall target of CO2-neutrality by 2030 will be reached, including:

- Energy from non-fossil fuels
- Energy-efficient buildings and homes
- Energy-efficient transport
- Intelligent energy system
- Exports
- Water and climate adaptation

Aarhus : an energy-efficient city

The city's heating system is highly energy-efficient, and will be even greener over the next few years.

Denmark is internationally renowned for its district heating system, in which heat and electricity production is combined to utilize surplus heat from electricity generation in district heating. All the social housings managed by the Municipality of Aarhus use district heating, resulting in energy-efficiency to the benefit of the climate and tenants heating bills.

In the coming years the city's entire district heating distribution system, over 2,000 kilometres of district heating pipes will be the subject of a large energy renovation aiming at lowering distribution losses. It will make the CO2 "cost" for district heating lower in the coming years before the entire production is CO2 – neutral.

1.3 MILLION TONS LESS CO2

The various initiatives will reduce CO2 emissions from heat and electricity production by 1.3 million tons, and pave the way for green, safe and efficient energy supply without the use of fossil fuels by 2030.

And not just Aarhus: The know-how we gain will help create a cohesive heat and electricity system which can be systematically provided to cities and towns in the rest of the world. Several hundred international politicians, scientists and businessmen and women visit Aarhus every year, and countries such as China have already expressed considerable interest in the city's energy system. The beneficiaries will be the world's climate - and local businesses

WIND IN THE HEATING GRID

The high degree of efficiency of the district heating grid makes it possible to facilitate conversion to green energy over the next few years. Initially, the Studstrup plant north of Aarhus will be converted by 2015 from coal to wood pellets and a new strawfired plant will be built.

Looking ahead, the phase-in of wind energy by 2030 into the heating system will reduce dependence on biofuels, including via the development of new heat reservoirs, heat pumps or other technologies designed to provide better integration with the electricity grid.

The potential of phasing-in wind energy into the district heating system is huge, because the Aarhus area has a number of international market leaders and further education centres within the field.

II. GENERAL IMPACTS OF AFTER PILOT ESMs ON YOUR ASSET AND/OR FACILITY MANAGEMENT PLANS

On the basis of experiences from the pilot-sites in the AFTER-project, Health and Care magistrate has decided to work actively with commissioning in some form on all new constructions but also on major system replacements.

The figures below is based on the planned investments/improvements mentioned above + an added saving of 2,0 % on both district heating and electricity based on the retro-commissioning experience acquired in the frame of the AFTER project.

As we will incorporate commissioning and retro-commissioning in our routines, the potential of energy savings might be quite high, at least if we implement them in the initial use immediately after the end of the refurbishment and/or a system replacement.

			BEFORE			
Usage	Total of m² concerned		Average energy performance (kwh/m²/year)	Total Energy consumption MWh	Total CO_2 Emissions tons	
Service	125.000		153	57.500	14.523	
Dwellings	470.000		127	59.517	15.852	
TOTALS	595.000	2014	0	117.017	30.375	

Note: energy consumption for heating + electricity (1 MWh heating = 169 Kg CO2 1 MWh electricity = 525 Kg CO2

			AFTER			
	Total of m² concerned			Total yearly Energy saving after ESM MWh	Yearly CO_2 Emissions savings	
WP3	125.000			4.600	1.321	
WP4	595.000			23.380	6.227	
WP5	92.000			8.737	3.494	
WP6	14.400			730	194	
TOTALS		2020		37.447	11.236	

2020 PERFORMANCE	
% of Energy savings	32,01%
% of CO_2 reduction	36,98%

Note: the reduction in CO2 emission is higher in percentage than energy savings as the suggested ESM's are expected to give higher savings on electricity than heating. The above mentioned improvements to the production system for district heating and electricity have not been taken into account when calculating emissions for 2020.

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O 1. 6 Strategic Asset Management Planning in 6 SHO integrating the 20% reduction objectives in 2020.

D8.4	6 examples of strategic SHO asset management plans integrating the 20% objectives in 2020

D8.4

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COST OPTIMUM AND STANDARD SOLUTIONS
FOR MAINTENANCE AND MANAGEMENT
OF THE SOCIAL HOUSING STOCK