

# HFC Phasedown Under the Montreal Protocol



Presented at the 30<sup>th</sup> Open-Ended Working Group  
of the Parties to the Montreal Protocol in Geneva,  
15-18 June 2010

Canada, Mexico and the United States of America



# Agenda

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- ❑ Overview of Trilateral Proposal
- ❑ Overview of Micronesia Proposal
- ❑ Comparisons
- ❑ Benefits
- ❑ Substitutes
- ❑ Path Forward
- ❑ HFC-23 By-Product Emissions
- ❑ Discussion

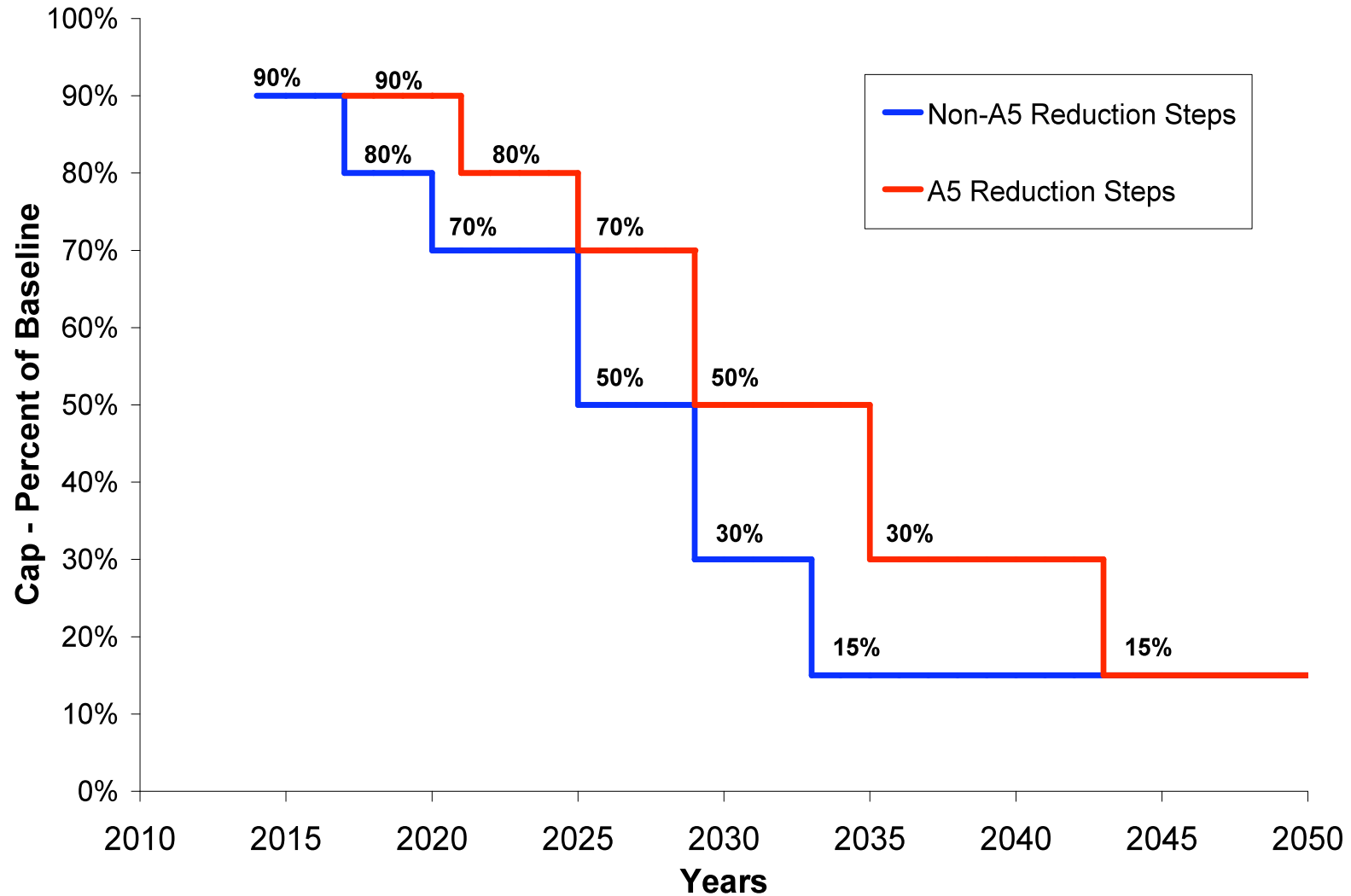


# Trilateral Amendment Proposal

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- Canada, Mexico and United States Proposal
- Similar to 2009 Proposal
  - Phased**down**, not phase**out** of HFCs
    - Phases down to 15% of baseline
  - Phasedown is GWP weighted
  - Covers 20 HFCs, including 2 known as HFOs
  - Limits by-product emissions of HFC-23
  - Leaves UNFCCC obligations unchanged
    - Supports global efforts to reduce GHGs
  - MLF eligibility for production and consumption and HFC-23 by-product reductions

# Trilateral Proposal Phasedown Schedule

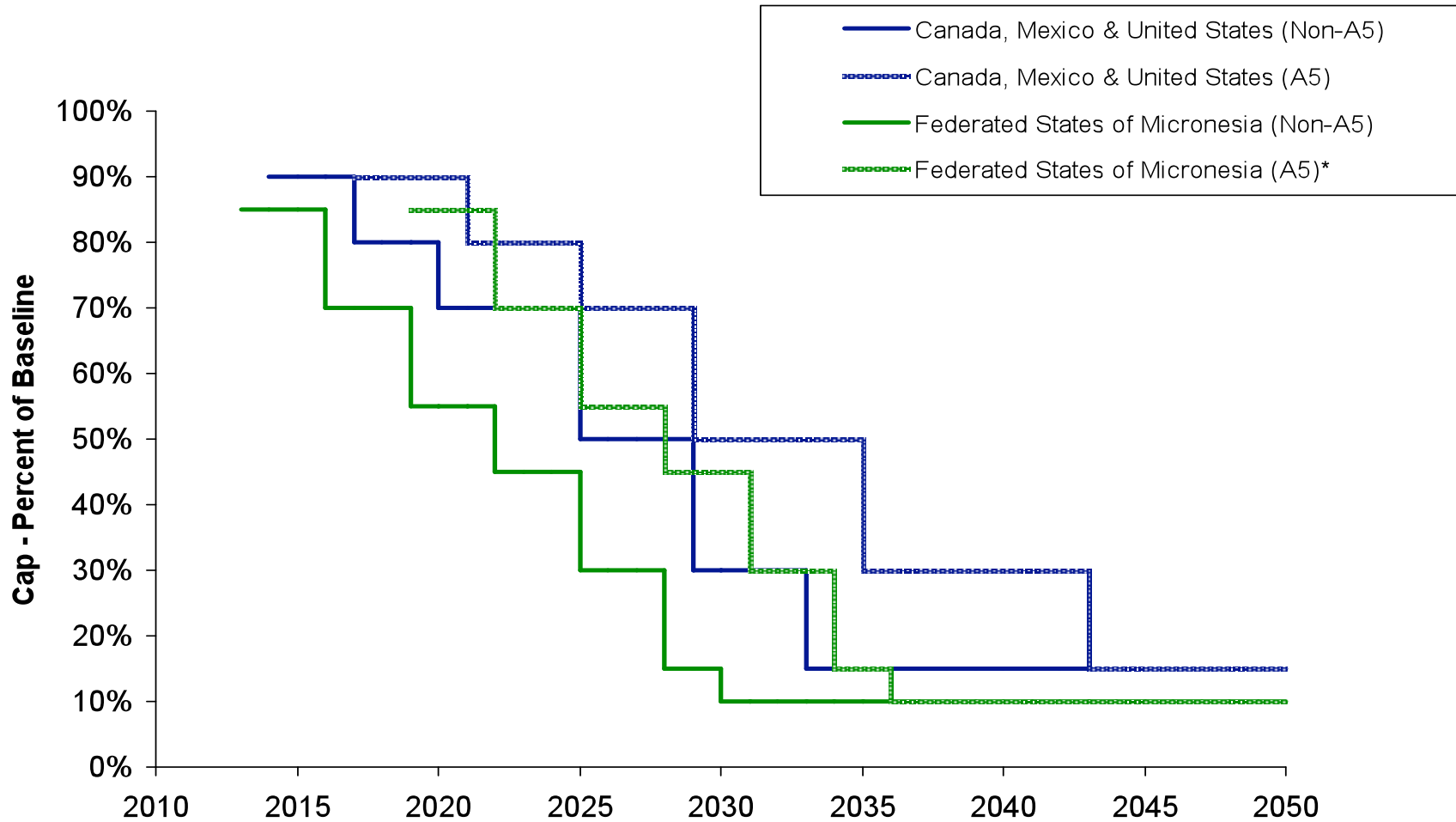


# Federated States of Micronesia HFC Amendment Proposal: Differences

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- ❑ A5 Country baseline established with different methodology
  - Article 5 – Average 2007-2009 HCFC
- ❑ Schedule differs
  - Reductions every 3 years until 2028, then plateau established in 2030
  - Plateaus at 10% of baseline
  - Includes by-product control provisions starting in 2013

# Proposed HFC Reduction Steps for Article 5 and Non-A5 Countries

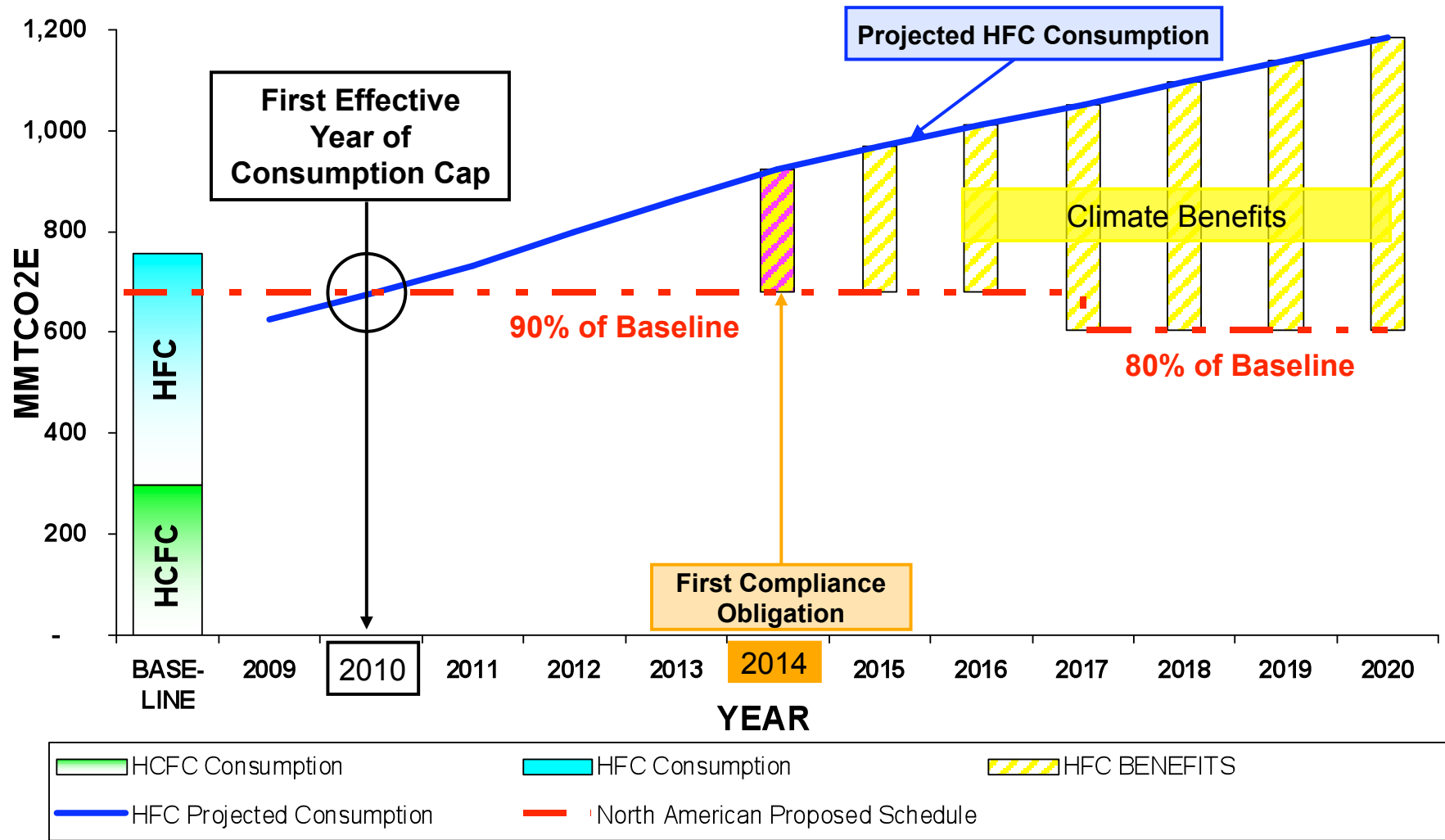


\* Baseline = Average HCFC Consumption, 2007-2009 (all others Average HCFC+HFC, 2004-

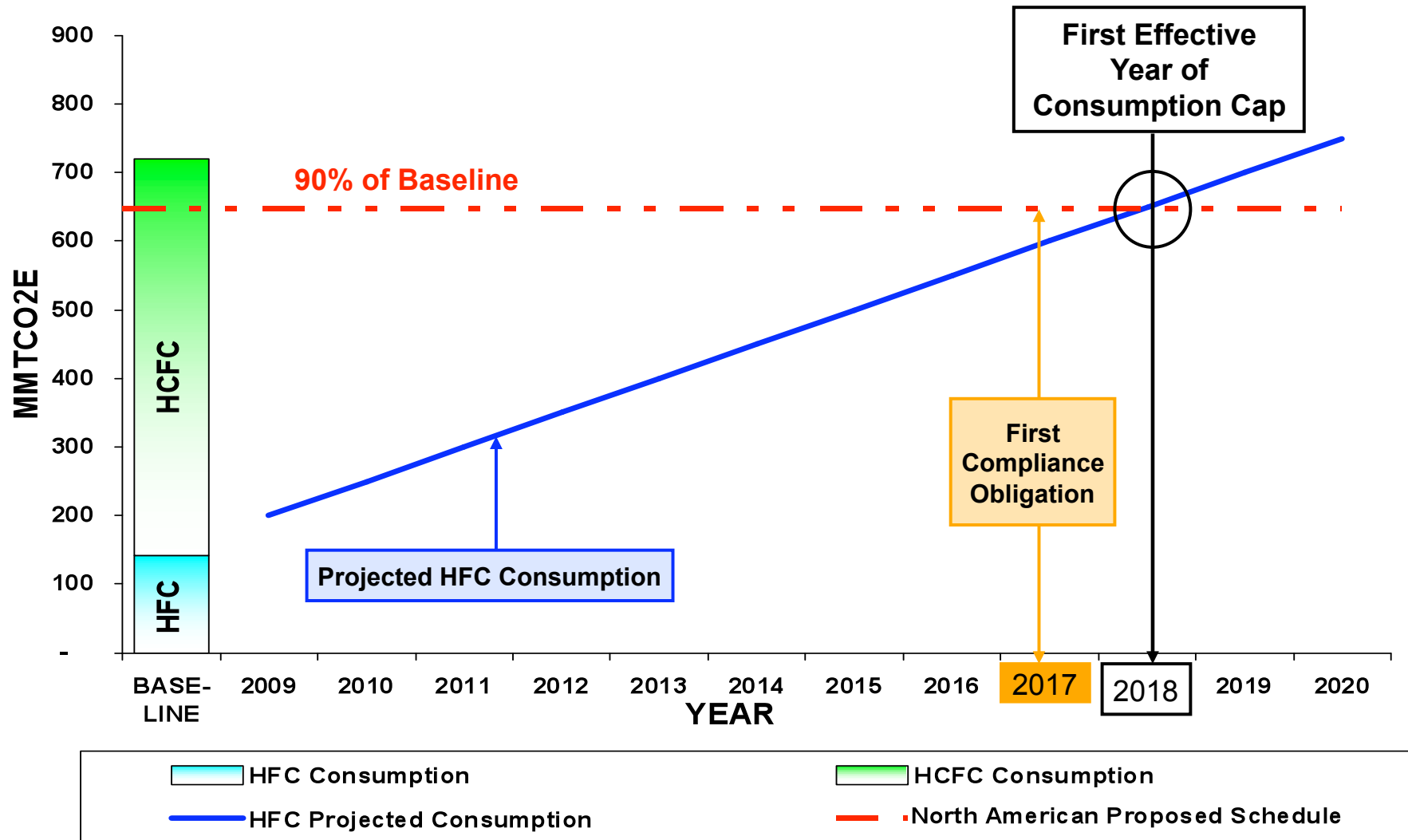
# Overview of HFC Proposals

Trilateral Proposal				Micronesia Proposal			
Non-A5 Schedule		A5 Schedule		Non-A5 Schedule		A5 Schedule	
Year	Cap	Year	Cap	Year	Cap	Year	Cap
2014	90%	2017	90%	2013	85%	2019	85%
2017	80%	2021	80%	2016	70%	2022	70%
2020	70%	2025	70%	2019	55%	2025	55%
2025	50%	2029	50%	2022	45%	2028	45%
2029	30%	2035	30%	2025	30%	2031	30%
2033	15%	2043	15%	2028	15%	2034	15%
Plateau	15%	Plateau	15%	2030	10%	2036	10%
				Plateau	10%	Plateau	10%
Non-A5 Baseline		A5 Baseline		Non-A5 Baseline		A5 Baseline	
HFC+HCFC from 2004-2006		HFC+HCFC from 2004-2006		HFC+HCFC from 2004-2006		HCFC from 2007-2009	

# Non-Article 5 Parties Estimated HFC Consumption and Benefits from Phase Down



# Estimated First Effective Year of Proposed Phase Down for Article 5 Parties



# Climate Benefits are Substantial

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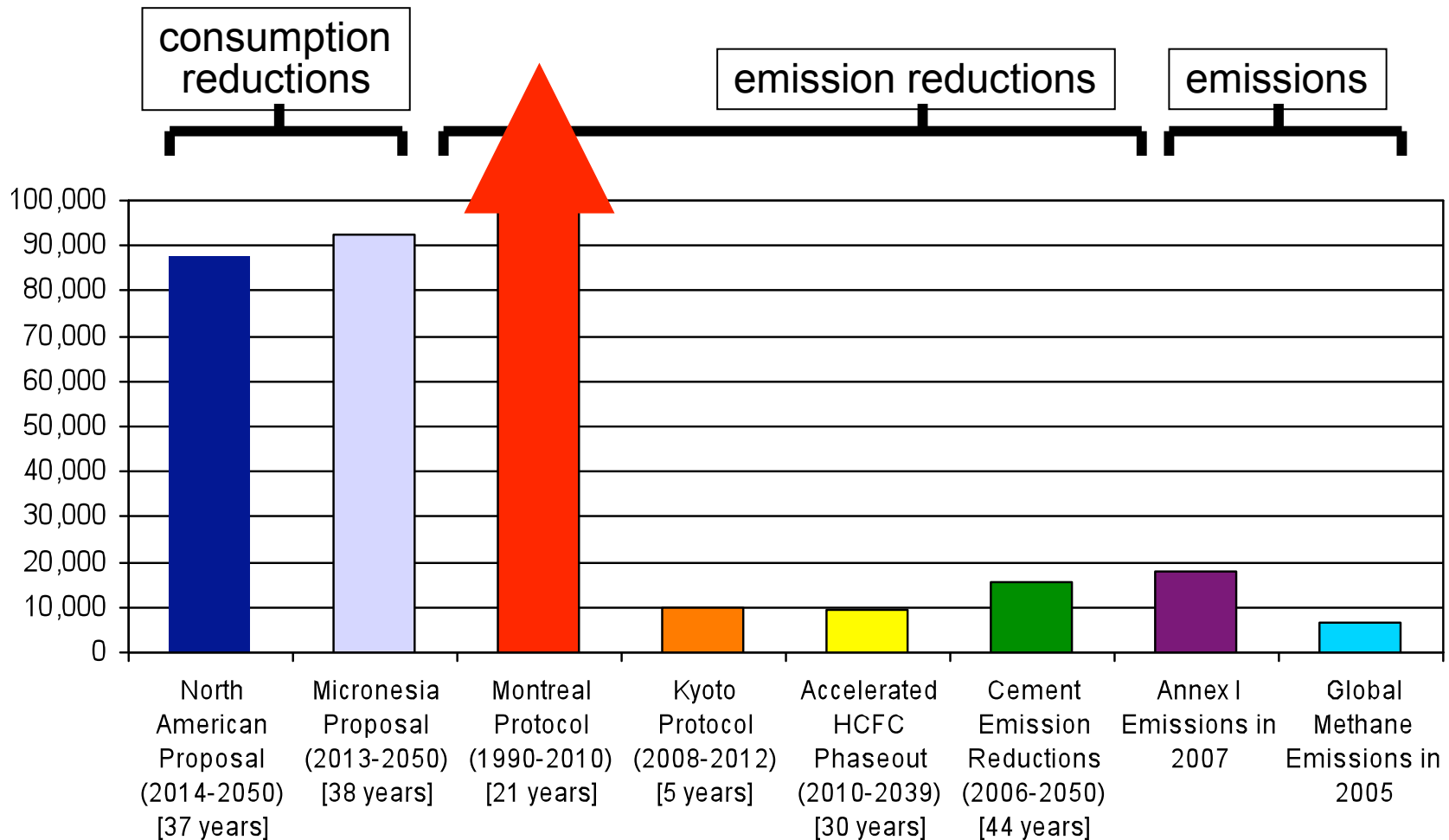
- Trilateral proposal cumulative benefits:
  - ~3,000 MMTCO<sub>2</sub>eq\* through 2020
  - ~88,000 MMTCO<sub>2</sub>eq through 2050
  
- FSM Proposal cumulative benefits:
  - ~4,000 MMTCO<sub>2</sub>eq through 2020
  - ~93,000 MMTCO<sub>2</sub>eq through 2050
  
- EPA's *Analysis of HFC Production and Consumption Controls*:
  - [http://www.epa.gov/ozone/downloads/Analysis\\_of\\_HFC\\_Production\\_and\\_Consumption\\_Controls.pdf](http://www.epa.gov/ozone/downloads/Analysis_of_HFC_Production_and_Consumption_Controls.pdf)
  - \*MtCO<sub>2</sub>eq

# Methodology For Estimating Benefits

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- ❑ Use ODS consumption data, by ODS type and end-uses
- ❑ Use ODS consumption to estimate HFC consumption multiplying by ratio for relevant year
- ❑ U.S. HFC consumption estimates from EPA model
- ❑ HFC consumption scaled by each region's GDP growth, historical/projected GDP
- ❑ Apply adjustment factors for transition pathways
- ❑ Multiply consumption by average GWP to derive GWP-weighted consumption (i.e., MMTCO<sub>2</sub>eq)

# How Do the HFC Amendment Proposals Stack Up?



# Many Substitutes Available and More on the Way

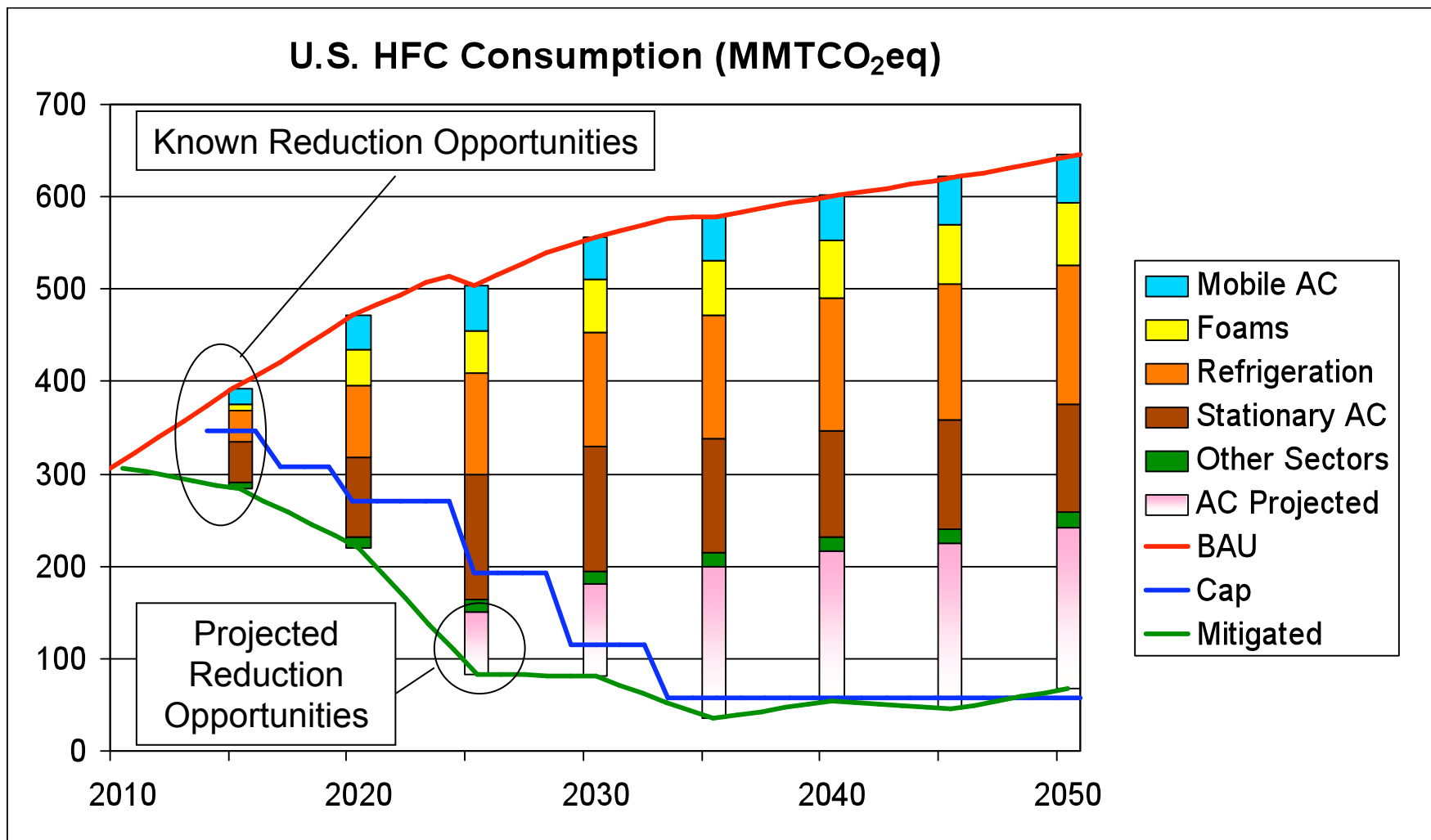
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- “The ultimate choice of technology to phase-out HCFCs will be based on ozone depletion and also climate impact, health, safety, affordability and availability, as Decision XIX/6 requires”

*May 2010 TEAP XXI/9 Task Force Report  
Assessment Of HCFCs and Environmentally Sound Alternatives*

- 2010 TEAP Progress Report
  - Substitutes for many sectors and sub-sectors available
  - Additional substitutes under development
  - Global acceptance for alternatives strengthening
  - Potential to skip higher-GWP HFC alternatives, go directly to lower GWP alternatives

# How U.S. Could Meet HFC Phasedown



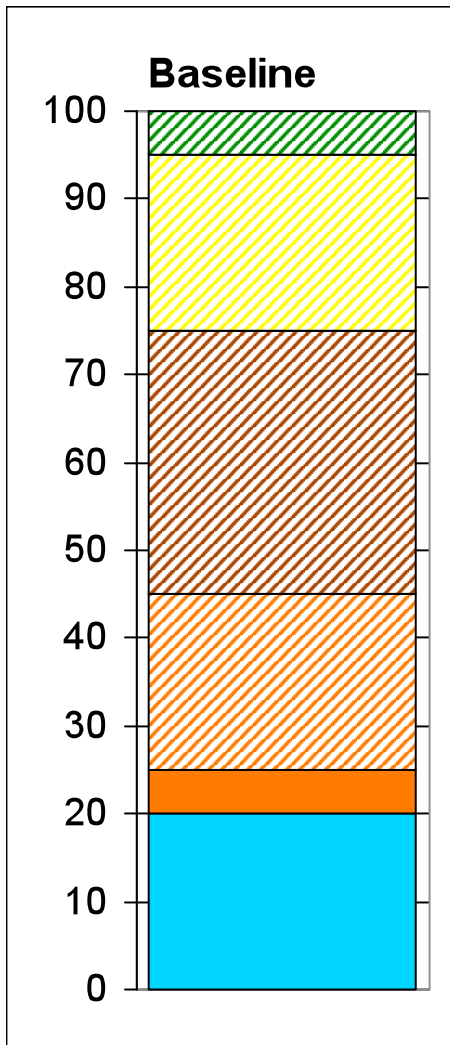
# What Substitutes will be Available?

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Sector examples:

- ❑ MVACs: very low GWP HFC-1234yf, CO<sub>2</sub>, HFC-152a
- ❑ Refrigeration:
  - domestic refrigeration - HCs
  - Retail refrigeration: secondary loop, CO<sub>2</sub>, ammonia
- ❑ Foams: HCs, water, very low GWP HFCs
- ❑ Stationary AC: micro-channel heat exchangers, Moderate GWP blends
- ❑ Non-Medical Aerosols: very low GWP HFC-1234ze
- ❑ Fire Suppression: very low GWP fluorinated ketones & Solvents: low GWP HFEs

# Country "A" Baseline



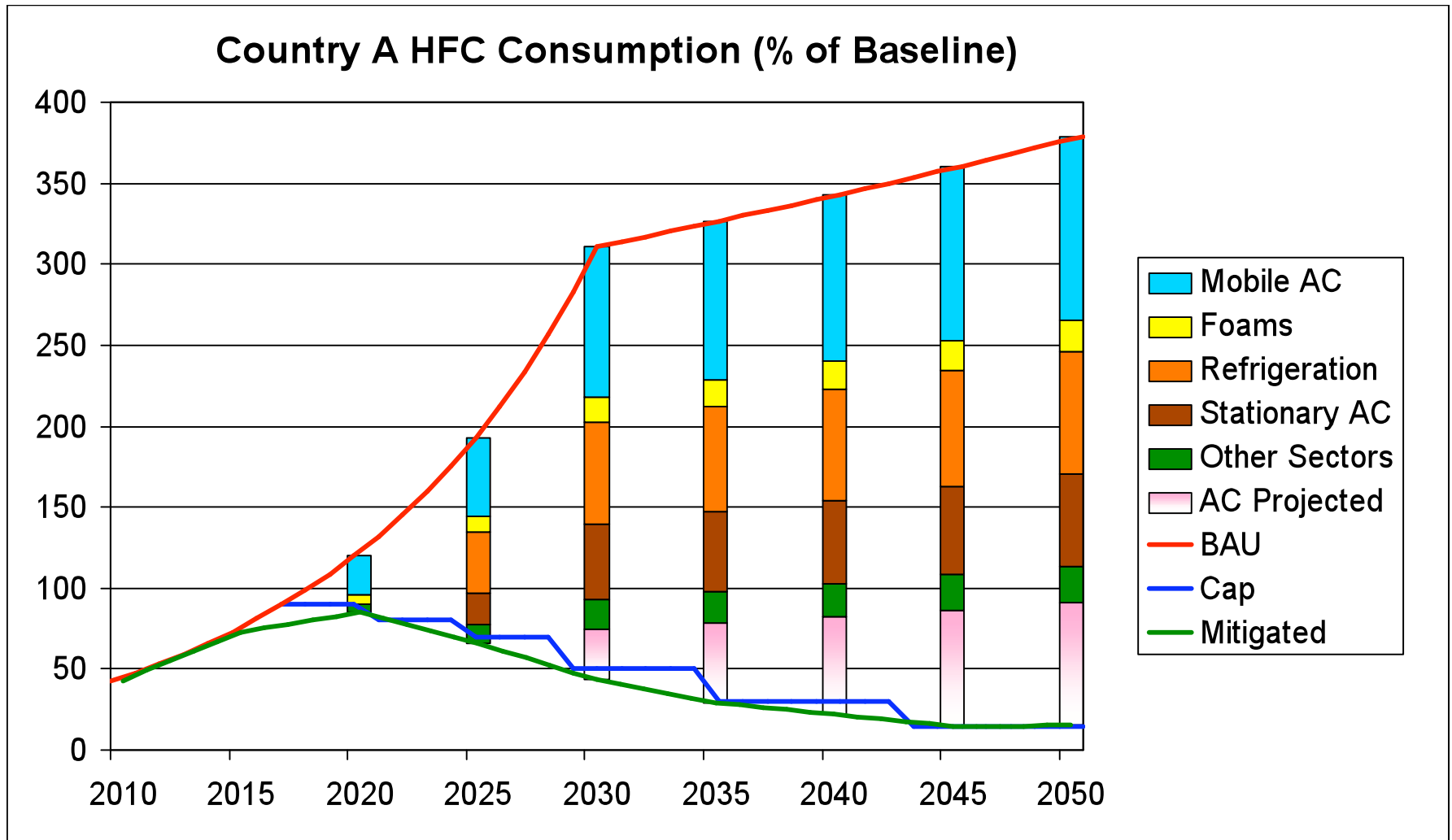
## □ Makeup

- 20% Mobile AC (HFC)
- 5% Refrigeration (HFC)
- 20% Refrigeration (HCFC)
- 30% Stationary AC (HCFC)
- 20% Foam (HCFC)
- 5% Other Sectors (HCFC)

## □ Growth Rates:

- 10% 2010-2030 (majority of HCFC phased out)
- 1% 2030-2050 (population growth)

# How Country "A" Could Meet the HFC Phasedown





# HFC-23 By-Product Controls

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- Amendment refines control of by-product emissions
  - Covers emissions from all facilities
  - Makes by-product obligations eligible for MLF funding
    - Would cover facilities *not* covered by CDM
    - Does *not* allow double payment if receive other funds

# Decision on HFC-23 By-Product Emissions

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- Recognizes HFC emissions covered by Kyoto Protocol to UNFCCC
- Requests ExCom of MLF to:
  - Update information on Article 5 HCFC-22 facilities, including whether CDM-covered
  - Develop estimates of capital and operational costs
  - Formulate Guidelines by 64<sup>th</sup> ExCom Meeting
  - Facilitate implementation of projects
- Request TEAP/SAP to:
  - Study cost and environmental benefit



## HFC-23 By-Product Emissions

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- ❑ Increases in HFC-23 global emissions attributable to increases in HCFC-22 production
- ❑ While globally HFC-23 emitted per HCFC-22 has decreased, higher emissions in Article 5 countries with facilities not covered by CDM projects (Montzka, et al)
- ❑ CDM projects cover >50% HFC-23 emissions in Article 5 countries

# Methodology for HFC-23 Benefits

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- Estimate number of facilities
  - Those covered by CDM & those not covered by CDM
- Estimate requirements for the adoption of thermal oxidation technologies
- Estimate number of facilities without thermal oxidation technologies
- Estimate unmitigated annual emissions
- Calculate benefits – based on annual emissions
- Additional Benefits from HFC-23 Mitigation:
  - **~6,000 MMTCO<sub>2</sub>eq by 2050**



# Summary

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- ❑ HFC amendment proposals provide meaningful opportunities for near-term climate benefits by allowing Parties to harmonize policies in addressing ODS substitutes
- ❑ Low GWP alternatives and proper refrigerant management are available now, with further alternatives coming on line to meet demand