

19 FOOD PROCESSING · PROCESS HEAT WITHOUT LPG

# ₱180,000 a month back in your pocket. *From day one.*

For Philippine food & beverage processors — juice, sauce, dairy CIP, brewery, cannery, ready-to-eat. The LPG steam boiler that feeds your blanchers, your CIP, your pasteuriser — swapped for one Karnot iHEAT R290 cascade. One bill, financed by the bank, paid out of the saving. 78% off the process-heat line, no flame on site.

MODELLED · MID-SIZE PH FOOD PROCESSOR · 150,000 KWH/YR USEFUL PROCESS HEAT

**₱180K**

**In your pocket every month**

Net of the green-loan payment · from day one

**< 6 mo**

**Cash payback**

Kit pays for itself before the loan's first interest-only quarter ends

**78%**

**Off your process-heat cost**

₱17/kWh useful LPG steam → ₱2.50/kWh delivered from a heat pump

**You pay nothing up front. *The bank does.***

DBP, LandBank and BPI all run **green-loan programmes** built for exactly this kind of project — **~6.5–8% p.a., 5–10 year terms, 70–80% LTV**. The monthly LPG saving is larger than the monthly loan payment. Net result: **cash flow goes UP from day one**. After the loan is paid in year 5, you keep 100% of the saving for the remaining ten years of asset life. Karnot files the loan application as part of project scope — **plus BOI Pioneer status and Income Tax Holiday under RA 11285**. You don't fight the bank alone.

— WHY YOUR STEAM LINE IS WRONG

# Your blancher wants heat. The CIP wants heat. *You buy it all from LPG, every kWh.*

Most Philippine food processors run an LPG (or diesel) steam boiler 24/7 to deliver process heat to blanchers, sterilisers, CIP loops, pasteurisers, evaporators and packing lines. Once you net out boiler efficiency, line losses and the real LPG price, useful process heat at the point of use costs about **₱17 per kWh delivered**. A heat pump *moves heat from the air around the plant* into your process loop at **₱2.50 per kWh delivered** — same duty, no combustion, no flue, no flame inspection.



### LPG steam is a peso-per-kWh bill that only goes up

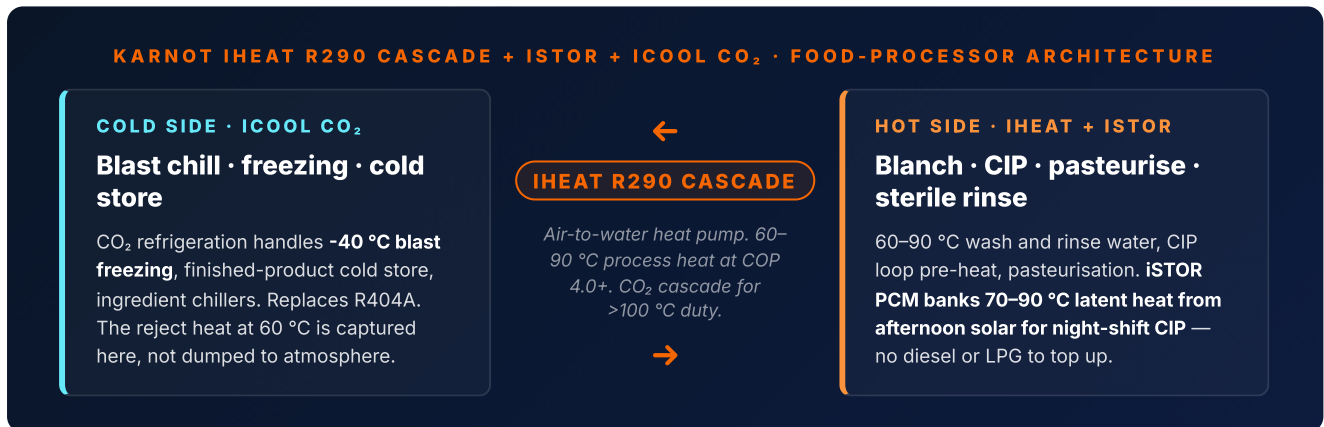
LPG in PH has climbed **~40% since 2020**. Net out 82% boiler efficiency, ~5% steam-line losses, condensate that never returns, and useful heat at the process is **~₱17/kWh**. Most CFOs cost their process heat as the boiler fuel bill divided by tonnes shipped — the real number per useful kWh is higher than they think.



### A flame, a flue, a DENR file, an insurance loading

An LPG boiler room means a permit, a continuous combustion risk, a periodic DENR inspection, a flue-gas record, and an insurance loading on your plant licence. **Karnot iHEAT R290 sits outdoors** with a sealed refrigerant charge under 5 kg per unit — no flame, no flue, no inspection, no boiler-room maintenance schedule.

— ONE CLOSED LOOP · HEAT PUMP + THERMAL STORAGE



— THE FOUR BOXES · ONE PROJECT

<p><b>Karnot iHEAT R290</b>  <b>9.5–105 kW · cascade</b>                  Air-to-water heat pump. 60–90 °C delivery at <b>COP 4.0+</b>. R290 natural refrigerant (GWP 3). Direct replacement for LPG/diesel steam for sub-100 °C duty — blanching, pasteurisation, CIP, sterile rinse. Outdoor, sealed, no boiler room.</p>	<p><b>iCOOL CO<sub>2</sub></b>  <b>10–500 kW · R744 cascade</b>                  CO<sub>2</sub> (R744) refrigeration cascade. <b>-40 °C cold to 90 °C hot in one machine</b>. Process cooling, blast chill, finished-product cold store. Reject heat captured at 60 °C, not vented. GWP 1, A1 safety. No R404A phasedown clock.</p>	<p><b>iSTOR PCM</b>  <b>100 kWh–2 MWh latent</b>                  Phase-change thermal battery at 70–90 °C. <b>Banks afternoon solar as hot CIP water</b> for night-shift cleaning — no LPG top-up. Non-lithium, fire-safe, FLX coconut PCM under development.</p>	<p><b>iVOLT Solar</b>  <b>Zero-export · load-matched</b>                  Behind-the-meter rooftop PV plus LiFePO<sub>4</sub> battery, sized at <b>~117% of the iHEAT + iCOOL electrical demand</b>. No export, no Meralco net-metering paperwork. Daytime solar runs the heat pumps directly; surplus charges the iSTOR thermal battery.</p>
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— WHAT YOU STOP PAYING

# Mid-size PH food processor — *LPG boiler retired, iHEAT R290 cascade installed.*

ANNUAL FIGURE · 150,000 KWH/YR USEFUL PROCESS HEAT	TODAY · LPG STEAM BOILER	KARNOT iHEAT R290 CASCADE	YOU STOP PAYING
Cost per kWh useful (delivered to process)	~₱17/kWh	~₱2.50/kWh	<b>6.8x better per peso</b>
System efficiency	82% boiler × 95% steam line	COP 4.0 annualised	<b>5x better at the meter</b>
Refrigerant / combustion	Scope 1 LPG · ~750 tCO <sub>2</sub> e/yr	R290 · GWP 3 · natural	<b>Scope 1 → zero</b>
Annual energy cost · process heat only	~₱2,550,000	~₱375,000	<b>-78% / ~₱2.175M</b>
<b>Total investment (VAT-inc)</b>	<b>(already paid)</b>	<b>~₱2,500,000 (iHEAT 50kW cascade + iSTOR + Permits)</b>	<b>&lt; 6 mo cash payback</b>

*Modelled · mid-size PH food processor · 150,000 kWh/yr useful process heat at the point of use (juice concentrate plant, sauce factory, dairy CIP — representative). LPG baseline ₱85/kg, 13.6 kWh/kg gross, 82% boiler efficiency, 95% steam-line + condensate loss = ₱17/kWh useful. iHEAT R290 cascade 50 kW, COP 4.0 annualised on Meralco GP ₱14/kWh including 3-phase premium = ₱2.50/kWh delivered after thermal-store losses. CAPEX includes iHEAT 50 kW + 500 kWh iSTOR PCM buffer + controls + Permits-Managed Service. NPV ~₱19M at 8%, lifetime saving ~₱33M over 15 years. Excludes iVOLT solar (cuts OPEX 30–50% further) and iCOOL CO<sub>2</sub> refrigeration (separate scope). Your plant might be smaller (50,000 kWh/yr, divide everything by 3) or much larger (500,000 kWh/yr, multiply by 3.3) — the per-kWh economics hold.*

— THE CASH FLOW · PLAIN AND DULL

<p><b>MONTH 1</b></p> <p><b>₱180K</b></p> <p>Saving on the bill <b>minus</b> the green-loan payment. Net cash in pocket. Every month. From day one.</p>	<p><b>YEAR 1</b></p> <p><b>₱2.16M</b></p> <p>In your pocket while the loan is being repaid. The kit pays for itself in cash terms before the end of month 5.</p>	<p><b>YEAR 5</b></p> <p><b>₱10.8M</b></p> <p>Loan paid off. From now on you keep <b>every peso</b> of the ₱2.175M annual saving — with no LPG price-risk exposure.</p>	<p><b>YEAR 15</b></p> <p><b>₱32.6M</b></p> <p>Total cash retained over the 15-year asset life vs running the existing LPG steam boiler. The hidden bill you stopped paying.</p>
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## — HOW YOU PAY FOR IT · YOU DON'T

## Three banks already lend for this. *Karnot files the paperwork.*

### Philippine green-loan programmes *built for exactly this project*

#### DBP · SEFP

##### Sustainable Energy Finance Programme

Agri-industrial priority (food & beverage qualifies) · 70–80% LTV · 5–10 year terms  
· ~6.5–8% p.a.

#### LANDBANK · SEILP

##### Sustainable Energy Investment Loan

Path of least resistance if you already bank with LandBank · ~7% p.a.

#### BPI · SDF

##### Sustainable Development Finance

Fastest decisions for established SMEs with BPI relationships · ~1–1.5% below standard SME rate

These are **loans**, not grants. They are real green-discounted commercial loans, with payment schedules sized to fit on top of the monthly LPG savings. **Karnot files the application as part of project scope — plus the BOI Pioneer registration paperwork and the RA 11285 Income Tax Holiday filing.** You sign at the bank window, not before.

## — WHY WE SIZE THE SOLAR TO NOT EXPORT

#### ZERO-EXPORT · SIZED TO THE HEAT-PUMP LOAD

### Meralco buys back at ₱6. They sell to you at ₱14. *Exporting kills the maths.*

Food plants run continuous shifts and have generous flat roofs — perfect for behind-the-meter solar sized to the iHEAT + iCOOL electrical demand. If you put a generic 100 kWp on the roof and let the surplus export, you sell at the Bilateral Generation Contract rate (~₱6/kWh) and buy back at retail (~₱14/kWh). **You lose 60% on every kWh you exported.** Karnot iVOLT is sized at **~117% of the heat-pump electrical demand** so the solar runs the heat pumps directly during day shifts, charges the iSTOR PCM thermal battery for night-shift CIP, and exports essentially nothing. **No Meralco net-metering paperwork, no export losses, no surprise bill from a wrong tariff classification.**

**“Food processors are the most under-served retrofit market in the country. Every plant runs an LPG boiler 24/7 to feed CIP and blanchers, every plant pays ~₱17 per useful kWh of steam, every CFO costs the line as “boiler fuel ÷ tonnes shipped” and misses the real number. We bolt an iHEAT R290 cascade onto the CIP and blanch loop, decommission the boiler, and the process-heat line drops by 78%. Less than 6-month cash payback. ₱180K a month in your pocket from day one. Juice, sauce, dairy, brewery, cannery, ready-to-eat — same maths. The only question is when you want it to start.”**

Stuart Cox · Founder & CEO · Karnot Energy Solutions Inc.