SYSTEM BOUNDARIES: Energy certification based on actual energy consumption

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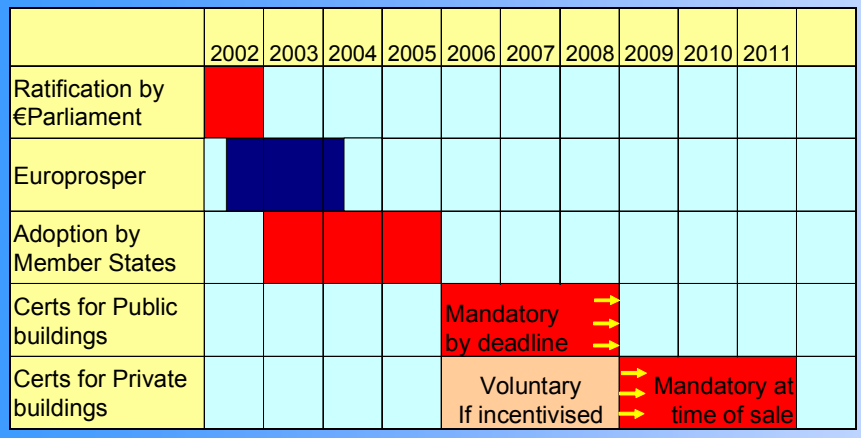
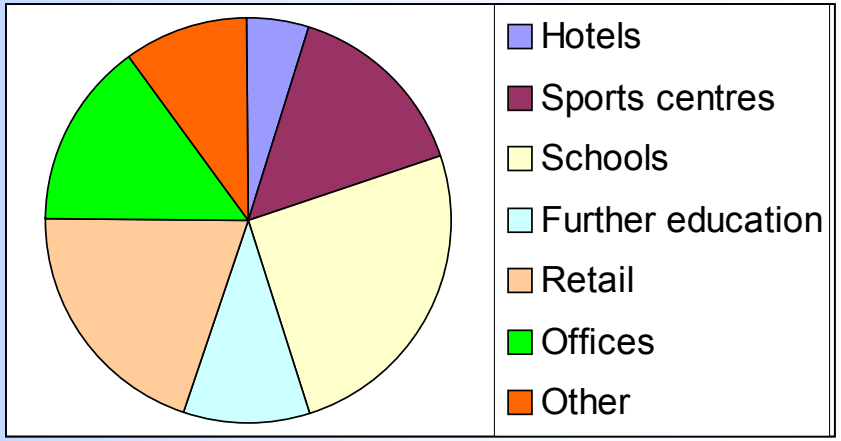
When are certificates required??

1. On construction, sale or rent of any building
2. In all "*public*" buildings > 1,000 m² energy certificate must be displayed in prominent place

   (100,000 buildings in UK alone, say 500,000 in EU)

We need method suited to the early requirement to certify the operation of existing public buildings





State of Art Review

Country	Name of scheme	Type of scheme	Grading method
Experience with national certification schemes			
Denmark	ELO	**Mandatory audit & certification for buildings > 1,500 m²**	By statistical distribution of peers
Finland	Energy Audit Programme (EAP)	**Incentivised audits**	N/A
US	Energy Star	**Voluntary web scheme**	By statistical distribution of peers
Australia	Australian Building Greenhouse Rating (ABGR)	**Voluntary web scheme**	Against benchmarks for a typical office building
Experience with national benchmarking schemes			
UK	ECONs 19 and 78 TM22	**Voluntary 'official' rating; benchmarks for end uses**	Against benchmarks for 4 iconic office buildings
Norway	Key Numbers	**Voluntary 'official' rating by end use analysis**	Against benchmarks for a typical office building

Proposed method for a full certificate: step 1

INPUTS

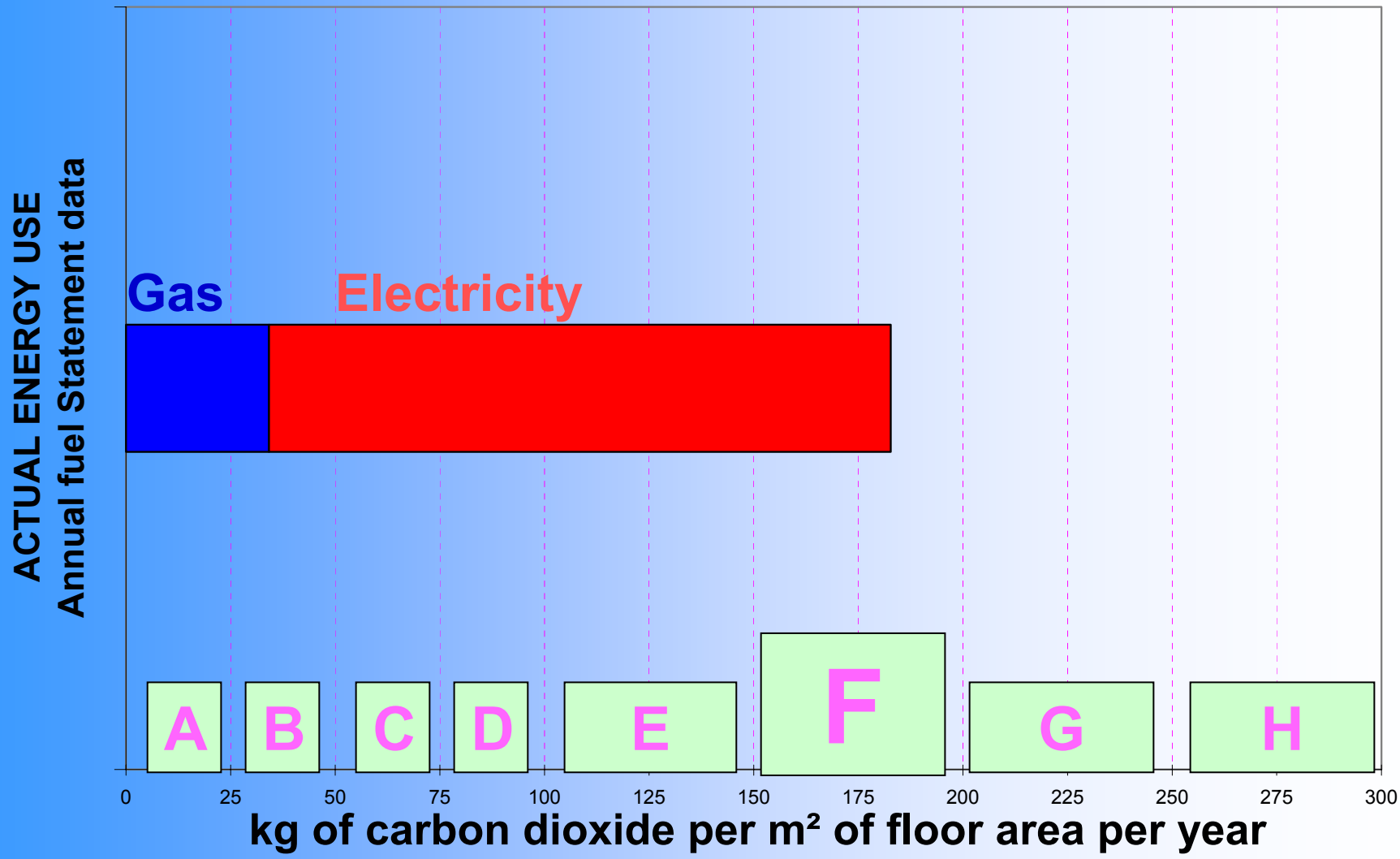
1. Confirmed building type.
2. Accredited building area
3. Accredited annual energy consumption by each fuel
4. Carbon dioxide or primary energy factors per fuel

OUTPUTS

1. **Absolute energy rating**

(e.g. on fixed scale of primary energy or CO_2 emissions per m^2 of floor area)

Absolute Grading by CO2 emissions bands



Proposed method for a full certificate: step 2

INPUTS

- Building area and annual energy consumption by fuel (step 1)

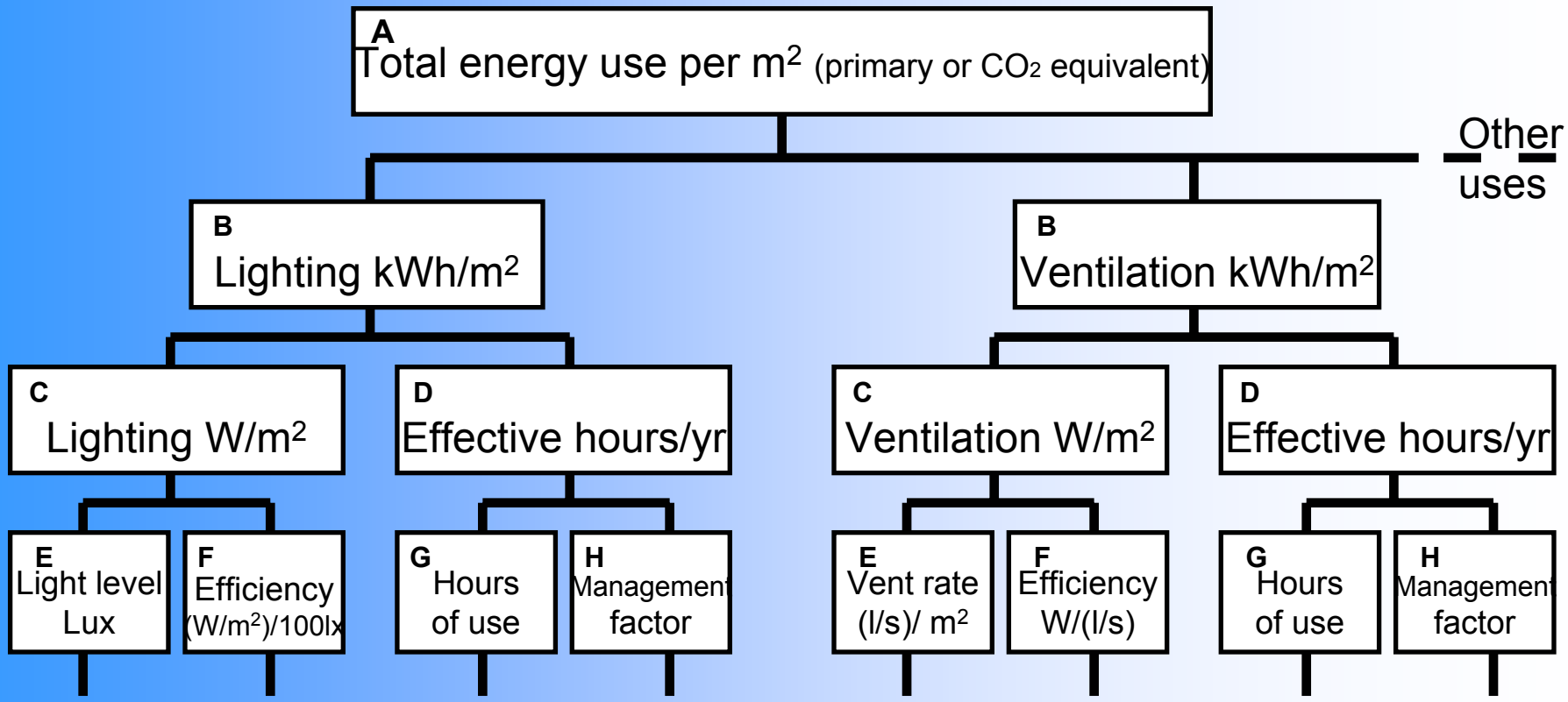
1. Split of area by ventilation type, workstation numbers and hours of use
2. Daylight availability
3. Catering detail
4. Special areas or special end uses

OUTPUTS

1. Absolute energy rating

2. **Relative energy rating (to benchmarks)**

Tailored benchmark generator: Tree diagrams



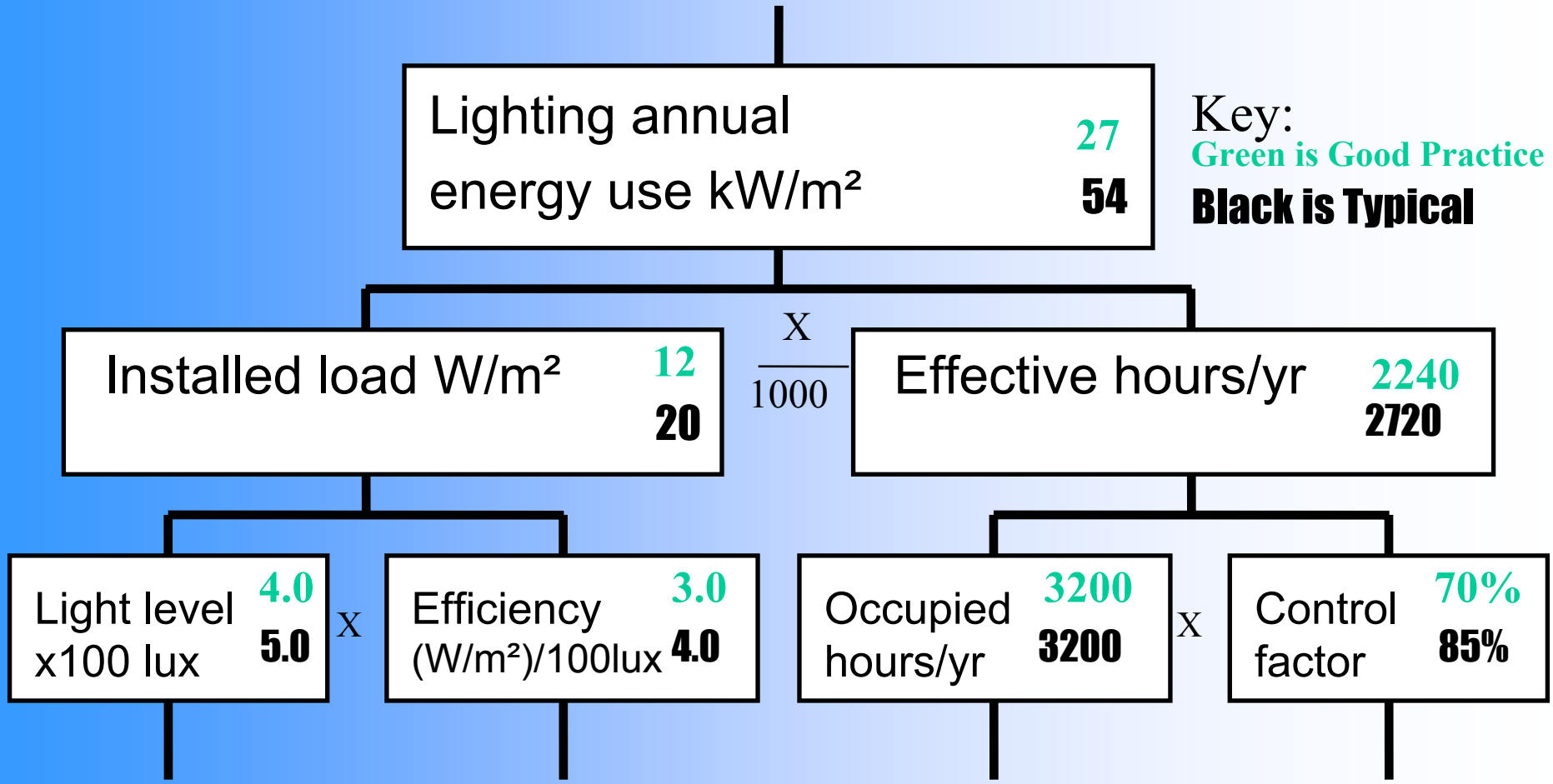
Asset

Control & management

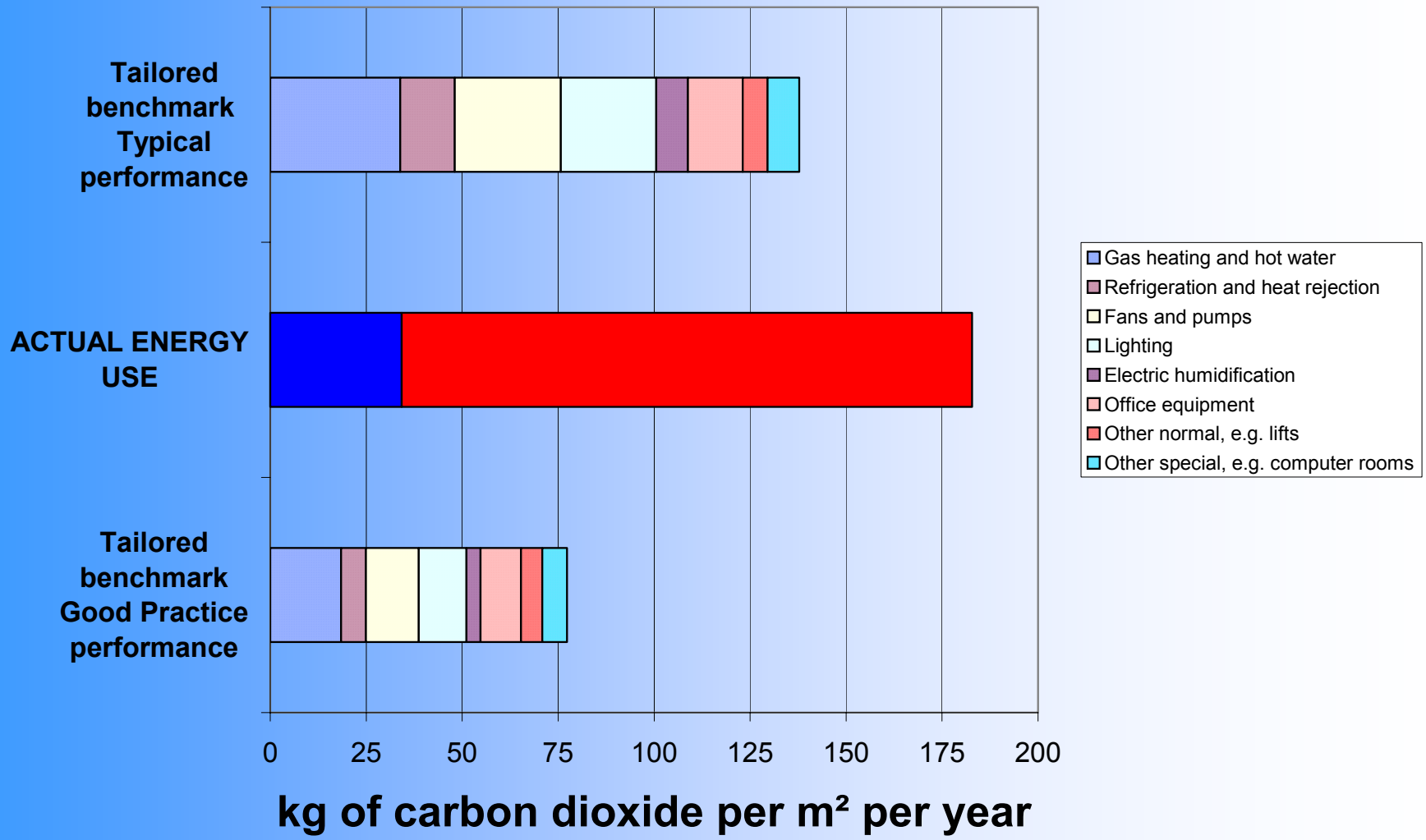
Asset

Control & management

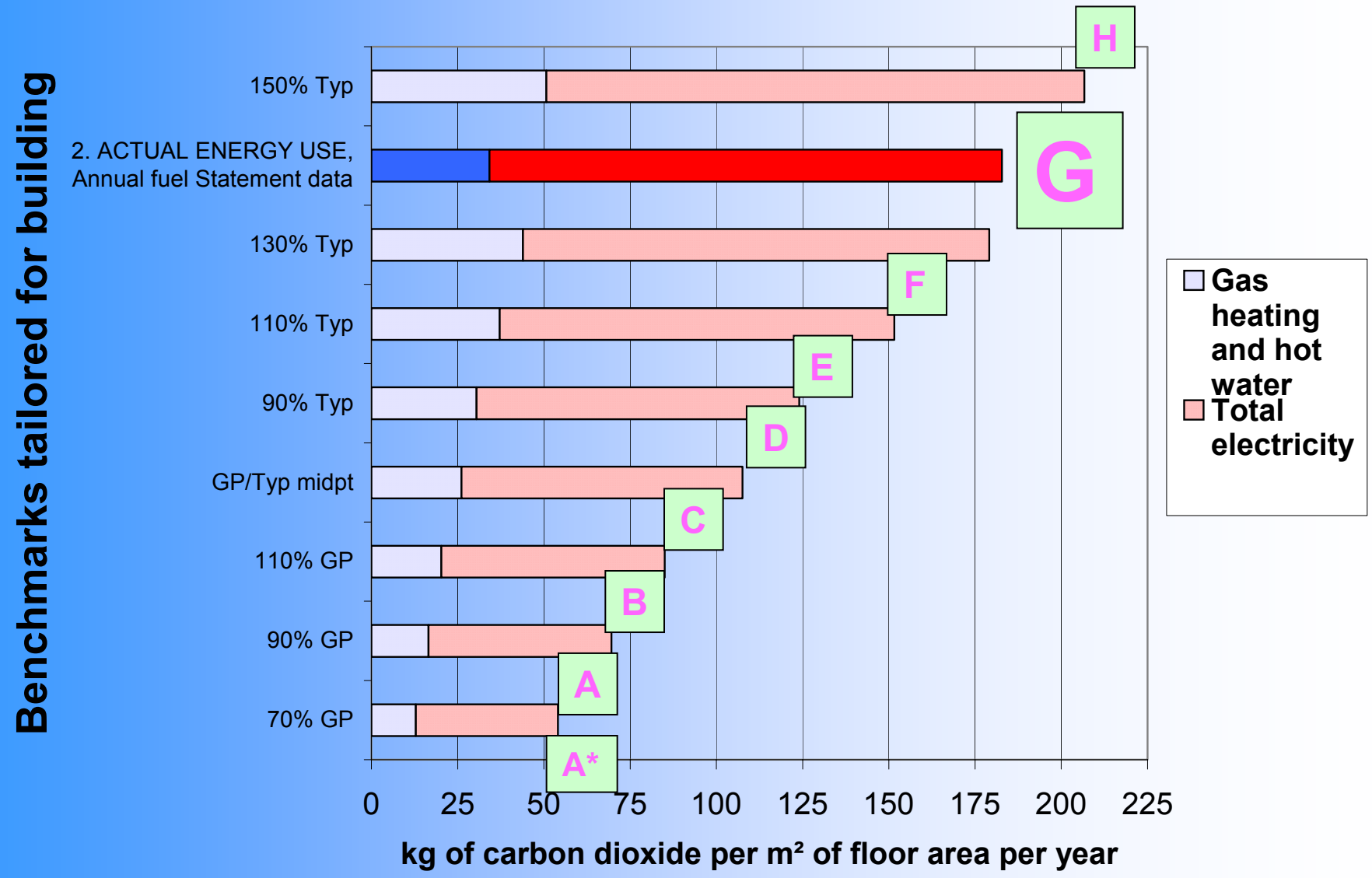
Tailored benchmark generator



Tailored benchmarks: Typical and Good Practice



Relative Grading
CO2 emissions against tailored benchmarks



Proposed method for a full certificate: step 3

INPUTS

- Building details and annual energy consumption by fuel (steps 1 and 2)

1. Plant or systems data
2. Measures already present (by %)
3. Potential for new measures (ie increasing % present)
4. Priority for measures

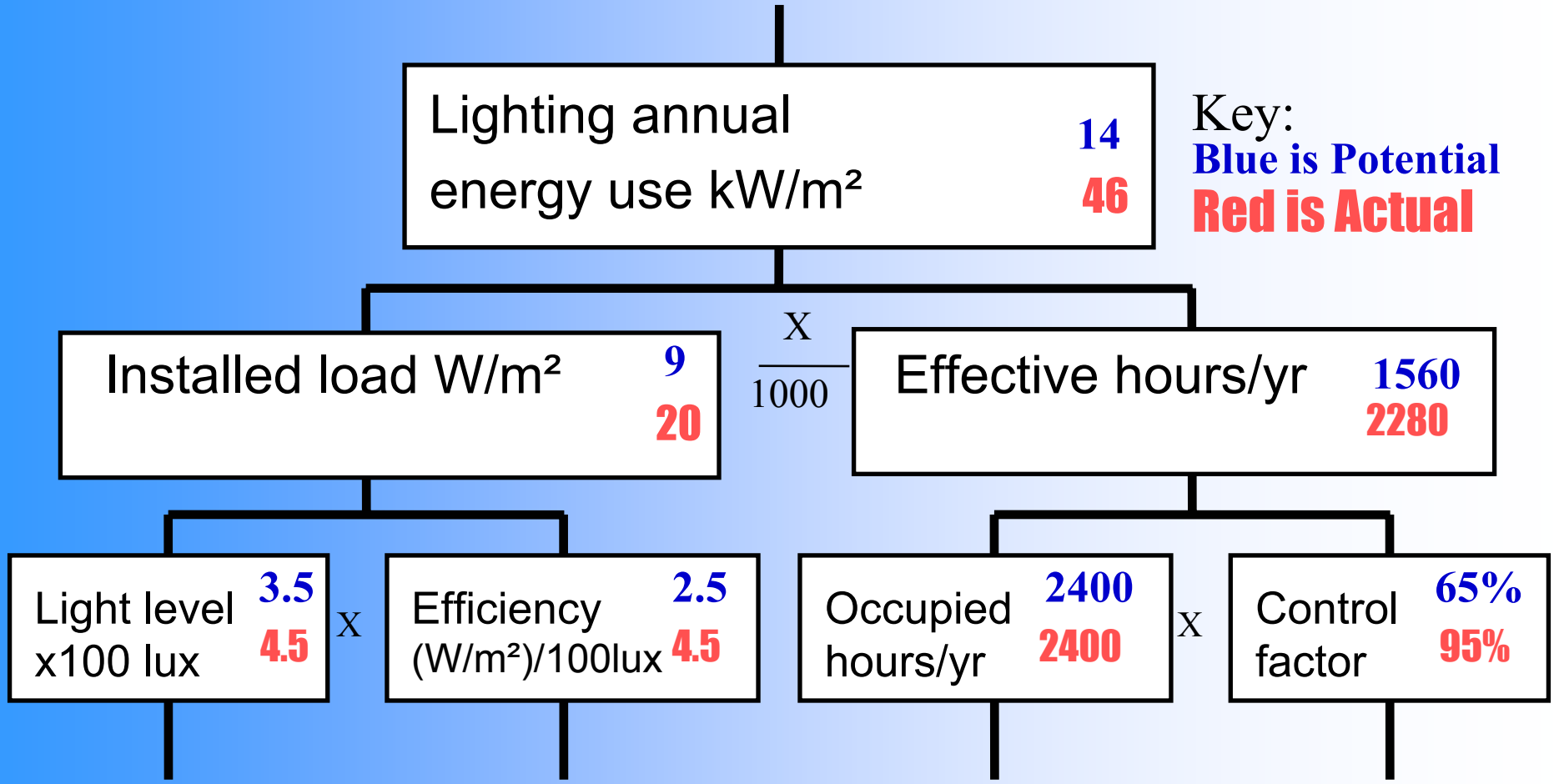
OUTPUTS

1. Absolute energy rating
2. Relative energy rating

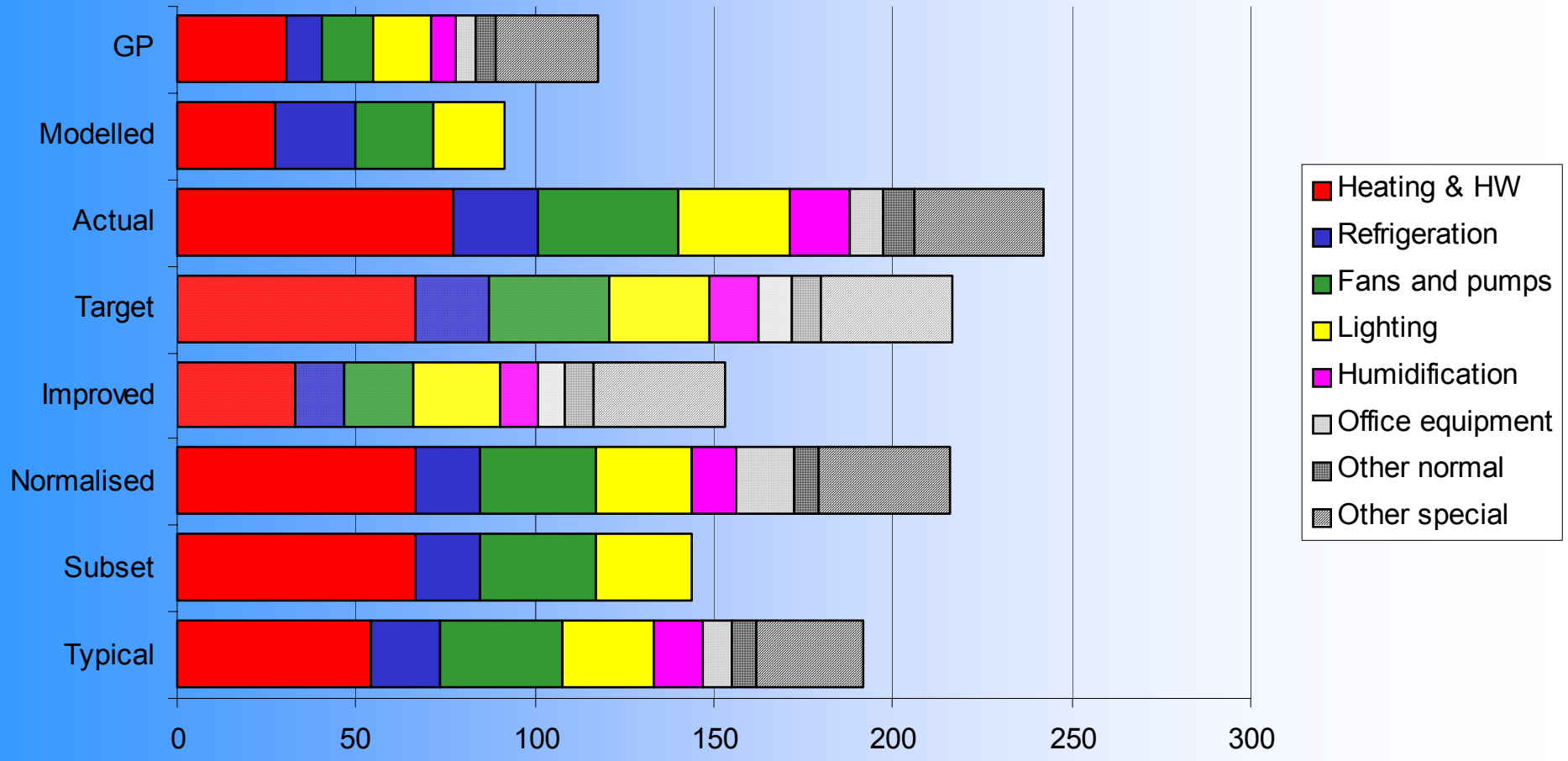
(to benchmarks)

3. **Energy saving advice**
   Implementation cost
   Energy / CO2 saving
   (no double counting)

Breakdown of actual energy – and potential improvements



Building performance in summary



Kg of carbon dioxide per m² floor area per year

SUMMARY

1. Transparency between modelled results and actual energy consumption
2. Pragmatic and quality assured approach
3. Implementation can be smoothed by co-ordination with Regulations and existing information sources
4. We need a CEN Standard for energy Certificates based on actual energy use