

TABLE OF CONTENTS

Acknowledgements	1
Abstract	2
List of Tables and Figures	4
Glossary	5
Executive Summary	6
Introduction	6
Results	7
Résumé	9
Introduction	19
Résultats	10
1. Introduction	12
1.1 Halving global energy-related emissions by 2050	12
1.2 Differences with earlier studies	13
2. No Policy Case	15
3. Straight Targets	16
3.1 Setting intermediate targets	16
3.2 Halving global emissions from 2005 levels, straight targets	17
3.3 Halving global emissions from 1990 levels, straight targets	21
4. Assessing Price Caps and Price Floors	23
4.1 Half of the 2005 levels and low price caps	23
4.2 Half of the 2005 level and middle-high price caps	25
4.3 Half of the 2005 levels and high price caps	26
4.4 Price caps and price floors	27
4.5 Half the 1990 levels with price caps and price floors	29
4.6 Tighter targets, price caps and price floors	30
5. Conclusions, Caveats and Future Work	34
6. Appendix: The ACTC Model	37
6.1 Abatement Costs	37
6.2 Model structure	37
6.3 Business-as-usual emissions assumptions	37
6.4 Abatement cost functions	39
6.5 Marginal abatement curve for 2041-2050	40
6.6 Marginal abatement cost curves 2011-2020, 2021-2030, 2031- 2040	44
6.7 Correlating uncertainties	46
6.8 Discounting	46
6.9 Total costs, price caps and floors	47
6.10 Concentration levels and temperature changes	47
References	50

LIST OF TABLES

TABLE 1: PRICE CAPS AND PRICE FLOOR LEVELS	7
TABLE 2: SUMMARY RESULTS	8
TABLEAU 1: NIVEAUX DES PRIX PLAFONDS ET PLANCHERS	10
TABLEAU 2: RÉSULTATS	11
TABLE 3.1: INTERMEDIATE OBJECTIVES FOR HALVING EMISSIONS BY 2050 FROM 2005 LEVELS	17
TABLE 3.2: INTERMEDIATE OBJECTIVES FOR HALVING EMISSIONS BY 2050 FROM 1990 LEVELS	17
TABLE 3.3: MARGINAL AND TOTAL ABATEMENT COSTS TO 2050, HALVING CO ₂ FROM 2005 LEVELS	20
TABLE 3.4: MARGINAL & TOTAL ABATEMENT COSTS TO 2050, HALVING CO ₂ FROM 1990 LEVELS	21
TABLE 3.5: COSTS OF HALVING GLOBAL EMISSIONS BY 2050	22
TABLE 4.2: SUMMARY RESULTS	32
TABLE 6.1: CARBON INTENSITY VALUES	38
TABLE 6.2: SIGNIFICANT MARGINAL ABATEMENT COST VALUES FOR A 10-YEAR PERIOD	42
TABLE 6.3: MINIMAL AND MAXIMAL MAC VALUES 2041-2050	43

LIST OF FIGURES

FIGURE 2.1: WARMING COMMITTED BY 2050 IN THE NO POLICY CASE	15
FIGURE 3.1: NET PRESENT VALUE OF ABATEMENT COSTS TO 2050 (NO PRICE CAP)	18
FIGURE 3.2: TOTAL ABATEMENT COSTS TO 2050 AS A PERCENTAGE OF WORLD GROSS PRODUCT	18
FIGURE 3.3: REGRESSION COEFFICIENTS OF THE NET PRESENT VALUE OF TOTAL ABATEMENT COSTS 2011-2020	19
FIGURE 3.4: MARGINAL ABATEMENT COSTS IN THE PERIOD 2011-2020	19
FIGURE 3.5: TOTAL ABATEMENT COSTS IN THE PERIOD 2011-2020 (NO PRICE CAP)	20
FIGURE 3.6: WARMING COMMITTED BY 2050, STRAIGHT TARGETS HALF 2005 LEVELS	21
FIGURE 3.7: WARMING COMMITTED BY 2050 — STRAIGHT TARGETS HALF 1990 LEVELS	22
FIGURE 4.1: TOTAL ABATEMENT COSTS 2011-2020 WITH USD 40 PRICE CAP	23
FIGURE 4.2: ACTUAL EMISSIONS 2011-2020 WITH USD 40 PRICE CAP	24
FIGURE 4.3: ACTUAL EMISSIONS 2041-2050 WITH LOW PRICE CAPS	24
FIGURE 4.4: CO ₂ CONCENTRATION BY 2050 WITH LOW PRICE CAPS	25
FIGURE 4.5: WARMING COMMITTED BY 2050 WITH LOW PRICE CAPS	25
FIGURE 4.6: ACTUAL EMISSIONS 2011-2020 WITH MIDDLE PRICE CAP	26
FIGURE 4.7: ACTUAL EMISSIONS 2041-2050 WITH MIDDLE-HIGH PRICE CAPS	26
FIGURE 4.8: ACTUAL EMISSIONS 2041-2050 WITH HIGH PRICE CAPS	27
FIGURE 4.9: ACTUAL EMISSIONS 2011-2020 WITH USD 80 PRICE CAP AND USD 40 PRICE FLOOR	27
FIGURE 4.10: ACTUAL 2041-2050 EMISSIONS WITH PRICE CAPS AND PRICE FLOORS	28
FIGURE 4.11: WARMING COMMITTED BY 2050 WITH PRICE CAPS AND PRICE FLOORS	28
FIGURE 4.12: ACTUAL EMISSIONS 2011-2020 WITH USD 110 CAP AND USD 35 FLOOR	29
FIGURE 4.13: ACTUAL EMISSIONS 2041-2051 WITH PRICE CAPS AND PRICE FLOORS	29
FIGURE 4.14: WARMING COMMITTED BY 2050 WITH TARGET OF HALF OF 1990 LEVELS, PRICE CAPS AND FLOORS	30
FIGURE 4.15: ACTUAL EMISSIONS 2041-2050 WITH TARGET 25% 1990 LEVELS, PRICE CAPS AND FLOORS	31
FIGURE 4.16: WARMING COMMITTED BY 2050 WITH TARGET 25% OF 1990 LEVELS, PRICE CAPS AND FLOORS	31
FIGURE 6.1: BUSINESS-AS-USUAL ENERGY-RELATED CO ₂ EMISSIONS	38
FIGURE 6.2: ENERGY-RELATED AND INDUSTRIAL CO ₂ EMISSION SCENARIOS (IPCC, 2007)	39
FIGURE 6.3: ETP 2008 ABATEMENT COST CURVE BY 2050	40
FIGURE 6.4: TECHNICAL IMPROVEMENTS RECREATE CHEAP OPPORTUNITIES	41
FIGURE 6.5: MINIMAL AND MAXIMAL MAC VALUES 2041-2051	43
FIGURE 6.6: GLOBAL ECONOMIC MITIGATION POTENTIAL IN 2030 FROM BOTTOM-UP STUDIES AND TOP-DOWN STUDIES	45
FIGURE 6.7: MARGINAL ABATEMENT COST CURVES FOR THE FOUR 10-YEAR PERIODS	45
FIGURE 6.8: CLIMATE SENSITIVITY IN THE ACTC MODEL	48
FIGURE 6.9: EQUILIBRIUM CLIMATE SENSITIVITY IN THE IPCC AR4	48