Crane Peak Shaving Prototype – Cost Estimate

Prototype scope: Industrial crane current peak shaving using a hybrid storage system (4× supercapacitor modules + 2× LFP battery modules) connected to a common DC bus via bidirectional DC/DC converters.

Executive Summary

Objective: Limit grid current peaks and voltage dips caused by crane starts (~250 A for ~200 ms) while maintaining grid current close to site limits.

Selected architecture: 4× supercapacitor modules in series (high power, fast response) 2× 48 V LFP battery modules in parallel (energy support and supercap refill) 2× bidirectional DC/DC converters (supercap branch + battery branch) **Estimated total prototype cost: Lean / minimum viable:** ~€53,000 **Typical realistic build:** ~€75,000 – €105,000 **High / industrial grade build:** up to ~€150,000 **Main cost drivers:** Supercapacitor bidirectional DC/DC converter (high peak power) HV DC safety and protection hardware Cabinet integration, copper, and commissioning

Detailed Cost Breakdown

A) Supercapacitor Subsystem

Component	Low (€)	High (€)
4× Supercapacitor modules	13,500	16,000
Busbars, cabling, mounting, fuses	1,500	4,000
Monitoring / balancing	500	2,500
Subtotal – Supercapacitors	15,500	20,500

B) Battery Subsystem

Component	Low (€)	High (€)
2× LFP battery modules	1,300	1,500
Rack, DC disconnect, fuses	600	2,000
Subtotal – Batteries	1,900	3,500

C) Bidirectional DC/DC Converters

Component	Low (€)	High (€)
Supercap DC/DC (peak power)	15,000	50,000
Battery DC/DC	6,000	25,000
Subtotal – DC/DC	21,000	75,000

D) Safety & Protection

Component	Low (€)	High (€)
Contactors, DC disconnects,	1,200	6,000
Pre charge, DC fuses	1,000	5,000
Insulation Monitoring Device	800	3,500
Grounding, SPD, thermal sensors	700	3,500
Subtotal – Safety	3,700	18,000

E) Control & Monitoring

Component	Low (€)	High (€)
PLC / controller	500	4,000
Current & voltage sensors	800	4,000
HMI, logging, communication	800	5,500
Subtotal – Controls	2,100	13,500

F) Cabinet & Integration

Component	Low (€)	High (€)
Cabinet & mounting	1,500	8,000
Busbars & HV cabling	1,500	7,000
Cooling	700	6,000
Assembly & commissioning	5,000	25,000
Subtotal - Integration	8,700	46,000

G) Total Cost Summary

Category	Low (€)	High (€)
Total Prototype Cost	≈53,000	≈150,000

All prices are indicative estimates, excluding VAT unless stated. Final costs depend on selected suppliers, voltage levels, power ratings, cooling method, and certification scope.