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EDITORIAL

For buildings, transformational EU energy law was already unstoppable – War is the accelerant _____ page 2

REAL ESTATE VALUATION

#01 Investment Value vs Market Value
Heinz Muhr _____ page 6

#02 Spain's Journey to European Valuation Standards and Qualifications
Alberto Cabrera Guardiola _____ page 9

AGRICULTURAL VALUATION

#03 Agricultural values in a time of change
Jeremy Moody _____ page 12

BUSINESS VALUATION

#04 Common mistakes in discount rate determination
Nina Milenković _____ page 17

PLANT MACHINERY & EQUIPMENT VALUATION

#05 Real Estate Valuation and Plant, Machinery & Equipment Valuation – An indispensable alliance for valuing the energy efficient transformation of the European building stock
Ana Caldeira Martins _____ page 23

Podcasts

- ▶ Assessing the value at risk in the energy performance of European buildings
EV interviews Peter Sweatman, Chief Executive of Climate Strategy
- ▶ Cutting the crap in real estate valuations – Pricing the decarbonisation transition
EV interviews Xavier Jongen, Managing Director, Catella Residential

page 28

For buildings, transformational EU energy law was already unstoppable – War is the accelerant

There are at least half a dozen building-relevant laws currently in the legislative pipeline, but two are transformational, designed to meet the EU Climate Law's targets of 55% reduction in GHG emissions by 2030 and net carbon neutrality by 2050 via a step-change in the rate and depth of renovation:

- ▶ The Energy Efficiency Directive (EED)'s obligations for renovation of the public building stock; and
- ▶ The Energy Performance of Buildings Directive (EPBD)'s renovation requirements for all buildings, public and private.

The EED was the litmus test because the relevant article is aptly titled "The exemplary role of public bodies' buildings". Indeed, if governments don't have the courage to step-change the renovation of their own buildings, what legitimacy do they have to make demands on private owners?

The key elements of the European Commission's game changing EED Proposal are:

- ▶ The existing obligation to renovate 3% of the public building stock per annum is extended from central government buildings to all levels of government: central, regional and municipal.
- ▶ The scope now covers buildings rented by government, not just those they own and occupy.
- ▶ In the existing Directive, the depth of renovation is unspecified; in the Proposal, renovation is to Near Zero Energy Building (NZEB) level.
- ▶ Under the existing Directive, governments can go for an 'alternative' approach' which experience shows can be very little. Under the Proposal, no more alternatives.

" My amendments were tabled before the war, but Russia's attack is an alarm bell for European energy policy." Markus Pieper MEP, Rapporteur for the Renewable Energy Directive

The latest draft amendments from the Council of Ministers and from the European Parliament show an extraordinary degree of agreement with the Commission: Everyone agrees on extension to all levels of government and on renovation to NZEB level. Parliament agrees on including rental; Council wants some flexibility. Parliament agrees to exclude 'alternative approaches' while Council proposes one alternative, but so heavy that it doesn't reduce the ambition at all.

The likely survival of a high-ambition EED means that we can take the Commission's EPBD Proposal seriously.

For twenty years already, the EPBD has imposed an obligation to energy efficiency renovate all buildings undergoing 'major renovation' (renovation costing 25% of the value of the building or covering 25% of the outer shell). But the depth of the renovation was left largely open, and crucially, the requirement was contingent on the owner's sovereign decision to undertake a major renovation.

" The revolution of the Commission's EPBD Proposal is that it imposes absolute renovation deadlines, regardless of the building renovation cycle."

No longer. The draft that European Valuer revealed in December took the form of a combination of renovation obligations triggered by sale or rental (for commercial property and single-family housing) and absolute obligations requiring no trigger; the job just had to be done by a certain date (for multi-apartment buildings). At the last minute, possibly for legal reasons, the Commission dropped the sale or rental triggers and single house / apartment block distinction and kept it simple: an across-the-board renovation obligation for the 15% worst-performing building stock, all building types included.

" an across-the-board renovation obligation for the 15% worst-performing building stock, all building types included."

The new renovation requirements are underpinned by EU harmonisation of the national EPCs that European Valuer revealed in December: the key element connected to the renovation requirements is that across the Union, the EPC 'G' rating shall correspond to the 15% worst-performing buildings in the national building stock.

The EPBD Proposal combines that common 'G' rating with this:

- ▶ All public buildings and all private non-residential must be renovated to EPC level 'F' by 2027 and 'E' by 2030.
- ▶ Residential must be 'F' by 2030 and 'E' by 2033.

That is the Commission's solution for achieving massive, step-change renovation of the worst-performing building stock in time to meet the 2030 55% GHG emission reduction requirement.

The EPBD Proposal was launched in December, five months after EED, so it's too early for amendments from Council and Parliament, but the complete lack of political or private-sector protest augurs well for keeping the level of ambition high.

And that was before the Russian invasion of the Ukraine.

Less than a week after the attack, the Christian Democrats started aligning themselves with the more ambitious positions of the Liberals, Socialists and Greens for both renewables and energy efficiency. Christian Democrat Markus Pieper, Rapporteur for the Renewable Energy Directive, declared "My amendments were tabled before the war, but Russia's attack is an alarm bell for European energy policy.", and his party colleague Peter Liese made similar statements for energy efficiency.

Indeed, the talk in Parliament is now about being more ambitious than the Commission Proposals, a source confirming that both the EED and the EPBD are concerned. Jutta Paulus (Greens) summed it up: "Each extra percentage of energy efficiency means 2.6% less gas imports."

"... the talk in Parliament is now about being more ambitious than the Commission Proposals"

Michael MacBrien, Editor





REAL
ESTATE
VALUATION

#01

Investment Value vs Market Value



Heinz Muhr

General

In most instances the commission of a real estate valuer to prepare a valuation report involves the calculation of the market value pursuant to EVS 1. However, when preparing the valuation, the valuer must often strike a balance between the market value and the subjective or individual investment value.

This gives rise to the following questions that are in part decisive for the valuation: Which data are not deemed suitable for determining market value due to their subjective nature? Which input data should be used as the basis for the valuation in order to establish the market value? What is the difference between a subjective investment value and market value?

EVS 2020

EVS 2. 6.1.1. defines investment value as: "The value of a property to an owner or prospective buyer, calculated on the basis of their individual investment criteria. Whilst every prospective buyer will individually calculate the investment value of a property for the purposes of establishing a price at which to bid for the property, the value so calculated may equal the Market Value of the property but may also be higher or lower than the Market Value".

EVS 2. 6.1.2. goes on to explain that "the Investment Value is most often used for the purposes of measuring the performance of a property investment".

"... the valuer must often strike a balance between the market value and the subjective or individual investment value..."

Investment Value

The investment value of a property can be viewed as a special case of the so-called subjective value. In principle this clarifies that special preferences or other particular assessments of individual persons should not be taken into consideration in a valuation unless they are supported (exclusively) by economic considerations and therefore influence the market value of a property. However, should a number of market participants be of the opinion that a property has immaterial characteristics that can increase or decrease its value, these, too, must be priced into the valuation.

It should be noted that valuation methods for determining market value may only use those value-relevant input data that are clearly not based on unusual or personal circumstances.

If, therefore, special characteristics or features of a property represent a particular value for just one special person, but are deemed above the market value by all others, a subjective purchase interest of this person must be assumed. A subjective value is certainly the case if this particular investor assesses the value above the market value of the property for personal reasons¹.

How can subjective value assessments be discerned?

Due to their unusual and personal circumstances, subjective input data are not suitable as the basis for presenting a market value of a property. They do not in fact reflect the normal course of business or market developments. These values must therefore be eliminated from the valuation as a matter of law.

The question then arises for the commissioned valuer as to how presumably subjective input data can be determined and how these should be handled subsequently.

Influence of unusual or personal circumstances can be assumed in principle if, for example, purchase prices and ancillary agreements deviate significantly from the purchase prices and ancillary agreements in comparable cases. Furthermore, it can be potentially assumed that unusual or personal circumstances between the parties had an impact on the price in the case of transactions within a co-ownership association, but also if there is a family, personal, economic or other close association between the contracting parties.

It must nevertheless be noted that the valuer does not automatically have to eliminate the data sets of these

transactions due to any such presumption. On the contrary, these must be examined and investigated in more detail and more exactly on a case-by-case basis. Not until detailed examinations have provided sufficient indications that unusual or personal circumstances are highly likely to be the case and that these also determined the price, may these data be left out of consideration when determining market value. Exact and detailed research into value-relevant input data is therefore indispensable.

Investment value – a subjective value

In special cases it is the task of the commissioned valuer to determine an investment value for a specific investor. In international literature the term 'worth' is also used for the investment value and – in addition to other value definitions – expressly distinguished from market value, as the 'value'.

As a rule, the investment value is calculated in the course of a project development with the residual value method. The basis for such an investment calculation is always specific considerations of an individual, specific market participant concerning the expected costs and earnings, the financing costs, the duration of the marketing, the overall costs excluding the costs of acquiring the land etc. A calculation model and profitability model with an individually assumed rate of interest (equity capital and borrowed capital) are

¹ See EVS 2. 5.1.

therefore determined based on the expected yield from the individual's real estate investment.

The investment calculation therefore depends on many individual assumptions on the part of the client, which do not necessarily – and in fact often do not – conform with the market. For this reason, the residual value method is widely regarded as a method for determining a subjective value on a case-by-case basis. The calculation of an investment value is always based on subjective considerations of the respective or future owner of a property and as a ‘non-market value’ is therefore characterised and determined by the owner's individual assumptions and assessments.

Residual investment value vs market value

A residual determination of an investment value must generally be distinguished from that of a market value in a valuation. The two values can diverge greatly². At first glance this is clear and understandable, because in the case of an investment calculation – as has already been explained in detail – the individual value measurement of an individual market participant serves as the basis for the valuation.

Consequently, the residual property value does not result in the market value, this being in particular the case where the residual value is used as an investment calculation. This circumstance is explained by the fact that the value is determined for a specific investor whose requirements and project assumptions are therefore incorporated in the valuation. If, for example, costs or earnings that are not in conformity with the market, but are instead oriented toward the special circumstances of the particular investor, have been included in a residual valuation of a property, then the residual value method can only result in the price that corresponds to the personal circumstances of the special investor.

It must be considered in this context that client instructions which do not reflect the ‘Highest & Best Use Approach’, do not result in the market value of the real property, but in fact the ‘worth’ for the respective individual, i.e., a subjective investment value.

In contrast, if a real estate expert uses the residual value method, – the norm in most cases – then the market value is demanded as the target figure for the so-called ‘acceptable land value’. In the case of the market value estimation, the assumptions and input data must be transparently derived

from the market. The highest and best use must always be assumed for the fictive earnings at the end of the project development, i.e., the valuation strategy, the technically possible, legally permitted and economically most expedient use which therefore reflects the highest value of the developed and completed property.

² See EVS 2.5

#02

Spain's Journey to European Valuation Standards and Qualifications



Alberto Cabrera

Under a 1981 revision of the Spanish Mortgage Law, valuation companies became the sole valuers, to the detriment of individual valuers, and in-house valuation services were allowed in financial institutions.

In 1983, the Spanish Real Estate Valuation Association (AEVI) fought for Spain to adopt an American-style model with valuers having specific and continuous training, but the government followed the supervisory body (the Bank of Spain), which preferred to supervise a few businesses and then let them supervise the professionals who were actually doing the work without power of decision.

On the other hand, individual valuers undertaking valuations for land registry, expropriation or judicial purposes, did not (and still do not) work under the restrictions of the Mortgage Law. For these kinds of valuations, the law puts the focus on university degrees covering less than 30% of MER and passing over crucial pillars such as CPD and ethics.

For mortgage valuation, a Ministerial Order of 1994 enabled the creation of a business oligopoly initially owned by valuers who set up businesses in the form of valuation companies.

In 1997, legislation was passed regulating these valuation companies and tacitly limiting professional practice by forcing professionals to work for these business conglomerates who were the ones actually issuing the opinions in valuation reports.

There was still no specific academic path to valuation qualification. The valuation companies had to hire architects and technical architects for residential or commercial valuations, and engineers or technical engineers for agricultural valuations, for example.

In 2003, an Order established a series of constraints on the preparation of valuation reports. At this point, five of the 70+ valuation companies were conducting more than 55% of the valuations. Moreover, the professionals who had created these business conglomerates had largely sold them to financial institutions.

The global financial crisis caused legislators to force financial institutions to divest from valuation companies and limit maximum turnover. At that time, most mortgage business was already in the hands of companies owned by investment funds.

In 2012, the Spanish Association of Real Estate and Urban Valuation (AEVIU), took up the baton from the AEVI of the 1980s. At AEVIU, we bring together professionals with knowledge of valuations, regardless of their training but always with a minimum of professional experience, continuous training and observing a Code of Ethics compatible with EVS and MER. AEVIU became a full member of TEGOVA in 2013 and soon achieved Recognised European Valuer (REV) awarding status.

AEVIU has established partnership agreements with several universities so that the EVS can be taught there, familiarising next-generation valuers with European standards beyond State legislation, internationalising their work even while operating in Spain. We hope that continued use of EVS will favour the sector's self-regulation, as well as enabling valuers to provide their services to all market players, as their reports will be understood anywhere in the world.

In 2019, when Spain finally transposed the Mortgage Credit Directive, AEVIU joined forces with the Spanish General Council of Technical Architecture (CGATE) and the High Council of the Orders of Architects of Spain (CSCAE) to encourage legislators to incorporate an article

into Spanish law enhancing the status of the valuer as an "accredited professional", in line with the Mortgage Credit Directive's Article 19 on property valuation. The wording of the article in the Spanish law is:

"Article 13. Real estate valuations.

*The real estate provided as collateral shall be subject to an appropriate valuation prior to the conclusion of the loan agreement. The valuation shall be carried out by a valuation company, a valuation service of a credit institution regulated by Law 2/1981 of 25 March on the regulation of the mortgage market **and/or a professional accredited** in accordance with Royal Decree 775/1997 of 30 May and the 10th additional provision of this Law, who shall be independent of the lender or real estate credit intermediary and use reliable and internationally recognised valuation standards, pursuant to the provisions of Order ECO/805/2003 of 27 March on standards for the valuation of real estate ...".*

AEVIU continues to work with CGATE and CSCAE, also full members of TEGOVA, to develop the regulations governing accredited professionals and bring Spanish legislation into line with the EU framework, paving the way for full movement of European professionals in the

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country. The three Associations have formed TEGOVA Spain, working together to publicise TEGOVA and its European Valuation Standards and European Business Valuation Standards.

AEVIU awards REV and TRV (TEGOVA Residential Valuer). These recognitions can only be obtained by professionals either demonstrating training to MER level plus a minimum of two years' professional experience, or having ten years' experience. Valuers must also evidence CPD and adhere to the AEVIU Code of Good Practice.

TEGOVA Spain is working to ensure that mortgage legislation recognises holders of the REV and TRV designations as having the necessary level of training, experience, ethics and good professional practice for accredited professionals and requires that valuers not having REV or TRV be able to demonstrate that they meet EVS levels of knowledge and experience.



AGRICULTURAL VALUATION

#03

Agricultural values in a time of change



Jeremy Moody

It is a fascinating time to be active in agricultural and rural property valuations with the changing world and developing competition from new uses for rural land. Pressure from changing markets, policies and technologies drives the prospect of new values from climate change, biodiversity and other concerns while also bearing on agriculture. These raise issues not only for ordinary property valuation but for taxation, compulsory purchase, divorce, business restructuring and many other purposes as well as the advice to those facing change.

Climate Change

It brings challenges of storm, flood, drought and heat with disease and other stress with local and global disruption. Its mitigation will require:

- ▶ carbon sequestration, properly done on a century horizon to match the life of carbon in the atmosphere, bearing on rural land use from soils and forestry to the “blue carbon” of absorbing it in wetland
- ▶ reducing emissions by business and land management, a large challenge for farming in general and cattle in particular, as well as renewable energy and peatland restoration.

With more climate change to come even if policy is successful, adaptation will affect land management from how it is cropped, trees to shade livestock and water conservation to keeping buildings habitable.

Farming Economics

Most sectors of farming see strong prices for produce, whether wheat, beef and lamb but, as so often with strong prices, also increased input costs – this time as much driven by badly jolted world supply chains as farming’s ability to pay. Most obviously, nitrogen fertilisers have more than doubled in price with supplies then shortening in response to natural gas prices. That may lead to changed practices and, for livestock farms on grassland, the risk of less conserved fodder for next winter. Higher prices for steel and timber affect investment projects. As high grain prices drove the Arab Spring, so more change may come with international tension. Yet, in a thin market, conventional UK farmland prices remain unaltered.

With climate change and other factors, vineyards are a developing sector in the UK while new technologies include autonomous machinery and may bring gene editing. The first developments in controlled environment farming

" ... this is a time of great challenge and opportunity. It calls heavily on the agricultural valuer's role as the trusted adviser helping clients to find and implement their own answers over this decade, applying established skills in business appraisal, tailored holistic advice and facilitation."

with enclosed production facilities and LEDs at specified wavelengths are typically at present for salads but have wider potential applications.

These developments drive the need for valuers not only to consider the farmland used for cropping and grazing, but also the businesses that use specialist properties with their capital investment from poultry sheds to high technology-controlled environment farming where business contracts and profit potential are the keys to value.

Meanwhile and outside the EU, England has already begun its agricultural transition from the Common Agricultural Policy (CAP), phasing out the area-based Basic Payment that has rewarded land occupation and fed into costs. That money is to be progressively re-directed towards buying largely environmental "public goods" in land management and farming practice. Rather than the inherited approach of paying for "income forgone/cost incurred", payments are developing to make the environment one of a farmer's business choices alongside grain, milk and meat, with a transactions-based approach to securing habitat change and then encouraging private money into this work.

This phased re-direction of money will prompt many farmers to reappraise their businesses after decades of support channelling them into commodity production. With a very wide range of farming performance, from the bad to the good, this is a time of great challenge and opportunity. It calls heavily on the agricultural valuer's role as the trusted adviser helping clients to find and implement their own answers over this decade, applying established skills in business appraisal, tailored

holistic advice and facilitation. Where some farmers may see this as a moment to reduce operations or withdraw, others will seek out the newly available land. The CAAV is promoting tenancies that may see owners have better income from good tenant farmers than they are achieving from direct farming and publicising the success of the Irish Republic's use of the tax system to encourage this.

This process of adjustment to the withdrawal of longstanding support and the pressures from climate change mitigation will see farming and land use become more diverse with:

- ▶ good competitive commodity producers staying just that but being selective about which land suits them and earns a margin
- ▶ more moving into higher investment and undercover production of higher value output, perhaps less linked to farmed area
- ▶ many finding ways other than commodity production to achieve higher value and higher margins by specialism, branding, adding value and other routes, perhaps no longer seeing the scale of area farmed as the measure of business efficiency
- ▶ many, often on more marginal land, using farming to manage land to produce both environmental outputs and food, as by more extensive, higher margin grazing of species-rich pasture
- ▶ some, including new owners, using land for more extensive environmental management (sometimes "re-wilding"), perhaps with little agricultural production.

These decisions will be individual ones by farmers and landowners, not necessarily simply driven by public policy but by private priorities. Some will follow natural pressures when 60 per cent of food output comes from 30 per cent of land while 20 per cent of land produces 3 per cent of calories. However, some areas, such as lowland peat with its productive land also emitting carbon, pose much sharper conflicts.

As markets adjust to changing demands, they may answer the challenge of improving productivity in a high-cost country, where the issue has been long blunted by area support payments. It will be a generation's change in a decade.

Competing Land Uses

New bidders are in the market for the use of significant areas of rural land with:

- ▶ renewable energy
- ▶ forestry
- ▶ environmental uses.

While all may be seen to meet policy goals, they bring conflict over larger scale land use with the impact on the landscape as well as lost productive farmland.

Renewable Energy

Alongside generation from anaerobic digestion, biomass, wind and hydro, **developing technology and economics now enable large scale solar farms**, especially in England. They have grown from their origins a decade ago at 10 ha units on 25 year leases and area based rents within subsidy rules to much larger unsubsidised operations on 30 and 40 year leases with

proposals now for schemes each using over 1,000 ha of land. The longer leases now have more use of turnover rents after an initial period. Negotiations over terms now cover ways, starting with batteries, to store the power generated for release when needed so bringing more value to sites, potentially improving rents. Biodiversity and carbon issues are now joining those topics.

The expected doubling of electricity use with the move to net zero will bring much work in re-wiring the country, both across rural areas and to serve them, not only taking power from renewable generation but delivering it to support the heat pumps, electric vehicle charging points and other new rural demands.

Forestry

While the UK historically had little timber, forestry is expanding on a commercial basis, enabled by buoyant economics to bid for a wider range of lower value farmland. This is seen notably in Scotland where larger landownerships offer necessary scale but now also in parts of Wales but less in England with higher values. However, in keeping with a wider risk in “green” investment, capital keenly chasing apparent opportunities may be relying on hopes of future income streams as yet unrealised. Commercial forestry may usually be less concerned with carbon sequestration than the business prospects of directly supplying future low carbon supply chains with construction and other materials. As Cellulosa Svenska feared on seeing last year’s draft EU forestry plans, carbon sequestration requirements could frustrate timber production with only the much lower value possible from carbon.



Environmental Purchases

The UK land market is seeing new buyers, corporate and individuals, paying stronger prices for, often lower value, land seen generally, even non-specifically, to have some

environmental potential, albeit overlapping with amenity value or even “trophy” value. Much of this has been Scottish hill land, some in competition with sporting interests, and at larger scale with blocks of up to 4,000 ha. More commercial motives include bringing stocks of carbon and tree planting to match other parts of a business, establishing eco-tourism and, in one case, matching the peat used in Islay malt whisky while others are buying to “re-wild”. It remains to be seen how much this is solid investment and how far a “bubble” in the green investment cycle.

New Markets

We see the prospect of new markets emerging with precautionary but often uninformed positions being taken when much is as yet still unclear. With investment markets now warier of offsetting and the different interpretations of “additionality”, the principle of only paying for change, we have much to understand. Where it is strictly defined, additionality excludes commercial forestry or renewable energy from offsetting investment where they are anyway commercially viable and so could happen anyway on normal business criteria. It focuses that money where it will make a difference.

The Carbon Paradox

Many want to talk about carbon reduction and sequestration thinking it must offer value but will find that they face the paradox of farming needing to control all the carbon it can but it having little value at farm scale. Outside the EU and UK Emissions Trading Schemes, private values are between €8 and €17/t of CO₂. Supply chains will expect farmers to move to

"If carbon values appear an illusory distraction, a combination of regulation and recognised measurements is engendering what may be more valuable markets: creating habitats for biodiversity on the back of development."

net zero, a challenge when agriculture produces 8 per cent of emissions. That makes "selling" carbon to other businesses both counterproductive and of little value. Even for woodland, a hectare of 80 year old oak trees might have less than €2,500 of carbon, after all that time.

Deals made now risk seller's remorse. The carbon sold now would be the buyer's carbon, no longer in the farm business, leaving the farmer to work harder towards net zero. The farmer would also be liable to meet the obligations to the buyer with restrictions and risks of penalties.

Last summer's Californian forest fires destroying large areas of offsetting timber exposed many issues in this approach. The 40 year agreements used did not fully offset the century long life of carbon in the atmosphere. Part of the planting had to be held back from sale, reducing income, to provide a buffer against such risk but, as with any futures contract, leaving the carbon seller ultimately liable to make good the commitment to the buyer.

Biodiversity

If carbon values appear an illusory distraction, a combination of regulation and recognised measurements is engendering what may be more valuable markets: creating habitats for biodiversity on the back of development. The new Environment Act is introducing a requirement that all development result in a 10 per cent gain in biodiversity as measured by an assessment of habitat creation, whether on-site as part of a development or



off-site, changing the use of other land, under binding 30 year commitments. Those transactions, unlocking development value, could have much higher values than anything offered by the state through official schemes but the size of the market, opening in later 2023, is yet to be seen. The CAAV has prepared initial guidance for members on the issues for heads of terms for such agreements. In principle, it should both enable

improved habitats by funding their improvement and make the development of ecologically diverse habitats more expensive by requiring more net gain to be achieved.

Nutrient Neutrality

The CJEU's 2018 "Dutch N" decision that development affecting ecologically protected sites should only be allowed where there is scientific certainty that it would have no adverse effect on them now sees an emerging "nutrient neutrality" market to control and reduce phosphates and nitrates in ecologically important waters. Some of that is achieved by transactions that change land use to eliminate phosphate loss into waters for a century with values seen so far of €6,000 to €9,000 a house.

These glimpses show that it is now indeed a fascinating time of change as we come to gain useful perspectives on its shape, opportunities and risks, where value lies and how it might be achieved and assessed.

For a further view on changing rural land uses, see the CAAV publication [Future Rural Land Uses in the United Kingdom: A Review of Pressures and Opportunities](#)

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BUSINESS VALUATION

#04

Common mistakes in discount rate determination



Nina Milenković

Abstract: The discount rate is one of the key parameters in valuation, regardless of subject and/or purpose of valuation. Therefore it is crucial for a valuation to determine it in a proper way. The key rule is consistency, both between discount rate and cash flows being discounted, and mutual consistency among discount rate components. In this paper, the most common mistakes made by appraisers as well as their consequences are shown through the definition of weighted average cost of capital.

Keywords: discount rate, weighted average cost of capital, consistency with cash flow definition and among components.

1. Introduction

The discount rate is a parameter that is used to transform capital-generated or asset-generated cash flows into their value. For this reason, the discount rate is one of the key parameters in the valuation of any “valuation subject”, regardless of whether it is the

equity/invested capital of an entity, its assets, a separate tangible or intangible asset, and also regardless of whether the purpose of the valuation is to determine the value of equity for a potential transaction or the value of assets for financial reporting purposes.

Besides a good understanding of the fundamental definition and meaning of the discount rate, and familiarity with (and accessibility) of data sources, consistency is a key requirement in determining the discount rate, both between the discount rate and the cash flow to which it is applied, and between the discount rate components themselves. Unfortunately, in practice this requirement is frequently not met.

In this paper, common mistakes made by valuers in the discount rate determination are separated into two groups: inconsistency between the discount rate and the cash flow, and inconsistency between the discount rate components themselves. Frequent and potential sources of mistakes are presented through the structure of the weighted average cost of capital, after which we consider potential consequences on the valuation results.

Finally, it should be noted that this paper does not deal with selection of the sources of data, given that the choice more often comes down to the availability of appropriate sources (both in technical and financial terms), than to the valuer's preferences.

2. Discount Rate Definition

The discount rate is often called the cost of capital, but is in fact either the rate of return on equity required by investors (for valuation of equity) or a combination of the rate of return on equity required by investors and the cost of debt (for cash flows from invested capital)[1].

Given the fact that the weighted average cost of capital (WACC) in its structure also contains the cost of equity, our presentation will be based on the WACC.

The structure of the weighted average cost of capital is usually presented as follows:

WACC = $r_E \frac{E}{V} + r_D (1-t) \frac{D}{V}$ (1)	
<i>where</i>	
r_E	<i>cost of equity or required return on investment in a company</i>
r_D	<i>cost of debt before tax</i>
E	<i>equity</i>
D	<i>borrowed capital (debt)</i>
V	<i>invested capital (E+D)</i>
E/V	<i>share of equity in invested capital</i>
D/V	<i>share of debt in invested capital</i>
t	<i>tax rate</i>

Specific discount rates used for determining external obsolescence in the valuation of fixed assets, impairment testing, valuation of intangibles, etc. are most often derived from the WACC. Individual components are further discussed in section 4.

3. (In)Consistency Between Discount Rate and Cash Flow

The basic rule, the mandatory maxim of any valuation standard, textbook and report states: the discount rate **must** be consistent **in every respect** with the cash flows it is used to discount.

At first glance, there is nothing unclear in this requirement and nothing that invites mistake. As is evident from various names for different discount rates, the choice of definition (type) of rate depends on the cash flow definition in **terms of treatment of debts**: cash flow from equity is discounted using the cost of equity, while the cost of invested capital (i.e. cash flow before servicing of debts) is discounted using the weighted average cost of capital. It would be really difficult to find even a moderately experienced valuer who would make this kind of mistake in the valuation of equity. The situation is somewhat different when it comes to valuations that do not relate directly to equity (mostly asset valuations), but even here it is difficult to overlook the basic requirement of determining whether cash flow includes debt servicing or not.

Another possible inconsistency refers to the inflation treatment in the cash flow, i.e. whether cash flow is expressed in **nominal or real terms**. This is a fairly common mistake: real cash flow is used, but the components of the discount rate are expressed nominally and no adjustment for inflation is made. Depending on the currency, the result is a greater or lesser overestimation of the discount rate, and thus an underestimation of the value of equity.

A third very common mistake is not paying attention to **the currency in which cash flow projections are stated**. Namely, projections expressed in euros are very often discounted using a rate for which some components are taken from the American financial market that are calculated based on yields in dollars. To avoid this mistake, it is safest (if possible) to use data obtained for the same currency and then convert the calculated rate into the currency in which the projections are expressed in one of the usual ways (e.g. by purchasing power parity or inflation differential). The quantitative results of this mistake depend on the currency ratio and can be significant.

Consistency of the discount rate with the **duration of the projection period** is another specific problem. In the equity valuation, where the period is usually defined as “an indefinite period into the future” and a residual value is calculated using the Gordon’s model, the general rule is to take long-term yields as components of the discount rate. If any of the components are calculated using a model, it is desirable to take the rate for an indefinite period into the future. If, on the other hand, the projection is for a limited period (e.g., in valuation of the assets having a finite life), it is desirable (although not necessary) to adjust the maturity of the yields used to the length of the projection period. The results of this omission are not always quantitatively significant, but they certainly affect the credibility of the valuation.

A common oversight is inconsistency in the **treatment of taxation**. Although after-tax cash flow is most commonly used in equity valuation, taxes must be excluded in impairment testing. Surprisingly, a large number of valuers fail to make the adjustment for taxation in the WACC calculation. In countries with a relatively low corporate tax rate, the quantitative results are generally not significant, but in countries with high taxes (Western Europe 25-33%) this omission can lead to significant differences and incorrect conclusions about the impairment of assets.

Last but not least, a mistake that is almost inconceivable for professional appraisers, but that occurs relatively frequently to persons who use valuation less formally or as an analytical tool, relates to consistency with the **valuation date**. Namely, all components of the discount rate must be valid on valuation date, or possibly the closest previous date, but by no means a later date by a few months. As with the duration of the projection period,

the quantitative results do not have to be large and such valuation can be of use for pragmatic purposes, but is not in line with any valuation standards.

4. (In)Consistency Between Discount Rate Components

Equation (1) indicates that the three main WACC components are cost of equity, cost of debt and capital structure; below we provide a brief summary of their structure.

Cost of equity using the modified CAPM model is defined as follows:

$r_E = r_f + \beta \times ERP + CRP$ (2)	
<i>where</i>	
r_f	<i>risk free rate of return</i>
β	<i>beta coefficient, measure of systematic risk</i>
ERP	<i>market risk premium for equity (shares), the difference between the rate of return on a market portfolio of shares and the risk free rate</i>
CRP	<i>country risk premium¹</i>

Individual components have been discussed in great detail in the literature, starting with [2], while an overview of how they are determined and problems in emerging markets such as the Serbian one can be seen in [3] and [4].

In short:

- ▶ the risk-free rate is usually the (multi-year) average yield on government bonds issued either by subject’s country or developed countries;
- ▶ the market risk premium can be determined as historical, expected, required or implied; in undeveloped markets, the choice usually depends on the availability of data and the purpose for which the WACC is calculated;
- ▶ data on β coefficients is mainly provided from specialised publications or databases, and often from a sample of comparable companies;
- ▶ the country risk premium can be determined directly, by comparing the yield on government bonds and benchmark bonds of a developed country, or indirectly, through a country’s credit rating².

The cost of debt, if not determined empirically (weighted average interest rate on loans of appraised company or average rate on a specific market), can be expressed as follows:

$r_D = r_f + \Delta r + CRP$ (3)	
<i>where</i>	
r_f	<i>risk free rate</i>
Δr	<i>interest premium (credit spread) between the company and the benchmark</i>
CRP	<i>country risk premium¹</i>

¹ A significant number of authors and consulting companies apply the β coefficient on the country risk premium. Although there are arguments in favor of this approach, the author of this paper believes that the country risk premium has an additive character.

² If the country in which the subject of valuation operates issues government bonds, taking the yield on such bonds as the risk-free rate means the country risk is in fact directly included in the calculation and does not need to be added separately.

or as:

$$r_D = r_f + \beta_D \times ERP + CRP \quad (4)$$

where symbols designate the same values as in (2), and where β_D designates the debt beta value.

Finally, the third component is the capital structure (E/V and D/V, as well as D/E), which is derived directly from the value of equity and borrowed capital; these values should be market-based, which can be provided for listed companies, but not for private companies. That is why, in practice, the industry average or the average for the sample of comparable companies is usually used, or the actual or target structure for the valuation subject³.

In order for the discount rate to be consistent with the cash flow, all of its components have to fulfil that requirement, either in original or modified form. This appears to suggest that the components are consistent with each other, which is not always the case.

Namely, consistency can be assumed and relatively easily provided for components that represent yields or interest rates and are determined on the basis of market data (risk-free rate, market premium, country risk, cost of debt). It is sufficient to take into account the following characteristics:

- ▶ inflation treatment (i.e. nominal or real),
- ▶ currency,
- ▶ maturity,
- ▶ valuation date.

When it comes to components that are obtained empirically or from a sample of comparable companies, a number of factors need to be taken into account.

³ If the valuation purpose is other than the market value.

⁴ In previous articles on this topic, such as [5], this author's opinion was that this issue was critical. However, after ten years of dealing with numerous problems with comparable companies' samples in practice, the author's position on this issue has become much more flexible.

In order to comprehend the potential mistakes in determining the β coefficient, it is necessary to keep in mind its origin and structure. Originally, β represents the ratio between the covariance of the asset (to which the beta refers) and the market portfolio and the variance of the market portfolio, and is empirically obtained as the slope of the regression of the return on subject asset and the market index, approximating the market portfolio over the appropriate time period. Therefore, the empirically obtained β coefficient (published in specialised publications or databases) also includes the financial risk of comparable companies, which may not be appropriate for a particular object of valuation (the so-called levered β). Therefore, it is necessary to first adjust the β obtained in this way by excluding the financial risk of the original companies (unlevering), and then to re-adjust the capital structure applicable to the particular object of valuation (relevering).

The basic relationship between the original β and the β free debt is as follows:

$$\beta_U = \beta_L \frac{E}{V} + \beta_D \frac{D}{V} \quad (5)$$

where	
β_U	beta "cleaned" of financial risk of comparable companies (unlevered beta)
β_L	original beta which includes the financial risk of comparable companies (levered beta)
β_D	debt beta
E/V and D/V	share of equity and debt in total invested capital

By introducing the tax effects and expressing the capital structure as the D/E ratio, we get formulas for the described procedures:

unlevering

$$\beta_U = \beta_L \frac{1}{(1+(1-t)\frac{D}{E})} + \beta_D \frac{(1-t)\frac{D}{E}}{(1+(1-t)\frac{D}{E})} \quad (6)$$

where D/E represents the capital structure of those companies whose β values were taken for the sample;

relevering

$$\beta_L = \beta_U (1 + (1-t)\frac{D}{E}) - \beta_D (1-t)\frac{D}{E} \quad (7)$$

where D/E represents the selected capital structure.

One of the critical steps is adjusting β to a particular valuation subject (relevering); the most common inconsistency comes from the data sample. Namely, it is often the case that in a selected sample of comparable companies (which is used to determine or check several valuation parameters), β values are published for only a small number of companies. Although it is only appropriate to use the capital structure of only those companies whose β are published/included, it is very common to use the average capital structure for the entire sample. In this way, a significant distortion of the β coefficient can occur, as well as of the WACC and consequent valuation results.

The other potential although not critical inconsistency relates also to the capital structure: the capital structure for relevering ideally should be the same that will be used to weigh the cost of equity and the cost of debt. This is precisely the step where consistency between components can be compromised, although each one is consistent with the cash flows. However, this is one of the issues where ideal case could not always be achieved in practice⁴. Moreover, it is impossible to a priori assess the quantitative effects on the results.

All of the above-mentioned mistakes related to β refer to β obtained from a sample of comparable companies. If β is taken from a specialised publication or database as an already calculated average for a given industry, the commonest mistake that occurs is that no attention is paid to the β that is used, i.e. whether it is β with or without the financial risk of the original companies.

The effects of omitting debt β should also be mentioned, as it significantly underestimates over-leveraged companies, and to a certain extent overestimates companies that are under-leveraged (see [6]), as well as sampling mistakes (too large or insufficiently comparable companies). However, this is outside the scope of this paper, as is the choice of data sources.

5. Conclusion

If anything in the theory and practice of valuation could be called a principle, then it is the principle that the discount rate must be consistent **in every respect** with the cash flow it is designed to convert into value. Logically, the individual components of the discount rate should be consistent, both with the cash flow and with each other.

The commonest potential sources of mistakes are presented in this paper through the characteristics of cash flow and the discount rate structure, and an overview is provided of the commonest mistakes come across by the author in practice. The possible consequences of these mistakes are also pointed out.

In general, some of the mistakes can have significant quantitative effects on the discount rate itself, and thus the valuation result, which can further lead to wrong conclusions and business decisions. On the other hand, the effects of some mistakes are not quantitatively material, but they certainly have negative consequences on the credibility of the valuation and thus the valuer.

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PLANT, MACHINERY
& EQUIPMENT
VALUATION

#05

Real Estate Valuation and Plant, Machinery & Equipment Valuation

An indispensable alliance for valuing the energy efficient transformation of the European building stock



Ana Caldeira Martins

The revision of the Energy Performance of Buildings Directive (EPBD) currently in progress will bring significant regulatory pressure accelerating the decarbonisation of buildings, in the first instance with the upgrading of the 15% worst-performing building stock.

Technical building systems are an integral and key part of the Directive, with a new provision that:

“Member States shall ensure that the requirements they set for technical building systems reach at least the latest cost-optimal levels.” (Article 11(1), subparagraph 4)

The same Article underscores the overarching, transversal importance of technical building systems to the building’s energy efficiency and to the goals of the Directive:

“Member States shall ensure that, when a technical building system is installed, the overall energy performance of the altered part, and where relevant, of the complete altered system, is assessed. The results shall be documented and passed on to the building owner, so that they remain available and can be used for the verification of compliance with the minimum requirements laid down pursuant to paragraph 1 and the issue of energy performance certificates.” (Article 11(4))

Property valuation is one of the pillars of climate change mitigation and adaptation and needs to rapidly deploy the skills necessary to support the EPBD

strategies in order to achieve a totally decarbonised building stock by 2050. **Technical building systems are consubstantial to a complete and meaningful determination of the building’s value. They have to be analysed, not only with regard to their condition and useful life, but also in terms of fulfilment of the national requirements ensuing from transposition of the EPBD including their contribution to determining the hierarchical, alphabetical grade or class on the building’s energy performance certificate.**

Property valuation must foresee the risk posed by technical systems for each kind of building. Technical systems are subject to safety, energy efficiency and environmental legislation and standards which are liable to periodic review. In addition, the EPBD is placing limits on the use of equipment which had complied until now with specific legislation and standards. Valuers will need to identify the areas where equipment will have to be upgraded as well as areas where it will be possible to retain technical installations able to comply with legislation as long as they are well maintained.

For example, the valuer could identify equipment in a technical building system serving for heating and cooling the building which could be non-compliant with the EPBD or could prejudice the building’s energy certification grade, while not implying replacement of all the components of the plant.

Take the example of dedicated heating, ventilation and air conditioning (HVAC) systems. Their size depends on the function of each building, and they are made up of various individual pieces of equipment which, as a whole, provide the building with treated air, offering stable conditions in terms of comfort and quality of indoor air, along with domestic hot water. **These systems can keep pace with buildings' useful life because, although their components have a shorter useful life, scheduled replacement is possible without jeopardising the viability of the technical system of which they form part. Consequently, it will also be possible to introduce the adaptations required by the EPBD and its recasts, without having to replace buildings' HVAC systems completely.**

The image illustrates an existing HVAC system for a building. The system comprises Air Handling Units (AHUs) responsible for ventilation and heating and for cooling the treated air entering the building, units to cool the air – chillers, and units to heat the air – boilers. Domestic hot water is also produced by a boiler. The technical system is the subject of scheduled maintenance and complies with current legislation, but the building has a low EPC rating. The goal is to increase its energy efficiency significantly and ensure that all its equipment has zero direct GHG emissions, i.e., does not generate any on-site carbon emissions.

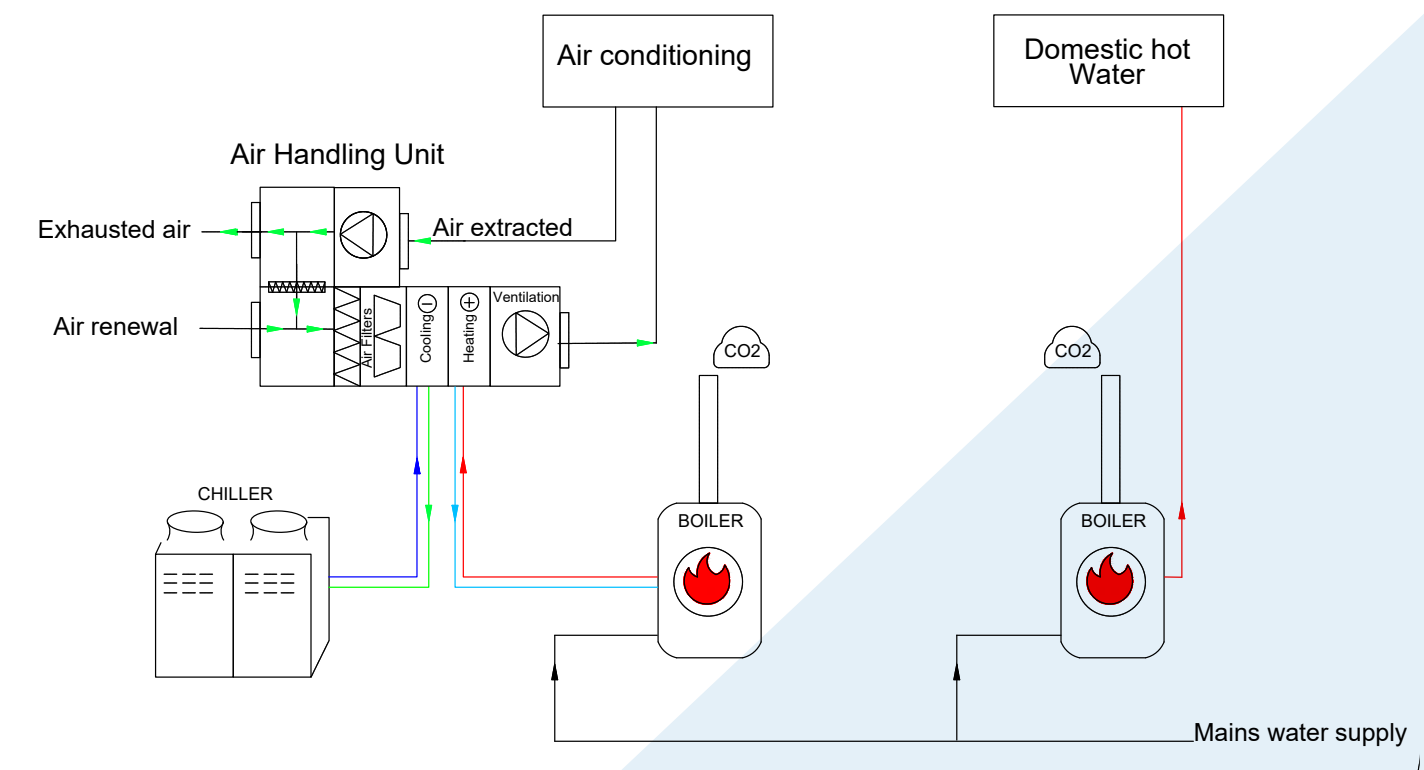
Various solutions could be adopted, as shown in the image below. These may or may not be fully implemented, depending on their contribution wholly or individually to the building's overall energy performance.

Examples include the following improvements (amongst others):

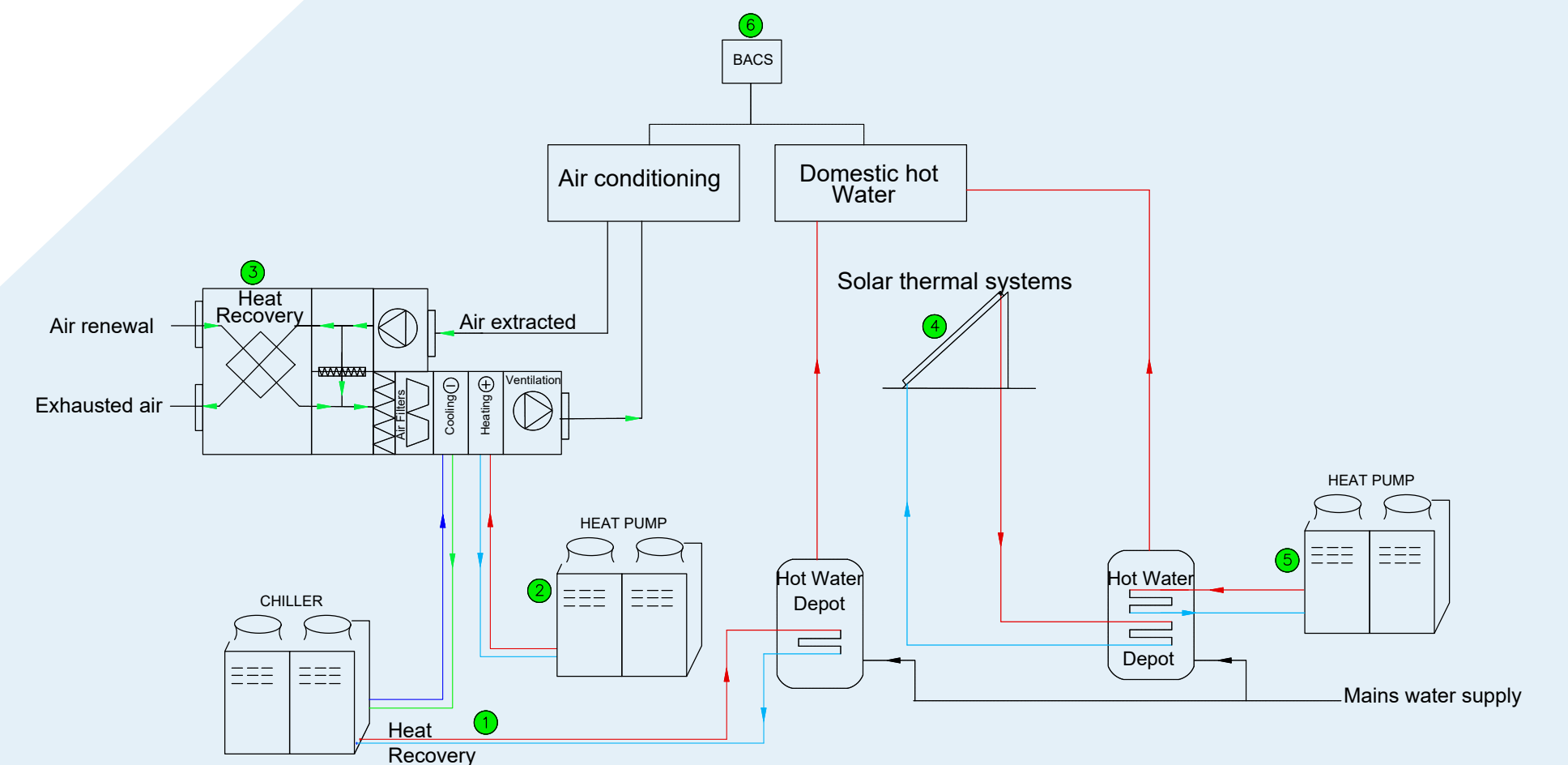
1. Installation of a chiller with heat recovery, so that some of the thermal energy given off by the equipment can be recovered and diverted to heat domestic water;
2. Replacement of the boiler used to heat the air with a heat pump unit offering much greater energy efficiency and generating zero direct emissions;
3. Installation of a heat recovery module in the AHU unit, making it possible to recover some of the thermal energy contained in the air extracted from the building and transfer it to the renewed air to be introduced to the building;
4. Installation of a solar thermal system to heat domestic water;
5. Replacement of the boiler used for domestic hot water with a high temperature heat pump;
6. Installation of a building automation and control system (BACS) for technical management of the HVAC system, as well as other technical building systems.

All the illustrated improvements contribute to greater energy efficiency of the HVAC system, helping to make use of the thermal energy which would be given off, reducing heating needs for air conditioning and domestic hot water and, finally, contributing towards a decrease in the building's electricity consumption and elimination of fossil fuel sources.

Example: Technical building systems for heating and cooling



Some strategies for improving the building energy certification grade, applied to the Example



It is not the goal of property valuation to implement the rehabilitation plan for technical systems, nor to determine buildings' energy performance in accordance with an alteration of one of their technical systems, but it should identify and analyse systems, their condition and maintenance, and the target equipment to be prioritised in rehabilitation work in line with the latest EPBD-compliant national regulation so as to inform property clients of the new variables impacting the property's valuation.

Depending on the size of the building and the importance of its technical installations, collaboration between property valuers and PME valuers can contribute strongly to its energy efficiency valuation, with a view to minimising the risk of error in the overall determination of value and attaining excellence, fulfilling the objectives of the EPBD.

Overview of the key technical building systems elements that valuers must assess

6. 'technical building system' means technical equipment for space heating, space cooling, ventilation, domestic hot water, built-in lighting, building automation and control, on-site **renewable energy** **electricity generation** **and storage**, or a combination thereof, including those systems using energy from renewable sources, of a building or building unit;

EPBD Recast COM(2021) 802 final 15.12.2021 Article 2(6) showing inserts to and deletions from the existing Directive

Heating and cooling systems, Building Automation and Control Systems (BACS), built-in lighting systems, energy regeneration in lifts, escalators and travelators, electric vehicle charging infrastructure and on-site electricity generation systems are amongst the technical building systems with the highest impact on the building's energy performance.

Technical building systems are planned to provide various technical solutions tailored to the specific use of each building, the type of system required and available energy sources, guided by the applicable mandatory standards and legislation governing their design, construction materials and energy efficiency and the safety of persons and property.

Heat Pumps

Systems using fossil fuel based energy sources include those supplying ambient heating and domestic hot water such as boilers, but the current EPBD revision provides that, as of 2027, Member States may no longer subsidise fossil fuel boilers. Alternative solutions with zero direct GHG emissions exist, such as heat pumps.

A heat pump is characterised by a refrigeration system that promotes circulation of a fluid (refrigerant gas) in a closed system, which changes status and condition to provide energy exchange through the system's coils. Coils make up the condensation unit usually placed on the outside and the evaporation unit normally placed inside which will be responsible for heating or cooling the space to be treated. Where the fluid is water, the evaporator will be placed inside the tank to be treated.

Refrigeration systems may simply cool the environment to be treated, as in the case of chillers, or heat and cool it, through a process of inversion of the refrigeration cycle, in which case they are known as heat pumps.

The refrigerant gases currently used in refrigeration systems are subject to legislation which imposes minimum standards of use in terms of atmospheric heating potential (AHP), along with maintenance standards for fluorinated gas systems covering both procedures and

the accreditation of maintenance companies. The gases currently used in these systems have no influence on depletion of the ozone layer and have medium-to-low global warming potential (GWP). Under pressure from the legal requirement to seek environmentally friendly solutions, the industry has been developing gases with ever lower GWP without compromising the systems' energy efficiency and has been developing alternatives to replace them with other natural gases having nearly zero environmental impact.

Heat pumps are highly energy efficient. Taking the example of heating, the energy efficiency of any given heating system depends on the relationship between the quantity of thermal energy supplied and the quantity available to operate it. Considering electrical resistance [heating], energy efficiency is '1', i.e., the heating power produced is equal to the nominal power absorbed by the equipment. In the case of a heat pump with energy efficiency of '3', this means that the thermal energy it produces corresponds to 3 times its nominal absorbed power.

Apart from ambient heating and domestic hot water, heat pump systems can also provide power for ambient cooling, offering a complete solution which can be incorporated in a thermal power plant serving one or more buildings or as an individual system serving a unit or part of a building. These systems can produce thermal energy in combination with passive systems (which use alternative energy sources), as in the case of thermal solar collectors for heating water, aérothermal systems which make use of existing thermal energy in the air and geothermal systems which capture the energy in the soil, benefiting from a constant temperature of around 16°C year-round.

The table below details some of the solutions found in buildings using heat pump units.

SYSTEM TYPOLOGY	FUNCTION	EXAMPLES OF EQUIPMENT
Direct Expansion Systems (Refrigeration Systems)	Ambient Heating / Cooling	Split: Consisting of an outdoor unit and an indoor unit.
		Multisplit: Consisting of one outdoor unit and several indoor units.
		VRF - Variable refrigerant flow - Consists of one outdoor unit and several indoor units.
		Rooftop: Compact unit for connection to air-conditioning distribution networks.
Indirect Expansion Systems (Refrigeration Systems)	Ambient Heating / Cooling	Chiller: Cold water production unit.
		Heat pump: Cold/hot water production unit.
		Fan coils: Climate control terminal units (placed in the spaces to be air-conditioned).
		AHU: Air handling unit for connection to air-conditioning distribution networks.
		UTAN: New air handling unit for connection to air-conditioned air distribution networks.
	URC: Heat Recovery Units (recovery of the energy contained in the exhausted air from inside the building).	
Heating systems	Ambient Heating / Domestic hot water	Heat pump: Hot water production unit.
		Underfloor heating: Systems powered by the heat pump unit for floor heating.
		Radiators: Terminal heating units fed from the heat pump unit (placed in the spaces to be heated).
Heating systems	Pool water heating	Heat pump: Hot water production unit.

Building automation and control systems (BACS)

7. 'building automation and control system' means a system comprising all products, software and engineering services that can support energy efficient, economical and safe operation of technical building systems through automatic controls and by facilitating the manual management of those technical building systems;
EPBD Recast op. cit. , Article 2(7)(unchanged vis-à-vis existing Directive)

BACS ensure technical management of all the equipment in the building, in terms of its operation, energy rationalisation and the safety of persons and property. The systems found in buildings are controlled and monitored electronically by means of the BACS communications interfaces which communicate directly with the equipment's controllers through bus communication lines with user-friendly navigation.

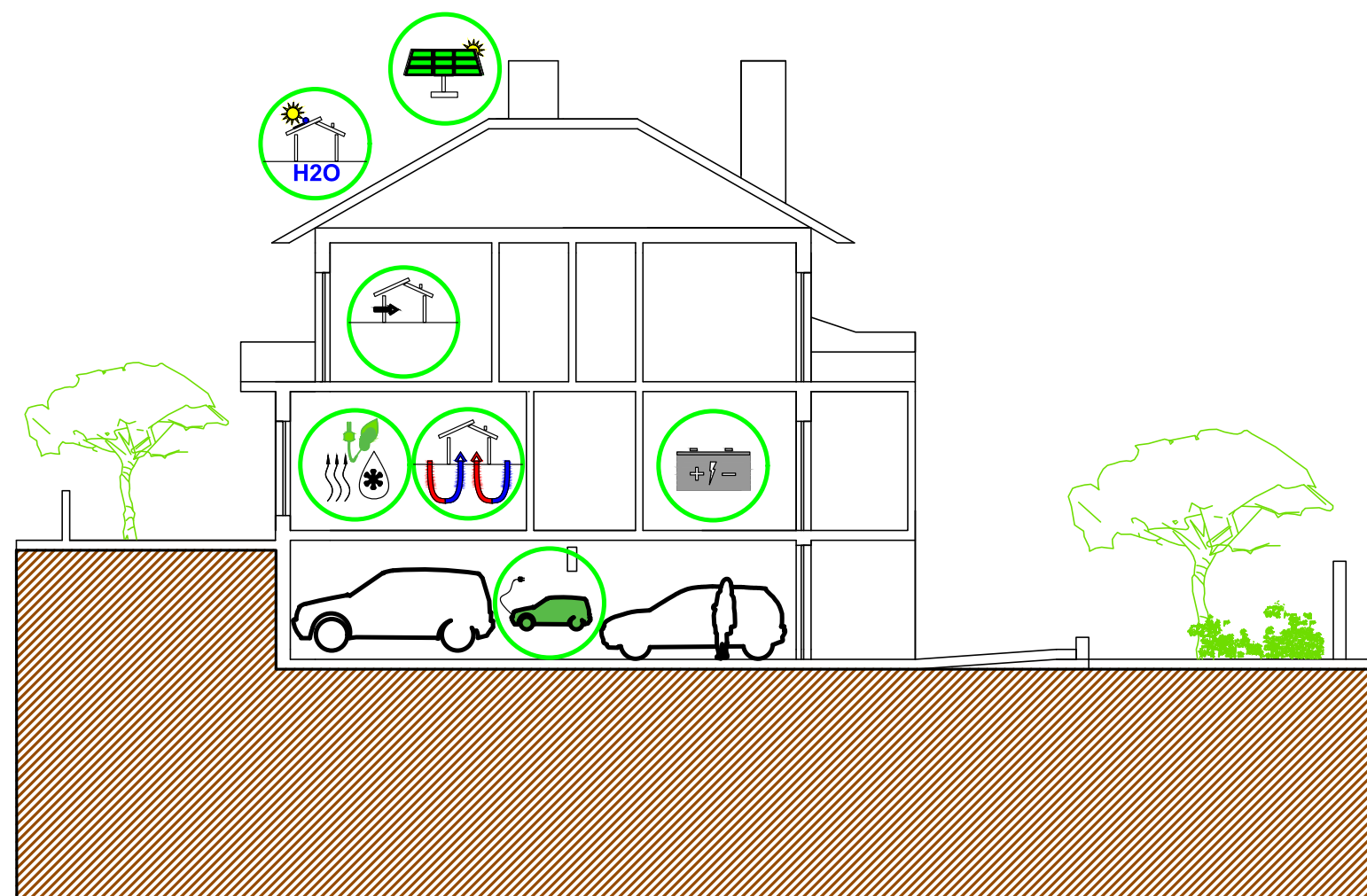
BACS enable continuous, comparative monitoring, recording and analysis of energy consumption and efficiency, providing information on the building's actual or potential energy performance, as well as communication and interaction between all the technical systems. This includes active and passive air-conditioning, domestic hot water, ventilation, smart lighting and mechanical access (lifts, escalators and travelators) systems.

Electric vehicle charging infrastructure

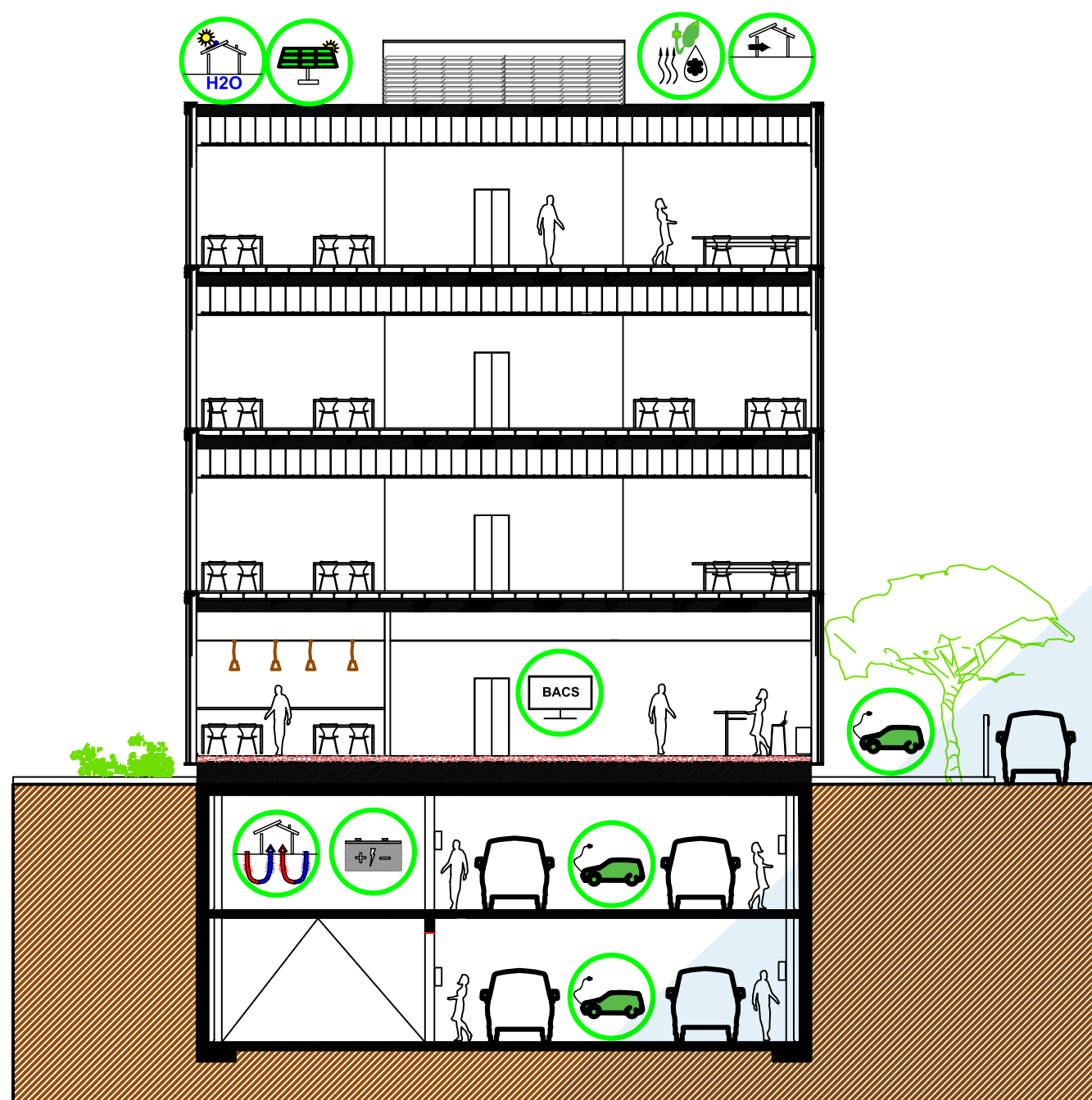
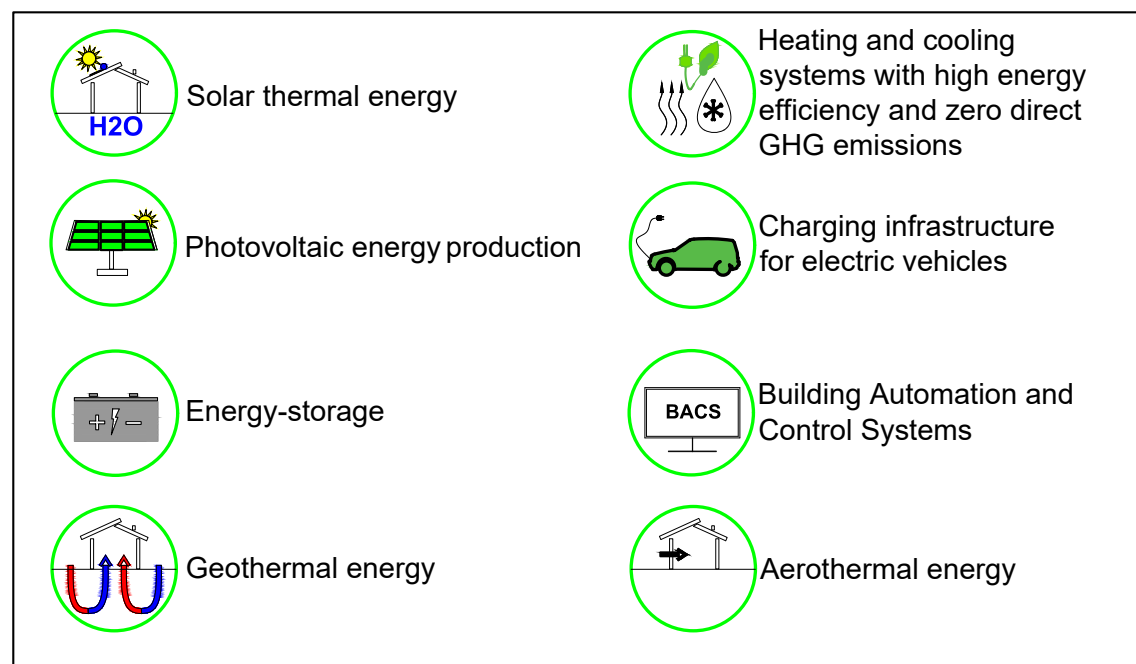
This is another of the strategies of the EPBD, which, in conjunction with revision of the Deployment of Alternative Fuels Infrastructure Regulation, sets down minimum requirements for buildings' infrastructure for sustainable mobility so as to accommodate the increasing use of electric vehicles (also regulated by other European Green Deal legislation: no more manufacture of internal combustion cars as of 2035). The charging infrastructure could be standard, simply using normal electrical sockets, or rapid, using chargers with specific rapid charging sockets. Bidirectional or reversible chargers are available on the market and these can charge the batteries of electrical vehicles or be used to supply power to the building.

On-site electricity generation systems in buildings

On-site electricity generation systems in buildings, such as photovoltaic systems, must also be considered in the light of the EPBD. Their operation is based on absorption of solar radiation and its conversion into direct current (DC) electricity which is then converted into alternating current (AC) electricity by means of an inverter. After conversion, all the power may be used locally or injected into the public grid. Currently, the technology has been fully developed by electricity distribution companies, who offer various on-site electricity generation system solutions, integrated within the grids of the buildings and associated with smart energy meters.



Example of measures in residential buildings



Example of measures in commercial and service buildings

In building renovations, the main measures involving their technical systems must focus as a priority on those directly influencing the building's energy performance, such as heating and cooling appliances, on-site electricity generation systems and electric vehicle charging infrastructure. In the case of commercial and service buildings, BACS should also be considered.

Conclusions

- ▶ Rehabilitation of the European building stock is under way and requires all operators in the sector to come together to achieve the objectives set for decarbonisation by 2050.
- ▶ Certain buildings, depending on their size and function, have very large technical systems and costs, so their configuration and type of equipment will have a direct influence on the building's energy performance classification and determine the property valuation.
- ▶ Property valuation reports should include an analysis of technical building systems, identifying cases where their sustainable rehabilitation is likely to be necessary, with a view to enhancement of their energy performance and compliance with the EPBD-enhanced national regulation.
- ▶ An alliance between property valuation and plant, machinery and equipment valuation is essential, in justified cases, to keep up with current and future requirements and also provide the market with support and confidence in the future of the property business.

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Podcasts

- ▶ **Assessing the value at risk in the energy performance of European buildings –**
EV interviews Peter Sweatman, Chief Executive of Climate Strategy
- ▶ **Cutting the crap in real estate valuations –**
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