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ONLINE

23-24/06/2020

Traditional HFC use – (when) will it stop?

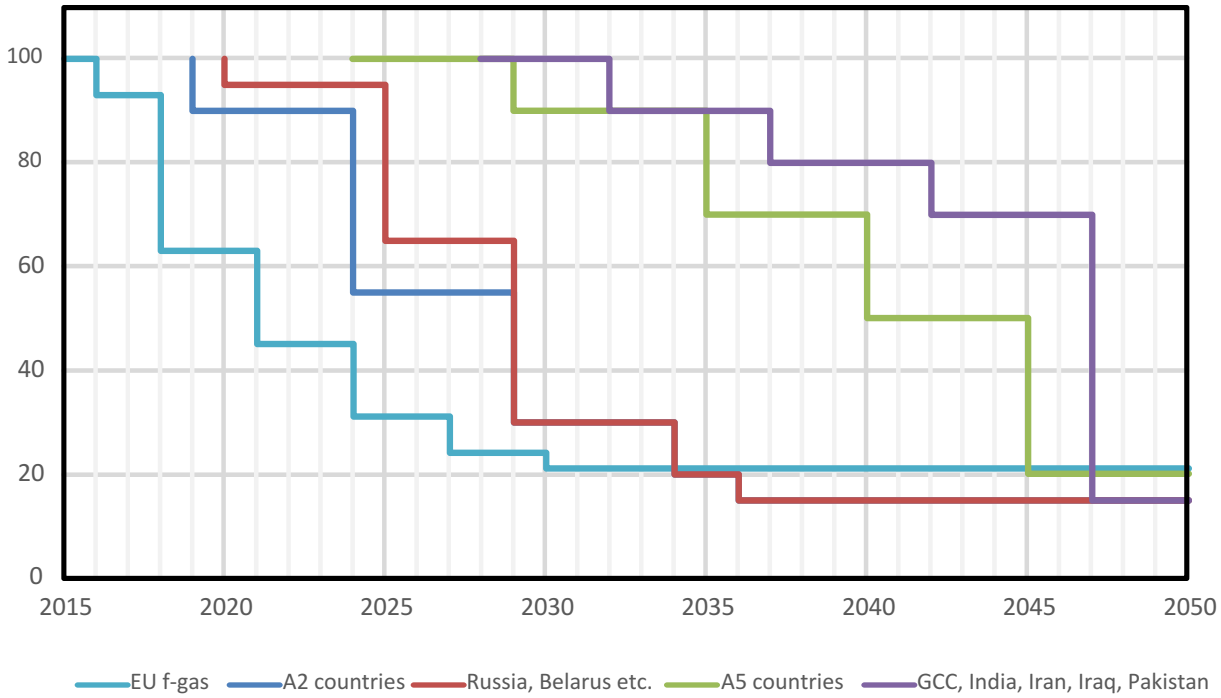
Vonsild Consulting Aps

#GoNatRefs

Global phase down of HFC – EU F-Gas and Kigali Amendment

When will various HFC's be phased out?

Phase down agreements have large steps, but how does this match with the need for servicing systems with refrigerant?



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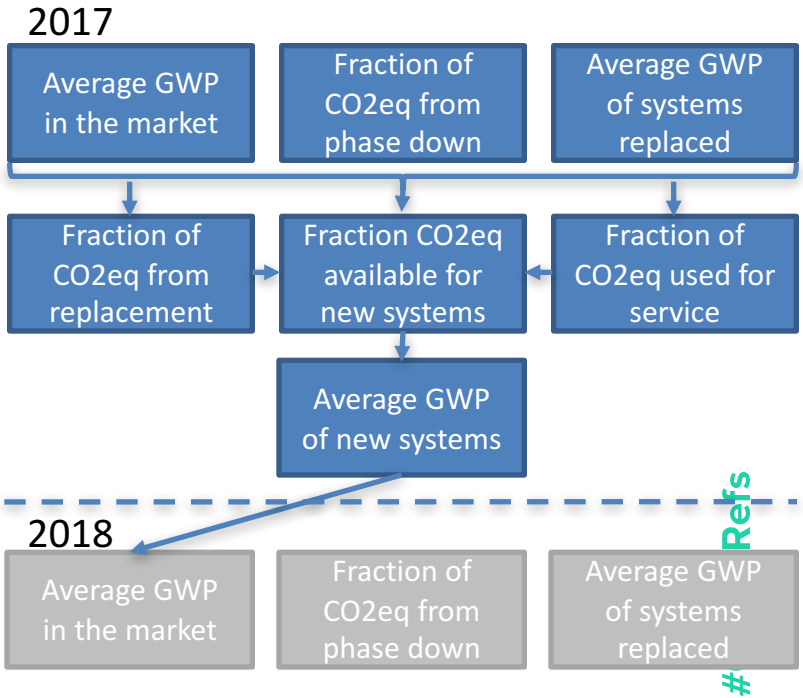
Simple simulation of EU F-Gas Regulation

Assumptions:

- Average GWP of 2017 assumed to be 2000
- Average amount user for service was 60% of total refrigerant consumption in 2017
- Average system lifetime 15 years
- Yearly growth in number of systems 3%
- Simulation deals with two market segments: New systems and service.
- The GWP available for new systems is calculated based on the amount of CO2 equivalents left when the current bank has been serviced.

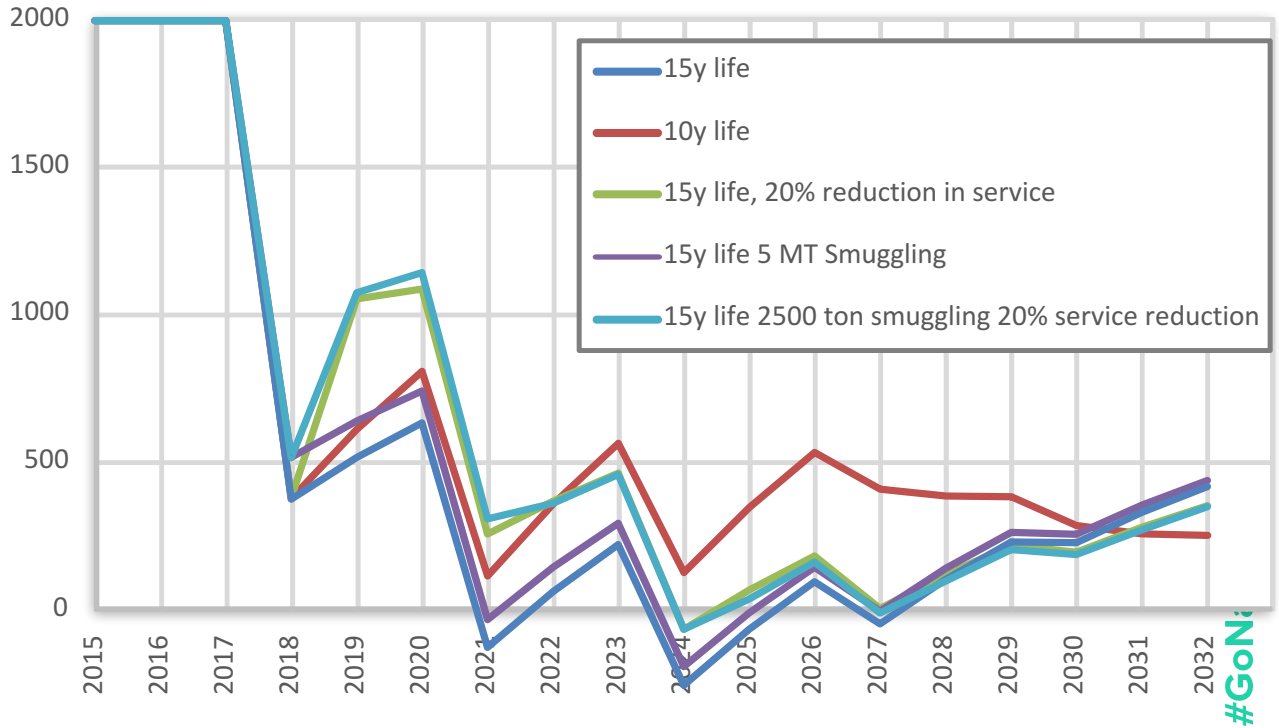


Average GWP

If the market keeps using all available HFC, then the service sector will make it crash…

The trend was correct, but the market didn't crash:

- Smuggling seems be 25 to 30% of the market!
- Reclaimed refrigerant is important!



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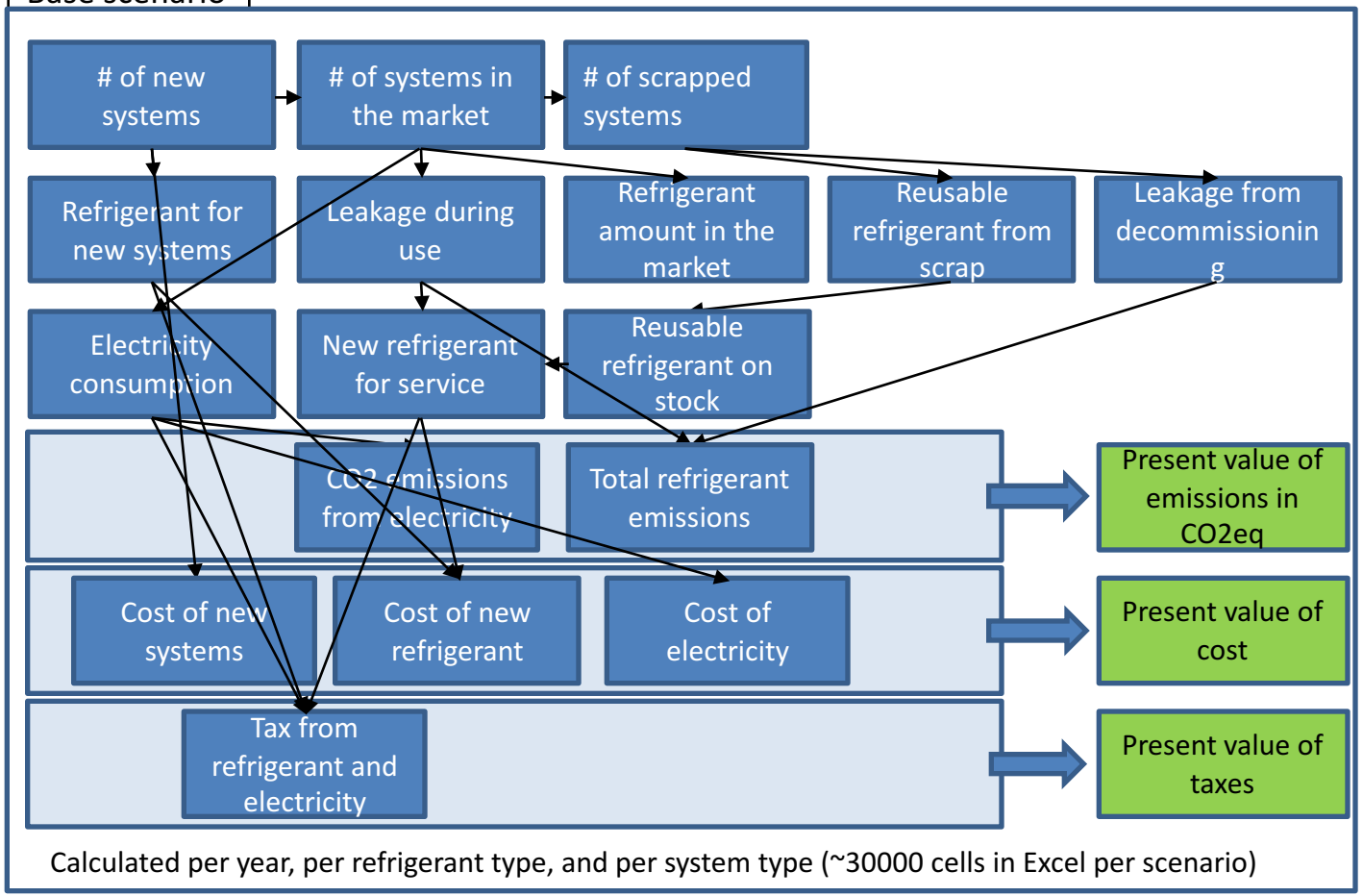
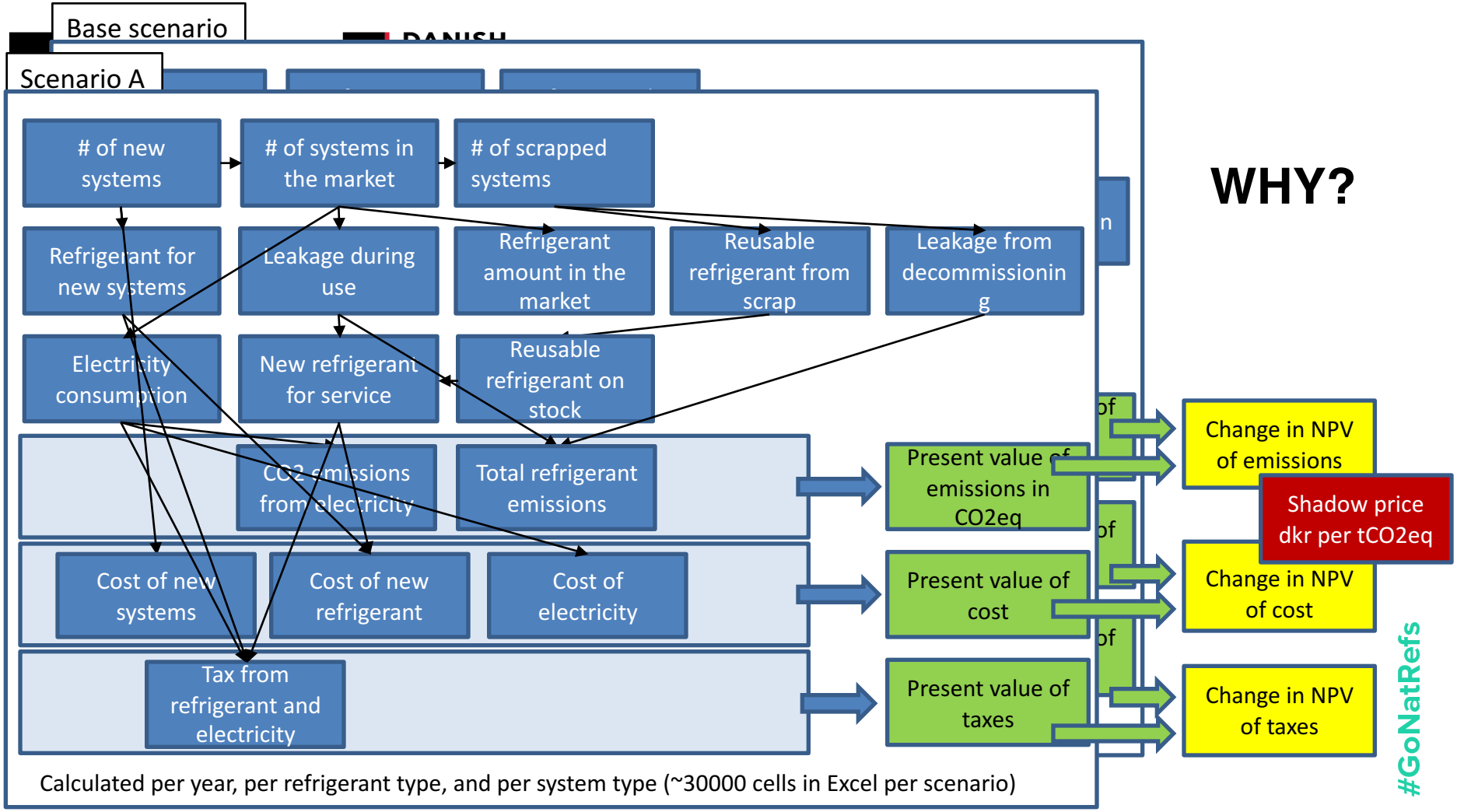
Complex Simulation

Simulation to evaluate effect of proposed new regulation in Denmark (with DTI).

Btw: Made before effect of smuggling became obvious.

Base scenario




Base scenario
Scenario A
# of new systems
# of systems in the market
# of scrapped systems
Refrigerant for new systems
Leakage during use
Refrigerant amount in the market
Reusable refrigerant from scrap
Leakage from decommissionin g
Electricity consumption
New refrigerant for service
Reusable refrigerant on stock
CO2 emissions from electricity
Total refrigerant emissions
Cost of new systems
Cost of new refrigerant
Cost of electricity
Tax from refrigerant and electricity
Present value of emissions in CO2eq
Present value of cost
Present value of taxes
Change in NPV of emissions
Shadow price dkr per tCO2eq
Change in NPV of cost
Change in NPV of taxes
WHY?
Calculated per year, per refrigerant type, and per system type (~30000 cells in Excel per scenario)
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Observations

Observations from the simulations:

- Decisions today on refrigerant for a new system will affect the need for refrigerant for the next 15 to 25 years
- If a quick change is done from traditional HFC's, then there will be sufficient reclaimed refrigerant for servicing the existing systems for the rest of their lifetime!
- A slow phased down will lead to lack of service refrigerant (low GWP fluids will normally not be suited for servicing old systems due to flammability).
- The cost of a wrong decision today will be on the system owners (who are often least informed)
- Common HFC's are underestimated by a factor of 2 compared to CO2 emissions when doing this type of shadow cost calculations (68% to 274%).

Predicting is difficult, especially about the future

It is very difficult to predict the future refrigerant market, but the use of high GWP refrigerants in broad segments of the market cannot continue forever.

Stein's Law: If something cannot go on forever, it will stop.

My addition: It is a lot less painful if the stop is controlled, than if it just happens when Stein's law eventually kicks in!

Enabling broader use of hydrocarbons

Many things can be done to speed up the transformation.

Personal opinion: The three most important factors are

1) specific bans,
2) branding, and
3) enable legal use of alternatives

One example of enabling legal use is updating safety standards to allow broader use of hydrocarbons.
From a European perspective safety standards are:

- EN 378,
- EN 60335-2-40,
- EN 60335-2-89.

EN 60335-2-40

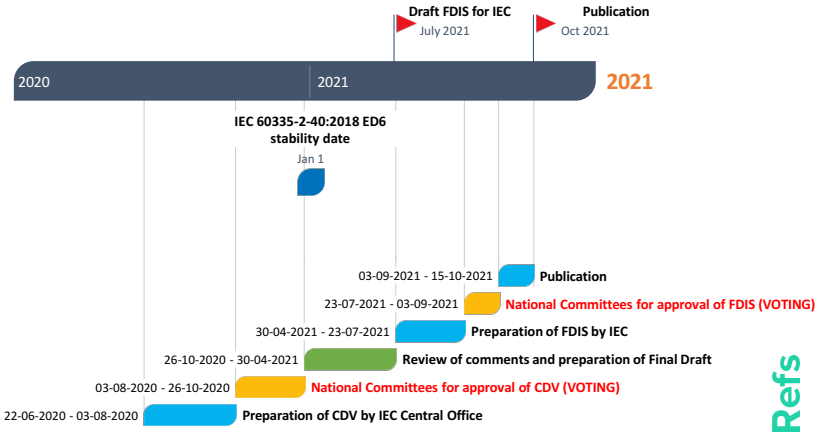
EN 60335-2-40 (based on IEC Ed. 6) has just finished Enquiry vote (1st of two votes) expected publication 2021/2022, with relaxations to A2L refrigerants.

IEC 60335-2-40 Ed. 7 will go out for Enquiry vote in August. Expected publication late 2021/early 2020. EN publication will be later…

IEC 60335-2-40 Ed. 7 increases charge for hydrocarbons (A3) by enabling more refrigerant charge in smaller rooms. This is by introducing new concepts:

- Releasable charge
- Build in airflow
- Enhanced tightness

IEC 60335-2-40 Ed. 7 time plan



EN 60335-2-89

IEC 60335-2-89:2019:

- Increased charge limit from 150g to 13 x LFL (494g of R290) .
- Added tightness and robustness requirements.
- Introduced a surrounding concentration test for more than 150g charge.

EN version is out for Enquiry vote (1st of two votes) until July 2020

According to time plan: EN 60335-2-89 will be updated by end of 2021 or early 2022.

EN 378

The working group behind EN 378 is working on adopting the concepts from 60335-2-40 and 60335-2-89.

The official project kick-off has been agreed by CEN/TC182 (to be confirm by the countries).

Expect the project to take 3-5 years….

Risk assessment — Speeding ahead safely

Risk assessments is an allowed alternative to safety standards in EU:

- The best risk assessments builds on draft EN or IEC safety standards

- Draft EN and IEC standards contain several methods which can be used to enable safe use of higher charges of flammable refrigerants. E.g.
  - Releasable charge
  - Build in airflow
  - Surrounding concentration test
  - Enhanced tightness

Conclusion

- Traditional HFC's will disappear from the market eventually... But a quick change is necessary!
- The cost of acting slow can be very expensive for especially for system owners and it can damage the environment for the next 15 to 25 years.
- High GWP HFC can be phased out of many applications already today.
- System safety standards are being updated, and contains plenty of inspiration. But no need to wait for the final publication.

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Thank you for listening!