TAQEEF
تكييف

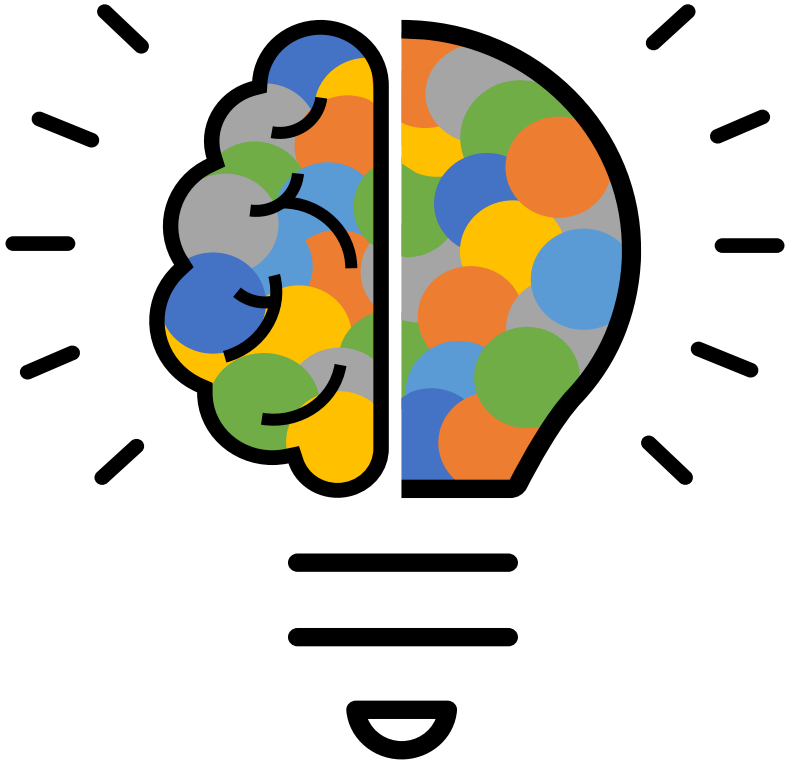
Unit Replacement Case Studies

6.December.2023

Background

What did TAQEEF Initiate?

TAQEEF piloted a project to replace old On/Off AC units with new highly efficient General Inverter AC units **across 5 villas.**



What was the objective?

To compare the annual electricity consumption before and after the replacement and quantify the saving effect of the new machines via the lower electricity bill and carbon footprint.

The electricity consumption details were extracted **from the monthly electricity bills via DEWA before & after replacement.**

AC REPLACEMENT
(OLD DUCT SPLIT WITH NEW DUCT SPLIT)

EMIRATES HILLS COMMUNITY, DUBAI

Project Details

Location:

Emirates Hills Community, Dubai

Project Details:

Ground Floor, 1st Floor, and Roof. The replacement works were done for 19 units.

Project Details

Background:

A replacement of the existing On/Off ducted units was required as the equipment was ageing which degraded the performance of the units and resulted in higher power consumption. The villa consisted of Ground Floor, 1st Floor, and Roof. In total, 19 units were replaced.

Solution Provided:

Taqeef proposed to replace the existing units with General Ducted Inverter units to cope with the increase in cooling load and to curb the overall electrical and carbon footprint. The project was challenging as tenants were already living in the accommodation. Hence, Taqeef personnel ensured the installation was done seamlessly without disturbing the tenants with the noise and vibration of construction.

Replacement Details

Tonnage of existing units	Total tonnage of replaced units
70 Tons	70 tons

New Units: General Ducted Inverter

System Details

- **Brand:** General
- **System:** DX Split
- **Type:** Ducted Inverter
- **Total Capacity:** 70 Tons
- **Indoor Unit Capacities that were installed:**

  2 Tons | 2.5 Tons | 3 Tons | 4 Tons

Features

- **High Efficiency Inverter Compressor**

The compressor can adjust its speed depending on the load requirement. As a result, the overall power consumption is less.

- **R32 Refrigerant**

Results in higher cooling performance and lower refrigerant charge is required. The GWP of R32 is lower than the refrigerant of the previous system, yielding lower equivalent carbon emissions.

- **Lower Noise Levels**
- **High EER**
- **Operation up to 55℃**

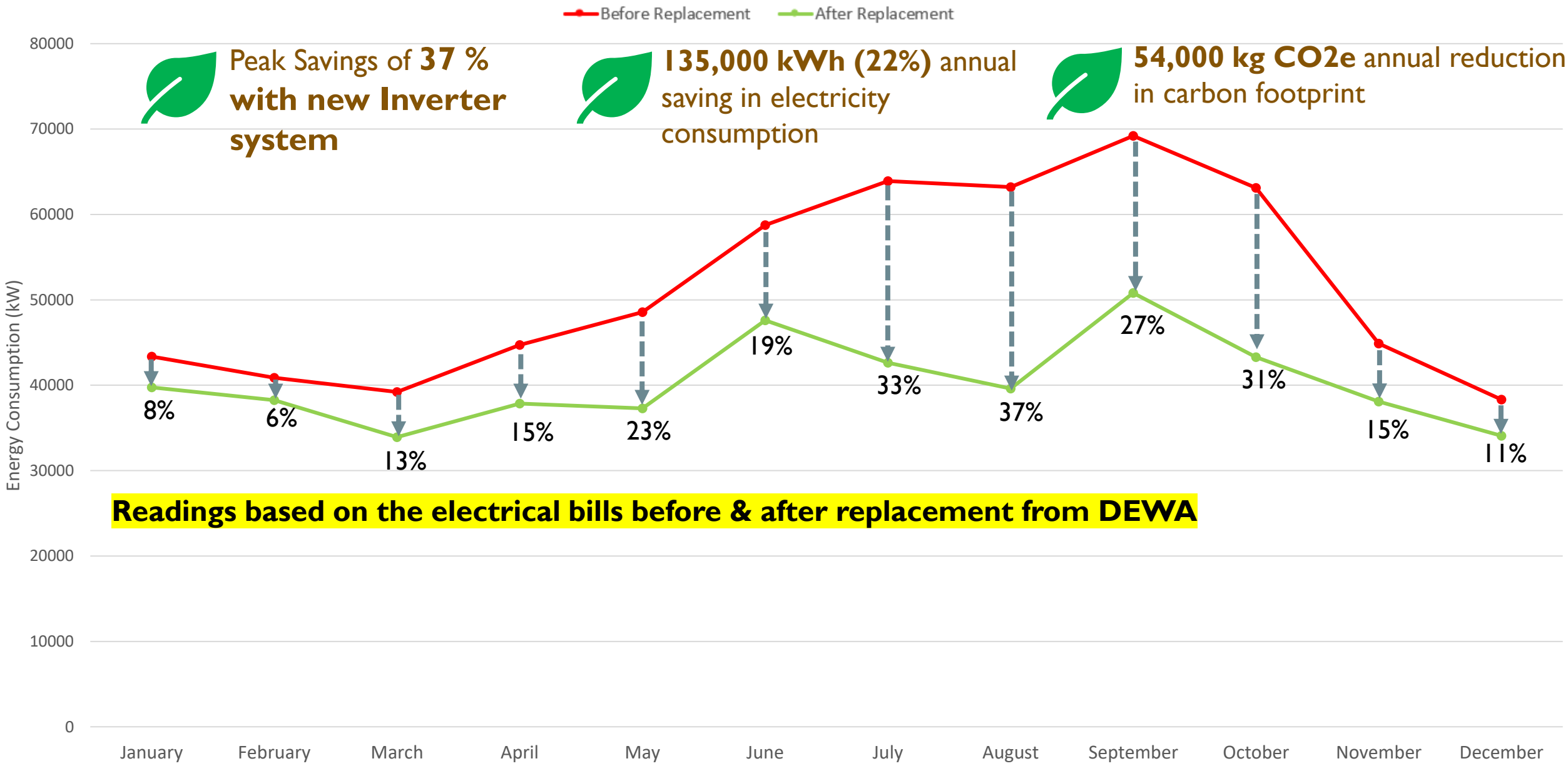
Monthly Electrical Consumption (kWh) Comparison – Emirates Hills

Month	KILOWATT HOURS (kWh)	
	Before Replacement	After Replacement
January	43,360	39,760
February	40,880	38,240
March	39,200	33,920
April	44,720	37,840
May	48,560	37,280
June	58,760	47,600
July	63,920	42,640
August	63,200	39,600
September	69,200	50,800
October	63,120	43,280
November	44,880	38,080
December	38,320	34,080
Total	618,120	483,120

The savings comparing the electricity consumption based on the DEWA electrical bill before and after AC unit replacement

Month	Savings	% Savings
January	3,600	8%
February	2,640	6%
March	5,280	13%
April	6,880	15%
May	11,280	23%
June	11,160	19%
July	21,280	33%
August	23,600	37%
September	18,400	27%
October	19,840	31%
November	6,800	15%
December	4,240	11%
Total	135,000	22%

EMIRATES HILLS COMMUNITY, DUBAI



Readings based on the electrical bills before & after replacement from DEWA

AC REPLACEMENT
(OLD DUCT SPLIT WITH NEW DUCT SPLIT)

ACACIA AVENUES, DUBAI

Project Details

Location:

Acacia Avenues, Dubai

Project Details:

Ground Floor and 1st Floor. The replacement works were done for 13 units.

Project Details

Background:

The owner of the villa wanted a system that would result in significant energy savings and minimal power consumption. They also wanted a system that could deliver comfort with maximum efficiency. The villa consisted of Ground Floor and 1st Floor. The units were changed in 5 areas.

Solution Provided:

Taqeef proposed to replace the existing units with General Ducted Inverter units. The inverter system was chosen for its superior efficiency and design flexibility to deliver the needs of the occupants.

Replacement Details

Tonnage of existing units	Total tonnage of replaced units
43 Tons	43 tons

New Units: General Ducted Inverter

System Details

- **Brand:** General
- **System:** DX Split
- **Type:** Ducted Inverter
- **Total Capacity:** 43 Tons
- **Indoor Unit Capacities that were installed:**

5 Tons | 3 Tons | 2.5 Tons | 2 Tons

Features

- **High Efficiency Inverter Compressor**

The compressor can adjust its speed depending on the load requirement. As a result, the overall power consumption is less.

- **R32 Refrigerant**

Results in higher cooling performance and lower refrigerant charge is required. The GWP of R32 is lower than the refrigerant of the previous system, yielding lower equivalent carbon emissions.

- **Lower Noise Levels**
- **High EER**
- **Operation up to 55℃**

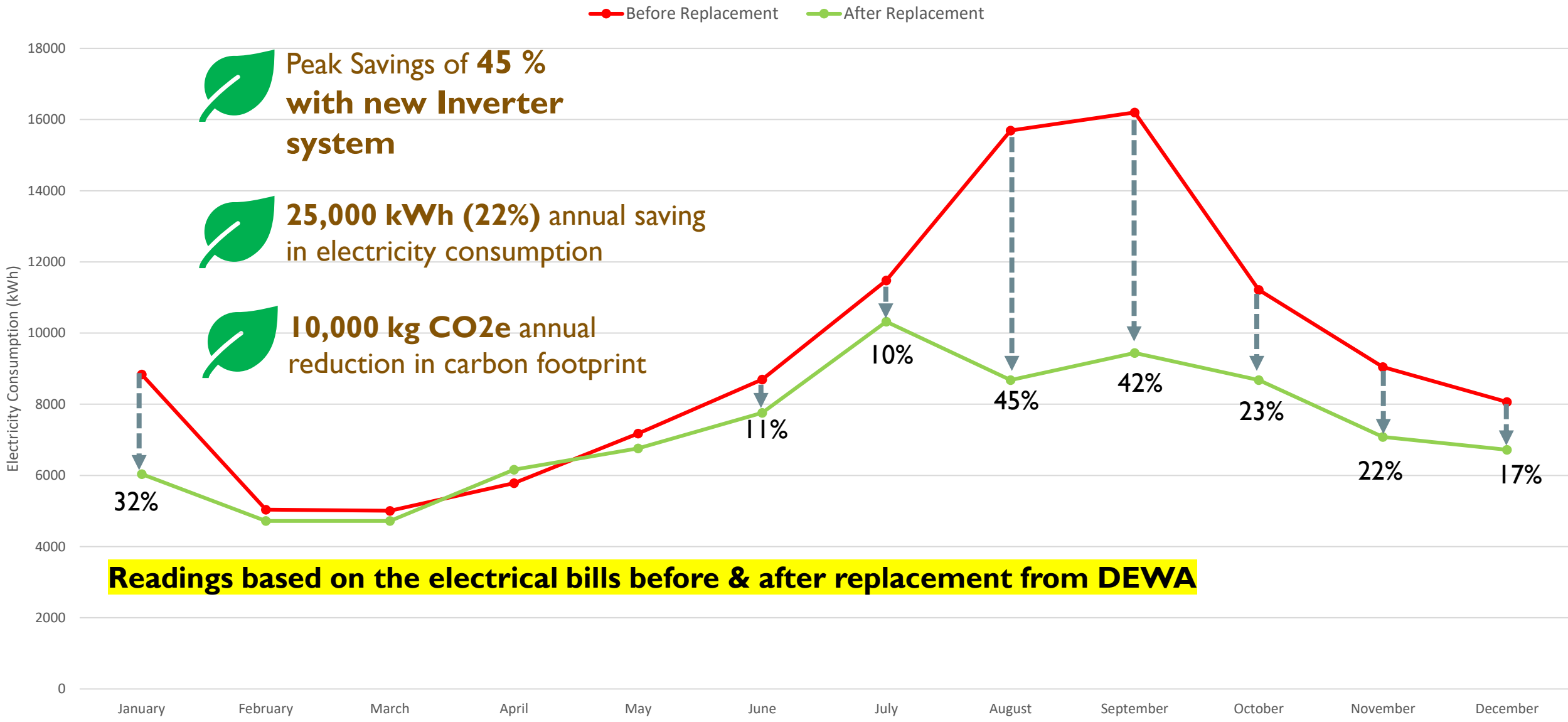
Monthly Electrical Consumption (kWh) Comparison – Acacia Avenues

Month	KILOWATT HOURS (kWh)	
	Before Replacement	After Replacement
January	8840	6040
February	5040	4720
March	5007	4720
April	5785	6160
May	7180	6760
June	8697	7760
July	11479	10320
August	15690	8680
September	16200	9440
October	11212	8680
November	9049	7080
December	8062	6720
Total	112,241	87,080

The savings comparing the electricity consumption based on the DEWA electrical bill before and after AC unit replacement

Month	Savings	% Savings
January	2800	32%
February	320	6%
March	287	6%
April	-375	-6%
May	420	6%
June	937	11%
July	1159	10%
August	7010	45%
September	6760	42%
October	2532	23%
November	1969	22%
December	1342	17%
Total	25,161	22%

ACACIA AVENUES, DUBAI



Readings based on the electrical bills before & after replacement from DEWA

AC REPLACEMENT
(OLD DUCT SPLIT WITH NEW DUCT SPLIT)

THE VILLA COMPOUND, DUBAI

Project Details

Location:

The Villa Compound, Dubai

Project Details:

Ground Floor and 1st Floor. The replacement works were done for 7 units.

Project Details

Background:

The owner of the villa wanted a system that could deliver comfort with high efficiency. The villa consisted of Ground Floor and 1st Floor. In total, 7 units were replaced.

Solution Provided:

Taqeef proposed to replace the existing units with General Ducted Inverter units. The inverter system was chosen for its superior efficiency and design flexibility to deliver the needs of the occupants.

Replacement Details

Tonnage of existing units	Total tonnage of replaced units
20 Tons	20 tons

New Units: General Ducted Inverter

System Details

- **Brand:** General
- **System:** DX Split
- **Type:** Ducted Inverter
- **Total Capacity:** 20 Tons
- **Unit Capacities that were installed:**

  2 Tons | 3 Tons | 4 Tons

Features

- **High Efficiency Inverter Compressor**

The compressor can adjust its speed depending on the load requirement. As a result, the overall power consumption is less.

- **R32 Refrigerant**

Results in higher cooling performance and lower refrigerant charge is required. The GWP of R32 is lower than the refrigerant of the previous system, yielding lower equivalent carbon emissions.

- **Lower Noise Levels**
- **High EER**
- **Operation up to 55℃**

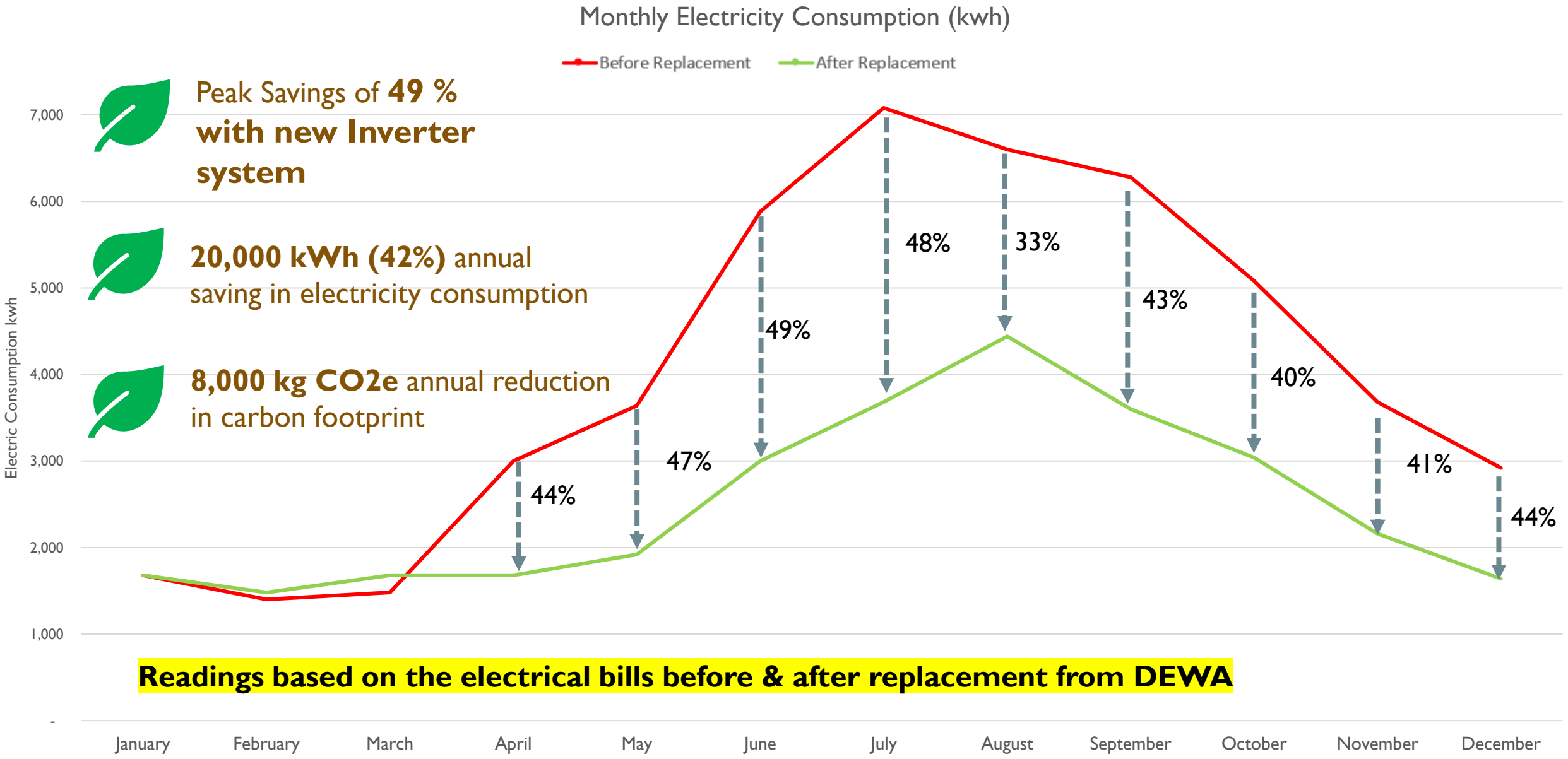
Monthly Electrical Consumption (kWh) Comparison – The Villa

Month	KILOWATT HOURS (kWh)	
	Before Replacement	After Replacement
January	1680	1680
February	1400	1480
March	1480	1680
April	3000	1680
May	3640	1920
June	5880	3000
July	7080	3680
August	6600	4440
September	6280	3600
October	5080	3040
November	3680	2160
December	2920	1640
Total	48,720	28,360

The savings comparing the electricity consumption based on the DEWA electrical bill before and after AC unit replacement

Month	Savings	% Savings
January	0	0%
February	-80	-0.05%
March	-200	-14%
April	1320	44%
May	1720	47%
June	2880	49%
July	3400	48%
August	2160	33%
September	2680	43%
October	2040	40%
November	1520	41%
December	1640	44%
Total	20360	42%

THE VILLA COMPOUND, DUBAI



Peak Savings of **49 %** **with new Inverter system**

20,000 kWh (42%) annual saving in electricity consumption

8,000 kg CO2e annual reduction in carbon footprint

Readings based on the electrical bills before & after replacement from DEWA

AC REPLACEMENT
(OLD DUCT SPLIT WITH NEW DUCT SPLIT)

LVING LEGENDS COMMUNITY, DUBAI

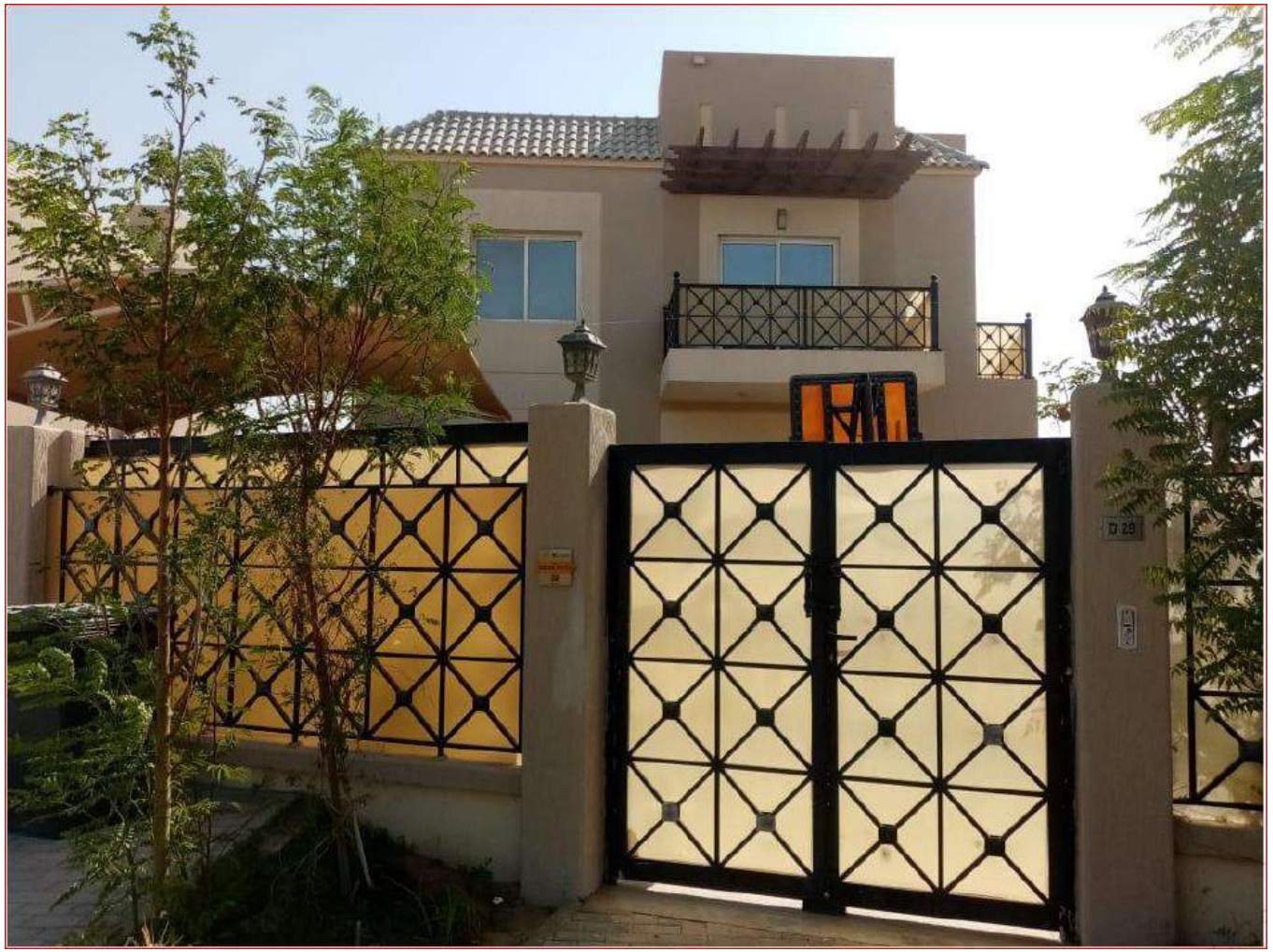
Project Details

Location:

Living Legends Community, Dubai

Project Details:

Ground Floor and 1st Floor. The replacement works were done for 6 units.



Project Details

Background:

A replacement of the existing On/Off ducted units was required as the existing equipment was consuming a high amount electricity during peak summer months. The villa consisted of Ground Floor and 1st Floor. In total, 6 units were replaced.

Solution Provided:

Taqeef proposed to replace the existing units with General Ducted Inverter units to provide better cooling performance, with specific attention to thermal comfort for occupants. The units are equipped with an inverter compressor that resulted in high energy efficiency.

Replacement Details

Tonnage of existing units	Total tonnage of replaced units
20 Tons	20 tons

New Units: General Ducted Inverter

System Details

- **Brand:** General
- **System:** DX Split
- **Type:** Ducted Inverter
- **Total Capacity:** 20 Tons
- **Unit Capacities that were installed:**

  2 Tons | 3 Tons | 5 Tons

Features

- **High Efficiency Inverter Compressor**

The compressor can adjust its speed depending on the load requirement. As a result, the overall power consumption is less.

- **R32 Refrigerant**

Results in higher cooling performance and lower refrigerant charge is required. The GWP of R32 is lower than the refrigerant of the previous system, yielding lower equivalent carbon emissions.

- **Lower Noise Levels**
- **High EER**
- **Operation up to 55℃**

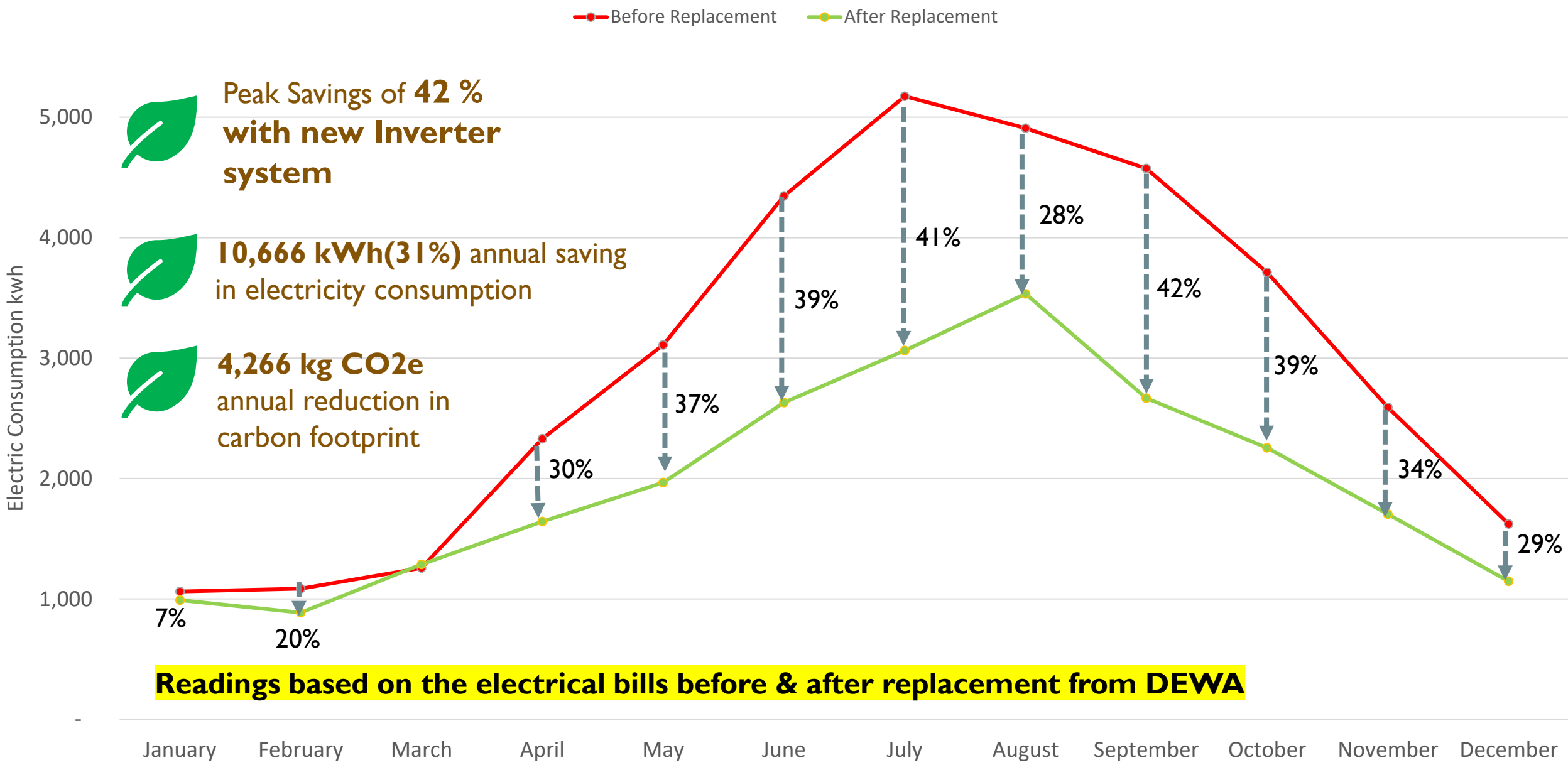
Monthly Electrical Consumption (kWh) Comparison – Living Legends

Month	KILOWATT HOURS (kWh)	
	Before Replacement	After Replacement
January	1062	990
February	1085	886
March	1,258	1,287
April	1,258	1,643
May	2,331	1,967
June	3,110	2,631
July	4,346	3,063
August	5,174	3,534
September	4,909	2,668
October	4,575	2,256
November	3,712	1,704
December	1,622	1,147
Total	34,442	23,776

The savings comparing the electricity consumption based on the DEWA electrical bill before and after AC unit replacement

Month	Savings	% Savings
January	72	7%
February	205	20%
March	-29	-0.02%
April	688	30%
May	1,143	37%
June	1,715	39%
July	2,111	41%
August	1,375	28%
September	1,907	42%
October	1,456	39%
November	886	34%
December	475	29%
Total	10,666	31%

LIVING LEGENDS COMMUNITY, DUBAI



Readings based on the electrical bills before & after replacement from DEWA

AC REPLACEMENT
(OLD DUCT SPLIT WITH NEW DUCT SPLIT)

SPRINGS, DUBAI

Project Details

Location:

Springs, Dubai

Project Details:

Ground Floor and 1st Floor. The replacement works were done for 5 units.

Project Details

Background:

A replacement of the existing On/Off ducted units was required as the existing equipment was consuming a high amount electricity during peak summer months. The villa consisted of Ground Floor and 1st Floor. In total, 5 units were replaced.

Solution Provided:

Taqeef proposed to replace the existing units with General Ducted Inverter units to provide better cooling performance, with specific attention to thermal comfort for occupants. The units are equipped with an inverter compressor that resulted in high energy efficiency.

Replacement Details

Tonnage of existing units	Total tonnage of replaced units
13.5 Tons	13.5 tons

New Units: General Ducted Inverter

System Details

- **Brand:** General
- **System:** DX Split
- **Type:** Ducted Inverter
- **Total Capacity:** 13.5 Tons
- **Unit Capacities that were installed:**

  1.5 Tons | 2.5 Tons | 4 Tons

Features

- **High Efficiency Inverter Compressor**

The compressor can adjust its speed depending on the load requirement. As a result, the overall power consumption is less.

- **R32 Refrigerant**

Results in higher cooling performance and lower refrigerant charge is required. The GWP of R32 is lower than the refrigerant of the previous system, yielding lower equivalent carbon emissions.

- **Lower Noise Levels**
- **High EER**
- **Operation up to 55℃**

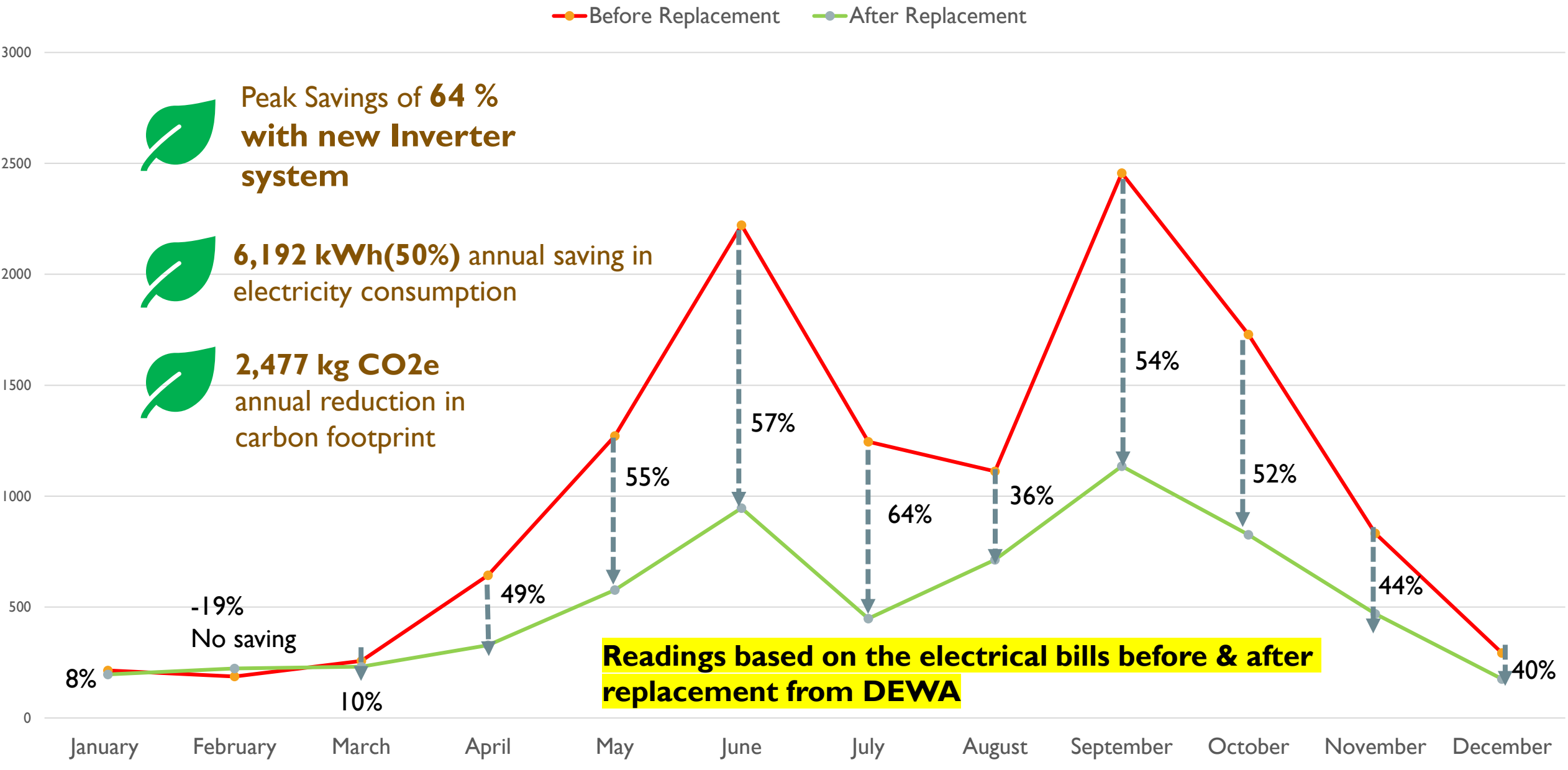
Monthly Electrical Consumption (kWh) Comparison – Springs

Month	KILOWATT HOURS (kWh)	
	Before Replacement	After Replacement
January	214	196
February	187	223
March	257	231
April	643	328
May	1,271	577
June	2,222	946
July	1,245	448
August	1,112	713
September	2,456	1,135
October	1,729	826
November	832	470
December	293	176
Total	12,461	6,269

The savings comparing the electricity consumption based on the DEWA electrical bill before and after AC unit replacement

Month	Savings	% Savings
January	18	8%
February	-36	-19%
March	26	10%
April	315	49%
May	694	55%
June	1,276	57%
July	797	64%
August	399	36%
September	1,321	54%
October	903	52%
November	362	44%
December	117	40%
Total	6,192	50%

SPRINGS, DUBAI



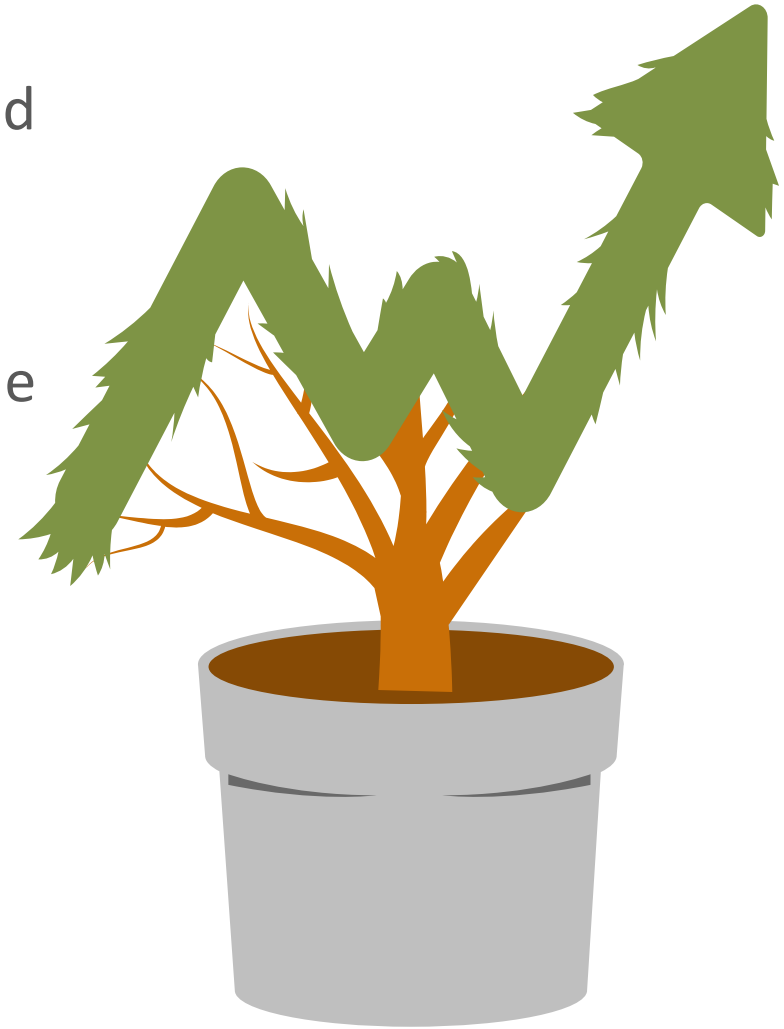
Replacement Summary

Emirates Hills Villa, Dubai	Acacia Avenues, Dubai	The Villa, Dubai	Living Legends Villa, Dubai	Springs Villa, Dubai
Highlights	**Highlights**	**Highlights**	**Highlights**	**Highlights**
• Replaced machines worth 70 Tons in cooling • Annual electricity consumption saving of 135,000 kWh (22%) • Monthly peak saving of up to 37% • Annual carbon footprint reduction by 54,000 kg CO2e	• Replaced machines worth 43 Tons in cooling • Annual electricity consumption saving of 25,000 kWh (22%) • Monthly peak saving of up to 45% • Annual carbon footprint reduction by 10,000 kg CO2e	• Replaced machines worth 20 Tons in cooling • Annual electricity consumption saving of 20,000 kWh (42%) • Monthly peak saving of up to 49% • Annual carbon footprint reduction by 8,000 kg CO2e	• Replaced machines worth 20 Tons in cooling • Annual electricity consumption saving of 11,000 kWh (31%) • Monthly peak saving of up to 42% • Annual carbon footprint reduction by 4,200 kg CO2e	• Replaced machines worth 13.5 Tons in cooling • Annual electricity consumption saving of 6,100 (50%) • Monthly peak saving of up to 64% • Annual carbon footprint reduction by 2,400 kg CO2e

Results

This replacement iniative **across 5 Villas** by TAQEEF helped achieve:

- **1,962,000 Btu/h (163.5 Tons)** of efficient and comfortable cooling
- Annual saving in electricity consumption by **196,000 kWh**
- Annual reduction in carbon footprint by **78,000 kg CO2e**
- Peak savings of up to **64%** on the electricity bill



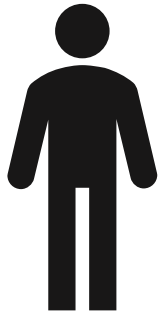
What Variables Impact the Amount of Electricity Saving in Air Conditioners?

Civil Work Required at Site

- Has the infrastructure been designed factoring the possibility of equipment replacement in 15-20 years
- State of the existing ductwork, pipework, walls, etc.

Air Conditioning System

- Age & condition of the existing units
- Service history
- Cooling capacity and efficiency of the existing units
- Efficiency of the new units



Human Behavior

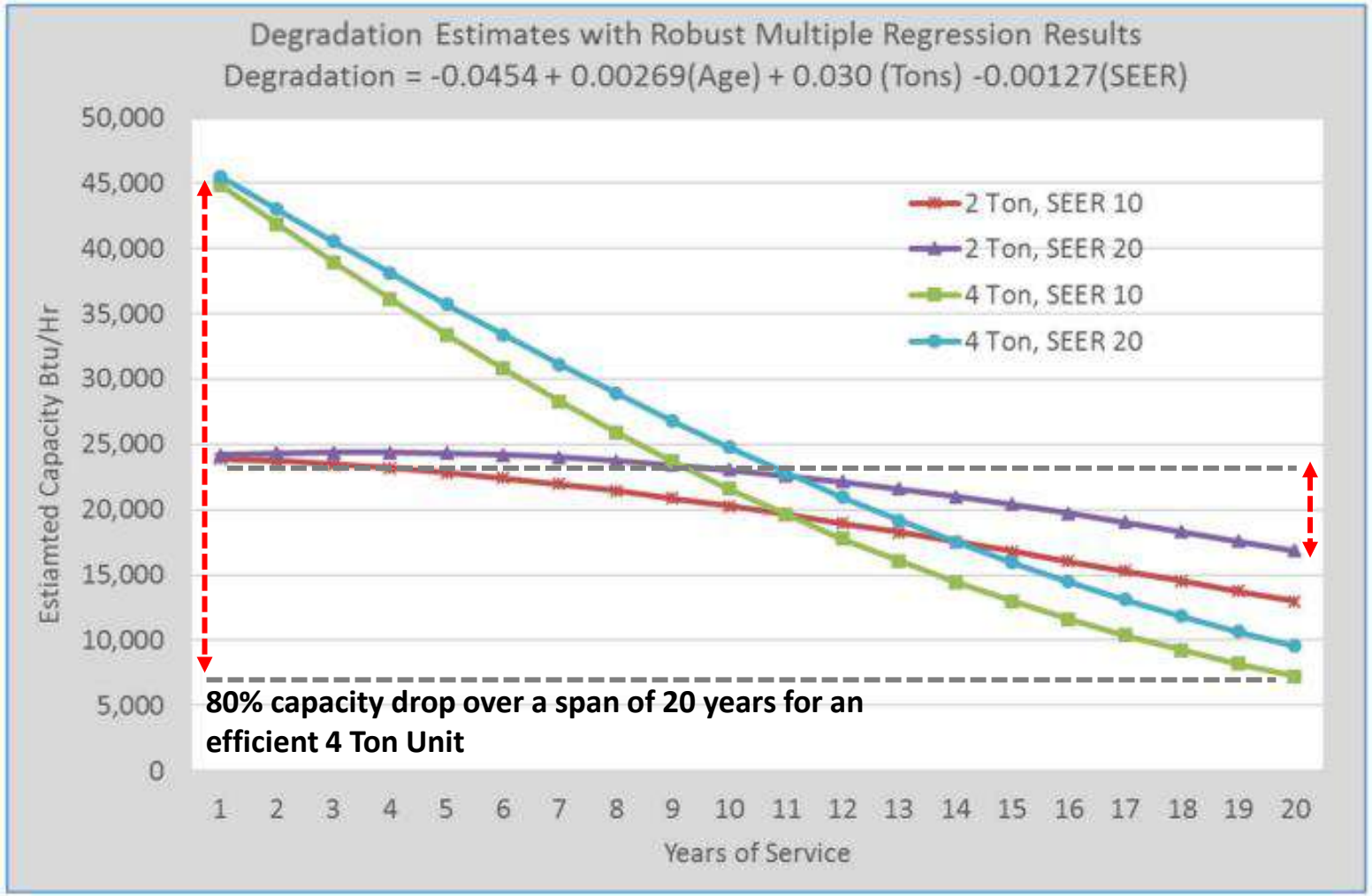
- Setpoint
- Occupancy level during peak months
- Unit Operation

What Impacts Electricity Saving? – AC Unit Performance Degradation

Reference: https://publications.energyresearch.ucf.edu/wp-content/uploads/2018/09/FSEC-PF-474-18.pdf

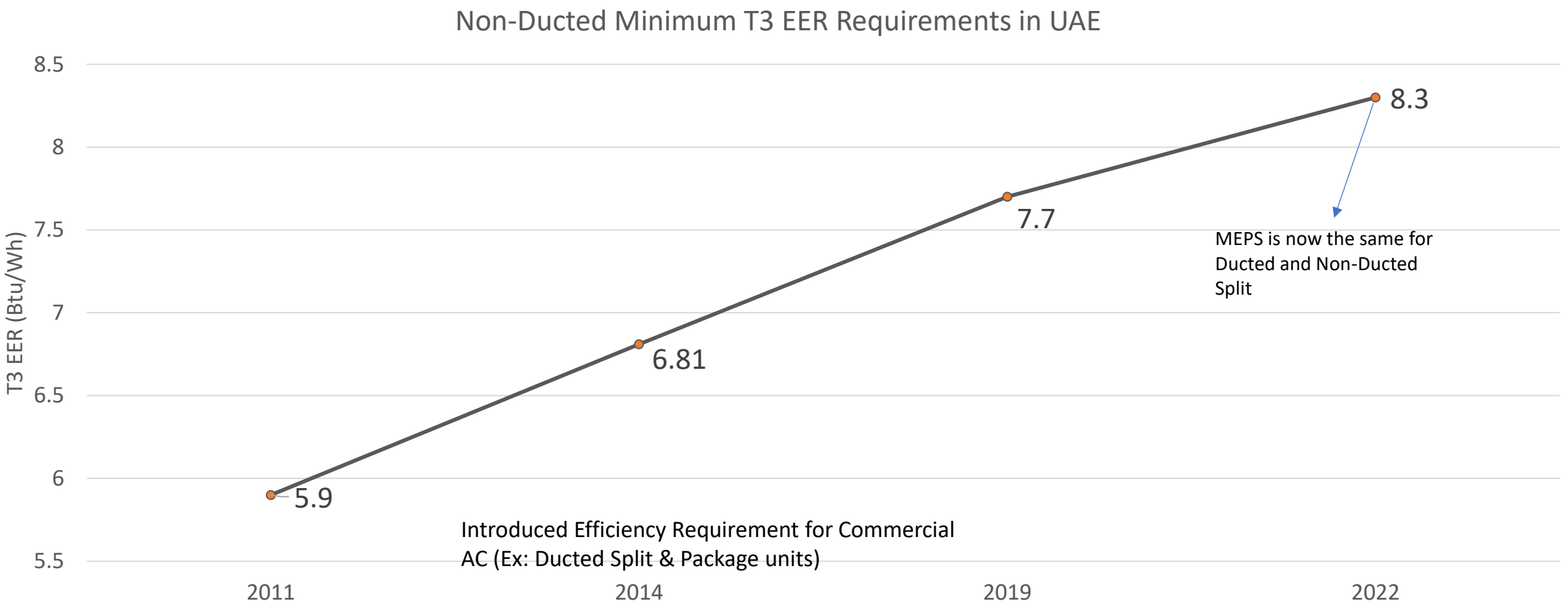
Capacity drop is not only a function of the efficiency of the AC system, but also a function of the system size as shown in the plot (The higher the capacity, the higher the drop).

The reason why system size has a significant negative impact on unit performance is because larger capacity systems are more prone to evaporator coil fouling



36% capacity drop over a span of 20 years for an efficient 2 Ton Unit

What Impacts Electricity Saving? – Efficiency Requirement Increment in UAE (Non-Ducted Split Example)



In 2011, the 5-star rating T3 EER requirement for non-ducted split was 7.11 Btu/Wh

In 2022, the 5-star rating T3 EER requirement for non-ducted split is 11.01 Btu/Wh

TAQ Converters

Product Presentation

Problem Statement

Most air conditioning systems use proprietary thermostats that lack intuitive controls and smart features. As demand for Smart Home Systems and IoT solutions grows, the need for smart control systems has increased.

A **thermostat converter** is essential for integrating third-party thermostats with AC systems. However, our current lineup does not meet compatibility requirements for most smart thermostats, creating a gap in our offerings and hindering customer satisfaction.

Limitations in current portfolio

Brand	Types of thermostats	
	24 V AC	240 V AC
Fujitsu General	✓	x
Midea	x	x

Challenges

Lack of Integrability
Traditional thermostats lack integration with other smart devices in the home

Remote Connectivity
Customers desire smarter controllers with remote connectivity

Incomplete Portfolio
Our current portfolio presents a big gap in the offerings

Product Overview

The TAQ thermostat converter is engineered for seamless connectivity between Midea and Fujitsu General AC units and third-party controllers, as well as Home Automation Systems (HAS).

It simplifies the integration of AC systems into smart home environments, enhancing comfort and efficiency with style.

Key Features

- ✓ **Universal Compatibility:** Connects effortlessly to any third-party thermostat utilizing voltage-based control.
- ✓ **Sleek and User-Friendly Design:** Features elegant touch buttons for intuitive configuration.
- ✓ **Rapid Setup:** Complete the configuration process in under 3 minutes.
- ✓ **Versatile Functionality:** Supports three fan speeds and compressor commands for optimal climate control.
- ✓ **Flexible Installation:** Can be conveniently installed above the ceiling for discreet operation.

Value Proposition For End-Users

Easy installation

Easy installation and configuration makes it a great choice for new and retrofit projects.

HAS Integration

Allows AC units to be integrated to most HAS using Zigbee, Wi-Fi, BLE, Tuya and other platforms.

Cloud Based Control

Customers can connect smart thermostats and operate their Midea and Fujitsu General AC units remotely.

Maintain Warranty

Retains the warranty of the AC unit whilst providing end-users with control options to improve comfort and efficiency.

Value Proposition For Taqeef

Brand Image

TAQ improves Taqeef's brand image in the HVAC market as a solution provider.

Higher Win-Ratio

TAQ allows Taqeef to comply with projects where 3rd party controllers are required.

Complete Portfolio

TAQ fills a big gap in the converter lineup leading to increased customer satisfaction

Product Expansion

TAQ expands Taqeef's portfolio and presents a new revenue stream

Technical Specifications

TAQ-24

General Specifications

Product type	Thermostat converter
Product name	TAQ-24
Colour	Black
Dimensions (H×W×D)	89 x 89 x 54 mm
Power input	240 V AC
Control voltage	24 V AC
Operating temp.	-20°C to 60°C
Relative humidity	20% to 90%
IR transmission range	Up to 7m

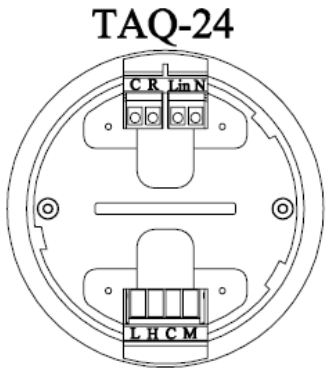
Wiring Specifications

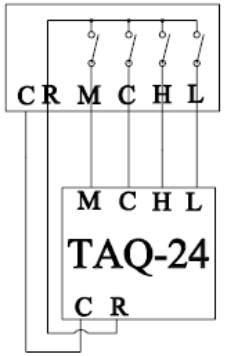
Control wiring cable	4 x 0.5 mm^2 cable
Power input (240 V)	2 x 1 mm^2 cable
Power output (24 V)	2 x 0.5 mm^2 cable

Control Parameters

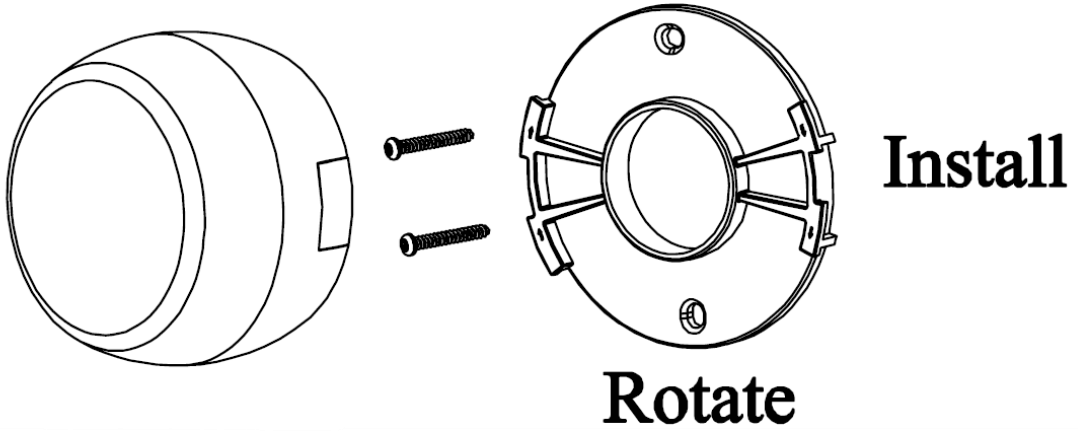
ON/OFF	●
Mode (Cool, Fan)	●
Fan speed (Hi, Med, Low)	●

Installation methodology





Power terminals	
Lin	240 V AC Live
N	240 V AC Neutral
R	24 V AC Live
C	24 V AC Neutral
Thermostat control terminals	
L	Low Fan
H	High Fan
M	Medium Fan
C	Cool



Technical Specifications

TAQ-240

General Specifications

Product type	Thermostat converter
Product name	TAQ-240
Colour	Black
Dimensions (H×W×D)	89 x 89 x 54 mm
Power input	240 V AC
Control voltage	240 V AC
Operating temp.	-20°C to 60°C
Relative humidity	20% to 90%
IR transmission range	Up to 7m

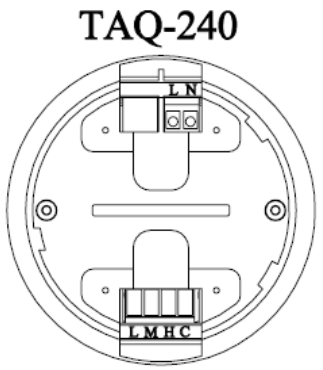
Wiring Specifications

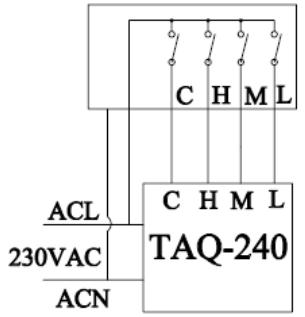
Control wiring cable	4 x 1 mm^2 cable
Power input (240 V)	2 x 1 mm^2 cable

Control Parameters

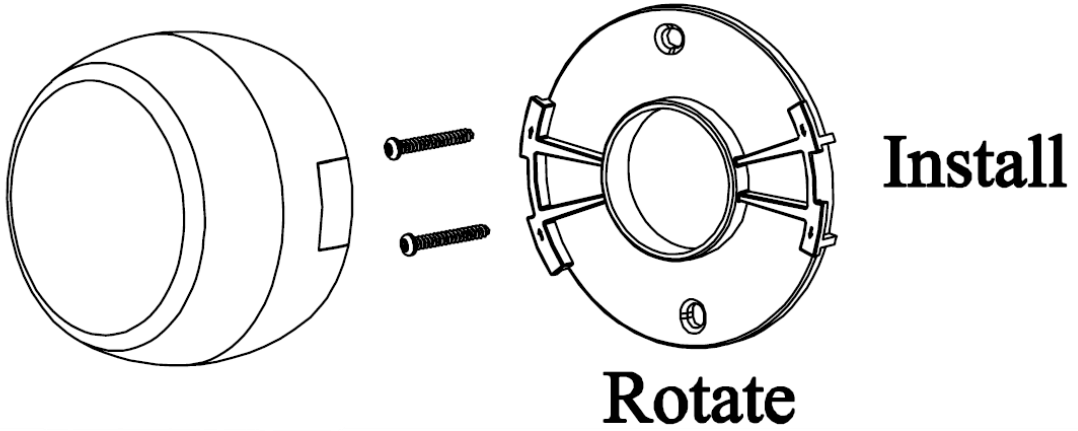
ON/OFF	●
Mode (Cool, Fan)	●
Fan speed (Hi, Med, Low)	●

Installation methodology





Power terminals	
L	240 V AC Live
N	240 V AC Neutral
Thermostat control terminals	
L	Low Fan
H	High Fan
M	Medium Fan
C	Cool



Use cases

Project Details

Project: Masaar phase 2 and 3

Client: Arada

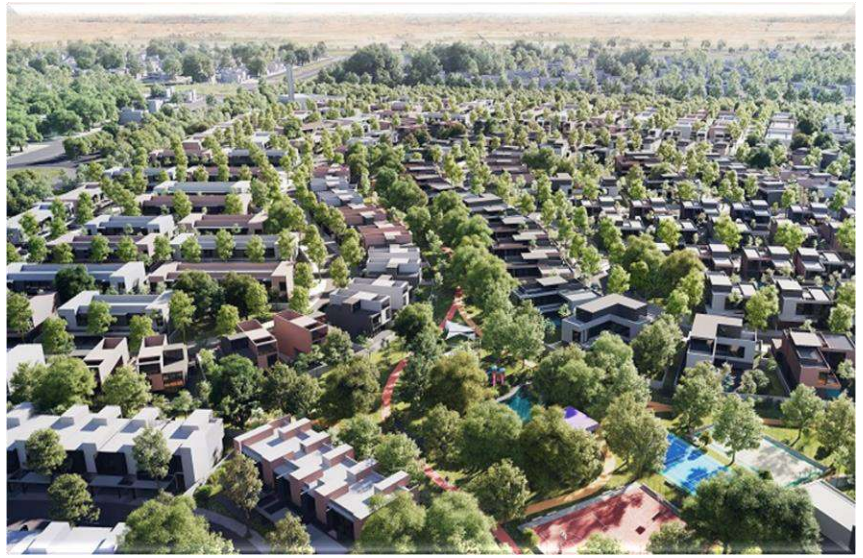
AC unit: Fujitsu General Ducted On-Off

Quantity: Over 5,000 AC units

Converter: TAQ-240

Outcome

- ✓ Successfully tested the compatibility of TAQ-240 with Zigbee Home Automation thermostat
- ✓ Approved by the client and consultant
- ✓ Won both phases
- ✓ Sold over 5,300 converters



Compatibility

With Our AC Units

	RAC		CAC	
AC type	**On-Off**	**Inverter**	**VRF**	**FCU**
GENERAL	✓	✓	✓	
Midea	✓	✓	✓	✓

With 3rd party Smart System

Smart thermostats		Home Automation	
240 VAC	**24 VAC**	**Wireless Protocols**	**Wired Protocols**
✓	✓	✓	×
✓	✓	✓	×

Wireless Protocols	Zigbee, Wi-Fi, BLE etc.
Wired Protocols	Modbus, KNX, BACnet etc.

Product Testing

Manufacturer Testing

Testing Includes:

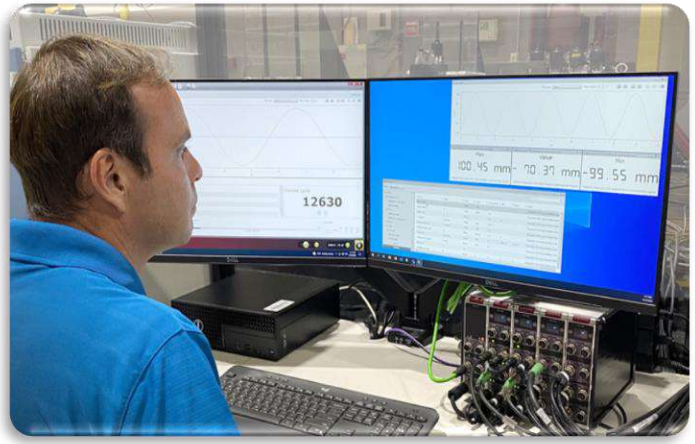
a) Functional testing

b) Reliability testing

c) Safety testing

d) Beta testing Improvements

3rd party Testing



Testing Includes:

a) Quality testing

b) Safety testing

c) Regulatory testing (CB, RoHS)

Taqeef Testing

Testing Includes:

a) Functional testing

b) Reliability testing

c) Safety testing

d) Beta testing + Feedback

e) Pilot testing