ACCELERATING THE PHASE-DOWN OF HYDROFLUOROCARBONS (HFCS) IN THE KINGDOM OF SAUDI ARABIA (KSA)

Honeywell

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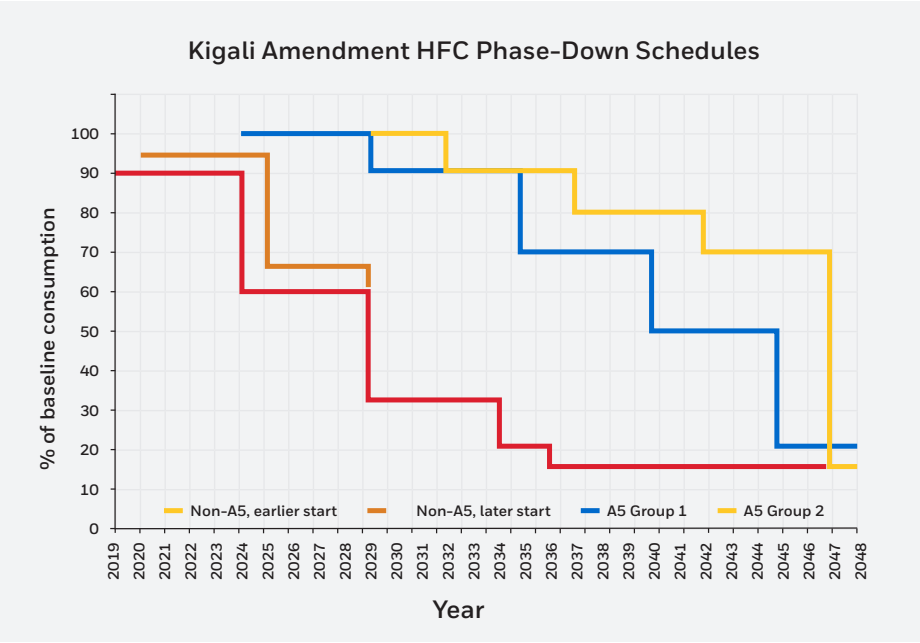
OVERVIEW

The Montreal Protocol is a global agreement to protect the stratospheric ozone layer by phasing out the production and consumption of ozone-depleting substances (ODS). It was first negotiated and signed on September 16, 1987 and is now considered to be one of the most successful environmental treaties ever negotiated. It remains the only treaty in the UN system to which every country is a party.

The Kigali amendment to the Montreal Protocol was adopted in October 2016. Meeting In Kigali, Rwanda delegates from around the world worked to negotiate and reach an agreement on a timetable that would mandate countries to phase down the production and usage of hydrofluorocarbons (HFCs) because of their high Global Warming Potential (GWP). **The Kigali Amendment seeks to achieve an 85% reduction in global consumption of HFC compounds by 2047 and is expected to save up to a 0.5 degree centigrade of warming by 2100.**

The new deal includes specific targets and timetables to replace HFCs with more planet-friendly alternatives like Low GWP HydroFluoroOlefins (HFOs).

The final Kigali Agreement divided the world economies into three groups, each with a target phasedown date.



ARTICLE 5 COUNTRIES

- **Group 1:** All those that are not Group 2
- **Group 2:**
  - Bahrain
  - India
  - Iran
  - Iraq
  - Kuwait
  - Oman
  - Pakistan
  - Qatar
  - Saudi Arabia
  - UAE

ARTICLE 2 COUNTRIES

- US & EU
- Initial phase-down steps for Belarus, Russia, Kazakhstan, Tajikistan and Uzbekistan

- The United States and countries in the European Union, agreed to an 85% phase-down of the production and consumption of HFCs between 2019 and 2036.
- Most of the other countries, including China, Brazil and all of Africa, agreed to an 80% phasedown between 2024 and 2045.
- Bahrain, India, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, **Saudi Arabia**, and the United Arab Emirates have agreed to an 85% phasedown between 2028 and 2047.

THE CASE FOR ACCELERATING HFC PHASEDOWN IN KSA

HFCs contribute to the Global warming with

1. Direct Emissions through its release to the atmosphere during storage, handling, and the usage in Airconditioning systems, foam insulation and aerosols etc.

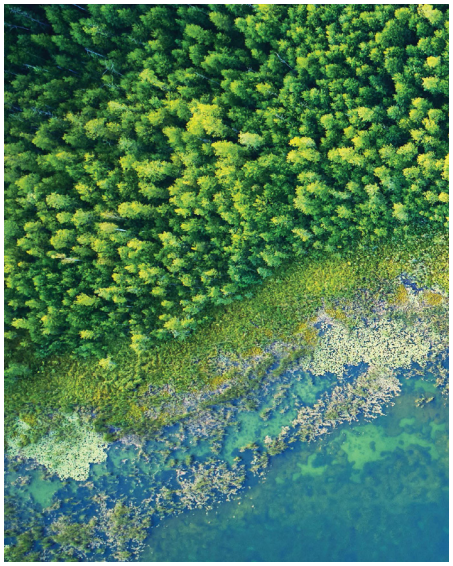
2. Indirect Emissions through **electricity consumption of systems using these HFC's as refrigerants** in air-conditioning systems or as blowing agents in building and appliance insulation, hence, causing emission at the PowerGrid level.

Saudi Arabia's accelerated phasedown of HFCs and transition to alternatives like HFOs would help reduce both emissions. HFOs not only have lower GWP (lower direct emissions) but also air-conditioning and refrigeration equipment/appliances designed with HFOs are more energy efficient over contemporary HFCs (lower Indirect Emissions).

This will fully support HRH Crown Prince Mohammed bin Salman's ambitious goal under the Saudi Green Initiative to reduce carbon emissions by 278 mtpa by 2030. It would of course also support Saudi Arabia's pledge to meet Paris climate goals of net zero by 2060.

ENVIRONMENTAL CONSIDERATIONS

The climate crisis is the prime suspect for the devastating scale of flooding in Pakistan earlier this year, which has killed more than 1,000 people and affected 30 million. The summer of 2022 saw severe heat waves across much of the Northern Hemisphere. Several Middle Eastern and Mediterranean countries including Saudi Arabia are projected to heat up quickly, prompting longer, more intense, and more frequent heat waves. This summer, parts of Iraq, Kuwait, Iran and Saudi Arabia hit 50°C (122°F) or higher.



Buildings (residential, commercial, and governmental) in the Kingdom consumed approximately 24 Mtoe of a total of 708.8 Mtoe of energy production and imports during 2018 (International Energy Agency (IEA), 2017). The rate of electricity intake in the residential sector was 48.1% of the total electrical energy consumption in the year 2017. That number is only projected to increase, in the coming years, 2.32 million new residential buildings are estimated to be constructed to meet the demand of the rising population in the KSA as part of Saudi 2030 Vision. The rise in population will contribute to increasing the energy consumption rate in the coming years (Alrashed and Asif, 2012).

HONEYWELL SOLUTIONS

The Kingdom's national emissions from a consumption perspective are fairly concentrated in the buildings sector, in part due to poor thermal insulation in over 70% of the existing residential buildings which in turn requires additional energy consumptions through cooling equipment.[1] To achieve controlled energy consumption in the residential sector, one of the concrete measures that can be implemented to enhance a building's cooling load effectively and promote a 'circular carbon economy' to reduce emissions, is through the accelerated adoption of a new generation of lower global warming gases such as Honeywell's breakthrough Solstice® hydrofluoroolefin (HFO) technology. Honeywell's **Solstice® HFOs are also 5-12% more energy-efficient while in use in various equipment and appliances.** Hence reducing the load on the PowerGrid while also reducing the emissions caused due to electricity production.

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5-12%

more energy-efficient while in use in various equipment and appliances.

Saudi Arabia imports close to 18KMT of HFCs into the Kingdom for new equipment and service of existing ones. Honeywell estimates that by transitioning to HFOs, Saudi Arabia can avoid 4.6% of its CO_2e emissions cumulatively from the savings through Direct and Indirect emissions.

Honeywell's low GWP gases are solutions that are ready and available now, easy to swap over to with minimal training and effort and provide substantive climate savings while improving efficiency.

1. *Almushaikah AS, Almasri RA. Evaluating the potential energy savings of residential buildings and utilizing solar energy in the middle region of Saudi Arabia – Case study. Energy Exploration & Exploitation. 2021;39(5):1457-1490.*

ECONOMIC CONSIDERATIONS

Beyond the immediate toll on humans and the environment, the economic consequences of early HFC phasedown are significant – through direct, indirect and multiplier effects. Drought and heat undermine energy production while increasing demand for electricity. The need to act now will improve long-term resilience, especially in the Saudi Arabia's rapidly evolving cities and help to bridge the gap between the full suite of solutions and immediate environmental and economic needs.

For example, Pure Harvest Smart Farms is using Honeywell Solstice® zd to control the environment and reduce carbon emissions in greenhouses in the United Arab Emirates and Saudi Arabia. Solstice zd has a GWP of less than 1, which is 99 percent below the GWP of hydrofluorocarbon (HFC) refrigerants it is designed to replace. Growing fruits and vegetables in the desert is not an easy proposition. But a new generation of farmers are using climate-controlled greenhouses to manage temperature, light, humidity, and water usage to create indoor oases where plants can thrive in ideal growing conditions. This is one of the concrete ways in which Honeywell's Solstice portfolio is reducing emissions across the food cold chain in the region. The benefits to multiplying these savings on a country wide level would be even more meaningful.

What makes the case for the accelerated transition from HFCs to HFOs even more compelling is the initiative currently under consideration between Honeywell and leading Saudi Arabian partners to establish a Honeywell Solstice® plant in Jubail, the first such facility in the GCC region. This would entail a significant investment the majority of HFO produced would support Saudi exports. This facility will also have capacity to support Saudi Arabia's demand, once Saudi Arabia starts the transition to HFOs.

CONCLUSIONS

This white paper has explored the significance of potential accelerated implementation of the Kigali Amendment, focusing on the initiatives and projects of Saudi Arabia. Adoption of Honeywell's Low GWP solutions will be a High Impact/ Low Effort solution that can help Saudi Arabia to implement such an acceleration. This can help to increase public awareness and provide critical solutions by creating a sense of responsibility towards the environment in the region and we believe the Kingdom is well poised to be a leader in this movement. Honeywell is willing to share its expertise with regulatory bodies in chalking up an accelerated transition plan.

So far, Honeywell has invested a billion dollars in research, development and new capacity for Solstice technology. Meanwhile, our teams of scientists, chemists and engineers continue to explore ways to protect the planet and meet society's needs.

For more information
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