



TABLE OF CONTENTS

Table of Contents

Executive Summary xii

Chapter 1 – Context, Methodology and Frameworks

1.1 Introduction 1

1.2 Canadian Clean Technology – The Complete Package: Exports, Well-Paid Employment and Strong R&D for Future Growth amid Shifting Exports Markets 3

 1.2.1 Clean Technology: Creating Strong Employment while Building Export Capacity..... 3

 1.2.2 The Shifting Landscape of Canadian Exports..... 5

1.3 Global and Domestic Context 8

 1.3.1 Positive Forces for Canadian Clean Technology: Environment Policy in China8

 1.3.2 Positive for Canadian Clean Technology Trade: Shift to Broader Environmental Policy in Bilateral and Plurilateral Tariff Negotiations9

 1.3.3 Neutral for Canadian Clean Technology Trade: Global Energy Markets continue to Restructure 13

 1.3.4 Positive for Canadian Clean Technology: Policies that Connect Innovation with Global Competitiveness..... 14

 1.3.5 Future Watch: Clean Technology and International Development..... 17

 1.3.6 Future Watch: National Energy Strategy and Canadian Clean Technology..... 19

 1.3.7 Future Watch: Climate Change Policy and Canadian Clean Technology..... 19

1.4 Rationale for Clean Technology Industry Reports..... 20

 1.4.1 Why the 2014 Report..... 20

 1.4.2 Company Definitions..... 23

 1.4.3 Methodology and Sample..... 25

1.5 Frameworks 26

 1.5.1 The Clean Technology Classification26

 1.5.2 Technology Commercialization Framework28

Chapter 2 – Global Industry Landscape

2.1 Introduction 35

2.2 Industry and Sector Revenues and Growth 38

 2.2.1 Estimated Industry Revenues 40

2.3 Industry Employment.....	46
2.3.1 Clean Technology Industry Employment.....	46
2.3.2 Clean Technology Industry Employment Growth.....	48
2.3.3 Clean Technology Industry Employment Characteristics.....	49
2.3.4 Clean Technology Industry Employment Progress to 2020 Targets.....	50
2.3.5 Clean Technology Industry Employment Progress to 2020 & 2022 Targets.....	50
2.3.6 Key Human Resource Gaps: Business Development and Sales Professionals both Domestically and Internationally.....	52
2.4 Regional Landscape.....	56
2.4.1 Regions and Sectors.....	56
2.5 Global Markets.....	59
2.5.1 Baseline for Global Markets in maintained with value estimated at \$1.1 Trillion for 2012.....	59
2.5.2 Commentary on Mid-Growth Scenario and Global Market Growth Rates (CAGRs).....	59
2.6 Measuring Canada’s Clean Technology Industry’s Progress to Becoming a Established Canadian Industry.....	64
2.6.1 Industry Revenue Projections.....	64
2.7 Exports and Export Markets of Interest.....	66
2.7.1 Canadian Clean Technology Export Revenues.....	66
2.7.2 The Potential for a Growing and Large Canadian Clean Technology Export Industry.....	69
2.7.3 2012 Canadian Clean Technology Companies Exporting by Sector.....	70
2.7.4 Canadian Clean Technology Export Countries of Interest.....	70
2.8 Research & Development and Intellectual Property.....	73
2.8.1 Canadian Clean Technology Firms were Founded to Commercialize Private Sector Originating IP.....	73
2.8.2 Clean Technology R&D or Business Expenditure on Research & Development (BERD).....	73
2.8.3 Clean Technology R&D in the Context of Other Industries.....	74
2.8.4 Clean Technology R&D Compared to Other Canadian Industries.....	76
2.8.5 Clean Technology Investment in Protecting Intellectual Property.....	77
2.9 Capital Investment.....	78

2.9.1 Debt and Equity Financing for Clean Technology Companies	80
2.9.2 Sources of Equity for Clean Technology Companies	81
2.9.3 Sources, Actual and Planned Equity Raised by Clean Technology Companies	81
2.9.4 The Role of Debt in the Financing of Canadian Clean Technology Industry Growth.....	83
2.10 Canadian Clean Technology Industry Overview.....	84
2.10.1 Global Markets and Canadian Market Share	84
2.10.2 Canadian Industry	85
2.10.3 Canadian Industry Exports and Markets.....	86
2.10.3 Canadian Industry R&D, IP Patenting, Commercialization Maturity	87
2.10.3 Canadian Industry Employment and Human Resources.....	88
2.10.6 Summary of Company Operating Ratios and Market Strategies	89

Chapter 3 – Biorefinery Products

3.1 Biorefinery Products Overview.....	95
3.2 Biorefinery Products Global Markets and Canadian Market Share.....	96
3.3 Biorefinery Products Exports and Markets.....	97
3.4 Biorefinery Products R&D, IP Patenting, Commercialization Maturity	98
3.5 Biorefinery Products Employment and Human Resources.....	99

Chapter 4 – Power Generation

4.1 Power Generation Overview.....	117
4.2 Power Generation Global Markets and Canadian Market Share	118
4.3 Power Generation Exports and Markets	119
4.4 Power Generation R&D, IP Patenting, Commercialization Maturity	120
4.5 Power Generation Employment and Human Resources.....	121

Chapter 5 – Energy Infrastructure/Smart Grid

5.1 Energy Infrastructure/Smart Grid Overview.....	161
5.2 Energy Infrastructure/Smart Grid Global Markets and Canadian Market Share.....	162
5.3 Energy Infrastructure/Smart Grid Exports and Markets	163

5.4 Energy Infrastructure/Smart Grid R&D, IP Patenting, Commercialization Maturity	164
5.5 Energy Infrastructure/Smart Grid Employment and Human Resources.....	165

Chapter 6 – Energy Efficiency/Green Buildings

6.1 Energy Efficiency/Green Buildings Overview	193
6.2 Energy Efficiency/Green Buildings Global Markets and Canadian Market Share	194
6.4 Energy Efficiency/Green Buildings Exports and Markets.....	195
6.5 Energy Efficiency/Green Buildings R&D, IP Patenting, Commercialization Maturity	196
6.6 Energy Efficiency/Green Buildings Employment and Human Resources	197

Chapter 7 – Industrial Processes & Products

7.1 Industrial Processes & Products Overview	223
7.2 Industrial Processes & Products Global Markets and Canadian Market Share	224
7.3 Industrial Processes & Products Exports and Markets	225
7.4 Industrial Processes & Products R&D, IP Patenting, Commercialization Maturity	226
7.5 Industrial Processes & Products Employment and Human Resources	227

Chapter 8 – Extractive Processes & Products

8.1 Extractive Processes & Products Overview	249
8.2 Extractive Processes & Products Global Markets and Canadian Market Share	250
8.3 Extractive Processes & Products Exports and Markets	251
8.4 Extractive Processes & Products R&D, IP Patenting, Commercialization Maturity	252
8.5 Extractive Processes & Products Employment and Human Resources	253

Chapter 9 – Recycling, Recovery & Remediation

9.1 Recycling, Recovery & Remediation Overview	267
--	-----

9.2 Recycling, Recovery & Remediation Global Markets and Canadian Market Share	268
9.3 Recycling, Recovery & Remediation Exports and Markets	269
9.4 Recycling, Recovery & Remediation R&D, IP Patenting, Commercialization Maturity	270
9.5 Recycling, Recovery & Remediation Employment and Human Resources	271

Chapter 10 – Transportation

10.1 Transportation Overview	293
10.2 Transportation Global Markets and Canadian Market Share.....	294
10.3 Transportation Exports and Markets.....	295
10.4 Transportation R&D, IP Patenting, Commercialization Maturity.....	296
10.5 Transportation Employment and Human Resources	297

Chapter 11 – Water & Wastewater

11.1 Water & Wastewater Overview.....	313
11.2 Water & Wastewater Global Markets and Canadian Market Share.....	314
11.3 Water & Wastewater Exports and Markets.....	315
11.4 Water & Wastewater R&D, IP Patenting, Commercialization Maturity	316
11.5 Water & Wastewater Employment and Human Resources.....	317

Chapter 12 – Agriculture

12.1 Agriculture Overview.....	357
12.2 Agriculture Global Markets and Canadian Market Share	358
12.3 Agriculture Exports and Markets.....	359
12.4 Agriculture R&D, IP Patenting, Commercialization Maturity	360
12.5 Agriculture Employment and Human Resources.....	361

Acknowledgements	373
-------------------------------	------------

Company Profiles.....	379
------------------------------	------------