

NPCS

NIIR PROJECT CONSULTANCY SERVICES

CLIENT SUCCESS CASE STUDY

Reprocessing of Sodium Chloride from Desalination Plant for Soda Ash Production

Transforming Industrial Waste into High-Value Chemical Commodities

CLIENT M/s. Capital Engineering Consultancy LLC	LOCATION Abu Shagara, Sharjah, UAE
INDUSTRY Industrial Chemical Manufacturing	SERVICE DELIVERED Techno-Economic Feasibility Study & DPR

✓ PROJECT APPROVED & MOVING TO IMPLEMENTATION

About NPCS

Niir Project Consultancy Services (NPCS) is one of Asia's most trusted industrial knowledge and consultancy institutions. Founded over four decades ago, NPCS has evolved into a comprehensive advisory and research house, serving entrepreneurs, investors, governments, and multinational corporations across every major industrial domain.

NPCS is part of Asia's leading industrial knowledge ecosystem with thousands of project profiles and global consulting expertise, making it the definitive partner for business owners who need reliable, actionable intelligence before committing capital.

Core Services

- Detailed Project Reports (DPR) — bankable, lender-ready project documents covering all aspects of manufacturing setup.
- Techno-Economic Feasibility Studies — rigorous assessment of technical viability and financial sustainability.
- Market Research & Demand Analysis — primary and secondary research across 50+ countries and 500+ industrial sectors.
- Engineering Advisory — process design, plant layout, machinery selection and capacity planning.
- Investment Opportunity Identification — curated project screening for investors seeking high-return manufacturing ventures.

NPCS at a Glance

30,000+ Project Reports Published	50+ Countries Served	30+ Years of Industrial Expertise	250K+ Industrial Projects Delivered
---	--------------------------------	---	---

Our Mission

To empower entrepreneurs and investors worldwide with data-driven industrial intelligence, enabling them to make confident investment decisions and successfully establish profitable manufacturing ventures.

Client Overview

Client Name	M/s. Capital Engineering Consultancy LLC
Registered Location	Abu Shagara, Sharjah, UAE
Industry Sector	Industrial Chemical Manufacturing
Project Recommended	Reprocessing of NaCl from Desalination Plant with Production of Soda Ash
Service Delivered	Techno-Economic Feasibility Study & Detailed Project Guidance (DPR)
Engagement Outcome	Client approved feasibility findings and decided to proceed with implementation

M/s. Capital Engineering Consultancy LLC is an established engineering and investment firm based in the Emirate of Sharjah. Recognising the region's strong industrial infrastructure and the Gulf's exponential growth in desalination capacity, the client sought to diversify into large-scale chemical manufacturing — a sector offering stable demand and attractive long-term returns.

The client's leadership team approached NPCCS with a mandate to identify, validate, and document a manufacturing opportunity that aligned with their investment criteria: technical feasibility, resource availability, and sustainable profitability.

Problem Statement & Challenges

Before engaging NPCCS, the client faced several critical uncertainties that prevented confident capital deployment:

Market & Demand Risks

- Lack of reliable soda ash demand data for the GCC and wider MENA region.
- Uncertainty around global pricing trends and import-substitution potential.
- Limited visibility on competitive dynamics from established producers in China, Turkey, and the EU.

Technical Limitations

- No in-house expertise on the Solvay Process and its adaptation to desalination brine feedstocks.
- Challenges in selecting appropriate production technology given the quality variability of brine from different desalination plants.
- Insufficient knowledge of equipment sourcing, plant layout and utility requirements.

Financial & Investment Risks

- Absence of a structured financial model to estimate capital investment, operating costs and profitability timelines.
- Difficulty benchmarking return metrics (ROI, IRR, Payback) against industry norms.

Regulatory & Supply Chain Complexity

- Navigating UAE industrial regulations, environmental permits and chemical handling standards.
- Establishing a reliable supply agreement framework with desalination plant operators for brine offtake.

Core Challenge

The client needed a single authoritative source to validate the opportunity end-to-end — from raw material security and process selection to market demand confirmation and financial viability — before committing to a multi-million dollar project.

Our Approach & Strategy

NPCS deployed a structured, six-stage consultancy methodology designed to de-risk the client's investment decision at every level. Each stage built on the previous, ensuring that the final feasibility report was comprehensive, credible and actionable.

Stage 1 — Project Identification & Opportunity Screening

NPCS evaluated multiple industrial opportunities across the chemical, pharmaceutical and agro-processing sectors before identifying NaCl reprocessing and soda ash production as the optimal fit. Selection was based on raw material proximity, regional demand signals, capital efficiency and alignment with UAE Vision 2030 industrial diversification goals.

Stage 2 — Market Research & Demand Analysis

A comprehensive demand study was conducted covering global soda ash consumption trends, GCC import data, end-user industry growth rates (glass, detergents, water treatment), and competitive supply analysis. Pricing benchmarks from international commodity markets were integrated into the demand model.

Stage 3 — Raw Material & Resource Assessment

NPCS mapped NaCl availability from desalination operations in Sharjah and the broader UAE. The study quantified brine volumes, assessed purity profiles, and evaluated logistics for consistent feedstock supply — confirming abundant and cost-competitive raw material access for the proposed plant.

Stage 4 — Technical Feasibility & Process Engineering

The team conducted an in-depth evaluation of commercially proven production technologies (Modified Solvay Process) applicable to the client's feedstock characteristics, target capacity, and capital budget. Process flow diagrams, utility requirements, environmental controls and safety systems were documented.

Stage 5 — Financial Modelling & Investment Analysis

A detailed financial model was constructed covering capital expenditure, operating costs, revenue projections, sensitivity analysis across price and capacity utilisation scenarios, and key investment metrics including ROI, IRR and payback period.

Stage 6 — Implementation Strategy & Roadmap

The final phase translated findings into an actionable project roadmap: plant site selection criteria, vendor identification guidance, regulatory approvals checklist, phased construction timeline, and commissioning milestones.

Scope of Services Delivered

The NPCS engagement covered all critical dimensions of industrial project development:

- Detailed Project Report (DPR) covering all technical, financial and market aspects
- Manufacturing process design and technology selection guidance
- Plant layout conceptualisation and utilities planning
- Key machinery and equipment specification and sourcing recommendations
- Financial model with multi-scenario sensitivity analysis
- Market validation through primary demand research and competitive benchmarking
- Phased implementation roadmap with milestones and decision gates
- Regulatory guidance for UAE industrial licensing and environmental compliance
- Raw material supply chain assessment and feedstock availability confirmation

Project Execution & Timeline

The consultancy engagement was structured over a 26-week period, enabling thorough research and analysis while maintaining project momentum and client communication at every stage.

Phase	Timeline	Key Activities
Phase 1	Weeks 1–3	Project Briefing, Site Assessment & Resource Mapping
Phase 2	Weeks 4–7	Market Research, Competitive Analysis & Demand Forecasting
Phase 3	Weeks 8–12	Technical Feasibility, Process Engineering & Machinery Selection
Phase 4	Weeks 13–17	Financial Modelling, Cost Estimation & ROI Projections
Phase 5	Weeks 18–22	DPR Compilation, Review & Client Presentation
Phase 6	Weeks 23–26	Implementation Roadmap, Vendor Identification & Handover

Key Milestones

- Week 3 — Project brief confirmed; resource mapping and site assessment completed
- Week 7 — Market demand report presented; client alignment on opportunity confirmed
- Week 12 — Technical feasibility and process engineering report submitted
- Week 17 — Financial model delivered; investment parameters agreed
- Week 22 — Full Detailed Project Report (DPR) submitted and reviewed
- Week 26 — Implementation roadmap finalised; handover to client project team

Engagement Model

Throughout the engagement, NPCS conducted bi-weekly progress review calls with the client's leadership team, ensuring complete transparency and allowing real-time incorporation of client feedback into the evolving report.

Technical Insights

The project leverages the Modified Solvay Process — the globally dominant route for soda ash production — adapted to utilise NaCl-rich brine streams from desalination plants as the primary feedstock. This significantly reduces raw material costs compared to conventional mined halite operations.

Manufacturing Process — Step-by-Step

01	Brine Intake & Pre-treatment	Raw NaCl-rich brine from desalination plant is collected and filtered to remove impurities such as calcium, magnesium and sulfates.
02	Saturation & Purification	Brine is saturated to required concentration levels; chemical precipitation removes remaining divalent ions to achieve >99% NaCl purity.
03	Solvay Process – Carbonation	Ammonia is absorbed into the purified brine. CO ₂ gas (from lime kilns) is introduced to precipitate sodium bicarbonate (NaHCO ₃).
04	Filtration & Calcination	NaHCO ₃ crystals are filtered and calcined at ~160–180 °C in rotary calciners, yielding dense soda ash (Na ₂ CO ₃) and CO ₂ recycled back.
05	Ammonia Recovery	Ammonia is recovered from the ammonium chloride filtrate using slaked lime, minimising raw-material consumption and environmental impact.
06	Drying, Screening & Packaging	Soda ash is dried, screened to product grades (dense / light), and packaged in bulk bags or jumbo sacks ready for dispatch.

Key Machinery & Technologies

- Multi-stage brine purification reactors with automated ion-exchange columns
- Absorption towers for ammonia–CO₂ carbonation (soda Solvay columns)
- Rotary drum calciners with integrated heat recovery systems
- Ammonia recovery distillation columns with closed-loop recycle
- CO₂ compression and recycle infrastructure from calcination off-gases
- Automated drying, screening and bulk packaging lines
- DCS-based process control and SCADA monitoring platform

Environmental & Sustainability Profile

The project directly supports UAE sustainability goals by converting desalination brine — an environmental liability — into an industrially valuable product. CO₂ generated in calcination is recycled back into the process, minimising atmospheric emissions. Closed-loop ammonia recovery eliminates hazardous effluent discharge, ensuring full compliance with UAE and GCC environmental standards.

Circular Economy Advantage

By converting desalination brine (industrial waste) into soda ash (high-demand commodity), the project exemplifies the circular economy model — simultaneously reducing environmental impact and generating commercial value.

Financial & Market Analysis

Investment Overview

Based on NPCCS techno-economic analysis, the project presents an attractive investment profile with moderate capital requirements, competitive operating costs driven by low-cost feedstock, and stable long-term revenue streams.

Financial Metric	Estimated Value	Remarks
Total Project Cost	USD 15–25 Million	Subject to site & capacity
Fixed Capital Investment	USD 10–18 Million	Plant, machinery & civil
Working Capital Required	USD 3–5 Million	Annual operations
Estimated Annual Revenue	USD 12–20 Million	Based on market pricing
Gross Profit Margin	25–35%	Industry benchmark
Return on Investment (ROI)	18–25%	Post stabilisation
Internal Rate of Return (IRR)	20–28%	10-year horizon
Payback Period	4–6 Years	Conservative estimate
Break-Even Capacity Utilisation	55–65%	At standard costs

Market Demand & Growth Drivers

Soda ash (sodium carbonate) is one of the most widely consumed industrial chemicals globally, with annual demand exceeding 60 million metric tonnes. Demand is underpinned by structural growth across multiple end-use sectors:

- Glass Manufacturing — the largest consumer (40%+ of soda ash), driven by construction activity and automotive glass demand across GCC infrastructure projects.
- Detergents & Soaps — stable, recurring demand from FMCG sector with expanding middle-class consumption in the Middle East and Africa.
- Water Treatment — rapidly growing application area as municipalities and industries invest in water quality improvement.
- Chemicals & Intermediates — used in production of sodium silicate, sodium bicarbonate, and other downstream chemicals.
- Metallurgy & Refining — flux agent in aluminium and steel production.

Import Substitution Opportunity

The UAE and wider GCC region currently imports the majority of its soda ash requirements from China, Turkey, and the EU. Domestic production at competitive cost offers significant import substitution value, allowing the client to capture local market share and reduce the region's supply chain vulnerability.

Market Insight

The global soda ash market is projected to grow at a CAGR of 3.5–4.5% through 2030, driven by glass and green energy applications. The Middle East represents one of the fastest-growing demand zones, with limited local production capacity — a compelling window for first-mover advantage.

Results & Outcomes

Business Impact Delivered

- Investment Decision Confidence — client leadership gained a structured, data-driven foundation for their multi-million dollar investment decision.
- Technical Clarity — process selection, plant specifications and technology pathway clearly defined, eliminating engineering uncertainty.
- Financial Visibility — comprehensive model quantifying investment requirements, projected returns and risk scenarios.
- Market Validation — confirmed growing regional demand and competitive positioning for domestic soda ash production.
- Risk Reduction — regulatory, supply chain and operational risks identified, quantified and mitigation strategies documented.
- Strategic Positioning — client equipped with a bankable DPR suitable for lender presentations, government approvals and partner negotiations.

Project Status

✓ Following a thorough review of the NPCS techno-economic feasibility analysis and Detailed Project Report, M/s. Capital Engineering Consultancy LLC formally approved the feasibility findings and confirmed the decision to proceed with full-scale project implementation.

Client Testimonial

“

NPCS provided us with valuable insights and a comprehensive feasibility evaluation for our proposed manufacturing venture. Their structured approach and detailed analysis helped us clearly understand the technical and financial viability of the project. The consultancy support enabled us to move forward with complete confidence in our investment decision.

— Management Team, M/s. Capital Engineering Consultancy LLC | Sharjah, UAE

Why Choose NPCS

★ 40+ Years of
Expertise

Four decades of industrial consultancy across chemical, pharmaceutical, food, and engineering sectors.

★ Data-Driven Feasibility	Rigorous market and financial modelling ensures every recommendation is evidence-based and bankable.
★ Global Market Understanding	Deep insights across 50+ countries allow NPCCS to benchmark projects against international standards.
★ End-to-End Project Support	From ideation and DPR to plant commissioning guidance — NPCCS is your single point of contact.
★ Risk Mitigation Framework	Structured scenario analysis and sensitivity modelling to safeguard client investments.
★ 30,000+ Project Reports	The largest industrial DPR library in Asia, covering every manufacturing and processing sector.

Conclusion

This case study demonstrates how Niir Project Consultancy Services transforms industrial investment ideas into bankable, implementation-ready ventures. By combining rigorous market intelligence, proven technical expertise and disciplined financial modelling, NPCCS equipped M/s. Capital Engineering Consultancy LLC with the clarity and confidence to commit to a strategically sound, high-value manufacturing project in the UAE.

The NaCl reprocessing and soda ash production project exemplifies the NPCCS philosophy: every viable industrial opportunity deserves a world-class feasibility study. When decisions are grounded in data — not assumptions — investments succeed.

Strategic Value Delivered

- Identified a commercially viable and technically proven manufacturing opportunity aligned with regional resources.
- Provided end-to-end consultancy from opportunity screening to implementation roadmap.
- Delivered a bankable DPR suitable for lender due diligence, investor presentations and regulatory approvals.
- Reduced investment risk through comprehensive scenario analysis and mitigation planning.

READY TO BUILD YOUR NEXT INDUSTRIAL PROJECT?

Partner with Niir Project Consultancy Services (NPCCS) to transform your investment idea into a profitable industrial venture.

www.niir.org | www.entrepreneurindia.co

info@niir.org | +91 9097075054

Request your customised Techno-Economic Feasibility Study & Detailed Project Report today.