

County of Dalarna



Borlänge



Dalahorse as elk

LCC – All the way and always!

Sören Björnbom

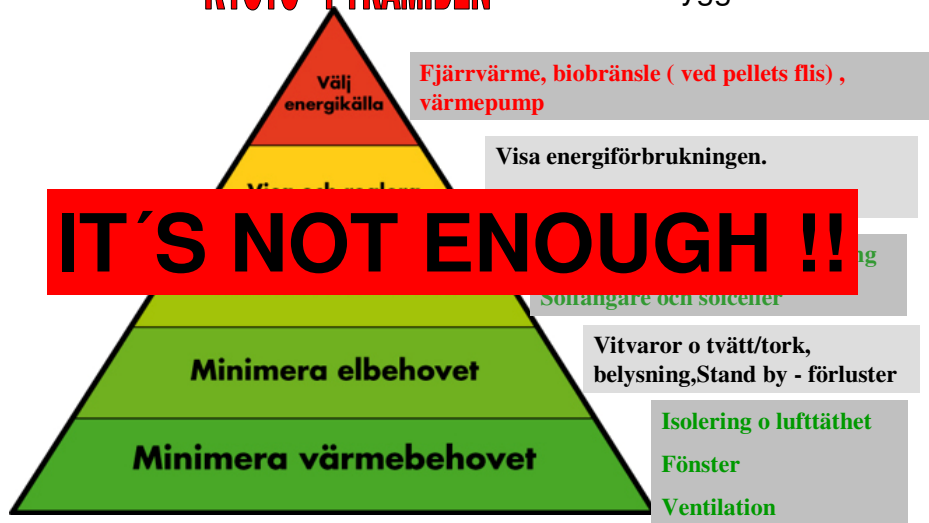
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Who is Sören Björnbom ?

- MSc Royal Inst. Of Technology : Thermal Engineering and **Energy**Systems **1977**
- **1977-79 ASEA-Atom** : Nuclear Power, Nuclear Heating, Solar**Energy**....
- **1979-91 Consultant: Energy**, District Heating, Boilers, Heatpumps... : *"We have **always** used Net Present Value Calculation (NPV) in cost-benefit studies and to calculate efficiency fees in Procurement of Boilers and Heat Pumps"*
- **1991-94 Landstingsfastigheter Dalarna** Chief of Development : **Energy**, Technical Equipment in Building, Environment, Real Estate Management....
- **1994- Consultant: Energy**, Real Estate Efficiency, Procurement of Operation and Maintenance, Integration of Contracting and Real Estate Technical Management, Systematic Energy Management/Maintenance, "Partnering", Company "Coaching", "Mentorship"...

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Jobba efter **KYOTO - PYRAMIDEN** när du ska bygga



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"Sörens modifierade"
Källa : Västfastigheter

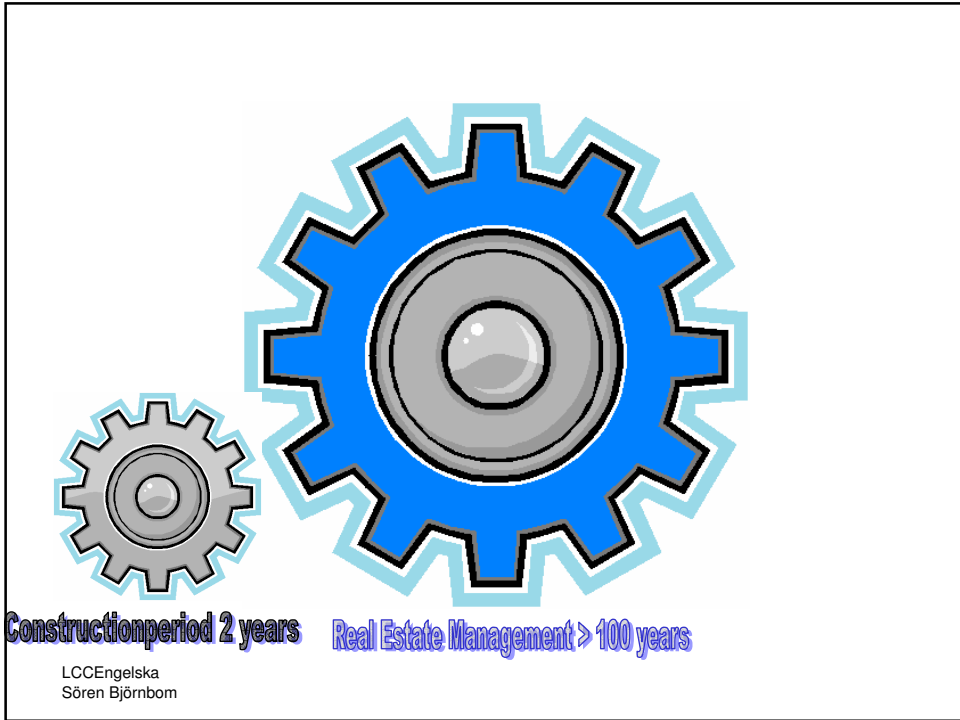
"My Experience"

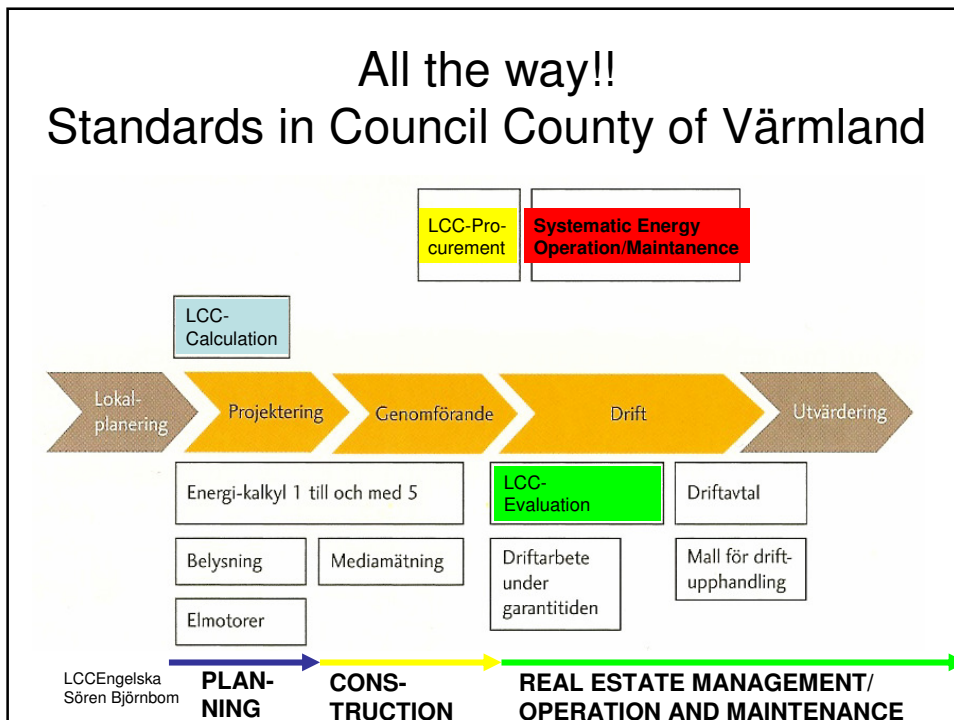


"Building projects is a relay race in which someone **ALWAYS** drops the baton and the team never reach the goal!!"

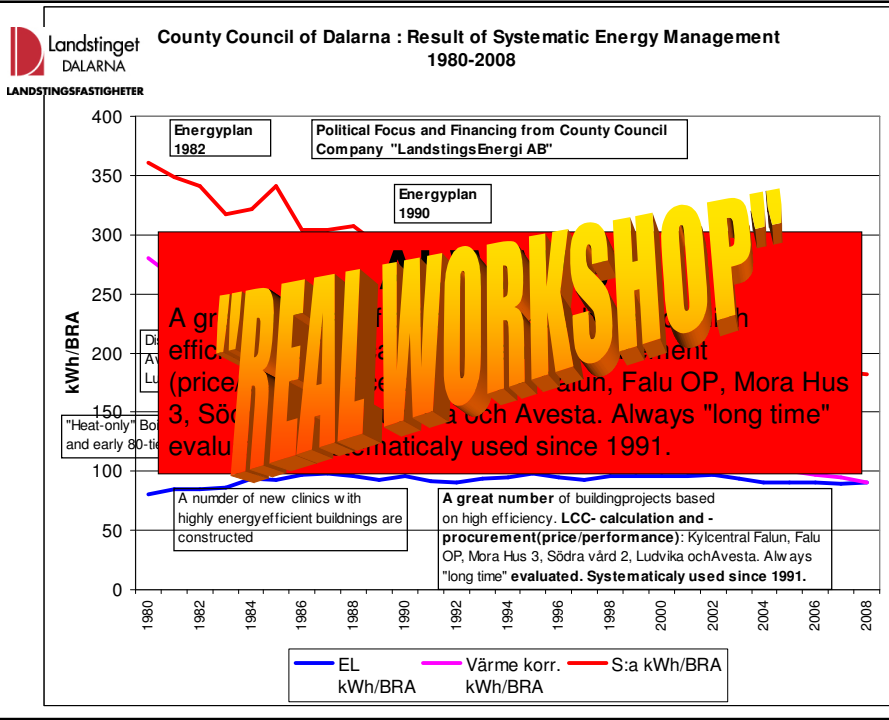
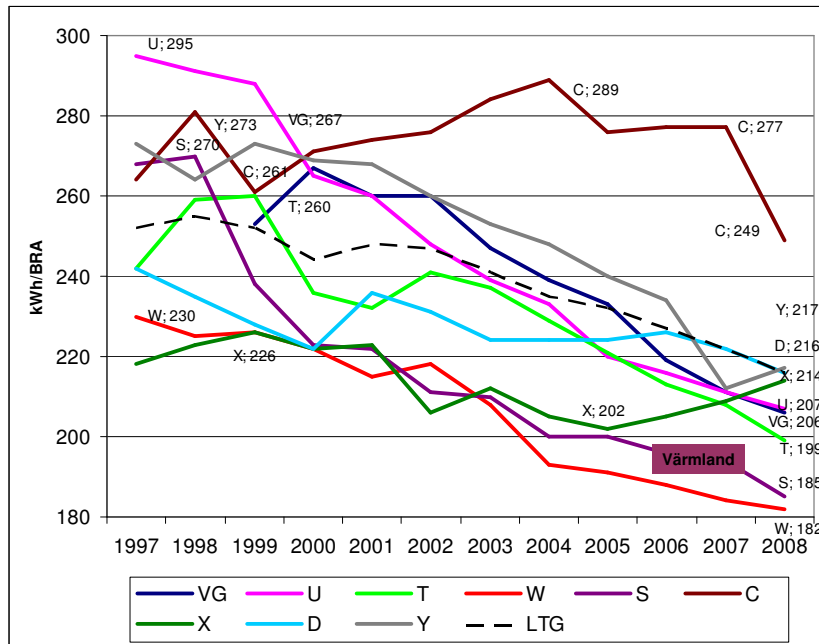
"Real Estate Management / Maintenance : What's that ??"

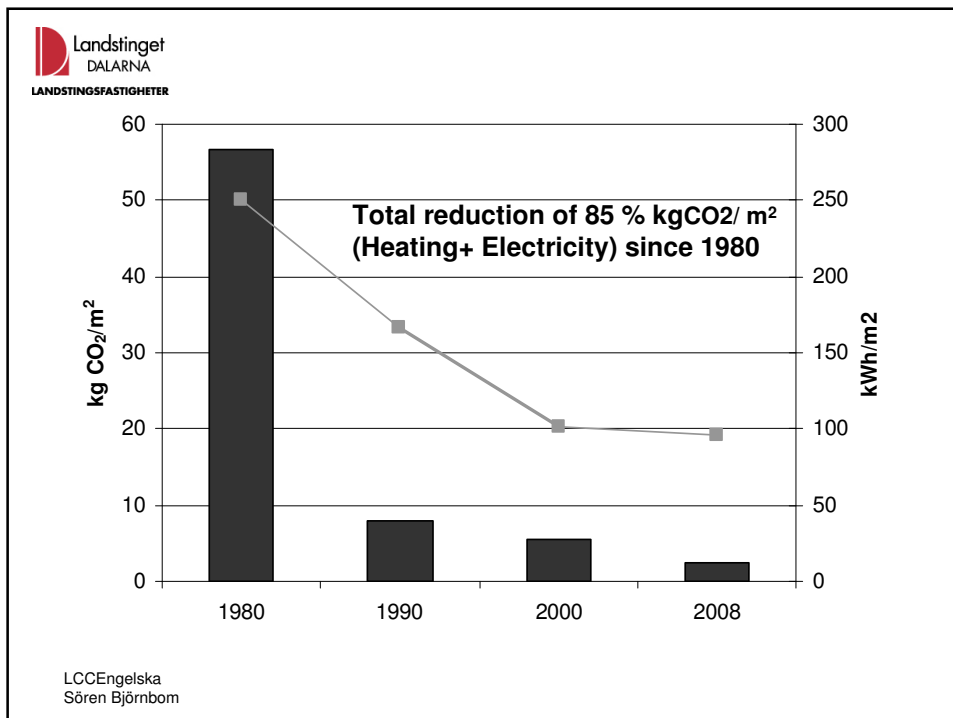
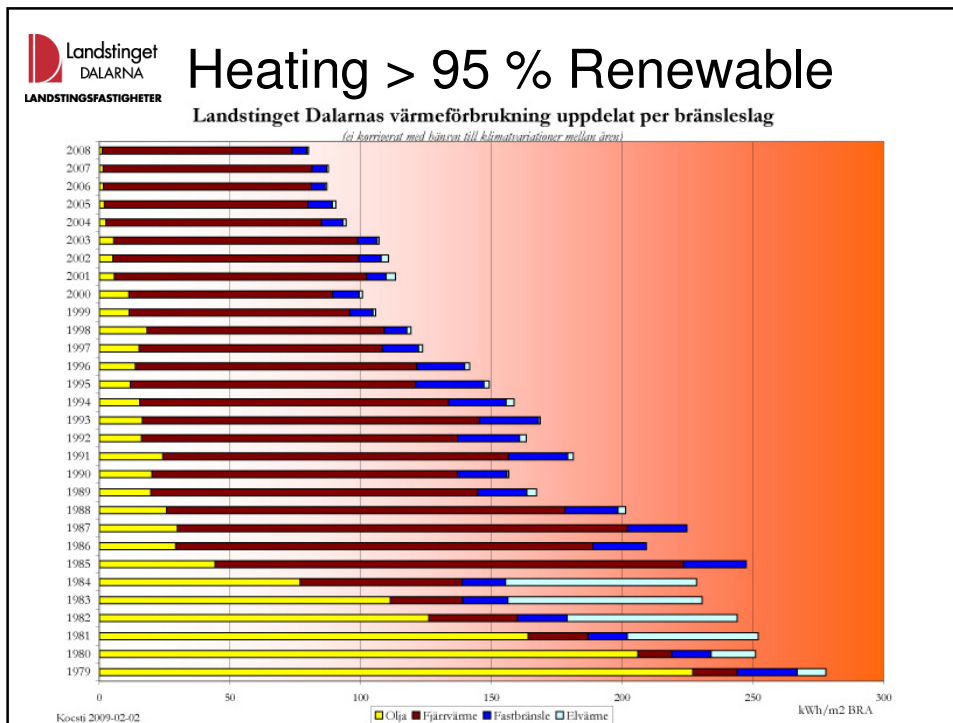
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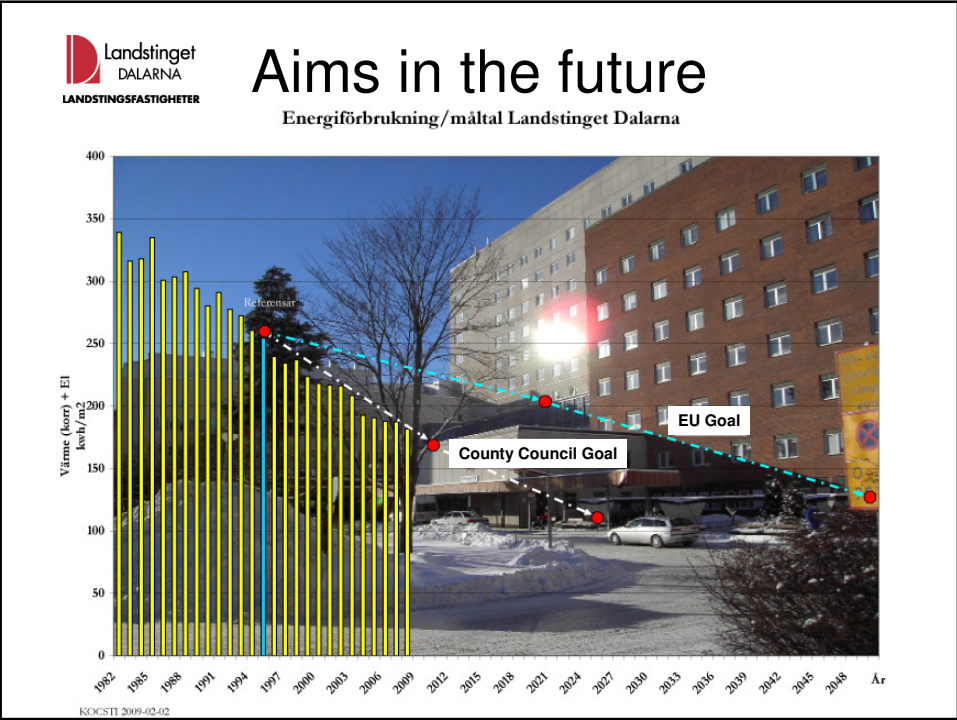




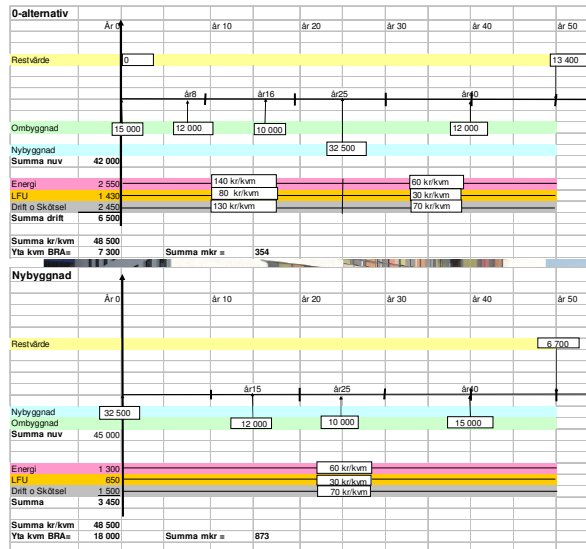
Results from Systematic Energy Operation/Maintenance in County Councils







All the way !



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From "Millionprogrammet" to modern student apartments

Owner : AB Stora Tunabyggen the Public housing company in Borlänge

Rebuilding project called LOCUS with a contracted Investmentcost of 35 MSEK . The project was the first one with "Partnering"-agreement.



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LOCUS

new air handling units with rotary heat recovery, new efficient windows and some insulation (70 mm).

**From 210 to sustainable under
100 kWh/m² in less than 3 years!**



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Tender Documents

- General Conditions
 - Description of how LCC is used.
 - Description of Evaluation of Tenderers.
- Standard of LCCpresentation and how LCC shall be used during Constructionperiod in terms of Calculation and Procurements.
- Standard of LCCevaluation during the Guaranteeperiod

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LCC-Calculation,-Procurement,-Evaluation

PLANNING

CONSTRUCTION

REAL ESTATE
MANAGEMENT/
MAINTENANCE



LCC – Calculation :
Part of decision support

LCC – Procurement :
1. Price/Performance
2. LCC-Calculation
3. Consequenses for the rentalcost

LCC – Evaluation :
1. Measuring at final examination.
2. Guaranteemeetings during guaranteeperiod.

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LOCUS : LCC-Calculation,-Procurement,-Evaluation

PLANNING



LCC – Calculation :
Part of decision support

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LCC – Calculation in LOCUS : Aim, Action and Result

AIM : "Support low costs for Operation and Maintenance over long period"

ACTION : LCC-Calculation shall be carried out for Energy/Climate-systems, Facadematerial, Roof, Showerrooms, "Lockersystem" and Flooring.

RESULT :

1. *Energy / Climate (Ventilation o Heating)* : 8 alternatives among others : Air Handling with heat recovery and Outlet Air Heatpump, Windows Change or not, Extra Insulation or not.
Choice : Air Handling with heat recovery, New Windows and Extra insulation. Based on LCCresult. **Extra Investment** : +2,3 MSEK.
2. *Facadematerials* :12 alternativs; Suggested Larch ;**Choice:** Norway Spruce. Based on LCCresult.
Extra Investment : - 0,15 MSEK
3. *Roof*: 6 alternativ. Not based on LCCresult. **Extra Investment** : +0,16MSEK
4. *Lockersystem* : Not possible to estimate the Operation and Maintenance Costs for existing system. No LCC carried out.
5. *Showerrooms and Flooring* : We had not time enough to use LCC. But the choice was based on and documentet as +/- evaluation.

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Additional results of the LCC-Calculation

- Consequenses on Rentalcost
- Operation / Maintenance schedule
- Long time Maintenance schedule

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LOCUS : LCC-Calculation,-Procurement,-Evaluation

CONSTRUCTION



LCC – Procurement :

1. Price/Performance
2. LCC-Calculation
3. Consequenses for the rentalcost

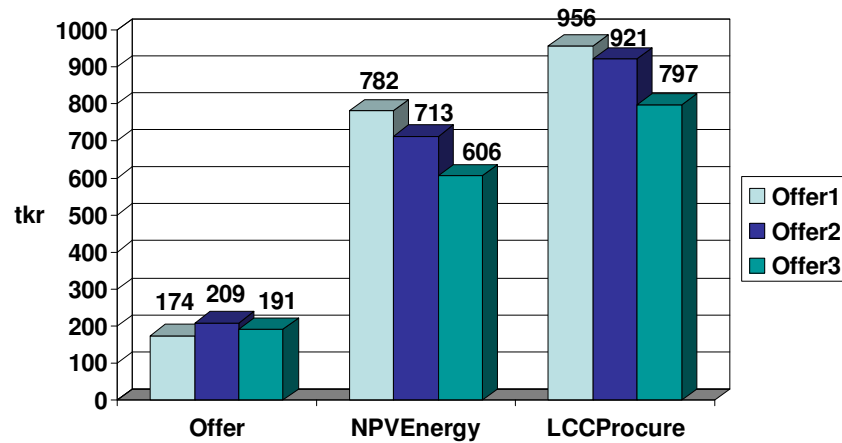
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LOCUS : LCC-Procurement

- Air handling units with heat recovery (rotary) based on Performace and fee for electrical efficiency and heat recovery efficiency.
- Total Price Evaluation :
 $LCC (tot) = Offer + NPV \text{ of Energycosts for Heating and Electricity with guaranteevalues. The Evaluationperiod is 30 years.}$

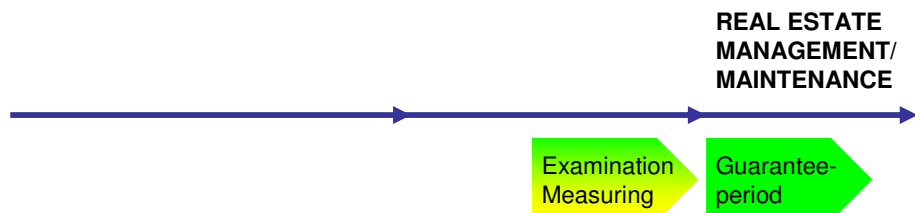
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LOCUS : Result of Evaluation



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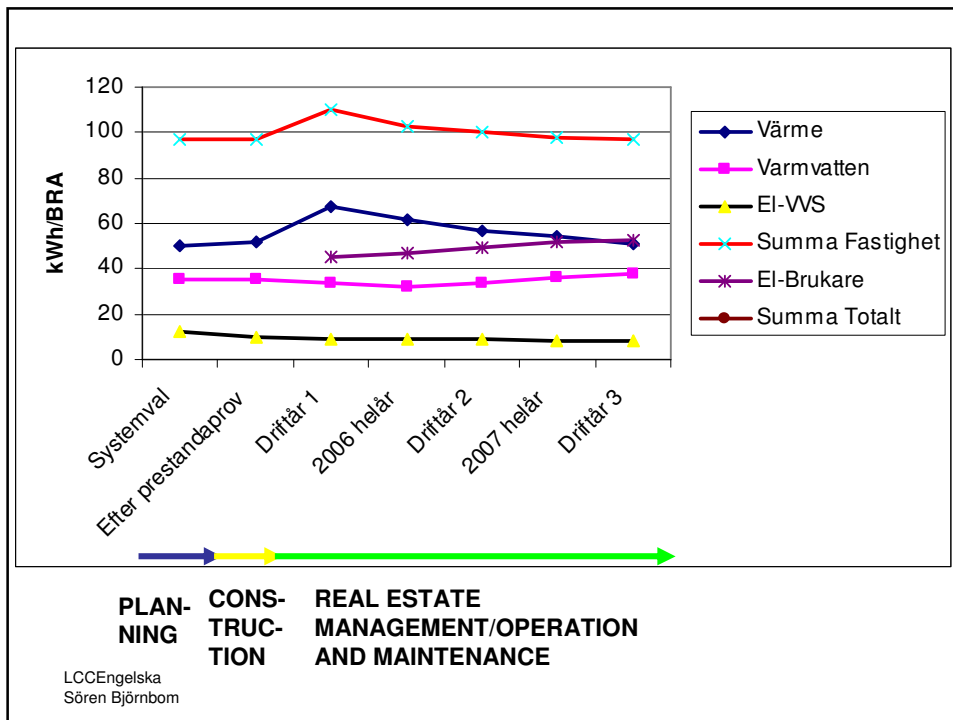
LOCUS : LCC-Calculation,-Procurement,-Evaluation



LCC – Evaluation :

1. Measuring at final examination.
2. Guaranteemeetings during guaranteeperiod.

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LCCEvaluation : Effects on Rental cost : Air Handling Units with heat recovery, new windows and 70 mm extra insulation. At choice of system(LCC-Calc), Examination, Guaranteeyear 1, 2 and 3.

	LCC-Calc	Examination	Guar.year 1	Guar.year 2	Guar.yea
Costs for capital	Investment SEK/m ² BRA				
Annual interest cost	2295	24			
Depreciate cost	2295	7			
		0			
Capital summary	32	32	32	32	32
Costs for Management/Maintenance					
Administration,Taxes					
Insurance and other costs					
Cost for heating	-40	-32	-25	-34	-39
Cost for electricity	2	-3	0	-3	-6
Water					
Operation and Maintenance					
Repairs					
Management/Maint summary	-38	-35	-15	-17	-15
Summary of Rentalcost SEK/m²BRA	-6	-3	7	-5	-13

Project Phases:
 PLAN-NING (blue arrow)
 CONSTRUCTION (yellow arrow)
 REAL ESTATE MANAGEMENT / OPERATION AND MAINTENANCE (green arrow)

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LOCUS Summary:

- We achieved the goal after three years : 97 kWh/m². Exactly what the Energy-Calculation and LCC predicted.
- The Economical result is better than expected.
- We will achieve < 90 kWh/m²; We know how. Perhaps even better!
- All parties understood the reason for using LCC. Not from the start but after some time.
- The local Conctrators were very interested and useful in the Evaluation during the guaranteeperiod. Normally they are not allowed to participate at all.

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Experiences

- **Always** : LCC-Calculation for systems and products when alternatives are available. Include all costs that can be foreseen.
- **All the way and always** : The Projectmanager shall be the one who makes the LCC-Calculation. No specialist. Each parties gives input. No standard costs.
- **All the way** : LCC-Procurement only for products (not systems or complex buildings) :
 - Make the inquiry as neutral as possible consider products.
 - Be as precise as possible in limits in scope of supply
 - Make the LCC-Procurement as simple as possible.
 - Don't "get lost" in measuring of performance and fees.
 - Use the agreed fees only when absolutely necessary.
- **All the way** : Don't miss the phase of evaluation during guaranteeperiod

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