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Institute for Energy and Transport

REHVA EUROVENT SEMINAR

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ASSESSMENT OF THE PROGRESS TOWARDS THE ESTABLISHMENT OF DEFINITIONS OF EFFICIENT BUILDINGS IN EUROPEAN MEMBER STATES

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Institute for Energy and Transport

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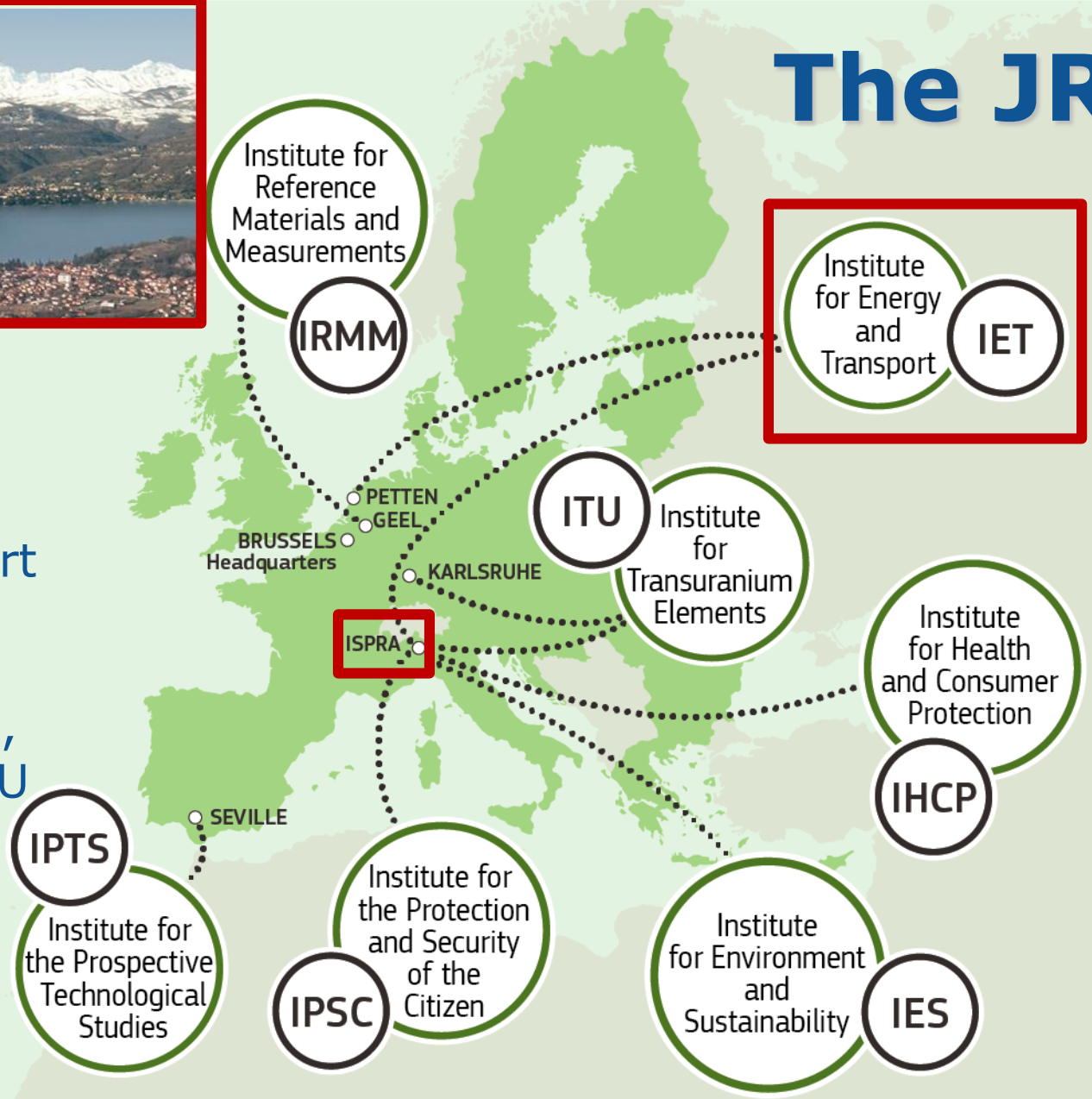

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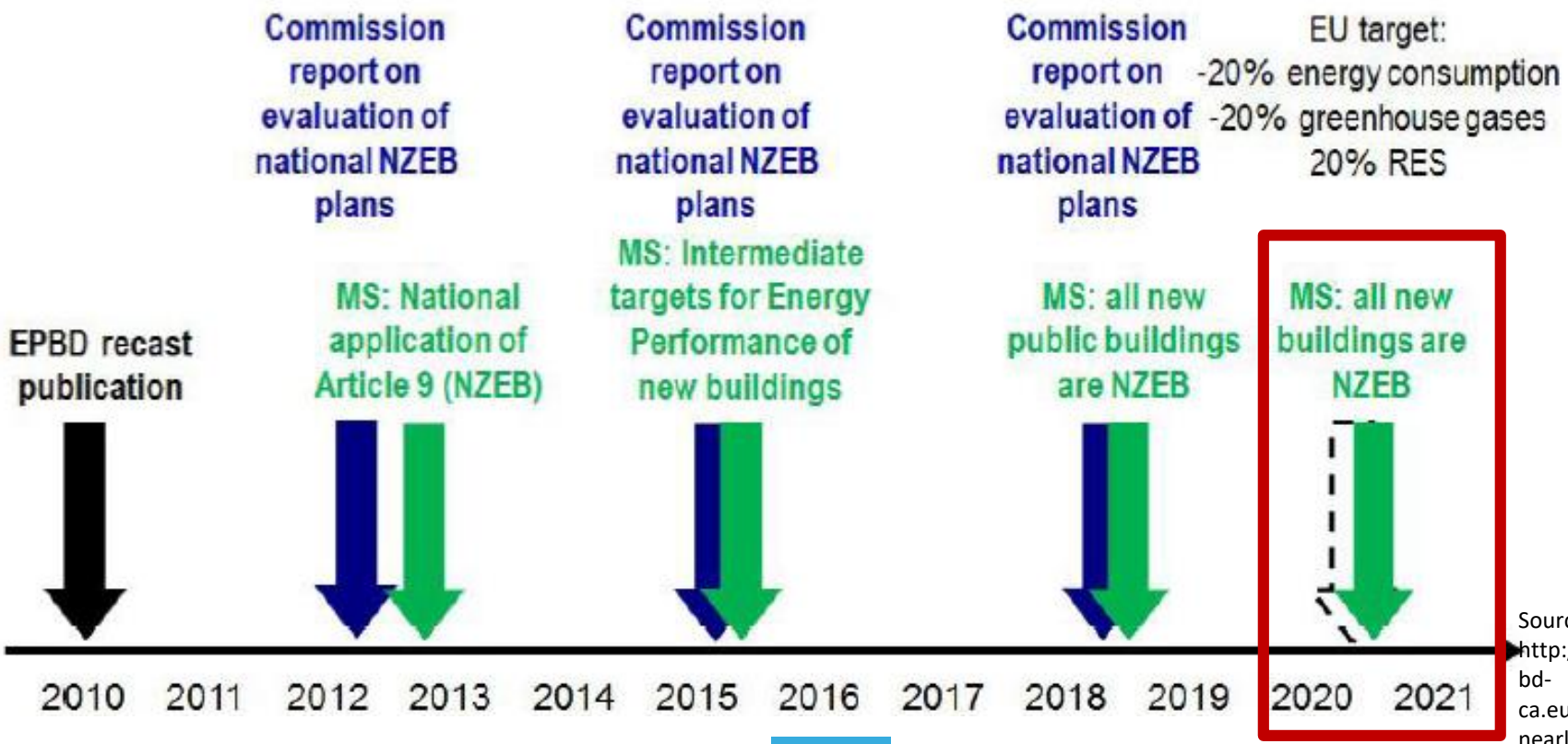
Policy contest

- **EPBD 2002/91/EC, EPBD Recast 2010/31/EU, EED 2012/27/EU, RED 2009/28/EC**



Source: http://www.epbd-ca.eu/themes/nearly-zero-energy

ZEBs categories

- **Nearly ZEB** : … «a **very high energy performance** with a low amount of energy required covered to **a very significant extent** by energy from RES, including energy from RES produced **on-site or nearby**».

- **Net ZEB**: … «energy **neutral over a year**, it delivers as much energy to the supply grids as it draws back.».

- **ZEB** (Zero Energy building) : … « an energy efficient building with **greatly reduced energy needs and/or carbon emissions** through efficiency gains ».

- **Autonoumous ZEB**: … « does **not require connection to the grid**. Stand-alone buildings can supply the own energy needs».

- **+ Building**: **produce more energy** from RES than it imports from the supply grid over a year.

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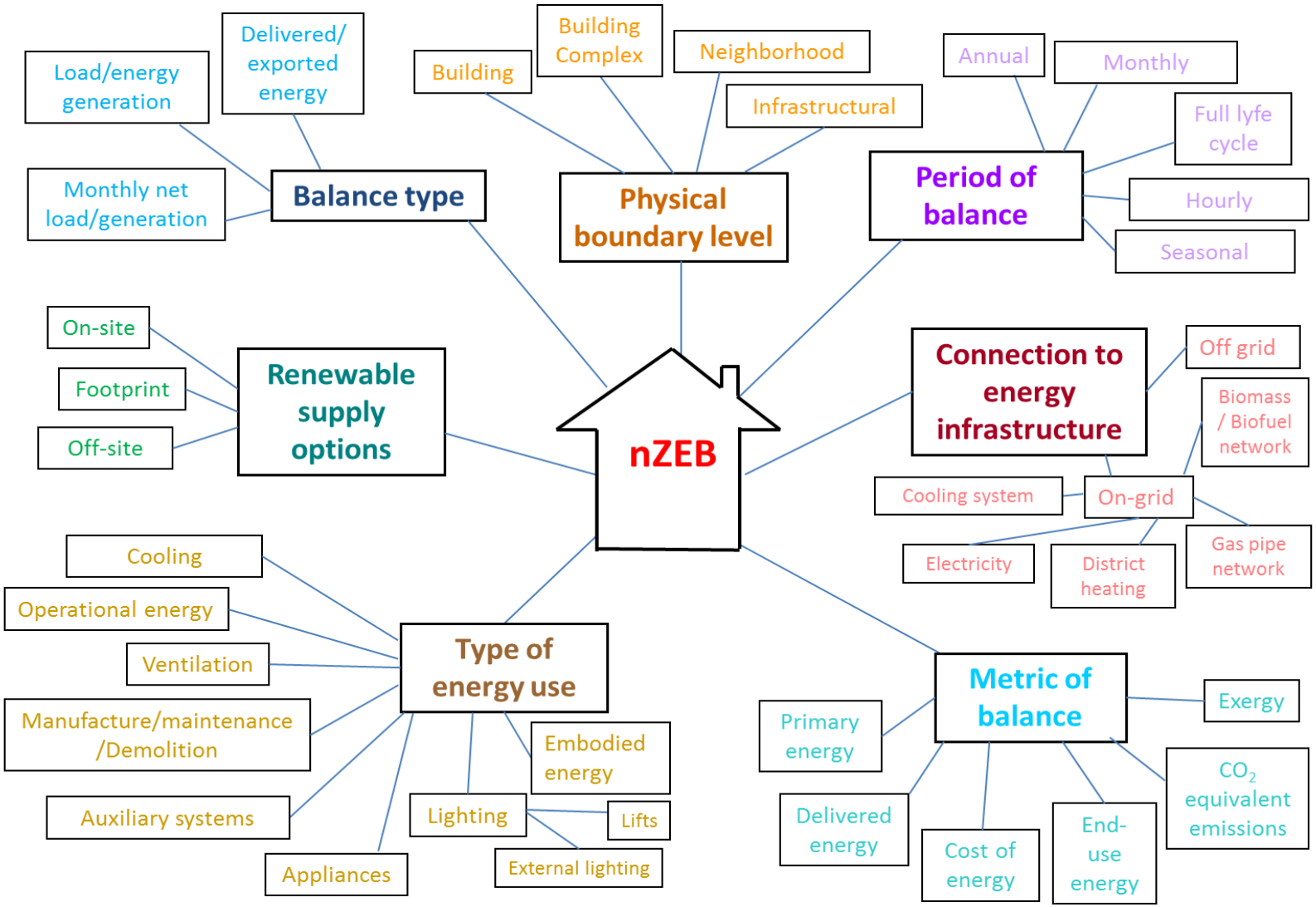
EPBD requirements for NZEBs

EPBD reference	NZEBs aspects
Article 9.1a/b	Private/Public
Preamble recital 15 Article 9.2	New/Retrofit
Annex I	Building category
Article 2.4	Balance type
Article 1.2a Article 2.1	Physical boundary
Article 2.4	System boundary demand
Article 2.6 (RED - Article 13.4)	System boundary generation
Preamble recital 9	Balance period
Article 9.3a	Normalization
Annex 1 9.3a Article 2.5	Metrics
Article 9.3a	Time weighting
Article 2.2 (RED Article 13.4)	Fraction of renewables
Annex 1	Energy performance
Article 1.1 Annex 1 Preamble recital 9	Comfort & IAQ
Article 2.4 Article 8.2	Monitoring

Main arguments around NZEBs to be established



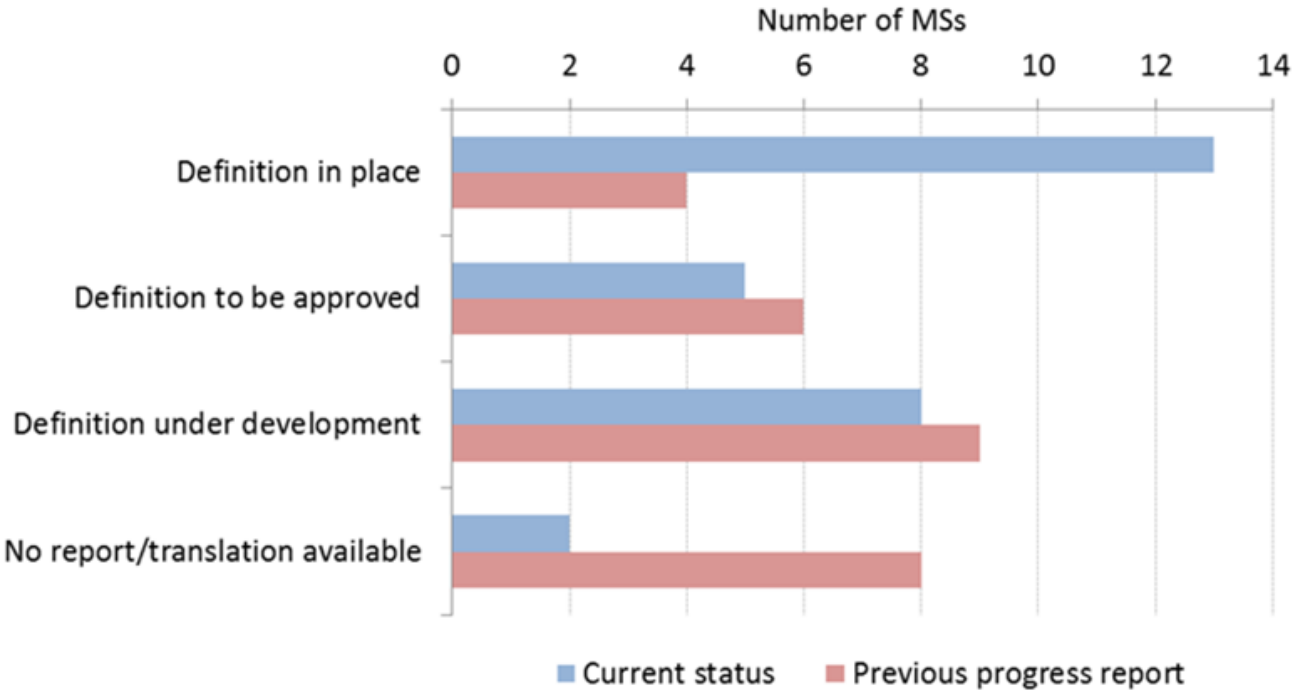
Progress of Member States towards NZEBs

- Technical support for the implementation of EPBD provisions

- NZEBs
  - Review of definitions
  - Analysis of National Plans
  - Comparison among Member States
  - Interim targets, policies and supporting measures for refurbishing the existing stock to nZEBs.
  - Evaluation of MS progress and policy implications.
  - EU 2030 and 2050 decarbonisation target

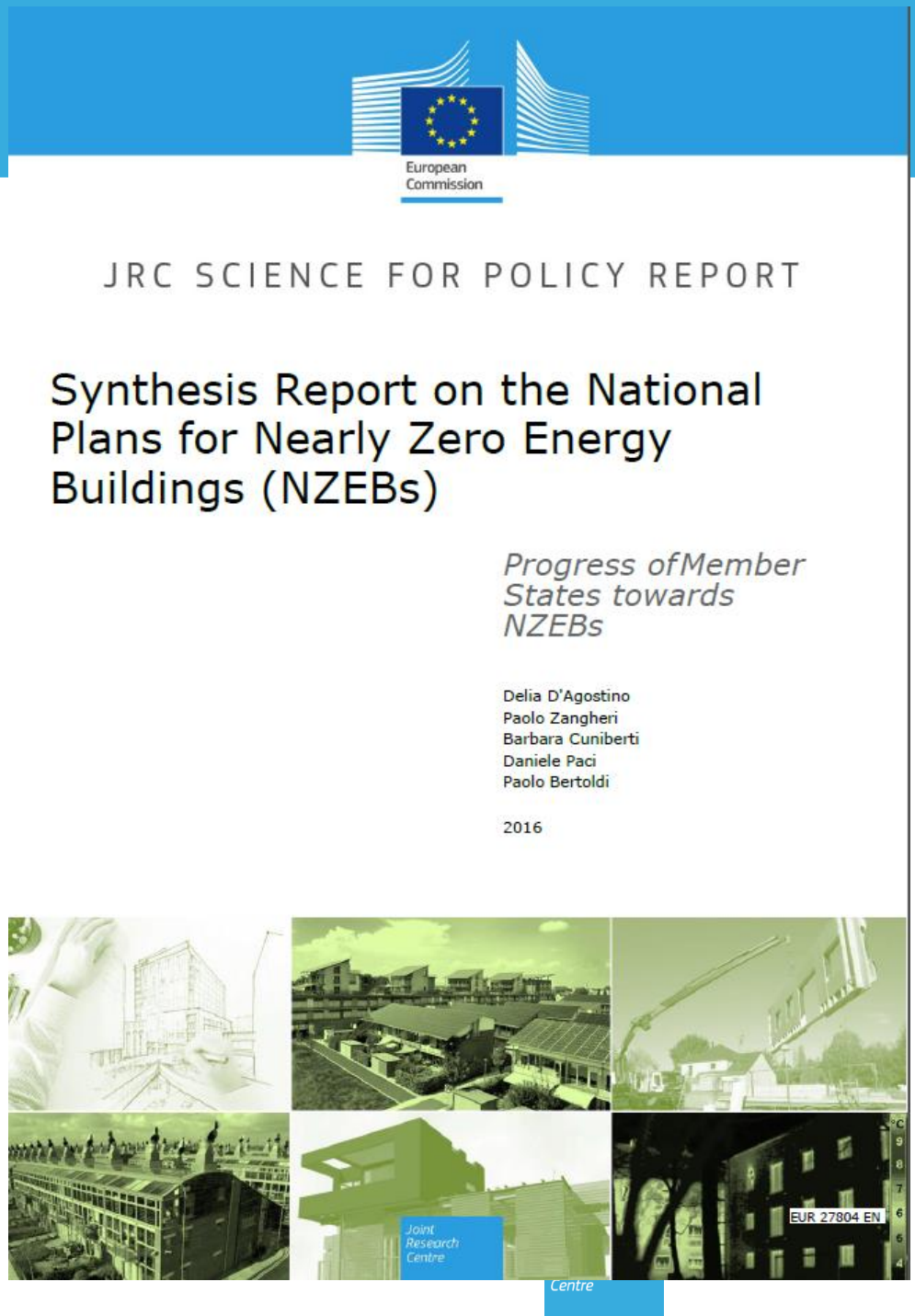
- A formal, comprehensive and consistent framework that considers the relevant aspects of nZEBs is missing

Member States progress towards NZEBs definitions



- MS definition with a numerical target of primary energy use: AT, BE (Brussels, Flanders), CY, CZ, HR, DK, EE, FR, IE, LU, LV, LT, NL and SK. MS having both a numerical target of primary energy use and the share of RES: (BE (Brussels, Flanders), DK, FR, IE, LV, LT, NL and SK).

Progress has improved but should be accelerated!



National Plans
Templates
2013 and 2014 Commission progress report
EPBD Concerted Action
Energy Efficiency Action Plans
National Codes

Status of NZEB definition development in EU Member States

MS	Included in an official document	Under development	To be approved
AT	✓		
BE - Brussels	✓		
BE - Flanders	✓		
BE - Wallonia	✓		
BG			✓
CY	✓		
CZ	✓		
DE		✓	
DK	✓		
EE	✓		
EL		✓	
ES		✓	
FI		✓	
FR	✓		
HR	✓		
HU		✓	
IE	✓		
IT	✓		
LV	✓		
LT	✓		
LU	✓		
MT		✓	
NL	✓		
PL	✓		
PT		✓	
RO	✓		
SI	✓		
SK	✓		
SE		✓	
UK		✓	

Building Typology and Building classification

New buildings

New buildings and renovations

Not available

Private buildings

Private and public buildings

Not available

Building subcategory accounted in Member States definitions

(✓ = Included in national definition, - = not defined, X = not considered)

MS	Single family houses	Apartment blocks	Offices	Educational buildings	Hospitals	Hotels/ restaurants	Sport facilities	Wholesale and retail
AT	✓	✓	✓	-	-	-	-	-
BE	✓	✓	✓	-*	-*	-*	-*	-*
BG	✓	✓	✓	✓	✓	✓	✓	✓
CY	✓	✓	✓	✓	✓	✓	✓	✓
CZ	-	-	-	-	-	-	-	-
DK	✓	✓	✓	✓	✓	✓	✓	✓
EE	✓	✓	✓	✓	✓	✓	✓	✓
FI	✓	✓	✓	✓	✓	✓	✓	✓
FR	✓	✓	✓	✓	✓	✓	✓	✓
HR	-	-	-	-	-	-	-	-
HU	✓	✓	✓	✓	✓	✓	✓	✓
IT	✓	✓	✓	✓	✓	✓	✓	✓
LV	-	-	-	-	-	-	-	-
LT	✓	✓	✓	✓	✓	✓	✓	✓
LU	✓	✓	✓	✓	✓	✓	✓	✓
MT	✓	✓	✓	✓	✓	✓	✓	✓
NL	✓	✓	✓	✓	✓	✓	✓	✓
PL	✓	✓	✓	✓	✓	✓	✓	✓
PT	-	-	-	-	-	-	-	-
RO	✓	✓	✓	✓	✓	-	-	-
SK	-	-	-	-	-	-	-	-
SE	✓	✓	✓	✓	✓	✓	✓	✓
UK	✓	✓	✓	✓	✓	✓	✓	✓

*not def. in Brussels Capital region, Walloon Region, Flemish region.

Balance and Physical boundary

- Energy demand vs energy generation
- Virtual balance between demand and generation
- Energy import vs energy export
- Not specified
- Not available

- Building unit
- Building site
- Single building
- Buillding / building unit / part of building / zone
- Other
- Not available

Energy uses included in NZEBs EU Member States definitions

(✓ = Included in national definition, - = not defined, X = not considered)

MS	Heating DHW	Ventilation, Cooling, Air conditioning	Auxiliary energy	Lighting	Plug loads, Appliances, IT	Central services	Electric vehicles	Embodied energy
AT	✓	✓	✓	✓	✓	X	X	X
BE*	✓	✓	✓	✓	X	-	X	X
BG	✓	✓	✓	✓	✓	✓	X	X
CY	✓	✓	✓	✓	X	X	X	X
CZ	✓	✓	✓	✓	X	X	X	X
DE	✓	✓	✓	✓	X	X	X	X
DK	✓	✓	✓	✓	-	-	-	-
EE	✓	✓	✓	✓	✓	✓	-	-
FI	✓	✓	✓	✓	✓	/	-	-
FR	✓	✓	✓	✓	X	X	X	X
HR	✓	✓	✓	✓	X	✓	X	X
HU	✓	✓	✓	✓	/	X	X	X
IE	✓	✓	✓	✓	X	X	X	X
IT	✓	✓	✓	✓	X	✓	X	X
LT	✓	✓	✓	✓	✓	✓	✓	✓
LU	✓	✓	✓	✓	X	✓	X	X
LV	✓	✓	✓	✓	✓	X	X	X
MT	✓	✓	-	✓	X	X	X	-
NL	✓	✓	✓	✓	✓	✓	✓	-
PL	✓	✓	✓	✓	-	-	-	-
PT	✓	✓	-	✓	-	-	-	-
RO	✓	✓		✓	X	X	X	X
SE	✓	✓	✓	✓	-	-	-	X
SK	✓	✓	✓	✓	X	✓	X	X
UK	✓	✓	✓	✓	X	X	✓	X

* Plug loads, Appliances, IT, Central services possible to add in Belgium Flemish region, Central services not considered in Belgium Walloon region at the moment.

Balance period and Metric

- Monthly
- Yearly
- Life cycle balance
- Other (i.e. seasonal)
- Not specified
- Not available

- Primary/source energy
- Energy need
- Delivered/site energy
- Energy use
- Equivalent carbon emissions
- Other
- Not available

System boundary generation in Member States definitions

(✓= Included in national definition, - = not defined, X = not considered)

MS	Generation on site	Generation off site (e.g.	External generation	Crediting[5]
AT	✓	✓	X	X
BE*	✓	✓	✓	-*
BG	✓	✓	✓	X
HR	✓	X	X	X
CY	✓	✓	-	-
CZ	✓	✓	✓	X
DK	✓	✓	✓	X
EE	-	-	-	-
FI	✓	✓	-	X
FR	-	-	-	-
DE	✓	✓	✓	X
HU	✓	✓	✓	X
IE	-	X	-	-
IT	✓	✓	✓	X
LV	✓	✓	X	X
LT	✓	X	✓	X
LU	✓	✓	✓	-
MT	✓	✓	✓	-
NL	✓	✓	✓	-
PL	✓	✓	✓	-
PT	-	-	-	-
RO	✓	-	✓	-
SK	✓	✓	X	X
SE	✓	✓	-	-
UK	✓	-	-	-

* In the BE Flemish region, crediting is foreseen in law (investments in nearby renewable energy infrastructure of at least 20 euro/m²).

European Commission

RECOMMENDATIONS

COMMISSION RECOMMENDATION (EU) 2016/1318

of 29 July 2016

on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings

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Energy performance expressed by Member States

MS	Residential buildings (kWh/m²/y)		Non-Residential buildings (kWh/m²/y)	
	New	Existing	New	Existing
AT	160	200	170	250
BE	45 + max (0; 30-7.5*C) + 15*max (0; 192/VEPR-1) kWh/m²y (Brussels region) E 30 (Flemish region) E_W45 and E_{spec}85 (equal to 85 kWh$_{EP}$/m²/y)(Walloon region)	~ 54	95-2.5*C Or (95-2.5*C)+(1.2*(x-15) kWh/m²y (Brussels region) E 40 (Flemish region) E_W45 (Walloon region)	~ 108
BG	~30-50	~40-60	~30-50	~40-60
CY	100	100	125	125
CZ	75-80% PE	75-80% PE	90% PE	90% PE
DE	40 % PE	55% PE	n/a	n/a
DK	20	20	25	25
EE	50 (detached houses)	n/a	100 (office buildings)	n/a
			130 (hotels, restaurants)	
	100 (apartment buildings)	n/a	120 (public buildings)	n/a
		n/a	130 (shopping malls)	n/a
		n/a	90 (schools)	n/a
		n/a	100 (day care centres)	n/a
		n/a	270 (hospitals)	n/a
FR	40-65	80	70 (office buildings without air conditioning)	60% PE
		n/a	110 (office buildings with air conditioning)	n/a
HR	33-41	n/a	n/a	n/a
HU	50-72	n/a	60-115	n/a
IE	45 - defined as Energy load	75-150	~ 60% PE	n/a
IT	Class A1	Class A1	Class A1	Class A1
LV	95	95	95	95
LT	Class A++	Class A++	Class A++	Class A++
LU	Class AAA	n/a	Class AAA	n/a
MT	55 (semi-detached and fully detached houses)-75 (terraced houses) – 115 (flatted dwellings)	< 220	220-255	n/a
PL	60-75	n/a	45-70-190	n/a
RO	93-117	120-230	50-102	120-400
ES	Class A	n/a	Class A	n/a
SE	30-75	n/a	30-105	n/a
SI	75 (single family), 80 (multi-family)	95 (single family), 90 (multi-family)	55	65
SK	32 (apartment buildings)	n/a	60-96 (office buildings)	n/a
	54 (family houses)	n/a	34 (schools)	n/a
UK	~ 44	n/a	n/a	n/a

NZEB level of energy performance	**Mediterranean** Zone 1: Catania (others: Athens, Larnaca, Luga, Seville, Palermo)	**Oceanic** Zone 4: Paris (others: Amsterdam, Berlin, Brussels, Copenhagen, Dublin, London, Macon, Nancy, Prague, Warszawa)	**Continental** Zone 3: Budapest (others: Bratislava, Ljubljana, Milan, Vienna)	**Nordic** Zone 5: Stockholm (Helsinki, Riga, Stockholm, Gdansk, Tovarene)
	Offices kWh/(m2/y)			
net primary energy	20-30	40-55	40-55	55-70
primary energy use	80-90	85-100	85-100	85-100
on-site RES sources	60	45	45	30
	New single family house kWh/(m2/y)			
net primary energy	0-15	15-30	20-40	40-65
primary energy use	50-65	50-65	50-70	65-90
on-site RES sources	50	35	30	25

nZEBs roadmaps

Estimated macro-economic benefits of implementing nZEBs 2010 - 2015

	Poland	Romania	Bulgaria
CO_2 savings (million t)	31	68	4.7-5.3
Energy savings (TeraWh)	92	40	15.3-17
Additional investments (million Euro)	240-365	82-130	38-69
New full time jobs	4100-6200	1390-2203	649-1180
Minimum requirements in 2015/2016			
Primary energy ($KWh/m^2/y$)	70	100	60-70
Renewable share (%)	>20	>20	>20
CO_2 emissions ($KgCO_2/m^2/y$)	<10	<10	<8
Minimum requirements in 2020			
Primary energy ($KWh/m^2/y$)	30-50	30-50	30-50
Renewable share (%)	>40	>40	>40
CO_2 emissions ($KgCO_2/m^2/y$)	<3-6	<3-7	<3-5

Intermediate targets

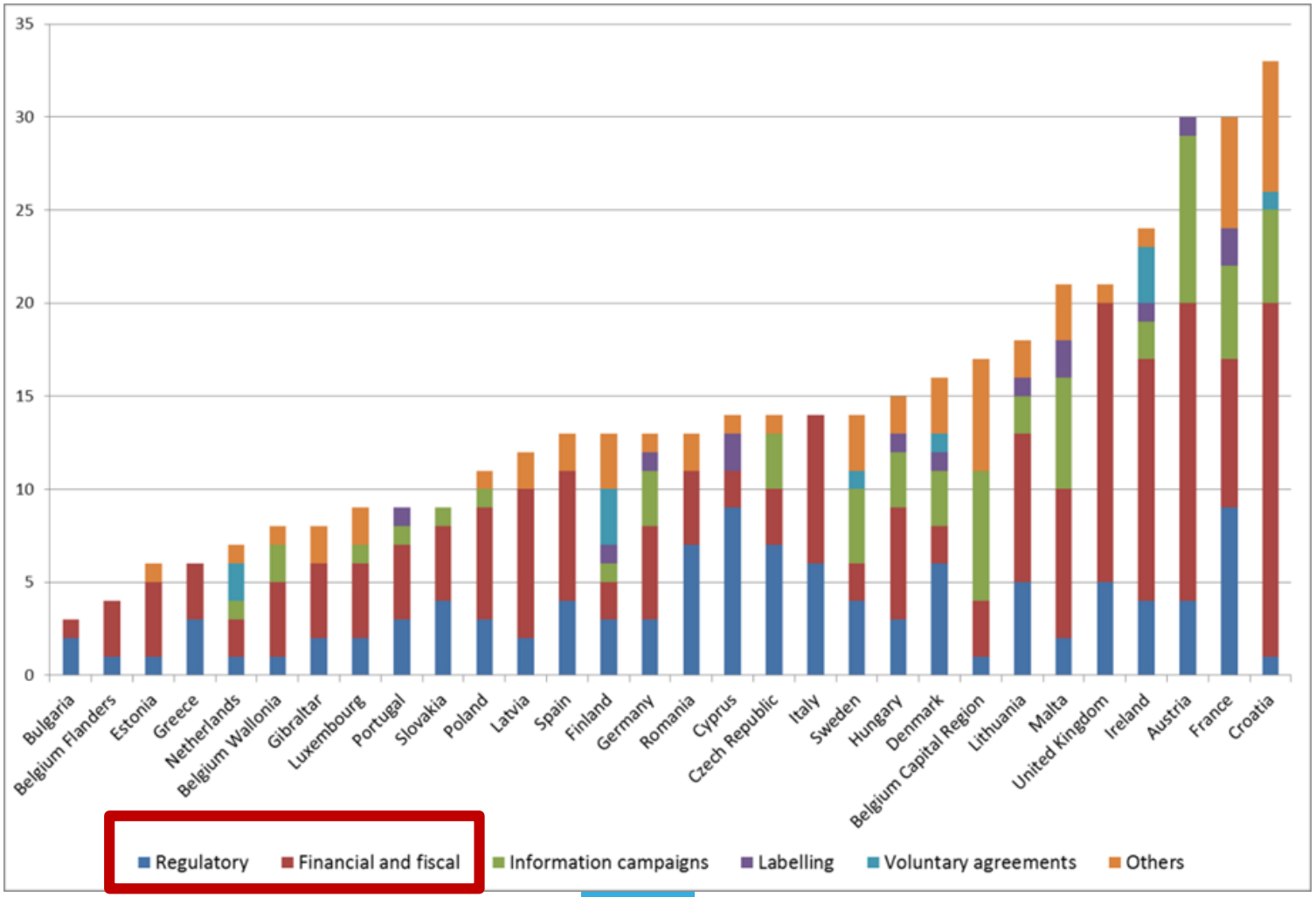
- Most Member States presented **only qualitative intermediate targets** for improving the energy performance of new buildings by 2016 (e.g. strengthening building regulations, obtaining energy performance certificates by a certain year).

- The targets appear variable, the **quantitative targets are almost never defined** (e.g number or share of NZEBs, foreseen number of buildings to be NZEBs within the intermediate period of time).

Policies designed to target building renovations

- Most **Member States did not describe in a detailed way policies and measures towards NZEBs refurbishment**.
  Reported policies are in line with the EPBD requirements, but rarely explicitly refer to a clear definition and level of NZEBs renovation.

- Heterogeneity of policy packages in terms of absolute number and in terms of policy type, with a predominance of financial/fiscal and regulatory measures



NZEB development evaluation in Member States

MS	NZEB Definition	RES included in the NZEB concept	Qualitative and quantitative intermediate targets	Measures promoting deep or NZEB renovation
AT				
BE Brussels				
BE Flanders				
BE Wallonia				
BG				
CY				
CZ				
DE				
DK				
EE				
EL				
ES				
FI				
FR				
HR				
HU				
IE				
IT				
LV				
LT				
LU				
MT				
NL				
PL				
PT				
RO				
SI				
SK				
SE				
UK				

Policy Recommendations

- Effort to **implement EPBD provisions,** all new buildings are NZEBs by 2020.

- Define mechanism to **monitor the fulfilment of the NZEB targets**.
  Consider differentiated **sanctions** after deadlines.

- Stronger **connection between policies, measures, NZEBs**.
  These should be **more specific** in clarifying to what extent they contribute to achieving NZEB targets.

- Set national definitions of **NZEB at a high level of ambition** – not below the cost-optimal level of minimum requirements.
  Use **renewables in an integrated design concept** to cover the low energy requirements.
  Assure proper indoor environment to avoid deterioration of **IAQ, comfort and health**.

- Develop **policies** addressing specifically **retrofit towards NZEB**.
  Design consistent policy packages to provide **long-term stability to investors**.
  Reliable data collection to assess policy impact to monitor the implementation of NZEB building stock level.

Conclusions

- NZEBs: huge potential to decrease energy consumption and increase RES.
- Most NZEB **definitions implemented** at national level.

  No consensus on different aspects (e.g. system boundaries, single /building unit, on-site production, energy efficiency level, inclusion of lighting, household electricity, RES).

  Not all Member States provided a definition with both a **numerical target** and a **RES share**.

- A few Member States mentioned **objectives beyond nZEBs requirements** (e.g. zero energy buildings - NL, positive energy buildings - DK and FR, climate neutral new buildings – DE, zero carbon standards in the UK).

  A few MS defined a specific **minimum percentage of RES share**.

  Need of a harmonized definition framework and a robust "zero" calculation methodology.

- Strengthen **quantitative intermediate targets** and mechanisms to **monitor NZEBs implementation** at national level.
- Further **strengthen and evaluate measures and policies for cost-effective NZEB renovation.**

Thank you for your attention

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