

SPECIAL REPORTS

Low Carbon Intensity Propylene

Table of Contents

A Report by **NexantECA, the Energy and Chemical Advisory company**

Published Date: September 2023

www.nexanteca.com/subscriptions-and-reports

Contents

| | | |
|-------|----------------------------------------|-----|
| 1 | Executive Summary | 1 |
| 1.1 | Overview | 1 |
| 1.2 | Introduction | 1 |
| 1.3 | Technology Analysis | 1 |
| 1.4 | Economic Analysis | 4 |
| 1.4.1 | Renewable Feedstocks | 5 |
| 1.5 | Carbon Intensity Analysis..... | 6 |
| 1.6 | Strategic Analysis | 8 |
| 1.6.1 | Emission Baselines..... | 8 |
| 1.6.2 | Results | 9 |
| 2 | Introduction..... | 11 |
| 2.1 | Background..... | 11 |
| 2.2 | Value Chain | 11 |
| 2.3 | Conventional Propylene Technology..... | 13 |
| 3 | Technology Analysis | 15 |
| 3.1 | Introduction | 15 |
| 3.2 | Overview | 15 |
| 3.3 | Steam Cracking Decarbonization | 17 |
| 3.3.1 | Process Overview..... | 18 |
| 3.3.2 | Cracking Furnaces..... | 22 |
| 3.3.3 | Steam Cracker Feedstocks | 24 |
| 3.3.4 | Steam Cracking Renewable Naphthas..... | 26 |
| 3.3.5 | Renewable Naphtha Production | 28 |
| 3.3.6 | Electrification..... | 44 |
| 3.3.7 | Blue Hydrogen Firing | 96 |
| 3.4 | rMTP | 98 |
| 3.4.1 | Methanol Synthesis | 98 |
| 3.4.2 | Methanol to Olefins..... | 106 |
| 3.5 | rPropane Dehydrogenation..... | 109 |

| | | |
|-------|--------------------------------------------------------------------------------|-----|
| 3.5.1 | Process Chemistry and Technology Overview..... | 109 |
| 3.5.2 | Technology and Licensors | 109 |
| 3.5.3 | Renewable Propane Feedstock Switching | 115 |
| 3.6 | Metathesis | 117 |
| 3.6.1 | Chemistry | 117 |
| 3.6.2 | McDermott/Lummus Technology Olefins Conversion and Ethylene Dimerization | 119 |
| 3.6.3 | TechnipFMC and Clariant | 121 |
| 3.6.4 | Renewable Feedstock Switching | 124 |
| 3.7 | Enhanced Fluid Catalytic Cracking..... | 125 |
| 3.7.1 | Renewable Feedstock Switching | 125 |
| 3.8 | Carbon Capture | 128 |
| 3.8.1 | Carbon Capture Overview..... | 128 |
| 3.8.1 | Carbon Capture by Gas Absorption..... | 129 |
| 3.9 | Developmental Bio-Routes | 140 |
| 3.9.1 | Gevo ATH | 140 |
| 3.9.2 | Glycerine Dehydration | 142 |
| 3.9.3 | Direct Fermentation | 143 |
| 3.9.4 | Propanol Dehydration..... | 148 |
| 4 | Economic Analysis | 160 |
| 4.1 | Methodology | 160 |
| 4.1.1 | Sources | 160 |
| 4.1.2 | Costing Basis | 160 |
| 4.1.3 | Capital Cost Elements | 160 |
| 4.1.4 | Operating Cost Elements | 164 |
| 4.2 | Key Modeling Data | 167 |
| 4.2.1 | Cases Modeled..... | 167 |
| 4.2.2 | Prices | 173 |
| 4.3 | Comparative Economics | 175 |
| 4.3.1 | United States..... | 175 |
| 4.3.2 | China | 177 |
| 4.3.3 | Brazil..... | 179 |
| 4.3.4 | Western Europe..... | 181 |
| 4.4 | Cost of Production Models | 183 |
| 4.4.1 | Steam Cracking | 184 |
| 4.4.2 | MTP | 191 |
| 4.4.3 | Metathesis..... | 193 |
| 4.4.4 | PDH | 195 |
| 4.4.5 | Refinery/FCC | 197 |
| 4.4.6 | Developmental Bio-Routes..... | 199 |
| 5 | Carbon Intensity Analysis | 202 |
| 5.1 | Methodology | 202 |

| | | |
|-------|-------------------------------------------------|-----|
| 5.1.1 | Generic Nature of This Analysis..... | 202 |
| 5.1.2 | Carbon Intensity Methodology | 202 |
| 5.2 | Results | 208 |
| 5.2.1 | Overall Carbon Intensity Comparison | 208 |
| 5.2.2 | Regional Overviews | 210 |
| 6 | Strategic Analysis..... | 218 |
| 6.1 | Strategic Insights | 218 |
| 6.1.1 | High Level Insights | 218 |
| 6.2 | Carbon Intensity Reduction Value Scenarios..... | 222 |
| 6.2.1 | Emission Baselines..... | 222 |
| 6.2.2 | Results | 227 |

Appendices

| | | |
|---|------------------|-----|
| A | References | 234 |
|---|------------------|-----|

Figures

| | | |
|-----------|---------------------------------------------------------------------------------|----|
| Figure 1 | Primary Routes to Propylene | 1 |
| Figure 2 | Primary Routes to Low CI Propylene with Fossil Feedstocks..... | 2 |
| Figure 3 | Primary Routes to Low CI Propylene with Renewable Feedstock Switching..... | 2 |
| Figure 4 | Novel Routes to Low CI Propylene at Developmental Stages..... | 3 |
| Figure 5 | USGC Fossil Feedstock Comparative Economics | 4 |
| Figure 6 | USGC Renewable Feedstock Comparative Economics | 5 |
| Figure 7 | Overall Carbon Intensity of Propylene Comparison | 6 |
| Figure 8 | Overall Comparative Regional Emissions Baselines | 8 |
| Figure 9 | Propylene Value Chain..... | 12 |
| Figure 10 | Conventional Routes to Propylene | 13 |
| Figure 11 | Primary Routes to Propylene | 15 |
| Figure 12 | Primary Routes to Low CI Propylene with Fossil Feedstocks..... | 15 |
| Figure 13 | Primary Routes to Low CI Propylene with Renewable Feedstock Switching..... | 16 |
| Figure 14 | Novel Routes to Low CI Propylene at Developmental Stages..... | 16 |
| Figure 15 | Steam Cracking Process Overview | 19 |
| Figure 16 | NGL Cracking (Cracking and Compression) Simplified Process Flow Diagram..... | 20 |
| Figure 17 | NGL Cracking (Fractionation and Recovery) Simplified Process Flow Diagram | 21 |
| Figure 18 | Typical Cracking Furnace Process Flow | 23 |
| Figure 19 | Typical Dual Radiant Cell Cracking Furnace Design | 23 |
| Figure 20 | Typical HEFA Process Block Flow | 28 |
| Figure 21 | Overall HEFA Chemistry | 29 |
| Figure 22 | UOP Ecofining HVO Process Flow Diagram | 30 |
| Figure 23 | FT Process Overview | 31 |
| Figure 24 | Bio-TCat™ Process | 33 |
| Figure 25 | Pyrolysis Schematic..... | 34 |
| Figure 26 | Plastics to Liquid Fuel Recycling Process | 36 |
| Figure 27 | BIC Simplified Process | 38 |
| Figure 28 | HC-HEFA SPK Production Process..... | 39 |
| Figure 29 | REACH Technology Flow Diagram..... | 40 |

| | | |
|-----------|-------------------------------------------------------------------------------------------------------|-----|
| Figure 30 | Simplified SBI Process | 41 |
| Figure 31 | BASF and Linde's Electrically Heatable Reactor Process Flow Diagram | 50 |
| Figure 32 | Proposed Electrical Heating/Cooling Methods for Steam Cracking Processes | 52 |
| Figure 33 | Linde Roadmap to Net Zero CO ₂ Emissions in Olefin Plants | 54 |
| Figure 34 | Linde's Customized Toolbox to Net Zero CO ₂ Olefin Plants..... | 55 |
| Figure 35 | Schematic Diagram of Shell Electric Furnace | 56 |
| Figure 36 | Simplified Schematic of TOYO e-Furnace™ | 57 |
| Figure 37 | Representation of Coolbrook's RDR | 58 |
| Figure 38 | Scaled Representation of RDR in a Cracking Plant..... | 59 |
| Figure 39 | Energy Transformation Profile along RDR's Three-Blade Row Configuration..... | 59 |
| Figure 40 | Schematic Diagram of RDR | 61 |
| Figure 41 | Global Annual Renewable Generation Capacity Growth | 70 |
| Figure 42 | Typical Large-Scale Solar PV, Wind and BESS System Design and Integration | 71 |
| Figure 43 | Global Annual Growth of Installed Renewable Power Capacity | 71 |
| Figure 44 | Profile of Load Demand with Impact of Storage | 75 |
| Figure 45 | Integration of Renewable Power Supply with BESS "Across-the-Meter" | 76 |
| Figure 46 | Battery Energy Storage Systems – FTM and BTM | 77 |
| Figure 47 | Variety of BESS End-Use Applications..... | 77 |
| Figure 48 | Solar PV Energy Shifting Use Case..... | 78 |
| Figure 49 | Solar PV Firming Use Case | 78 |
| Figure 50 | Solar PV Ramp Management Use Case | 79 |
| Figure 51 | Synthetic Inertia and Fast Frequency Response Use Case | 79 |
| Figure 52 | Power and Energy Requirements for End-Use Cases..... | 82 |
| Figure 53 | Role of Policies, Regulations, and Markets in Enabling Energy Storage | 83 |
| Figure 54 | ERCOT System Needs and Scenarios | 85 |
| Figure 55 | Broad Cost Metrics for Renewable Power | 86 |
| Figure 56 | Regional Weighted-average LCOE of Offshore Wind, 2010 and 2020 | 88 |
| Figure 57 | FTM Power Grid-Related Technical Issues | 91 |
| Figure 58 | Traditional Reactor versus Electrified Reactor | 93 |
| Figure 59 | Simplified Schematic of Biogreen® Reactor..... | 94 |
| Figure 60 | Methanol to Olefins Process | 98 |
| Figure 61 | Primary Bio-based Routes to Methanol | 101 |
| Figure 62 | BioMCN Bio-Methanol Process..... | 102 |
| Figure 63 | Diagram of Enerkem's MSW to Biofuel Process | 104 |
| Figure 64 | Chemrec's Entrained Flow Gasification Reactor | 104 |
| Figure 65 | CRI's Process for the Production of Renewable Methanol | 105 |
| Figure 66 | UOP Advanced MTO Process: Reaction and Olefins Recovery | 108 |
| Figure 67 | Olefplex™ Propane Dehydrogenation Simplified Flow Diagram | 111 |
| Figure 68 | Olefplex™ Catalyst Regeneration Simplified Flow Diagram..... | 114 |
| Figure 69 | Overview of the Feedstocks, Processes and Technology Readiness Levels for Biopropane Production | 116 |
| Figure 70 | SYN Energy DMTO Process: OCT and Dimerization Section Diagram..... | 120 |
| Figure 71 | TechnipFMC/Clariant Metathesis Process Flow Diagram | 123 |
| Figure 72 | Molecular Structure of a Vegetable Oil (Example: Rapeseed Oil)..... | 125 |
| Figure 73 | Reaction Pathways for Vegetable Oil Cracking | 126 |
| Figure 74 | Amine-based Carbon Capture | 131 |

| | | |
|------------|--------------------------------------------------------------------------------------------------------------------------|-----|
| Figure 75 | Carbon Capture Integrated with Ethylene Production | 133 |
| Figure 76 | Axens DMX™ Process | 135 |
| Figure 77 | Carbonate Looping Process Schematic | 139 |
| Figure 78 | Gevo's ATH Product Slates for High Propylene Yield Case and High Isobutylene Yield Case | 141 |
| Figure 79 | Reactor Effluent Hydrocarbon Composition | 143 |
| Figure 80 | Global Bioenergies' Bio-Propylene Process Diagram | 146 |
| Figure 81 | Solventogenesis Metabolic Pathways | 150 |
| Figure 82 | Fermentation Propanol Pathway Genome Sources and Augmentations | 151 |
| Figure 83 | Plastid Augmentation | 151 |
| Figure 84 | Schematic Flowsheet of Batch Gevo Patent Application U.S./2009 0246842 A1 Fermentation Propanol Production Process | 152 |
| Figure 85 | Block Flow Diagram for the Production of Propylene from Glycerin | 155 |
| Figure 86 | Reactor Effluent Hydrocarbon Composition | 157 |
| Figure 87 | USGC Fossil Feedstock Comparative Economics | 175 |
| Figure 88 | USGC Renewable Feedstock Comparative Economics | 176 |
| Figure 89 | China Fossil Feedstock Comparative Economics | 177 |
| Figure 90 | China Renewable Feedstock Comparative Economics | 178 |
| Figure 91 | Brazil Fossil Feedstock Comparative Economics | 179 |
| Figure 92 | Brazil Renewable Feedstock Comparative Economics | 180 |
| Figure 93 | Western Europe Fossil Feedstock Comparative Economics | 181 |
| Figure 94 | Western Europe Renewable Feedstock Comparative Economics | 182 |
| Figure 95 | Definitions of Scope Emissions | 202 |
| Figure 96 | Process Carbon Balance | 203 |
| Figure 97 | Equation for Raw Material Emissions | 204 |
| Figure 98 | Equation for Utility Emissions | 206 |
| Figure 99 | Overall Carbon Intensity of Propylene Comparison | 208 |
| Figure 100 | Carbon Intensity of Propylene in the United States | 210 |
| Figure 101 | Carbon Intensity of Propylene in China | 212 |
| Figure 102 | Carbon Intensity of Propylene in Brazil | 214 |
| Figure 103 | Carbon Intensity of Propylene in Western Europe | 216 |
| Figure 104 | Overall Comparative Regional Emissions Baselines | 222 |
| Figure 105 | United States Propylene Supply by Feedstock | 223 |
| Figure 106 | China Propylene Supply by Feedstock | 224 |
| Figure 107 | Brazil Propylene Supply by Feedstock | 225 |
| Figure 108 | Western Europe Propylene Supply by Feedstock | 226 |

Tables

| | | |
|----------|---------------------------------------------------------------------------------------------------------------------------|-----|
| Table 1 | USGC Fossil Feedstock Comparative Economics | 4 |
| Table 2 | USGC Renewable Feedstock Comparative Economics | 5 |
| Table 3 | Overall Carbon Intensity of Propylene Comparison | 7 |
| Table 4 | Overall Comparative Regional Emissions Baselines | 8 |
| Table 5 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Reductions for Fossil Feedstock-Based Cases | 9 |
| Table 6 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Reductions for Renewable Feedstock-Based Cases | 9 |
| Table 7 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Carbon Value Breakeven for Fossil Feedstock-Based Cases | 10 |
| Table 8 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Carbon Value Breakeven for Renewable Feedstock-Based Cases | 10 |
| Table 9 | Licorsors and Technology Holders for Steam Cracking Routes to Olefins | 17 |
| Table 10 | Overall Cracking Yields at Moderate Severity | 28 |
| Table 11 | Plastic Feedstock Type and Pyrolysis Product Type | 34 |
| Table 12 | Pyrolysis of Mixed Plastics Waste Technology Developers | 37 |
| Table 13 | Steam Cracking Decarbonization Technology Developers | 44 |
| Table 14 | Strengths and Opportunities of Electric Crackers | 45 |
| Table 15 | Typical Industrial Applications and Their Respective Temperature Ranges | 46 |
| Table 16 | Key Configurational Differences Between Conventional Steam Cracker, Electric Cracker, and Blue Hydrogen Firing | 48 |
| Table 17 | Pyrolysis Reaction Yield Comparison Between Coolbrook Turbo-reactor and Conventional Furnaces | 62 |
| Table 18 | Technical Features and Process Condition Settings of the Model Turbo-reactor | 62 |
| Table 19 | Total Steam Cracking Capacity in Europe by COF Consortium | 63 |
| Table 20 | Process Conditions of the Shockwave Reactor | 64 |
| Table 21 | Definition of Electric Heating Methods and Application in Feed Preheating | 65 |
| Table 22 | Electrical Hazards | 68 |
| Table 23 | Description of Power Generation in Terms of Modes of Duty and Service | 73 |
| Table 24 | Influencing Technical Factors and Recommended Mitigation Measures | 90 |
| Table 25 | Temperature Range and Yield of Biogreen® | 95 |
| Table 26 | Comparison of Methane and Hydrogen Physical Properties | 96 |
| Table 27 | SABIC Hydrogen Fuel Demand for Steam Crackers | 97 |
| Table 28 | SABIC Investment Costs for Hydrogen Fuel for Steam Crackers | 97 |
| Table 29 | Technip Summary of CO ₂ Reduction Techniques | 97 |
| Table 30 | Renewable Methanol Existing Commercial Scale Capacities | 102 |
| Table 31 | Representative C ₄ Stream Compositions | 118 |
| Table 32 | Clariant MetaMax® Metathesis Catalysts | 121 |
| Table 33 | Commercial Amine-Based Absorption Process | 132 |
| Table 34 | Gas Adsorption Processes for Post-Combustion CO ₂ Capture | 136 |
| Table 35 | Membrane Separation Processes for Post-Combustion CO ₂ Capture | 138 |
| Table 36 | Fermentation Propanol Patent Matrix | 148 |

| | | |
|----------|--------------------------------------------------------------------------------------------------------------|-----|
| Table 37 | Material Balance: Glycerin to Propylene Process | 156 |
| Table 38 | Key Assumptions in Developing and Estimating COPs for Electric Crackers..... | 171 |
| Table 39 | Assumed Renewable Power Prices (Onshore Wind)..... | 172 |
| Table 40 | Raw Materials Prices..... | 173 |
| Table 41 | Byproduct Prices..... | 174 |
| Table 42 | Utility Prices | 174 |
| Table 43 | USGC Fossil Feedstock Comparative Economics | 175 |
| Table 44 | USGC Renewable Feedstock Comparative Economics | 176 |
| Table 45 | China Fossil Feedstock Comparative Economics | 177 |
| Table 46 | China Renewable Feedstock Comparative Economics | 178 |
| Table 47 | Brazil Fossil Feedstock Comparative Economics | 179 |
| Table 48 | Brazil Renewable Feedstock Comparative Economics..... | 180 |
| Table 49 | Western Europe Fossil Feedstock Comparative Economics | 181 |
| Table 50 | Western Europe Renewable Feedstock Comparative Economics..... | 182 |
| Table 51 | Cost of Production Estimate for Propylene and Ethylene via Fossil Naphtha Steam Cracking..... | 184 |
| Table 52 | Cost of Production Estimate for Propylene and Ethylene via HVO Naphtha Steam Cracking..... | 185 |
| Table 53 | Cost of Production Estimate for Propylene and Ethylene via FT Naphtha Steam Cracking..... | 186 |
| Table 54 | Cost of Production Estimate for Propylene and Ethylene via ATJ Naphtha Steam Cracking..... | 187 |
| Table 55 | Cost of Production Estimate for Propylene and Ethylene via Fossil Naphtha eCracking..... | 188 |
| Table 56 | Cost of Production Estimate for Propylene and Ethylene via Blue Hydrogen Fired Fossil Naphtha Cracking | 189 |
| Table 57 | Cost of Production Estimate for Propylene and Ethylene via Fossil Naphtha Cracking with CCS..... | 190 |
| Table 58 | Cost of Production Estimate for Propylene via Conventional MTP | 191 |
| Table 59 | Cost of Production Estimate for Propylene via MTP with Renewable Methanol..... | 192 |
| Table 60 | Cost of Production Estimate for Propylene via Conventional Metathesis | 193 |
| Table 61 | Cost of Production Estimate for Propylene via Ethanol-Based Metathesis | 194 |
| Table 62 | Cost of Production Estimate for Propylene via Conventional PDH | 195 |
| Table 63 | Cost of Production Estimate for Propylene via PDH of Renewable Propane | 196 |
| Table 64 | Cost of Production Estimate for Propylene via Conventional FCC | 197 |
| Table 65 | Cost of Production Estimate for Propylene via Enhanced FCC of Vegetable Oils | 198 |
| Table 66 | Cost of Production Estimate for Propylene via Gevo ATH | 199 |
| Table 67 | Cost of Production Estimate for Propylene via Glycerine Dehydration | 200 |
| Table 68 | Cost of Production Estimate for Propylene via Direct Fermentation | 201 |
| Table 69 | Carbon Intensity of Steam Cracker Raw Materials | 204 |
| Table 70 | Carbon Intensity of Methanol Raw Materials..... | 205 |
| Table 71 | Carbon Intensity of Ethanol Raw Materials | 205 |
| Table 72 | Utility Emission Factors for all Regions | 206 |
| Table 73 | Grid Energy Mix across all Regions | 207 |

| | | |
|-----------|--------------------------------------------------------------------------------------------------------------------------|-----|
| Table 74 | Overall Carbon Intensity of Propylene Comparison | 209 |
| Table 75 | Carbon Intensity of Propylene in the US | 211 |
| Table 76 | Carbon Intensity of Propylene in China | 213 |
| Table 77 | Carbon Intensity of Propylene in Brazil | 215 |
| Table 78 | Carbon Intensity of Propylene in Brazil | 217 |
| Table 79 | SWOT Analysis of Carbon Capture for Propylene Production | 218 |
| Table 80 | SWOT Analysis of Carbon Capture for Propylene Production | 218 |
| Table 81 | SWOT Analysis of Electrification for Propylene Production | 219 |
| Table 82 | SWOT Analysis of Renewable Methanol for Propylene Production..... | 219 |
| Table 83 | SWOT Analysis of Renewable Naphthas for Propylene Production | 220 |
| Table 84 | SWOT Analysis of Metathesis for Propylene Production | 220 |
| Table 85 | SWOT Analysis of PDH for Propylene Production | 221 |
| Table 86 | SWOT Analysis of FCC for Propylene Production | 221 |
| Table 87 | SWOT Analysis of Developmental Bio-Routes for Propylene Production..... | 221 |
| Table 88 | Overall Comparative Regional Emissions Baselines | 222 |
| Table 89 | United States Baseline Propylene Carbon Intensity..... | 223 |
| Table 90 | China Baseline Propylene Carbon Intensity | 224 |
| Table 91 | Brazil Baseline Ethylene Carbon Intensity | 225 |
| Table 92 | Western Europe Baseline Ethylene Carbon Intensity | 226 |
| Table 93 | Scope 1 Emission Reductions for Fossil Feedstock-Based Cases..... | 227 |
| Table 94 | Scope 1 Emission Reductions for Renewable Feedstock-Based Cases | 227 |
| Table 95 | Scope 1 Emission Carbon Value Breakeven for Fossil Feedstock-Based Cases | 228 |
| Table 96 | Scope 1 Emission Carbon Value Breakeven for Renewable Feedstock-Based Cases..... | 228 |
| Table 97 | Scope 1+2 Emissions (Process Emissions) Reductions for Fossil Feedstock-Based Cases..... | 229 |
| Table 98 | Scope 1+2 Emissions (Process Emissions) Reductions for Renewable Feedstock-Based Cases | 229 |
| Table 99 | Scope 1+2 Emissions (Process Emissions) Carbon Value Breakeven for Fossil Feedstock-Based Cases | 230 |
| Table 100 | Scope 1+2 Emissions (Process Emissions) Carbon Value Breakeven for Renewable Feedstock-Based Cases | 230 |
| Table 101 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Reductions for Fossil Feedstock-Based Cases | 231 |
| Table 102 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Reductions for Renewable Feedstock-Based Cases | 231 |
| Table 103 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Carbon Value Breakeven for Fossil Feedstock-Based Cases | 232 |
| Table 104 | Scope 1+2+3 Emissions (Plant-Gate Value Chain Emissions) Carbon Value Breakeven for Renewable Feedstock-Based Cases..... | 232 |



SPECIAL REPORTS

The NexantECA Subscriptions and Report program is recognized globally as the industry standard source for information relevant to the chemical process and refining industries. Special reports are available as a subscription program or on a single report basis.

Contact Details:

Americas:

Steven Slome, Principal
Phone: +1-914-609-0379, e-mail: sslome@NexantECA.com

Erica Hill, Client Services Coordinator, Subscriptions and Reports
Phone: +1-914-609-0386, e-mail: ehill@NexantECA.com

EMEA:

Anna Ibbotson, Vice President, Sales and Marketing
Phone: +44-207-950-1528, aibbotson@NexantECA.com

Asia:

Chommanad Thammanayakatip, Managing Consultant
Phone: +66-2793-4606, email: chommanadt@NexantECA.com

NexantECA Subscriptions and Reports provide clients with comprehensive analytics, forecasts and insights for the chemicals, polymers, energy and cleantech industries. Using a combination of business and technical expertise, with deep and broad understanding of markets, technologies and economics, NexantECA provides solutions that our clients have relied upon for over 50 years.

Copyright © 2000-2023. NexantECA (BVI) Limited. All rights reserved