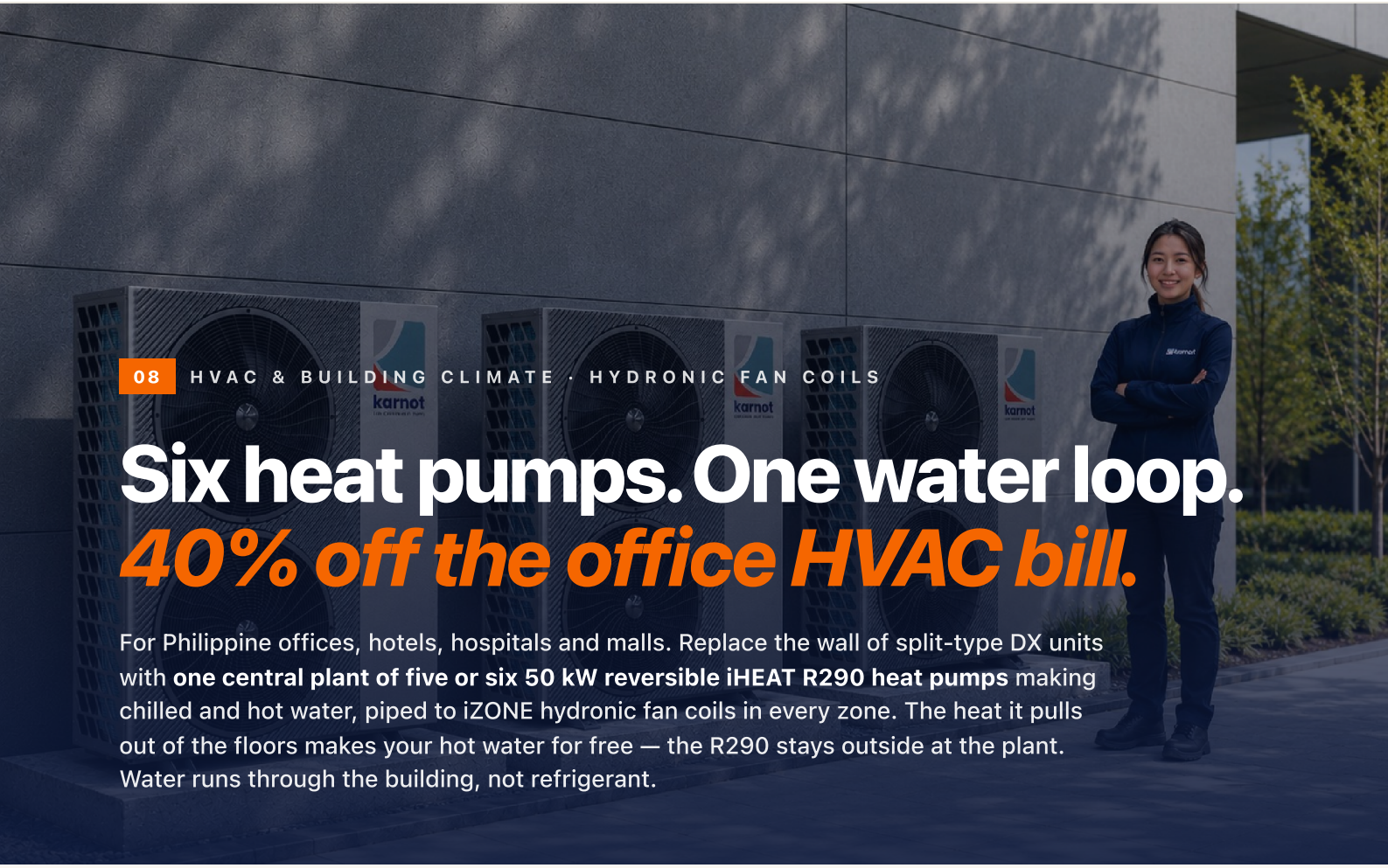

08 HVAC & BUILDING CLIMATE · HYDRONIC FAN COILS

Six heat pumps. One water loop. *40% off the office HVAC bill.*

For Philippine offices, hotels, hospitals and malls. Replace the wall of split-type DX units with **one central plant of five or six 50 kW reversible iHEAT R290 heat pumps** making chilled and hot water, piped to iZONE hydronic fan coils in every zone. The heat it pulls out of the floors makes your hot water for free — the R290 stays outside at the plant. Water runs through the building, not refrigerant.

MODELLED 3,000 M² PHILIPPINE OFFICE · 5–6 × 50 KW CENTRAL PLANT VS SPLIT DX

−40%

Off the HVAC + DHW bill

COP 4.5 vs ~3 · cooling heat recovered as free hot water

₱1.4M

Saved every year

3,000 m² office · ~₱3.6M/yr today → ~₱2.2M/yr

0

F-gas in the occupied building

R290 sealed at the outdoor plant only · GWP 3 vs R410A's 2,088 · water in the walls

On a new build, you were going to spend on VRF anyway. *Spend it on water.*

VRF and central R290 hydronic cost **roughly the same to install** on a new office or major refurbishment — both need indoor units and distribution. But the Karnot plant runs **~40% cheaper**, keeps the refrigerant outside, and recovers the cooling heat as free hot water. The **incremental** cost over VRF pays back in months; DBP, LandBank and BPI green loans (~6.5–8% p.a.) and a **BOI Income Tax Holiday under RA 11285** cover it. Karnot files the loan, the BOI paperwork and the permits.

WHY A SPLIT UNIT IN EVERY ROOM IS THE EXPENSIVE WAY

A split unit in every room is a *refrigerant leak in every room.*

A typical Philippine office runs **dozens of split-type DX units** — or a VRF system piping R410A through the ceiling of every occupied space. Each runs at **COP ~3**, leaks 5–10% of its F-gas charge a year, throws its waste heat onto the roof, and fails on its own schedule. One central plant of 50 kW heat pumps making water does the same job at **COP 4.5**, recovers the heat, and keeps the refrigerant outside.

VRF pumps R410A through the ceiling of every room

VRF runs **R410A (GWP 2,088)** in long pipe runs through occupied offices — a leak risk over every desk and a growing Scope 1 liability on the Kigali phase-down clock. Karnot keeps **R290 sealed at the outdoor plant** and circulates only water indoors. No F-gas in the building, nothing to leak over your staff.

A hundred small compressors at COP 3 — and a peak you pay for

Split units run at **COP ~3**, each short-cycling against its own room; the building's sharp morning cool-down builds a 15-minute demand peak that is a charge in itself. **One modular R290 plant at COP 4.5** stages units to match load, recovers the cooling heat as hot water, and lets iSAVE pre-cool storage to shave the peak.

ONE CENTRAL PLANT · CHILLED WATER OUT, HOT WATER BACK

KARNOT IHEAT R290 + IZONE PLATFORM · 5–6 × 50 KW · UP TO ~300 KW, N+1

COLD SIDE · WHAT THE OFFICE NEEDS

Chilled water · iZONE fan coils

7 °C chilled water piped to quiet iZONE fan coils in open-plan floors, meeting rooms and lobbies — ceiling cassette, concealed, exposed or floor-standing. Per-zone control; water, not refrigerant, in the occupied space.

← IHEAT R290 ×5–6 + IZONE →

One reversible R290 plant makes both. In 4-pipe, the cooling heat makes the hot water.

HOT SIDE · THE FREE BY-PRODUCT

DHW · 4-pipe reheat

45–60 °C hot water for pantries, toilets and end-of-trip showers — recovered from the heat the building is already rejecting. Plus reheat on the dehumidification coil. iSTOR buffers it; nothing wasted off the roof.

THE FOUR BOXES · ONE PROJECT

iHEAT R290 · 50 kW

Reversible · COP 4.5 · ~300 kW

Five or six 50 kW modules on one water loop, staging to load with **N+1 redundancy**. 7 °C chilled + 45–60 °C hot. Sealed R290 charge per module, EN 378, GWP 3.

iZONE fan coils

Cassette · concealed · exposed · floor

A fan coil for every space, 2-pipe or 4-pipe, per-zone control. **Water in the building, not refrigerant** — quiet, precise, decades of life.

iSAVE

BMS + M&V + peak shave

Zone-by-zone control plus **demand-peak shaving** on the air-conditioning load — the biggest controllable line on an office bill. Monthly IPMVP M&V to owner and lender.

iVOLT + iSTOR

Zero-export solar + buffer

Office cooling is **entirely daytime — a perfect solar match**. iVOLT runs the plant on midday sun; iSTOR banks chilled water for the afternoon peak. Another 30–50% off.

WHAT A SPLIT BUILDING PAYS TODAY · WHAT IT PAYS AFTER

3,000 m² office. *One plant instead of fifty split units.*

ANNUAL FIGURE · 3,000 M² OFFICE	TODAY · SPLIT DX / VRF	KARNOT CENTRAL R290 HYDRONIC	YOU STOP PAYING
Cooling electricity	COP ~3 · R410A	COP 4.5 · R290	**~₱0.8M/yr**
Hot water / DHW	Separate electric heaters	0 · recovered from cooling	**~₱0.2M/yr**
Demand charge (morning peak)	Unmanaged 15-min peak	iSAVE pre-cool + shave	**~₱0.4M/yr**
Refrigerant in occupied spaces	R410A GWP 2,088 · leaks 5–10%/yr	R290 GWP 3 · plant only	**Scope 1 + leak liability**
Total HVAC + DHW bill	**~₱3.6M/yr**	**~₱2.2M/yr**	**–40% / ~₱1.4M/yr**

*Basis: 3,000 m² Philippine office on split DX or VRF at COP ~3 with separate electric DHW, Meralco GP ₱14/kWh, daytime occupancy. Central plant of 5–6 × 50 kW reversible iHEAT R290 modules (up to ~300 kW, N+1) at COP 4.5 with 4-pipe heat recovery to DHW and iSAVE demand-peak control. CAPEX **comparable to a VRF install on a new build or major refurbishment**, where the distribution goes in anyway — incremental payback under a year. A full retrofit pays back on running cost in ~5–6 years. Excludes iVOLT solar (further 30–50% off).*

THE RUNNING SAVING · PLAIN AND DULL

PER YEAR
₱1.4M
Off the combined HVAC + DHW bill — a **40% cut**, every year, with the cooling heat recovered as free hot water.

NEW BUILD
<1 yr
Incremental payback. The plant costs **about the same as VRF**; the small extra pays back in months.

YEAR 5
₱7M
Cumulative saving. The demand shaving and the daytime solar match keep compounding it.

YEAR 15
₱21M
Total retained over the plant's life vs running split DX and replacing it twice — before solar.

THE NEW-BUILD MATHS · HYDRONIC VS VRF

Indoor units go in on any new build. *The only question is water or refrigerant.*

VRF and central R290 hydronic cost **roughly the same to install** — both need indoor units and distribution. But VRF runs **R410A through every ceiling at COP 3 with no heat recovery**, while the Karnot plant runs **R290 at COP 4.5, recovers the cooling heat as free hot water, and keeps the refrigerant outside**. Same capital line, 40% lower running cost, a morning peak shaved by iSAVE, and a plant with no F-gas phase-down date on it. The incremental payback against the VRF you would have bought is close to **immediate.**

HOW YOU PAY FOR IT · YOU DON'T, THE BANK DOES

Three banks. One BOI Income Tax Holiday. *Karnot files everything.*

Philippine green-loan programmes *built for building CAPEX*

DBP · SEFP

Sustainable Energy Finance Programme

Energy-efficiency priority for commercial real estate. 70–80% LTV · 5–10 yr · **~6.5–8% p.a.**

LANDBANK · SEILP

Sustainable Energy Investment Loan

Strong fit for **offices, hospitals, schools and hospitality** already banking with LandBank · **~7% p.a.**

BPI · SDF

Sustainable Development Finance

Fastest decisions for established developers and building owners · **~1–1.5% below SME rate**

On a new build the running-cost saving covers the loan payment with cash to spare. Plus **BOI Pioneer Income Tax Holiday under RA 11285** for qualifying green developments. Karnot files **the loan, the BOI registration, the building permits and the monthly IPMVP M&V report your lender wants** as part of project scope.

WHY R290 HYDRONIC · THE REFRIGERANT ANGLE

Propane outside. Water inside. *No F-gas over the desk.*

Split DX and VRF run **R410A (GWP 2,088) or R32 (GWP 675)** — F-gas refrigerants on the Kigali phase-down clock, piped through the occupied office where any leak is both a Scope 1 emission and an indoor-air event. Karnot runs **R290 (propane, GWP 3)** sealed at the outdoor plant in a small charge per module under EN 378, and circulates only **water** through the building. Nothing in the asset register with a phase-down date; nothing to leak over a desk; SEC PFRS S2 Scope 1 from refrigerant goes to near zero, audit-grade from iSAVE.

> **"The default for a new Philippine office is VRF — refrigerant pumped through the ceiling of every room, running at a COP of three, throwing its heat onto the roof. For about the same money you can put in five or six fifty-kilowatt propane heat pumps making chilled and hot water, pipe water to the floors instead of refrigerant, and recover the cooling heat as free hot water. Forty per cent cheaper to run, no F-gas over the desks, and a plant with no phase-down date. On a new build the maths is not subtle."**
>
> **Stuart Cox · Founder & CEO · Karnot Energy Solutions Inc.**