

Technologies for Goal #4: Reduce Emissions of Other Gases

	NEAR-TERM	MID-TERM	LONG-TERM
Methane from Energy & Waste	<ul style="list-style-type: none"> • Bioreactor Landfill Technology • Methane to Markets • New Drilling Techniques for Recovery of Coal bed Methane • Leak Detection, Measurement, and Mitigation Technologies for Oil & Natural Gas Systems 	<ul style="list-style-type: none"> • Advanced Landfill Gas Utilization (e.g., Fuel Cells, Microturbines), Cover, and Collection Technologies • Ventilation Air Methane Technology • Advanced End-Use Technologies to Use Methane at Remote Well Sites 	<ul style="list-style-type: none"> • Integrated Waste Management System with Automated Sorting, Processing & Recycle • Automated Coal Mining to Eliminate Methane Emissions • Smart Pipes and Self-Repairing Pipelines
Methane & N₂O from Agriculture	<ul style="list-style-type: none"> • Anaerobic Digesters that Produce Heat and Electricity • Precision Agriculture • Improved Livestock Production Efficiency 	<ul style="list-style-type: none"> • Better Understand Relationship among CH₄, CO₂, N₂O, N₂ & C in Agriculture • Soil Microbial Processes • Prescription Release of Nutrients and Chemicals for Crops • Genetically Designed Forages and Bacteria to Improve Digestion Efficiency 	<ul style="list-style-type: none"> • Zero-Emission Agriculture
High GWP Gases	<ul style="list-style-type: none"> • Advanced Refrigeration Technologies (Distributed and Secondary-Loop) • Advanced Abatement, Recovery, and Recycling Technologies • Advanced Aluminum Smelting Processes to Reduce Anode Effect 	<ul style="list-style-type: none"> • Alternative Refrigeration Fluids (Non-GHG) • Substitutes for SF₆ in High-Voltage Applications and Magnesium Production • Inert Anode to Eliminate PFC Emissions in Aluminum Production 	<ul style="list-style-type: none"> • Solid-State Refrigeration/AC Systems • New Equipment and Process Designs that do not Require High-GWP Gases
N₂O from Combustion	<ul style="list-style-type: none"> • Catalytic Reduction of N₂O in Nitric Oxide Plants • Better Understand N₂O Emissions from Vehicles 	<ul style="list-style-type: none"> • Catalysts That Reduce N₂O to Elemental Nitrogen in Diesel Engines • Understand Role of N Compounds from Combustion with Soils and N₂O 	<ul style="list-style-type: none"> • Advanced Vehicles and Non-Carbon Based Fuels
Ozone Precursors & Black Carbon	<ul style="list-style-type: none"> • Particulate Matter Control Technologies for Vehicles • Reflective Roofs to Reduce Heat Island Effects • Better Understand Effects of Ozone Precursors & Black Carbon 	<ul style="list-style-type: none"> • Model Linkages Between Air Pollution and Climate Change • Jet Fuel Additives to Minimize Black Carbon and Soot 	

Figure 7-10. Technologies for Goal #4: Reduce Emissions of Other Gases

(Note: Technologies shown are representations of larger suites. With some overlap, “near-term” envisions significant technology adoption by 10–20 years from present, “mid-term” in a following period of 20–40 years, and “long-term” in a following period of 40–60 years. See also List of Acronyms and Abbreviations.)