Muutused külmaainete valikus. Muudatused ja uued regulatsioonid jahutusseadmete turul.

Oktoober 2018

BVT Partners

- Läbi milliste külmainete oleme tänaseni jõudnud.
- Mis ajendab muutusi
- Mida võiks tuua lähitulevik
- Energiasäästust

CFC ühendid

- 1928. aastal töötati USA-s välja esimesed CFC ühendid (klorofluorosüsivesinikud). Ideeks oli asendada seni kasutatud mürgised ja plahvatusohtlikud (süsinikdioksiid, ammoniaak, vääveldioksiid jms) ohututе ainetega.
- Algus oli paljulubav, uued aineid olid püsivad, mürgitud, mittekorrodeerivad ning tuleohutud
- Halb üllatus saabus 1973. aastal, kui avastati, et kõrgemale atmosfääri sattudes ultraviolettkiirgus siiski vabastab ühendist kloori aatomi, mis hiljem seob endaga 0_3-st ühe aatomi lagundades sellega osoonikihti.
- 1987. aastal Montreali protokolliga lepiti kokku muuhulgas CFC-de kasutamise järk järgulise lõpetamine jahutusseadmetes
- P.S. levinud nimetus *freoon* tuleb tootja DuPont konkreetse toote kunagisest nimetusest

BVT Partners

HCFC ühendid

- Lisatud vesiniku aatom lagundab aine kiiremini ja kloori aatom ei jõua samas ulatuses reageerida ülemistes kihtides leiduva 0_3-ga*
- Vähemohtlikud, kuid siiski mitte ohutud osoonikihile
- On kallimad toota, kui CFC-d
- Levinumad ained R22, R124

BVT Partners

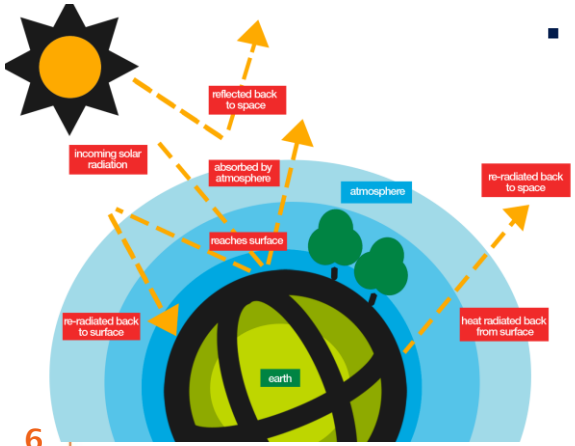
HFC ühendid

- Osoonikihti kahjustav kloori aatom on asendatud vesinikuga, ODP = 0
- Levinumad ained R410A, R134, R32
- Erinevate GWP väärtustega

BVT Partners

GWP – Global Warming Potential

- GWP kajastab mõju, mida atmosfääri sattunud gaas omab kasvuhooneefektile
- GWP-d väljendatakse võrdluses CO_2-ga
- Näiteks R-134a GWP arv on 1 430, ehk 1 tonn atmosfääri sattunud
  R-134a mõjutab kasvuhoone efekti sama palju, kui 1430 tonni CO_2-te
- *ülemaailmset soojenemist põhjustav mõju" (global warming potential, GWP) – määr, mille võrra 1 kg külmutusainet, mida kasutatakse auru kokkusurumise tsüklis, aitab saja aasta jooksul hinnanguliselt kaasa ülemaailmsele soojenemisele, väljendatuna* CO_2-ekvivalentides



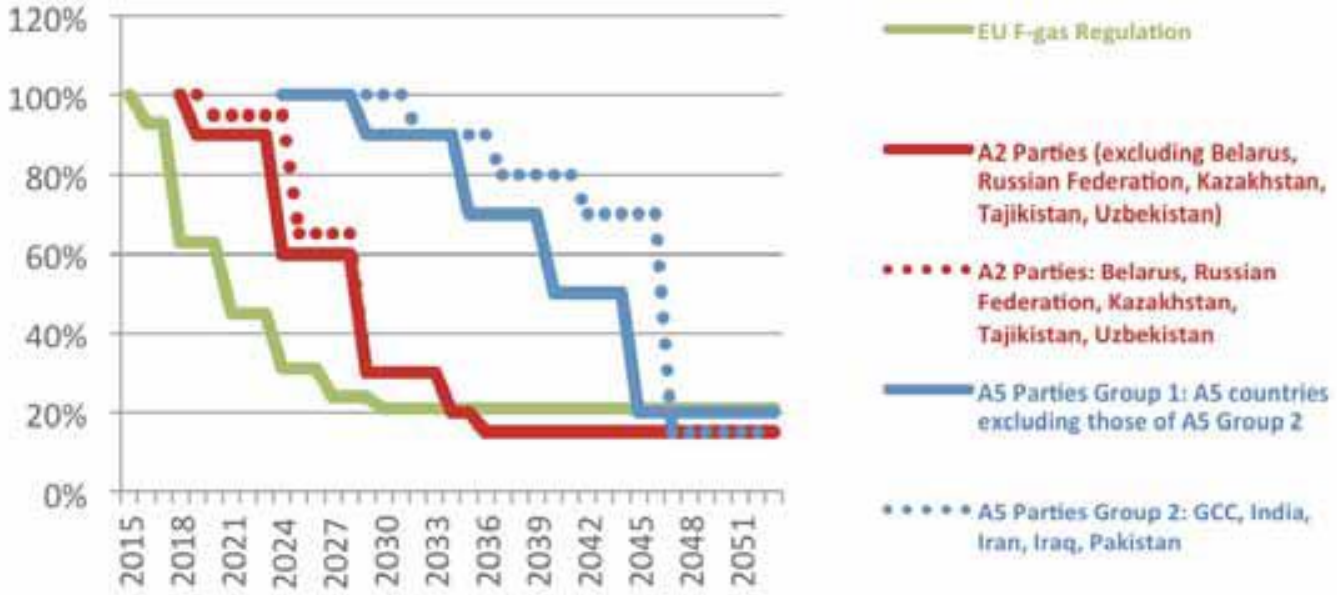
BVT Partners

Seadusandlus, kokkulepped

- ÜRO Pariisi kliimakokkuleppe (2016, esimene siduv kokkulepe) raames allkirjastati 2016 aastal Kigalis eelpool mainitud Montreali protokolli muudatused
- Lepiti kokku HFCde kasutamise vähendamises 85% aastaks 2040, mis aitaks ära hoida 0,5 kraadist kliima soojenemist aastaks 2100, jätkates samal ajal ka osoonikihi kaitse meetmeid.
- Riigid jaotati erinevatesse rühmadesse ja esimesed vähendamised on arenenud riikide poolt oodatud hiljemalt aastaks 2019

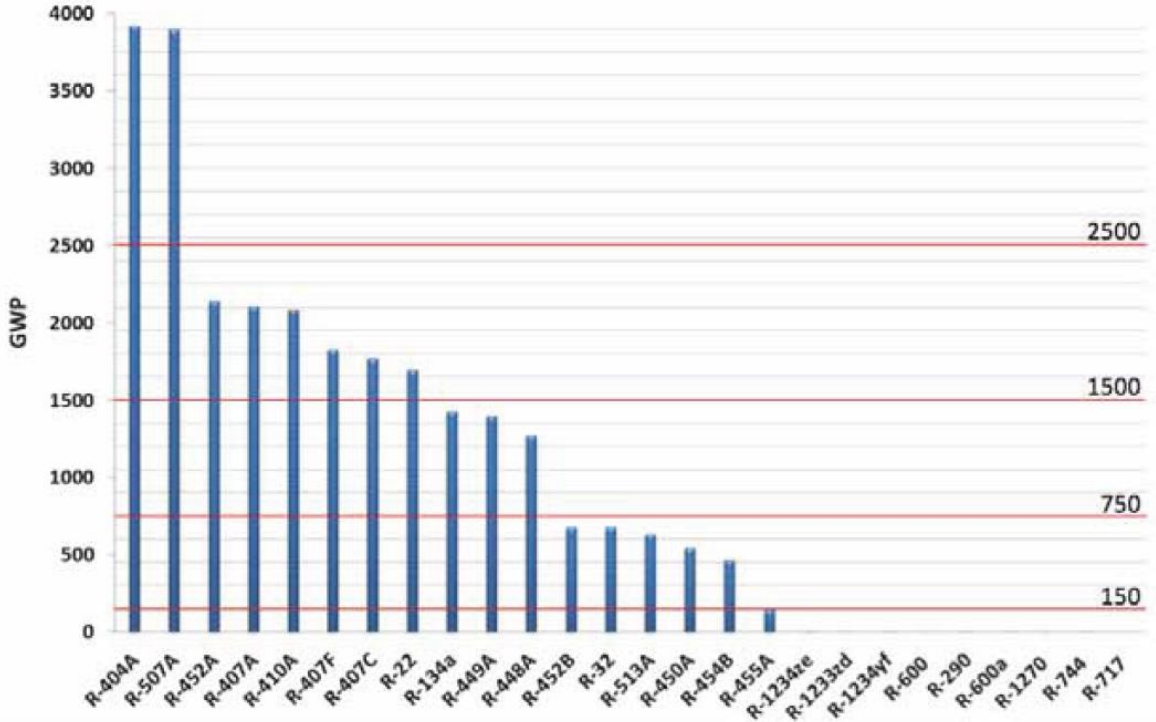
F-GAS regulatsioon No. 517/2014

- Eeltoodud eesmärgi saavutamiseks võttis EL komisjon vastu edenemiskava „Konkurentsivõimeline vähese CO_2-heitega majandus aastaks 2050”
- Edenemiskava üks osa on ELi normatiiv, nn F-GAS regulatsioon, mis jagab külmaained GWP järgi ning lisaks üldise koguse vähendamisele sätestab ka kasutusvaldkondade lõikes, millise GWP arvuga külmainete kasutus antud valdkonnas lähiajal keelustatakse.
- Võeti kasutusele mõiste CO_2-ekvivalenttonn
- Üldise koguse vähendamiseks toob F-GAS regulatsiooni sisse kvootide ja volituste mõisted
- Sarnased meetmed on võtnud kasutusele ka USA (EPA SNAP Rules), Jaapan (Act on Rational Use & Proper Management of Fluorocarbons), Hiina (Intended Nationally Determined Contributions)



BVT Partners

Levinumate külmaainete GWP väärtused



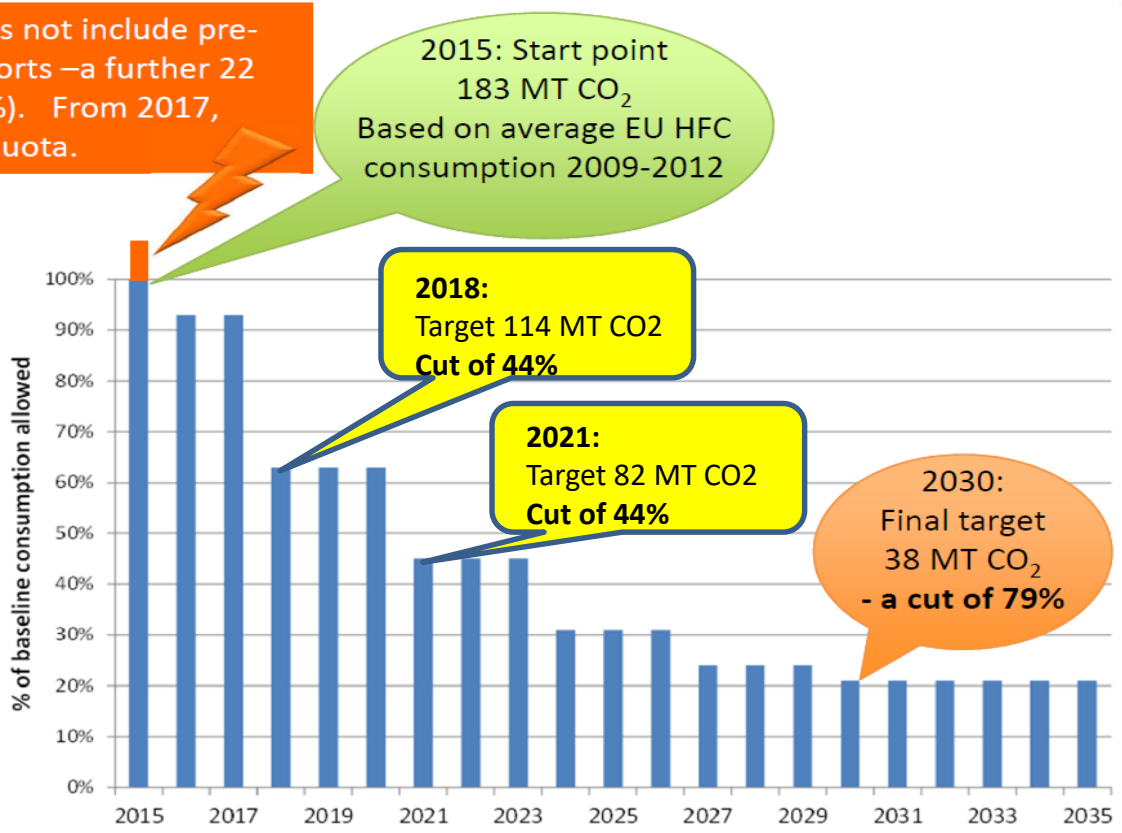
Oktoober, 2018

BVT Partners

F-GAS regulatsioon põhipunktid

- Toodete märgistus, sisalduv ja juurde täidetud külmaaine kogus
- Seadmete importimiseks vajalik registreerumine F-Gas teabesüsteemis ning volituse (*authorization*) olemasolu
- Vastavusdeklaratsiooni esitamine
- Iga aastase aruandluse auditeerimine ning andmete esitamine

Baseline does not include pre-charged imports –a further 22 MT CO_2 (12%). From 2017, included in quota.



BVT Partners

FLUOROSÜSIVESINIKE TURULELASKMISEGA SEOTUD MAKSIMUMKOGUSE, KONTROLLVÄÄRTUSTE JA KVOOTIDE ARVUTAMINE

Artikli 15 lõikes 1 osutatud maksimumkogus arvutatakse järgmiste protsendimäärade kohaldamisel perioodil 2009–2012 liidu turule lastud üldkoguse aasta keskmisele. Alates 2018. aastast arvutatakse artikli 15 lõikes 1 osutatud maksimumkogus järgmiste protsendimäärade kohaldamisel perioodil 2009–2012 liidu turule lastud üldkoguse aasta keskmisele, ning seejärel lahutades sellest summad, mis on vastavalt artikli 15 lõikele 2 kasutusalad, mille suhtes on tehtud erand, võttes aluseks olemasolevad andmed.

Aastad	Turulelastavate fluorosüsivesinike maksimumkoguse ja sellele vastavate kvootide arvutamise protsendimäär
2015	100 %
2016–17	93 %
2018–20	63 %
2021–23	45 %
2024–26	31 %
2027–29	24 %
2030	21 %

BVT Partners

Quota Authorization

Manufacturer of refrigerant

Importer of pre-charged units

QUOTA
Received free of charge from EU

AUTHORIZATION *
Received from quota holder(s)

The quota holder (refrigerant manufacturer) has the right to Authorize its Quota (Authorization) to the importer of record via F-GAS portal. Transaction may be chargeable directly to buyer, chargeable to intermediary or free of charge.
Quota is released yearly by the EU commission under "use or lose it" scheme

The importer of record has the obligation to:

- Declare the amount of units/tons of refrigerant imported per calendar year
- Procure sufficient authorization to continue a sustainable business

*No time limit to consume it, possibility to purchase more if needed, can be purchased from multiple quota holders

WHEN		WHAT
From	**2015 – 1st Jan**	Entry into Force of the Regulation (EU) N 517/2014
By	**2015 – 1st Jan**	Compulsory registration for quota in the F-Gas Portal
By	**2015 – 31st Mar**	Reporting of total F-Gas contained in pre-charged products imported in 2014
From	**2017 – 1st Jan**	• Imported F-Gas in pre-charged products have to be under the quota • Manufacturers and importers shall draw up a DOC • New F-Gas Label
By	**2018 – 31st Mar**	The accuracy of the documentation and DOC is verified, for the preceding calendar year, by an independent auditor
From	**2025 – 1st Jan**	Ban on Single Split A/C systems containing less than 3kg of HFC with GWP≥ 750 (R410A)
By	**2020 – 31st Dec**	The EU COMM shall publish a report on the availability of HFC in EU
By	**2022 – 31st Dec**	The EU COMM shall publish a comprehensive report on the effects of this Regulation

BVT Partners

Märgistus alates 01.01.2017

- Täiendavad märgistusnõuded vastavalt määrusele (EL) nr 2015/2068

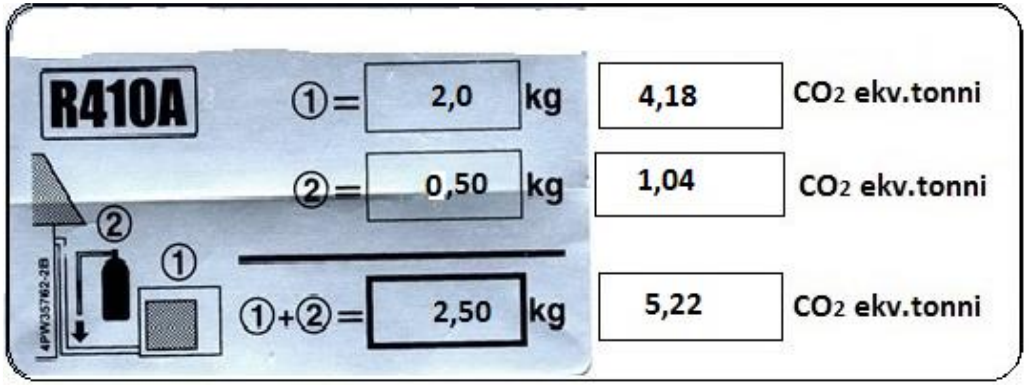
Sisaldab fluoritud kasvuhoonegaase

R-410A

…….. kg

GWP 2088

…… CO_2 ekvivalenttonni



- Märgised paigutatakse võimaluse korral fluoritud kasvuhoonegaase sisaldaval tootel või seadmel juba olevate nimeplaatide või toote muude andmesiltide kõrvale.

BVT Partners

- Ainete keelustamine F-Gas regulatsioonis.pdf

BVT Partners

TEWI - Total equivalent warming impact

TEWI= GWP • L • n + GWP • m • (1−α) + n • E • β

where:

GWP - Refrigerant Global Warming Potential (equivalent to CO2) [kg CO2/kg refrigerant]

L - Annual leakage rate [kg/year]

n - System operating life [years]

m - Refrigerant charge [kg]

α - Recycling factor [%]: proportion of refrigerant charge (from 0 to 1) that is recovered from the equipment when it is
decommissioned at the end of its useful life

E - Annual energy consumption [kWh/year]

β - CO2 emissions on energy generation [kg CO2/kWh]: depending on the country and the energy sources used, β may vary
from 0.35 to 0.9 with a worldwide average value of 0.53 kg CO2/kWh (source: IEA - International Energy Agency)

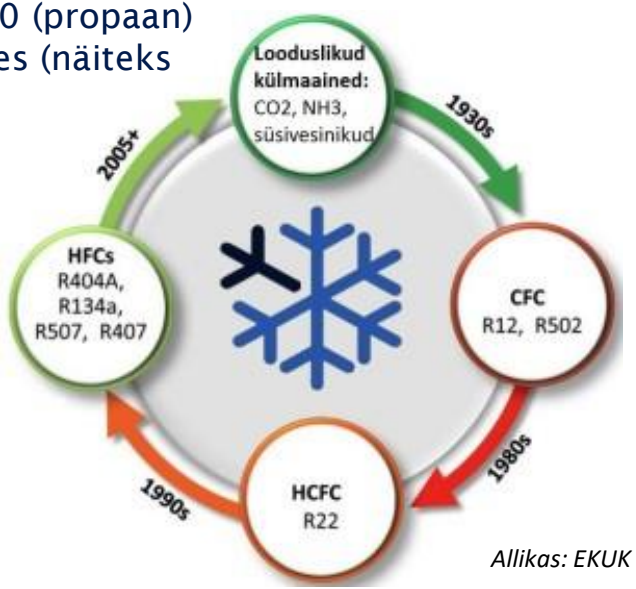
TEWI, measured in kg of CO2 equivalent, represents the global warming impact during the equipment life cycle, including:

- direct effect, caused by the release of refrigerant during working life and decommissioning;
- indirect effect resulting from the emissions of fossil fuel used to generate the electricity needed for its operation.

Allikas: EKUK

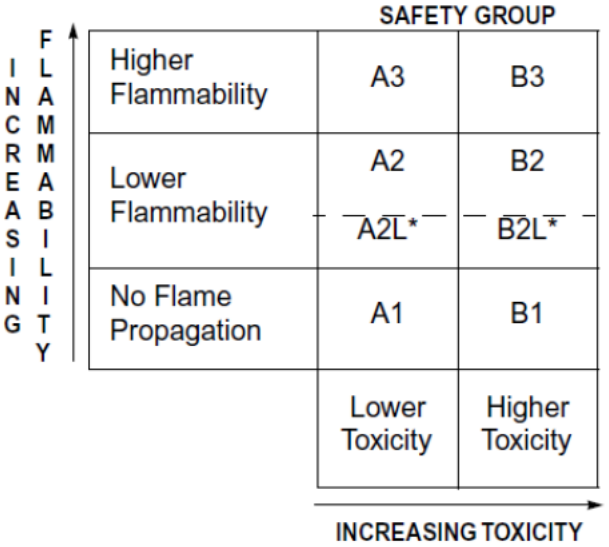
HC, HFO, looduslikud külmaained

- HC ehk süsivesinikud. RA600A (isobutaan), RA290 (propaan)
- Väga levinud juba väikestes, kinnistes süsteemides (näiteks kodukülmikud, väiksemad külmikud poodides)
- Looduslikud külmaained, levinumad NH_3 ja CO_2
- HFO ehk küllastumata süsivesinikud, levinumad ained R1234yf, R1234ze



Allikas: EKUK

Ohutusklassid



* A2L and B2L are lower flammability refrigerants with a maximum burning velocity of ≤3.9 in./s (10 cm/s).

Standard Type		International	Europe
Refrigerant Classification		ISO 817	Follows ISO 817
Safety in Use	General	ISO 5149	EN 378
	Equipment Specific	IEC 60335-2-24 IEC 60335-2-40 IEC 60335-2-89	EN 60335-2-24 EN 60335-2-40 EN 60335-2-89

Lühikokkuvõte külmaainetest konditsioneerimisel

- *F-Gas regulatsiooni mõnevõrra üllatav (tugev) mõju (webinar_price_monitoring_presentation_final.pdf)*
- R410A kaob kuni 3 kg sisaldavatest süsteemidest eelkõige F-Gas regulatsiooni tõttu kiiresti. Alates 2025. aastast ELis uutes süsteemides keelatud. Asendusaineks on hetkel R32 (GWP 675, A2L). Külmatehniliselt ained väga sarnased. *Asendamine olemasolevates küsitav tuleohutusnõuete tõttu.* The main differences between A1 and A2L refrigerants.pdf
- *EN378 ja ATEX*
- R134a asendatakse hetkeseisuga suuremas jaos R1234ze-ga (GWP 7, A2L). Ained on mõnevõrra erinevad omadused (NB ka positiivsed), asendamine on võimalik, kuid toob kaasa muudatusi süsteemides ja tootlikkuses
- Erinevad segud R448A, R449A, R449B jne
- NH_3 ja CO_2

2020 pakett EL-is. Ecodesign

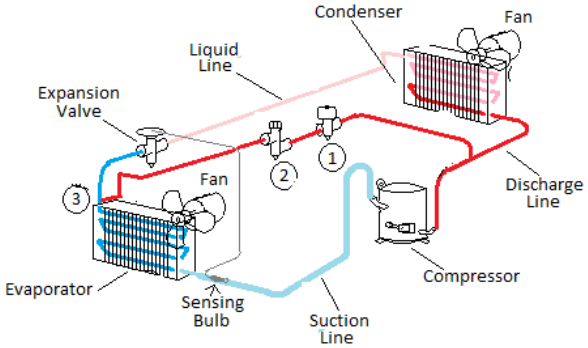
- 2020 pakett on komplekt meetmetest, mis peaks aitama EL-il saavutada keskkonna ja energiasäästuga seonduvalt aastaks 2020 järgnevat:

- 20% kasvuhoonegaaside emissiooni vähendamist võrreldes aastaga 1999
- 20% EL energiatoodangust peaks olema taastuvenergia
- 20% paremat energiaefektiivsust

- Ülaltoodu täitmiseks on raamdirektiiv 2009/125/EC (Ecodesign), mille alla on koondatud ligi 40-t tootegruppi puudutavat regulatsiooni (nn Lot´i). Lot´id omakorda jaotatud reeglina (ajalisteks) etappideks ehk Tier´iteks

Euroopa Liidu Komisjoni määrus (EL) nr. 206/2012 6. märtsist 2012

- Hakkas kehtima alates 1. jaanuarist 2013 (1. etapp) ja 1. jaanuarist 2014 (2. etapp)
- Võiks tinglikult nimetada *split-seadmete* regulatsiooniks, jahutusseadmed kuni 12 kW
- Valdav enamik neist seadmetest on toodetud väljaspool EL, mis veidi mõjutab seaduse rakendamist
- Toodi *split-seadmete* andmetesse sisse SEER ja SCOP



BVT Partners

Euroopa Liidu Komisjoni määrus (EL) nr 2016/2281 30. novembrist 2016

- Esimene etapp ehk nn Tier1 hakkab kehtima alates 1. jaanuarist 2018
- *Alates 26. septembrist 2018 (puudutab lämmastikdioksiide heidet)*
- Teine etapp ehk nn Tier2 hakkab kehtima alates 1. jaanuarist 2021
- Puudutab enamikke üle 12 kW jahutusseadmeid Ecodesign mojuala juhised.pdf

- „**jahutamise sesoonne energiatõhusus**“ (SSCEE, ηs,c) – jahutusseadme aastase võrdlusjahutusvajaduse (asjaomasel jahutusperioodil) ja aastase tarbitud jahutusenergia suhe [%] korrigeerituna temperatuuriregulaatori mõju ja põhjaveepumba/-pumpade elektritarbimisega (kui asjakohane);
- ‘**seasonal space cooling energy efficiency**’ (ηs,c) means the ratio between the reference annual cooling demand pertaining to the cooling season covered by a cooling product, and the annual energy consumption for cooling, corrected by contributions accounting for temperature control and the electricity consumption of ground water pump(s), where applicable, expressed in %;

- **„sesoonne energiatõhususteguri“** (SEPR) –kõrgel temperatuuril käitatava protsessijahuti energiatõhususteguri standardsetel nimitingimustel, mis iseloomustab koormuse ja ümbritseva keskkonna temperatuuri muutumist aasta jooksul ning mille arvutamiseks jagatakse aastane jahutusvajadus aastase elektritarbimisega;

- *‘The Ecodesign directive has brought in two new standardized performance metrics; Seasonal Space Cooling Energy Efficiency (SSCEE) for comfort cooling applications; and Seasonal Energy Performance Ratio (SEPR) for process cooling. Through the use of these standardized metrics, users are able to make better and more informed decisions when comparing products from different manufacturers.*

(a) From 1 January 2018, the seasonal space cooling energy efficiency of cooling products shall not fall below the values in Table 3:

Table 3

First tier minimum seasonal space cooling energy efficiency of cooling products, expressed in %

	$\eta_{s,c}$ (*)
Air-to-water chillers with rated cooling capacity < 400 kW, when driven by an electric motor	149
Air-to-water chillers with rated cooling capacity ≥ 400 kW when driven by an electric motor	161
Water/brine to-water chillers with rated cooling capacity < 400 kW when driven by an electric motor	196
Water/brine to-water chillers with ≥ 400 kW rated cooling capacity < 1 500 kW when driven by an electric motor	227
Water/brine to-water chillers with rated cooling capacity ≥ 1 500 kW when driven by an electric motor	245
Air-to-water comfort chillers, when driven by an internal combustion engine	144
Air-to-air air conditioners, driven by an electric motor, except rooftop air conditioners	181
Rooftop air conditioners	117
Air-to-air air conditioners, driven by an internal combustion engine	157

(*) To be declared in the relevant tables in this Annex and in the technical documentation rounded to one decimal place.

BVT Partners

(b) From 1 January 2021, the seasonal space cooling energy efficiency of cooling products shall not fall below the values in Table 4:

Table 4

Second tier minimum seasonal space cooling energy efficiency of cooling products, expressed in %

	$\eta_{...}$ (*)
Air-to-water chillers with rated cooling capacity < 400 kW, when driven by an electric motor	161
Air-to-water chillers with rated cooling capacity ≥ 400 kW when driven by an electric motor	179
Water/brine to-water chillers with rated cooling capacity < 400 kW when driven by an electric motor	200
Water/brine to-water chillers with ≥ 400 kW rated cooling capacity < 1 500 kW when driven by an electric motor	252
Water/brine to-water chillers with rated cooling capacity ≥ 1 500 kW when driven by an electric motor	272
Air-to-water chillers with rated cooling capacity ≥ 400 kW, when driven by an internal combustion engine	154
Air-to-air air conditioners, driven by an electric motor, except rooftop air conditioners	189
Rooftop air conditioners	138
Air-to-air air conditioners, driven by an internal combustion engine	167

(*) To be declared in the relevant tables in this Annex and in the technical documentation rounded to one decimal place.

BVT Partners

- Ecodesign Directive Implementation
- How will the Ecodesign Directive be implemented?
- The Ecodesign Directive applies in two steps:
- Step 1: from January 2018 onwards
- Step 2: active from 1 January 2021 (step 2 further tightens the requirements)
- Within the European Union chillers, heating products, cooling products and fan coil units have to meet the new energy efficiency requirements from these dates. You cannot market units in the EU that do not meet the defined minimum requirements.
- The requirements for relevant products shall be fulfilled when the unit is placed on the market.
- The rules in case of a project offered before and delivered after the deadline of a step are that
- the moment of unloading at the site is the moment which defines the requirements to be applied.
- What is defined by 'placing on to the market'?
- The Ecodesign Directive states that the units must be compliant at the point at which they are put on to the market.
- With Air Handling Units (AHUs) there was some discussion over whether this means at the point of delivery or at the point at which an order was placed.
- The final Ecodesign Directive draft states that:
- "The placing on the market occurs when the product is supplied for distribution, consumption or use and it is in any event necessary that the product has been manufactured and its conformity has been assessed.
- A contract which has been signed to manufacture a particular product, where this product still does not exist, cannot be constructed as placing on the market."
- How will the Ecodesign Directive be enforced?
- Each country has a designated Market Surveillance Authority (MSA). Ecodesign penalties for not respecting regulation.pdf

BVT Partners

- Q: Is it illegal to sell product into the EU that doesn’t comply?
- A: Yes. Failure to comply can lead to “penalties that should be effective, proportionate and dissuasive“. In some instances, they may be commensurate with the waste of energy incurred

- Q: What about shipping non-compliant products after the deadline for compliance?
- A: It is the manufacturer's responsibility to ensure that products placed upon the market are compliant. If, for instance, a non-compliant product is ordered before the compliance deadline, but it would be shipped after the deadline it must conform with the regulations. This has particular implications for site delays.

- Q: What about a noncompliant unit ordered before the relevant compliance deadlines that are put into storage before delivery to a site?
- A: Provided that the unit is delivered to a customer's storage facility that act in itself is seen as ‘placing a unit onto the market' and would be permissible.

- Q: Is the European Seasonal Energy Efficiency Ratio (ESEER) still relevant within Eurovent?
- A: The Seasonal Space Cooling Energy Efficiency (SSCEE) calculation is likely to replace the ESEER within Eurovent, although it has not done so yet.

- Q: Which performance metric applies if a chiller is for a dual purpose, i.e. comfort and process cooling?
- A: The primary focus of Ecodesign is the thermal comfort for people, and consequently the Seasonal Space Cooling Efficiency metric takes priority in this situation.

BVT Partners

Tänan!

BVT Partners, 2018

BVT Partners