Clean Energy Business Council
مجلس صناعات الطاقة النظيفة
Middle East & North Africa
الشرق الأوسط وشمال افريقيا

Webinar starts at 4:00 PM GST

CEBC Clean Energy Webinar Series
Webinar #7

"The Impact of COVID-19 on ESCO M&V Activities"

Lia Webster
Sr. Engineer / Principal
Facility Energy Solutions &
Chair of the IPMVP Sub-Committee on Advanced M&V, **EVO**

Amin El Najjar
Director
Operations for Dubai & Northern Emirates, Oman, Lebanon and Egypt
ENOVA

Gaurav Soni
Project Assurance Manager – O&M and M&V
ENGIE Smart4Power

Iwan Walters
Partner, **Eversheds Sutherland**
Board Member,
Clean Energy Business Council
Moderator

www.cebcmena.com

Become a member: ahmed@cebcmena.com

Clean Energy Business Council

مجلس صناعات الطاقة النظيفة

Middle East & North Africa

الشرق الأوسط وشمال افريقيا

Clean Energy Business Council (CEBC)

Sophie Collet

Managing Director

What is the Clean Energy Business Council?

- **The Clean Energy Business Council,** a Not for Profit Organization representing the private sector involved in the clean energy sector across the MENA region.
- Our goal is to **establish a dialogue** between the public and private sectors, and to drive the development of appropriate and much needed **regulation and policy** to support the development of the clean energy sector.
- Membership is open to all individuals, companies, business organizations based on an annual fee

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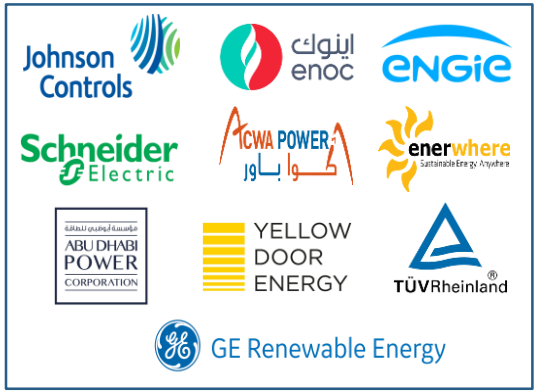
CEBC Members (+120)

and more…

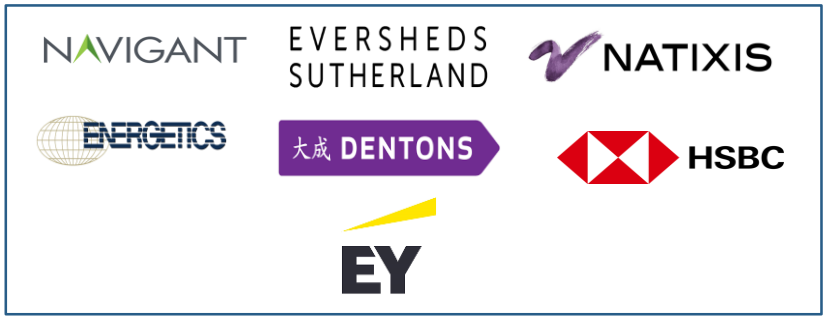
Renewables



Energy Efficiency

Green Mobility

Law, Consultancy, Banks and Investment Firms



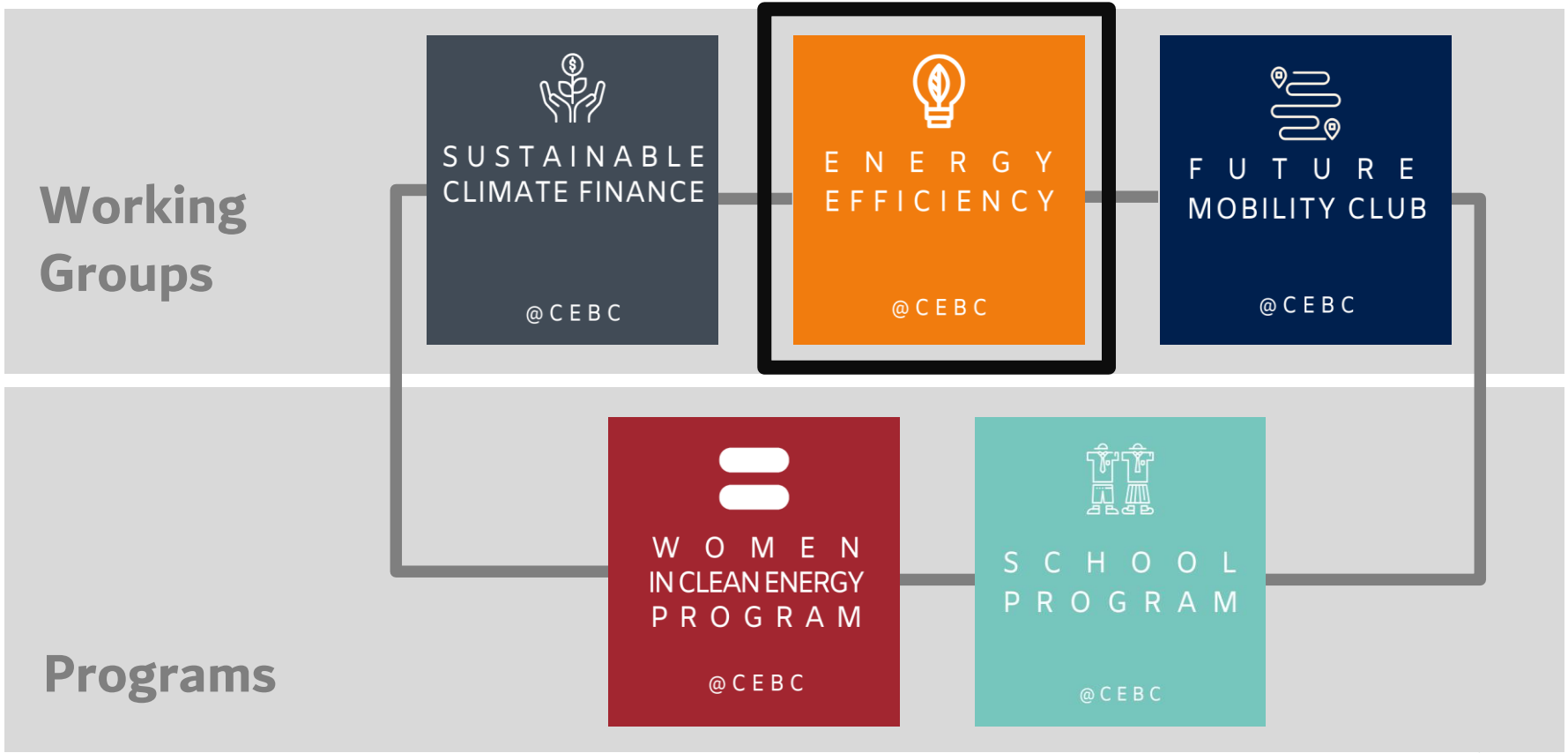
Other

CEBC Partners

What we do

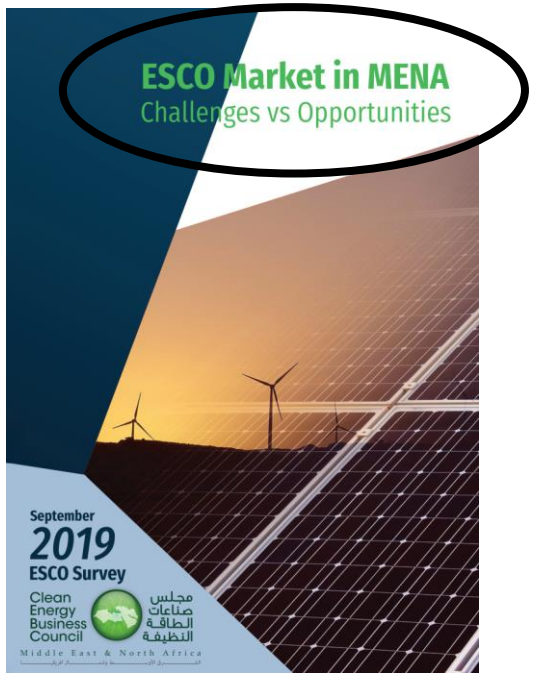
- Throughout the year, we **host workshops, events and webinars**, allowing our members the opportunity to share and promote their ideas, services and knowledge.
- We publish **reports, case studies, white papers and market survey**s.
- We run a range of **working groups**, such as the future mobility working group, the energy efficiency group and the climate finance group.
- We also run two **programmes**: the Schools Programme and the Women in Clean Energy (WICE) programme.

CEBC workstream structure



ESCO Market Survey White Paper 2019

- Available to download on the CEBC website
- Answers questions such as:
  - Past and future investments by ESCOs
  - Recruitment and expansion plans
  - Project revenue
  - Project cycle
  - Business evaluation & forecast
  - Major stumbling issues and more…
- 2020 survey will be launched in September 2020 covering **UAE and Saudi Arabia**



Clean Energy Business Council
مجلس صناعات الطاقة النظيفة
Middle East & North Africa


Looking forward to meeting
you in person soon ☺

Thanks for listening

Email us at ahmed@cebcmena.com

Or visit our website at

http://www.cebcmena.com

Notes

- Webinar **recording, summary document and presentation slides** will be shared after the webinar.

- Please put your questions in the **Questions** panel on your right hand and we will answer as many as we can at the end of the webinar.

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CEBC Clean Energy
Webinar Series
Webinar #7

"IPMVP and Routine and Non-routine Adjustments"

Lia Webster
Sr. Engineer / Principal,
Facility Energy Solutions &
Chair of the IPMVP Sub-Committee
on Advanced M&V, **EVO**

FACILITY
energy solutions

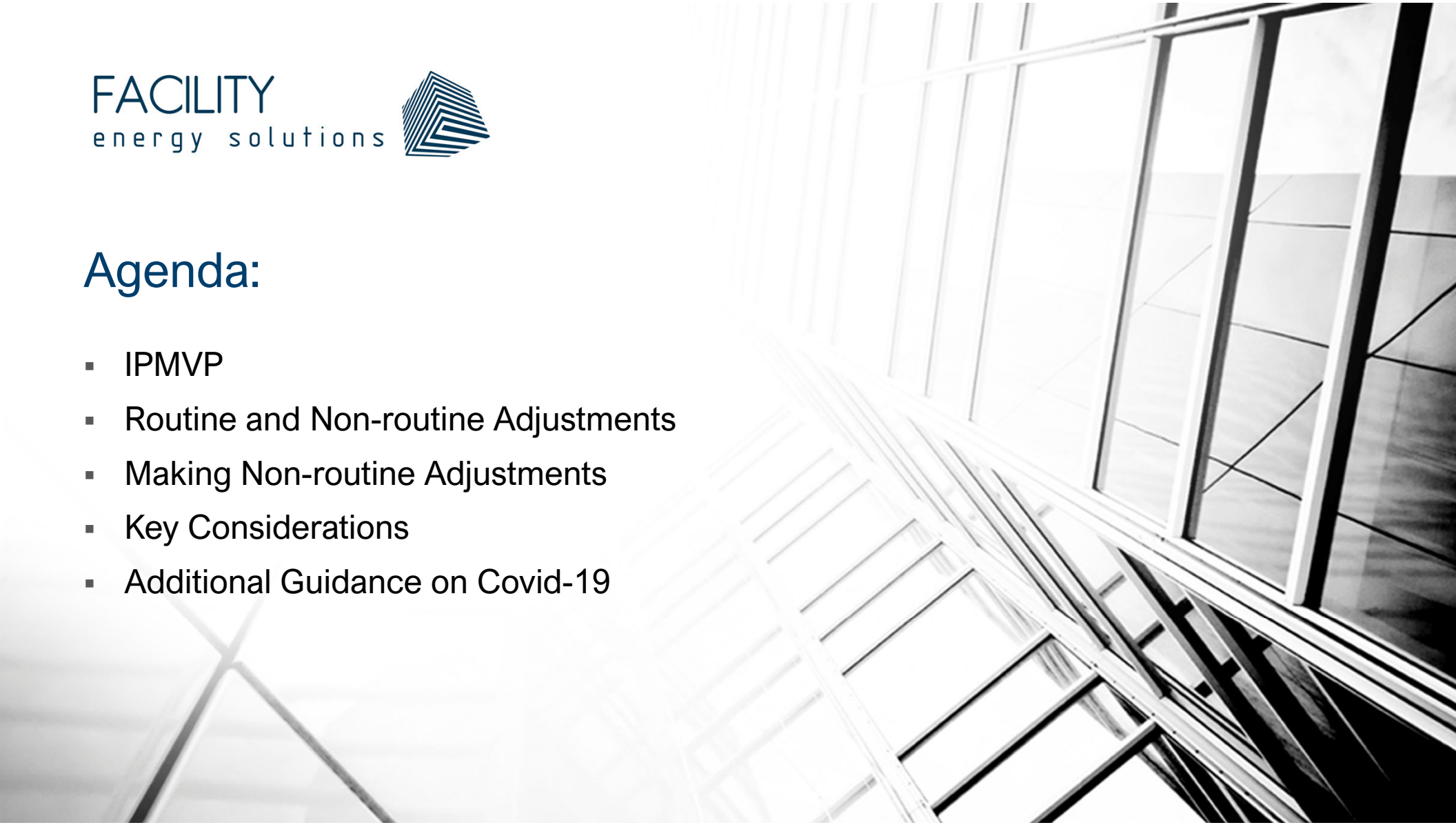
IPMVP:
Non-Routine Events & Non-Routine Adjustments

Lia Webster, P.E.
Principal
Facility Energy Solutions LLC

FACILITY
energy solutions

Agenda:

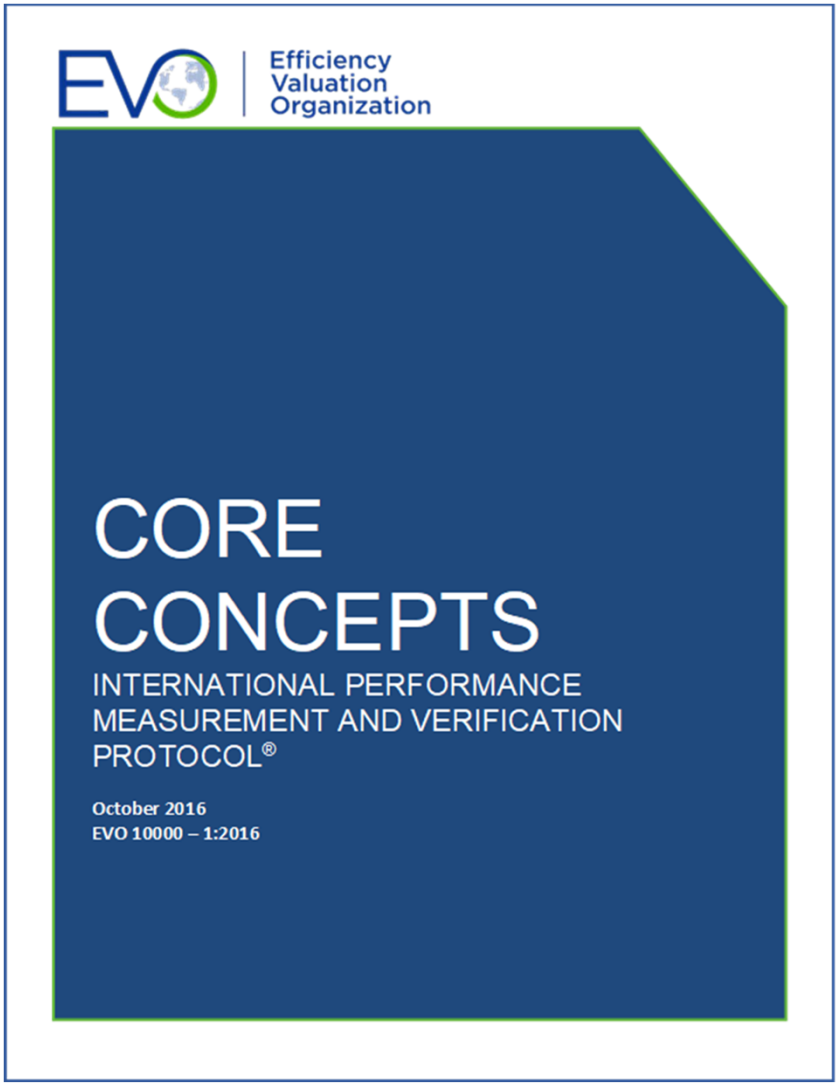
- IPMVP
- Routine and Non-routine Adjustments
- Making Non-routine Adjustments
- Key Considerations
- Additional Guidance on Covid-19



IPMVP

Key M&V Protocol:

- Used worldwide
- Framework to determine savings
- Provides M&V terms & definitions
- Defines four M&V Options
- M&V plan and reporting



IPMVP & EVO

Efficiency Valuation Organization (EVO):

- Publishes IPMVP
- International organization
- Provides tools to quantify energy efficiency business transactions

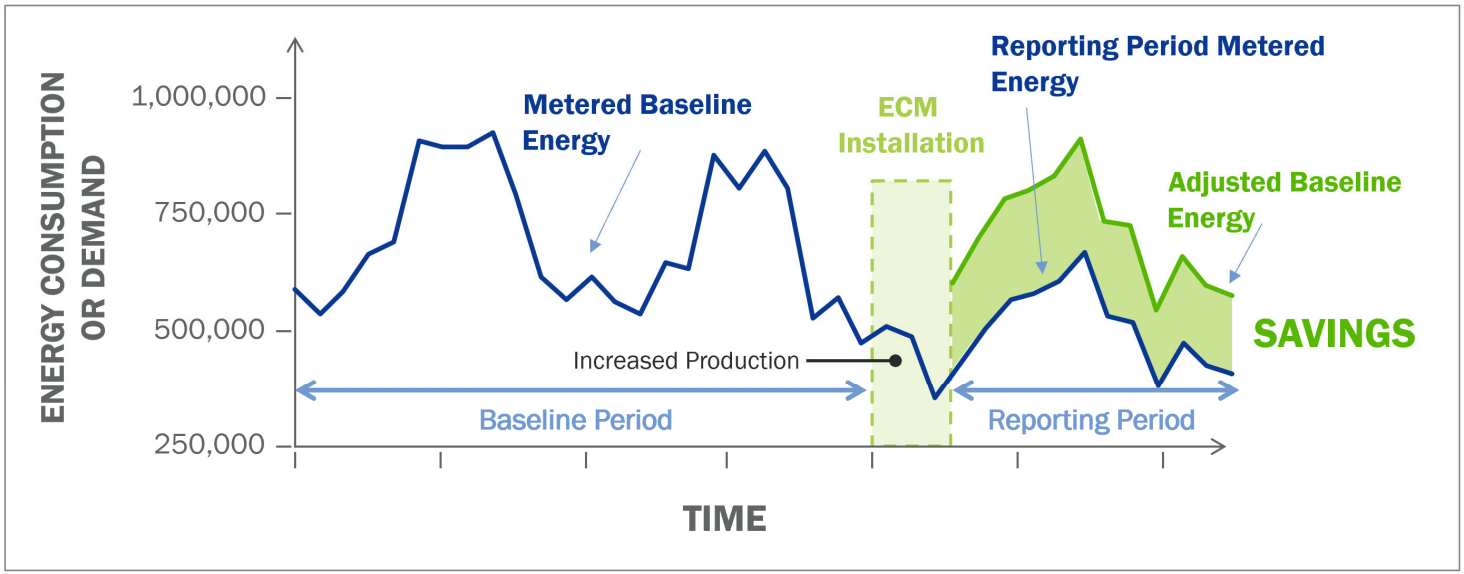
Goals:

- Build confidence in energy efficiency as a reliable resource, and
- Ensure impacts from energy projects are determined through appropriate M&V

http://evo-world.org/

Measurement and Verification (M&V)

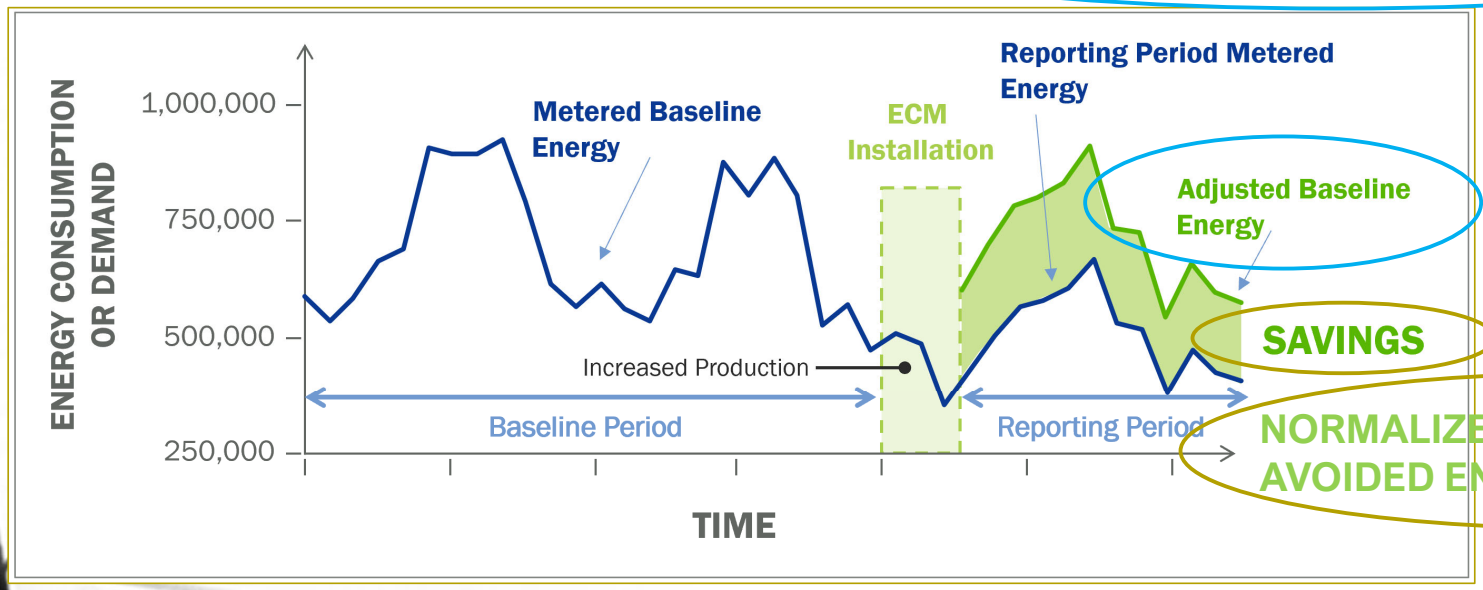
- Verifies and calculates energy savings within an individual facility
- Primary objective is to reduce performance risk to an acceptable level
- Calculating energy savings is unique as savings reflect the absence of energy use



Measurement and Verification (M&V)

Adjusted Baseline Energy

what "would have happened" without the energy project

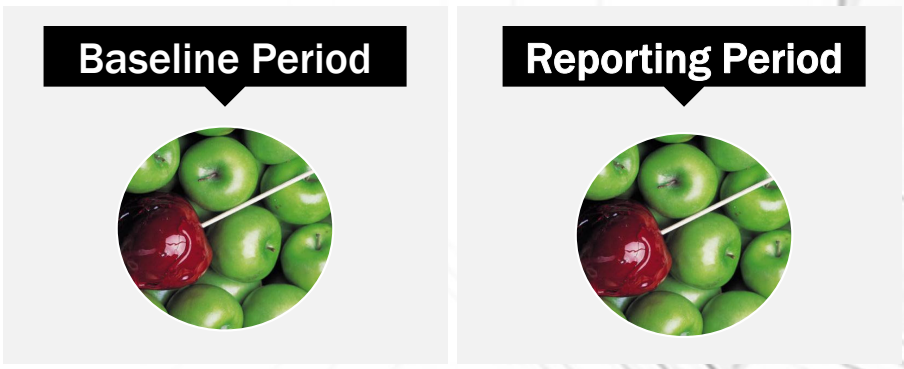


NORMALIZED ENERGY SAVINGS or AVOIDED ENERGY CONSUMPTION

Routine Adjustments

Account for the **expected** change in energy consumption due to changes in the *Independent Variables*

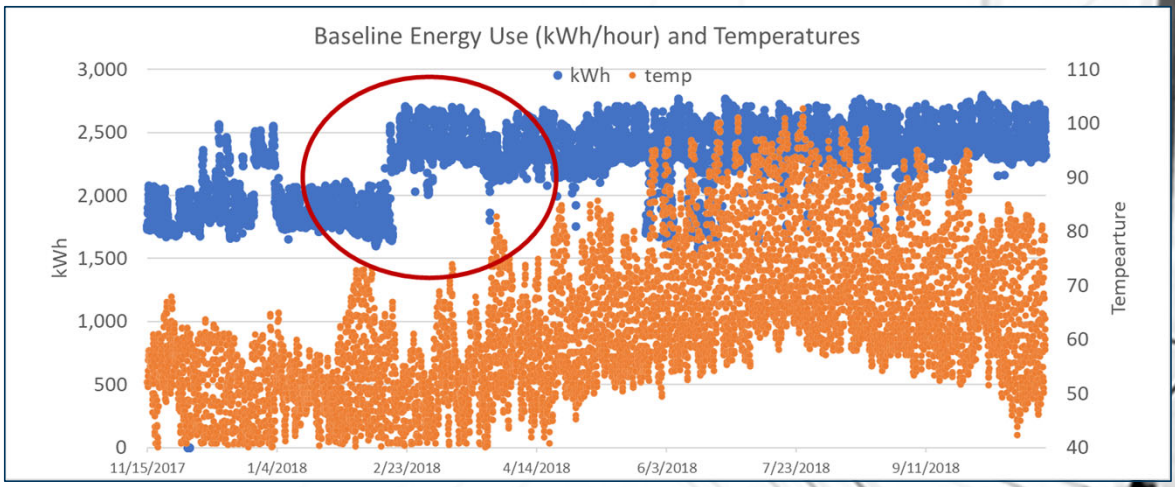
- Planned updates to Independent variables (e.g. weather, occupancy)
- To compare energy use under a common set of conditions
- Results in *Adjusted Baseline Energy*
- Normalized energy savings use *Adjusted Reporting Period Energy*



Non-Routine Events & Adjustments

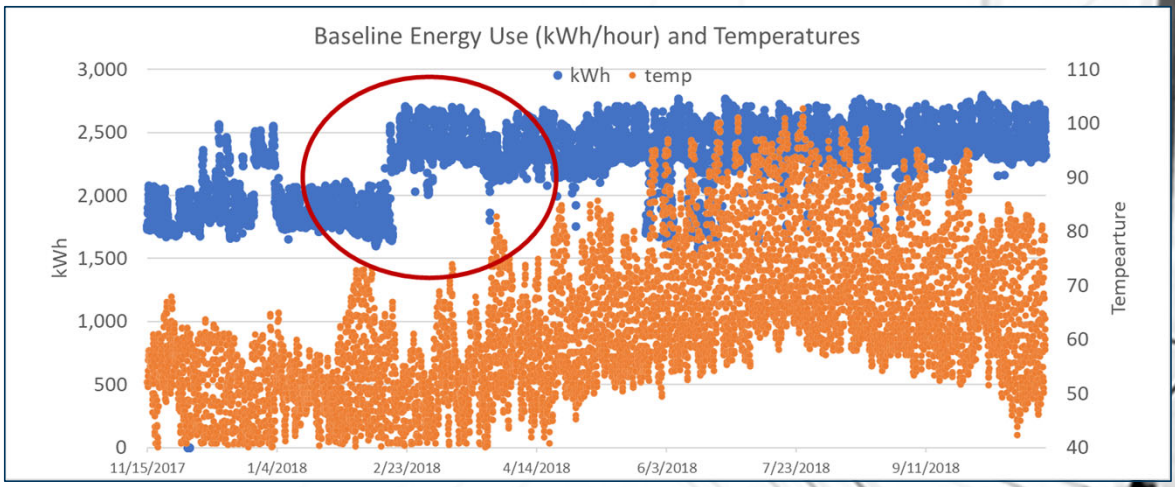
1. An ‘event’ that causes unexpected changes in energy use within measurement boundary (whole facility or retrofit-isolation)

2. Due to changes *Static Factors*
   - Unrelated to energy project and independent variables



Non-Routine Events & Adjustments

3. When impact to energy savings is ‘significant’ a non-routine adjustment is required
   - Individually engineered calculations to account for the energy effects due to changes in the Static Factors.



Static Factors

Characteristics of a facility which affect Energy Consumption within measurement boundary

- Not expected to change
- Not included as independent variables

Key static factors are documented in the baseline period and tracked for changes

- Used to validate non-routine adjustments
- Ensure the measured energy impacts are from the ECMs

Static Factors

Category	Example Metrics
Facility Overview	Facility size - gross sq. ft
	Conditioned sq. ft (Total amount of space being heated or air conditioned, in square feet (also called 'occupied square feet')
	Building envelope conditions (Level of insulation, window types/configuration, infiltration levels, levels of external shading)
Qty. Occupants	Qty. of occupants (e.g., total of workers & average Qty. of visitors; Qty. work-stations/chairs), Totals per area/schedule
	Aux. rental hours, number of occupants, type or use, additional equipment/loads
	% facility leased, occupied square feet
	Qty. classes/month, Qty. of occupied rooms/beds
Hours of Use	Schedule of occupants / area requiring 'occupied' setpoints.
	Equipment operating hours, which may exceed hours of occupancy, above, (e.g., Qty. hours per week, holiday schedule, afterhours/weekend operations for HVAC system).
Heating	Installed heating capacity (Qty. & size of Furnaces, Boilers, HPs, electric preheat & reheat), equipment staging, operating temperatures, % combustion efficiency
Ventilation	Carbon dioxide levels, CFM for make-up air units, Qty.of dedicated outdoor air units, Qty. fume hoods, HP of exhaust fans
Cooling	Installed cooling capacity (Chillers plant capacity, equipment staging, temperatures, ton-hours, peak tons), Water-side economizer capacity & setpoints

Potential Effects of NREs by Project Period

Baseline Period

- Increased uncertainty in energy model
- May invalidate baseline model

Implementation Period

- Can obscure or inflate savings from ECMs

Reporting Period

- Direct increase or decrease in Avoided energy use
- Added uncertainty in reporting period model
- May invalidate baseline and/or reporting period models

Options by Project Period

Baseline Period

- Extend baseline period until operations stabilize.
- Exclude period if impacts are temporary
- Baseline established on ‘new normal’ , *spans both old and new*
- Track key ‘static factors’ and include as variables in baseline model
- Determine impacts and make non-routine adjustment to baseline energy

Implementation Period

- Extend period until stable operations
- Consider another M&V option (e.g., sub-meter ECMs)

Reporting Period

- Omit data from period
- Determine impacts and make non-routine adjustment
- Pause contract and extend the performance period when the contract was "performing" in "normal" situations

Is a Non-Routine Adjustment warranted?

1. Determine if impact to savings is 'significant' and requires action
2. Are impacts temporary, permanent, or recurring?
3. Does the impact increase or decrease loads / energy savings?
4. Based on steps 1 - 3, develop approach to address impacts to energy savings

Making Non-Routine Adjustments

- Approach should be cost-effective, but accurate & conservative
- Best to follow M&V option used for ECM
- For Options B & C using metered or sub-metered energy data is preferred
  - Regression modeling strategies can quantify impacts
  - Can support time-of-use savings if needed
  - Use with avoided energy use or normalized energy savings
- For lower-value impacts, engineering calculations may be okay
  - Consider the life-cycle value of the non-routine adjustment

Data Needed for Non-Routine Adjustments

Data on NRE	Details
Date(s) and times affected	Define the event period's start date and end date and times. Note project period
Significance of the NRE	Impact on energy savings
	Impact to affected static factors such as “Leased Square Feet”
Nature of change in energy use	Increase or decrease in base-load, peak loads, or both
	Increase, decrease, or shift in operating hours
Project-specific criteria for non-routine adjustments	Threshold on making non-routine adjustments and other details from the M&V plan or contract

If a Non-Routine Adjustment is Required

1. Omit Data

2. Quantify Impacts

3. Re-Define Baseline Model

If a Non-Routine Adjustment is Required

1. Omit Data

- Claim no savings
- Extend contract period

2. Quantify Impacts

- Baseline model still valid
  - Loads and temperature response of building unchanged
  - Model compatible with other changes (e.g., Schedule)
- Quantify impacts and make non-routine adjustment

If a Non-Routine Adjustment is Required

3. Re-Define Baseline Model

- Permanent changes makes baseline model invalid
  - Reporting period variables beyond range of baseline period, or
  - Additional independent variables are needed for reporting period.
- Action:
  - Add the static factors affected to the baseline model as independent variables
  - Avoided energy consumption calculated by ‘Backcasting’

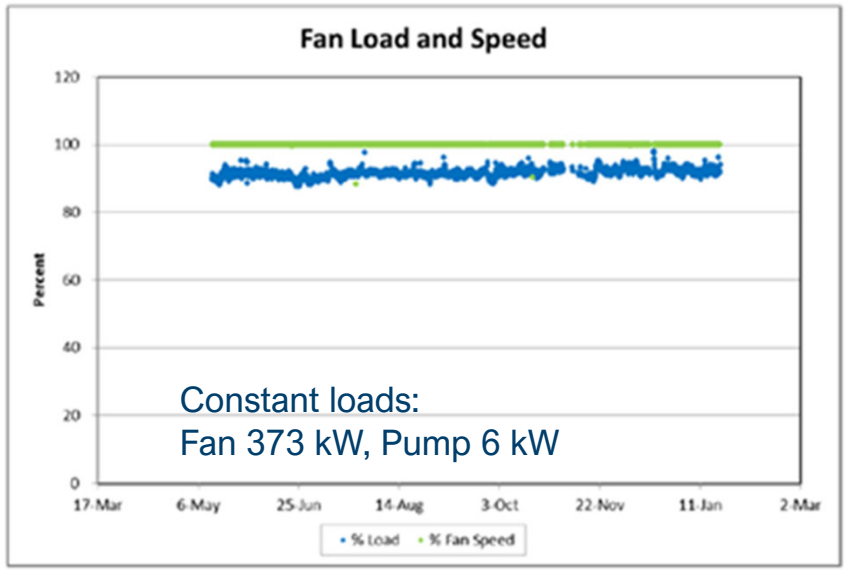
Other Considerations for Covid-19

- Resolutions based on content of contract / M&V Plan
  - Non-routine adjustment
  - Force majeure?
- If unanticipated, use a reasonable agreed-upon solution
  - Risk sharing should extend to unforeseen circumstances
- Consider adjusting investment duration or lease terms
  - Value is a mix of ‘savings’ and installation of new equipment that has the potential to perform

Example Non-Routine Adjustment

- Year 2 of reporting period
  - Added fan and pump system
- Sub-metered new equipment:
  - Energy use
  - Key operating parameters
- Hourly model:

Baseline model (kWh) = βo + β1(Production Volume) + β2 *(Moisture Content)*



***Revised** Baseline model (kWh) =*
βo + β1(Production Volume) + β2 *(Moisture Content) + 379*

IPMVP Resources

IPMVP Core Concepts

Application Guides include:

- Uncertainty Assessment
- Issues and Examples
- Renewables
- ***Non-Routine Events & Adjustments – Publication July 2020***
- *Advanced Meter-Based M&V – underway*

FACILITY energy solutions

Thank you.

EVO | Efficiency Valuation Organization

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Energy Valuation Organization (EVO)

https://evo-world.org/en/

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"Measurement & Verification Process: Adapting to Covid-19"
Case Study: Mall of the Emirates (MOE)

Amin El Najjar
Director, Operations for Dubai & Northern Emirates, Oman, Lebanon and Egypt
ENOVA

ENOVA by VEOLIA

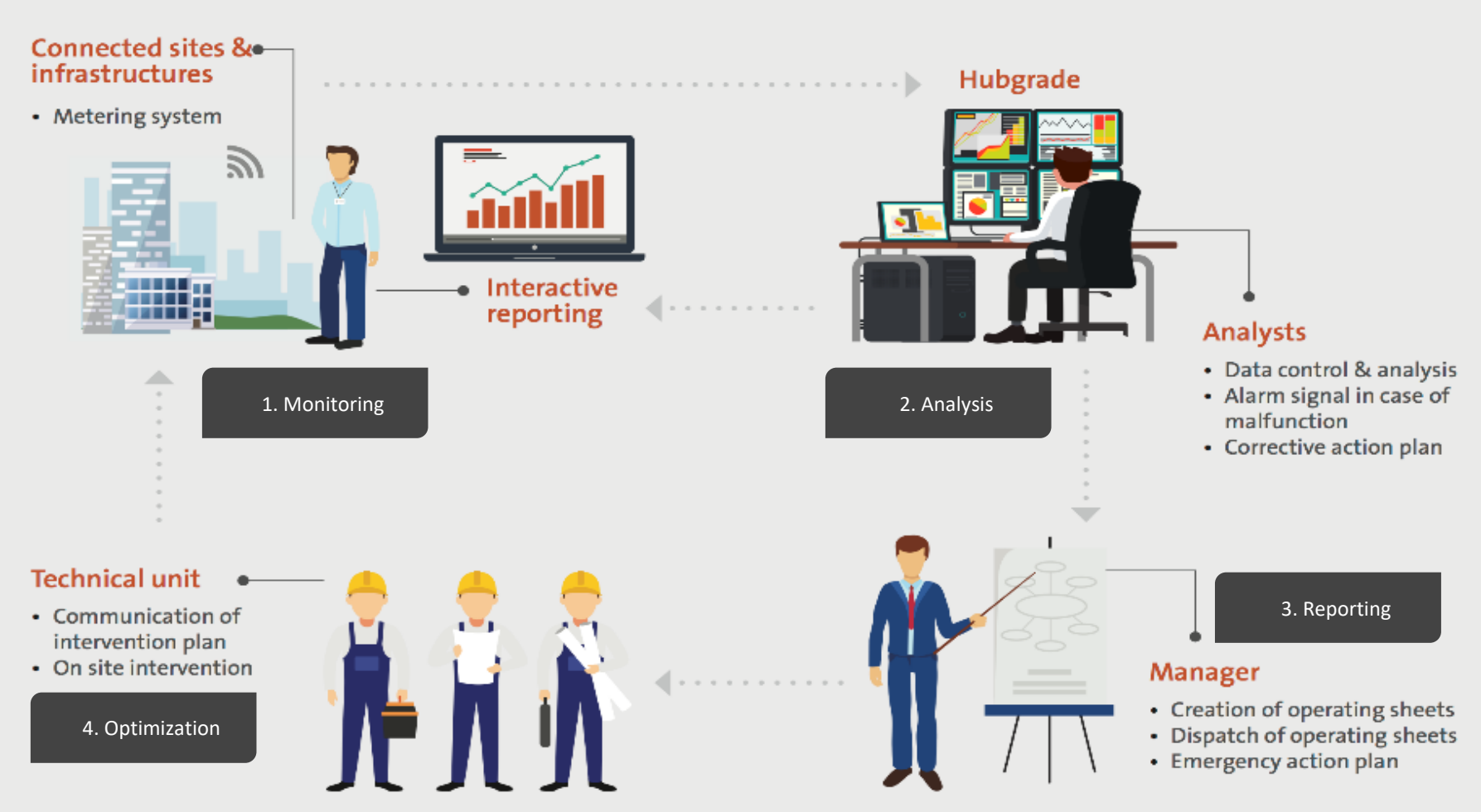
Measurement & Verification Process: Adapting to Covid-19

Case Study: Mall of the Emirates (MOE)

Reference No .: PTD/MOE/20/060
June 1st, 2020

Smart live monitoring platform ‘Hubgrade’

- Web-based applications for data monitoring, analysis and control
- Dedicated access for the client and Enova site ops
- Integration with technicians’ PDAs and CAFM



ENOVA by VEOLIA

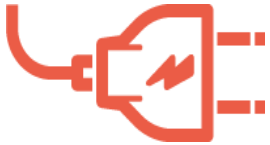
Smart live monitoring platform ‘Hubgrade’

Live Meter Points	Count
Electric Meters	7,194
AHU/FCU Points	5,081
Indoor Environment	3,518
BTU Meters	998
Chilled Water/Chillers	954
Water Meters	802
Pump Points	556
Solar Points	244

23.5k+
meter points monitored

979k m3 of water savings in 2019

68.5m AED
of guaranteed savings to date



64.1m kWh saved in 2019

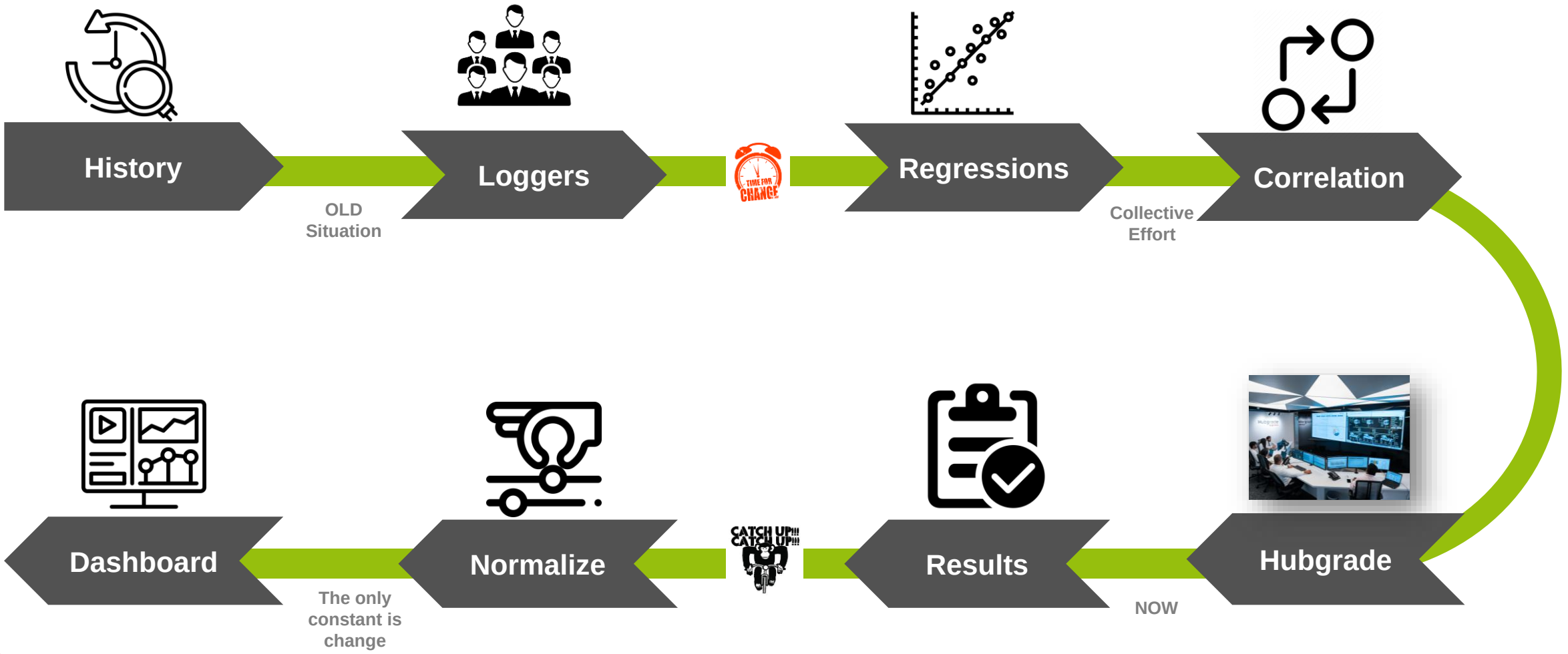
3,100 automated reports in 2019 (scheduled, alarm-triggered)

3 POCs for advanced analytics & machine learning systems

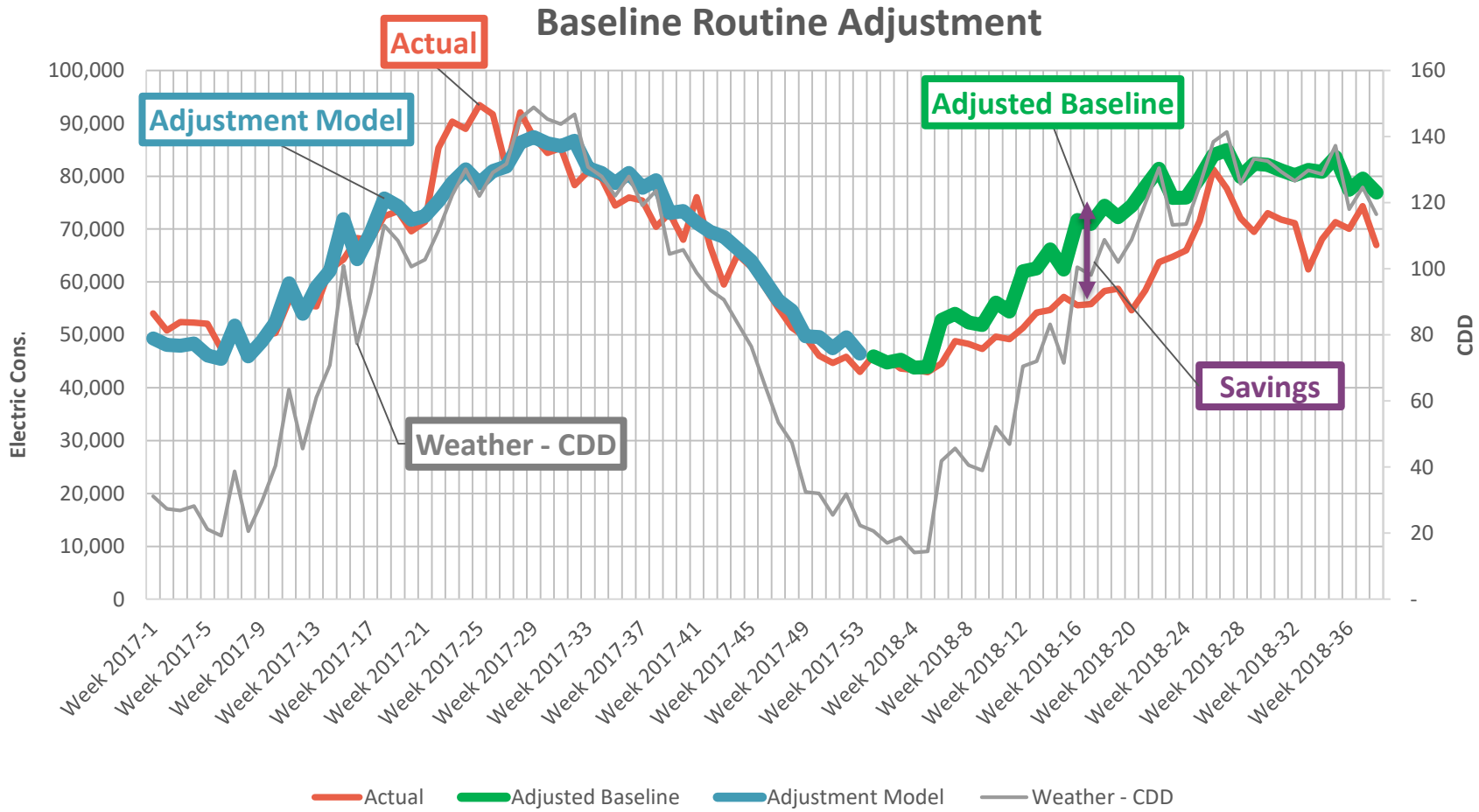
Equivalent to **820k**
tree seedlings grown for 10 years

ENOVA by VEOLIA

M&V Journey


History
OLD Situation
Loggers
TIME FOR CHANGE!
Regressions
Collective Effort
Correlation
Hubgrade
NOW
Results
CATCH UP!!! CATCH UP!!!
Normalize
The only constant is change
Dashboard

Measurement & Verification 101



Actual:

Consumption as recorded by monitored meters.

Adjustment Model:

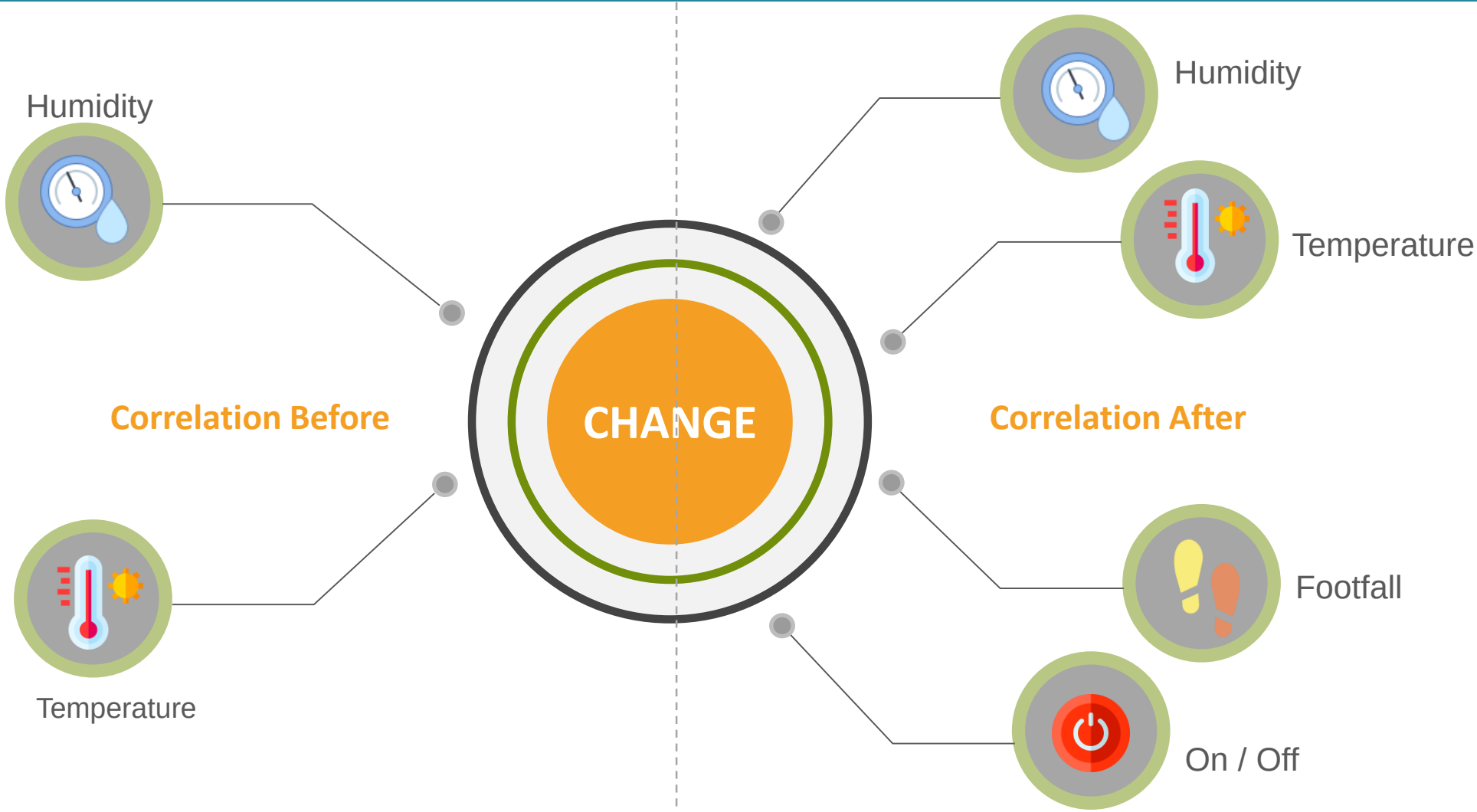
A statistical model mimicking the building performance based on 2018 data.

Adjusted Baseline:

An extension of the adjustment model using 2018 weather data to anticipate how the building would have performed without any energy conservation measures.

ENOVA by VEOLIA

Change in Correlations



Our Next Destination: M&V Part II

Aspire

Assess

Architect

Action

VUCA

Focus on
the When?

Adjust

Learn

Monitor

Advance

What Good
Looks Like

Collective
Effort

Mall of the Emirates

Mall of the Emirates is the world's first shopping resort, in the heart of Dubai.

It features about 630+ brands, in an area of 233,467 sqm.

It houses Ski Dubai and is connected to the iconic Kempinski Hotel and Sheraton Hotel.

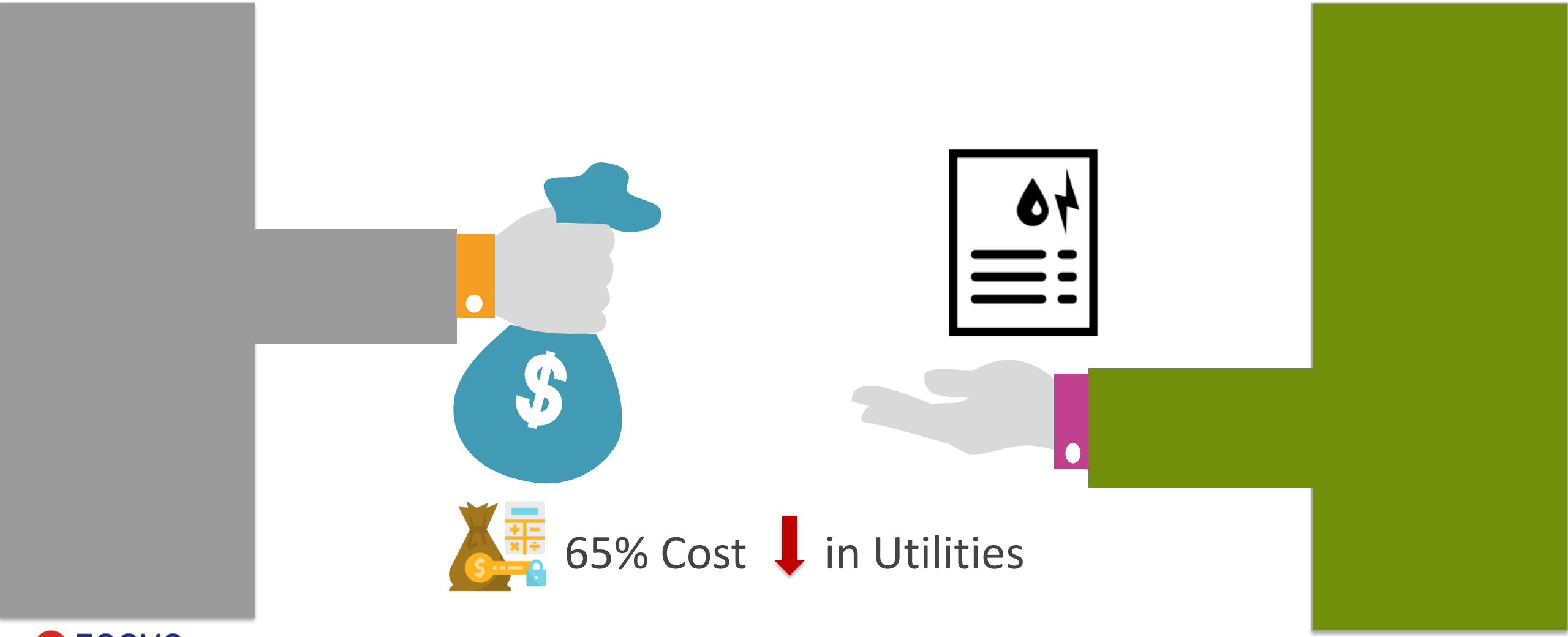
It includes department stores, fashion and lifestyle. It also has sports, electronics, home furnishing and the largest Carrefour in the city.

مـــــول الإمـــــارات
Mall of the Emirates

https://www.youtube.com/watch?v=UfXXwxinMjs

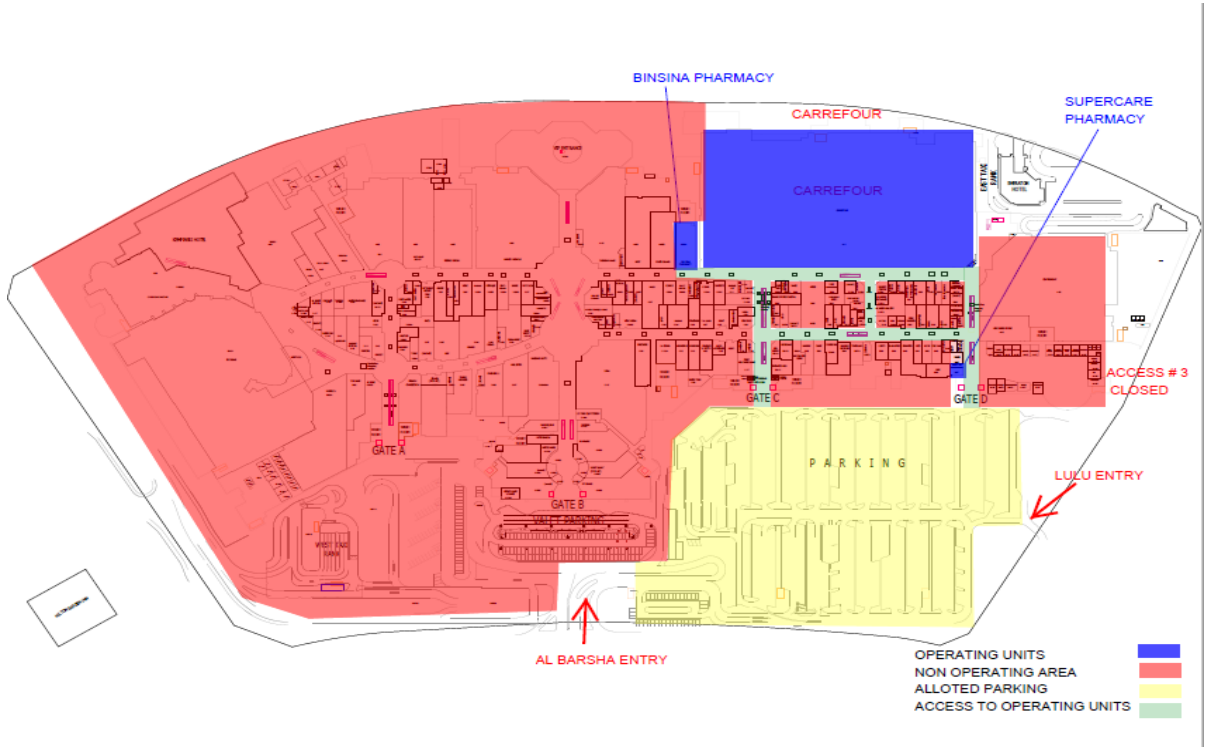
ENOVA by VEOLIA

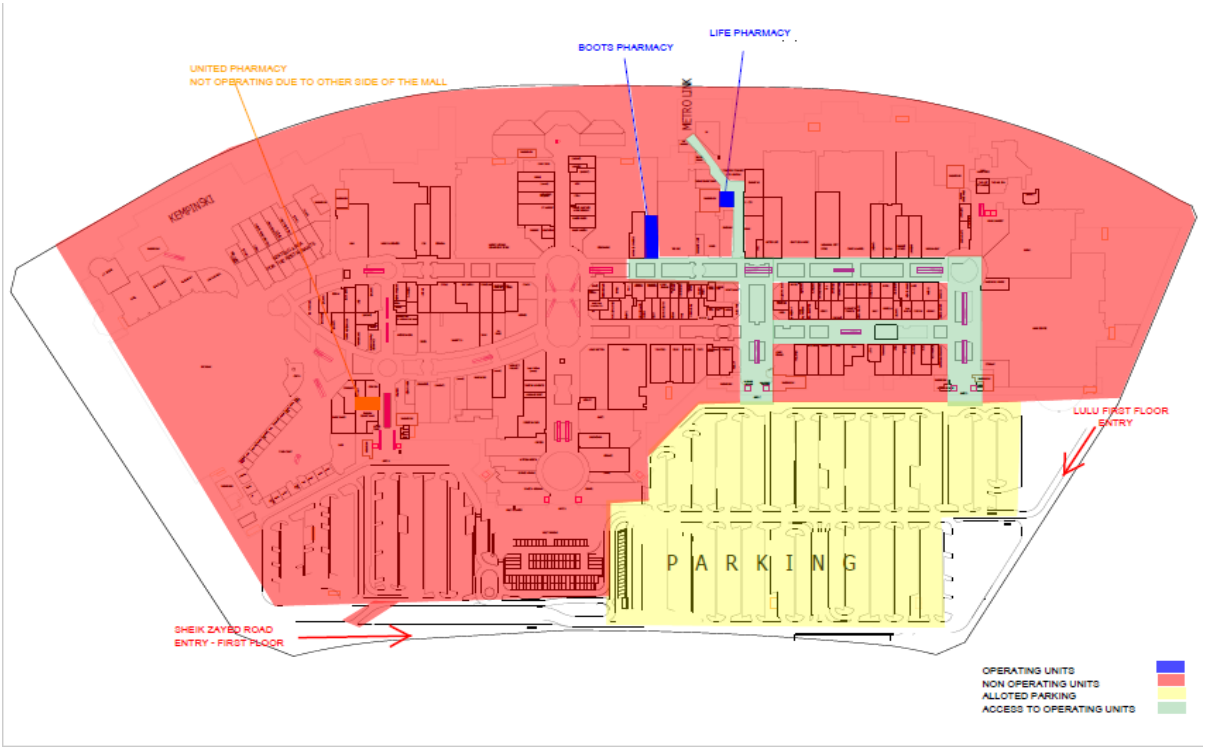
Aspire:



65% Cost ↓ in Utilities

Assess:


BINSINA PHARMACY
CARREFOUR
CARREFOUR
SUPERCARE PHARMACY
ACCESS # 3 CLOSED
GATE A
GATE B
GATE C
GATE D
PARKING
LULU ENTRY
AL BARSHA ENTRY
OPERATING UNITS
NON OPERATING AREA
ALLOTED PARKING
ACCESS TO OPERATING UNITS

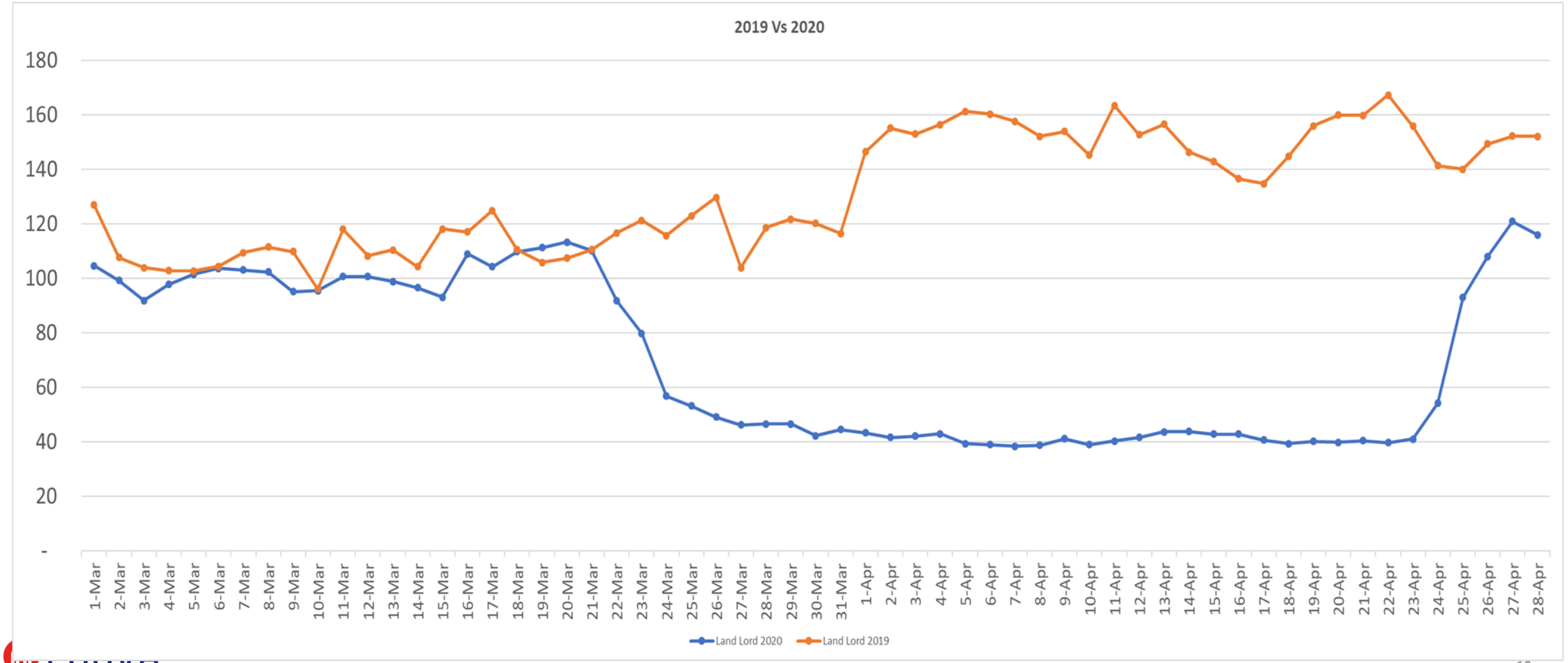

UNITED PHARMACY
NOT OPERATING DUE TO OTHER SIDE OF THE MALL
BOOTS PHARMACY
LIFE PHARMACY
METRO LINK
KEMPINSKI
LULU FIRST FLOOR ENTRY
PARKING
SHEIK ZAYED ROAD ENTRY - FIRST FLOOR
OPERATING UNITS
NON OPERATING UNITS
ALLOTED PARKING
ACCESS TO OPERATING UNITS

Architect:

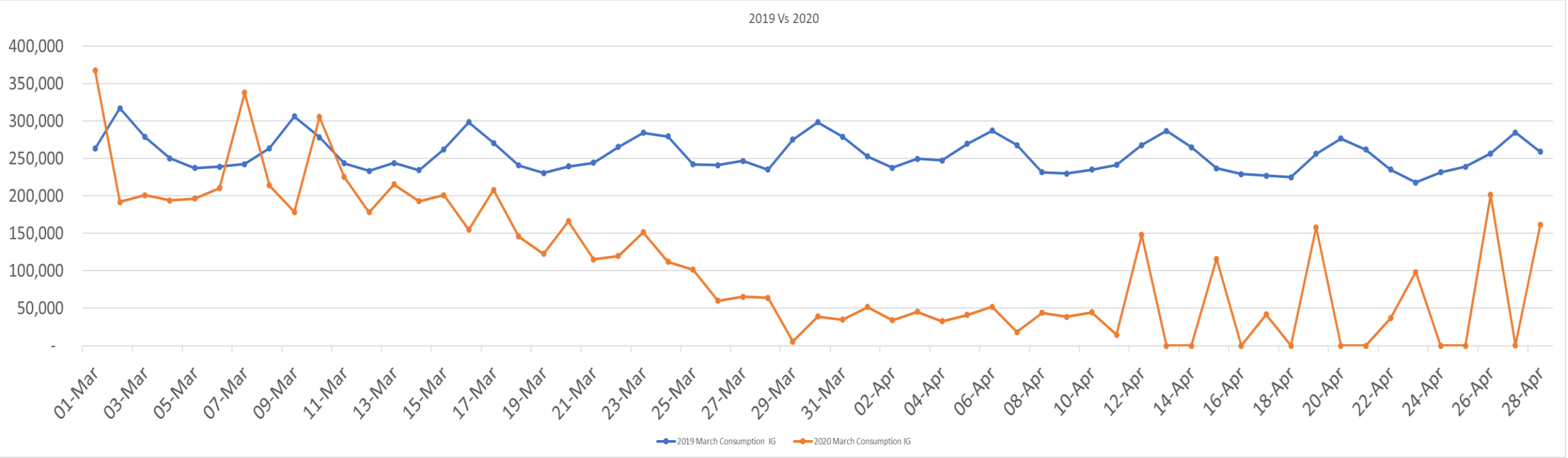
FAH U01	East Food Court	8:00 AM	11:30 PM	9:30 AM	11:00 PM
FAH U01S	West Food Court	8:00 AM	11:30 PM	9:30 AM	11:00 PM
AHU 116-1	West Food Court	8:00 AM	11:30 PM	OFF	OFF
AHU 116-2	West Food Court	8:00 AM	11:30 PM	OFF	OFF
AHU 01A	Common Area / Court 1	9:00 AM	10:30 PM	9:00 AM	10:00 PM
AHU 05A	Common Area / Mall 1	9:00 AM	10:30 PM	9:00 AM	10:00 PM
AHU 09	Common Area / Mall E	9:00 AM	10:30 PM	OFF	OFF
AHU 10	Common Area / Mall E	9:00 AM	10:30 PM	OFF	OFF
AHU 14	Common Area / Mall A	9:00 AM	10:30 PM	OFF	OFF
L 01	VIP Entrance	7:00 AM	2:00 AM	OFF	OFF
L 04	GATE 1 EAST	7:00 AM	2:00 AM	10:00 PM	7:00 AM
L 05	GATE 1 WEST	7:00 AM	2:00 AM	OFF	OFF
L 06	GATE 2 EAST	7:00 AM	2:00 AM	10:00 PM	7:00 AM
L 07	GATE 2 WEST	7:00 AM	2:00 AM	10:00 PM	OFF

ENOVA by VEOLIA

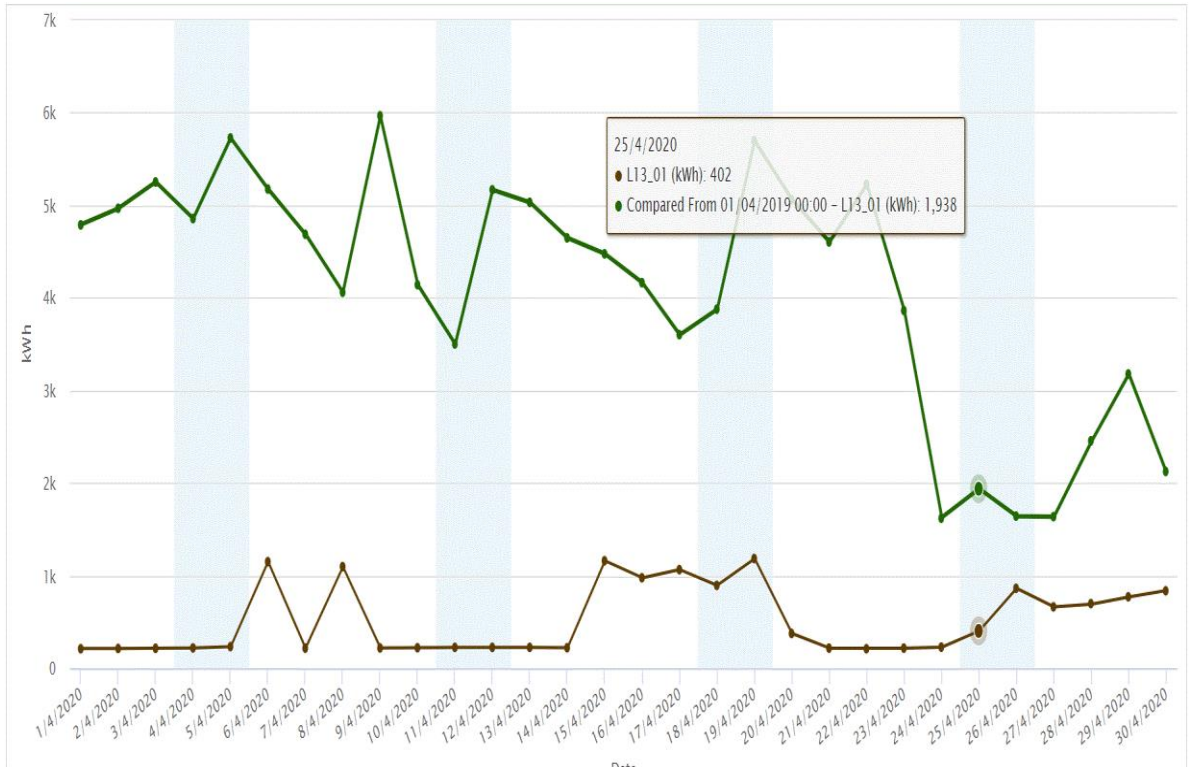
Action (COVID – 19 Trends Electricity)

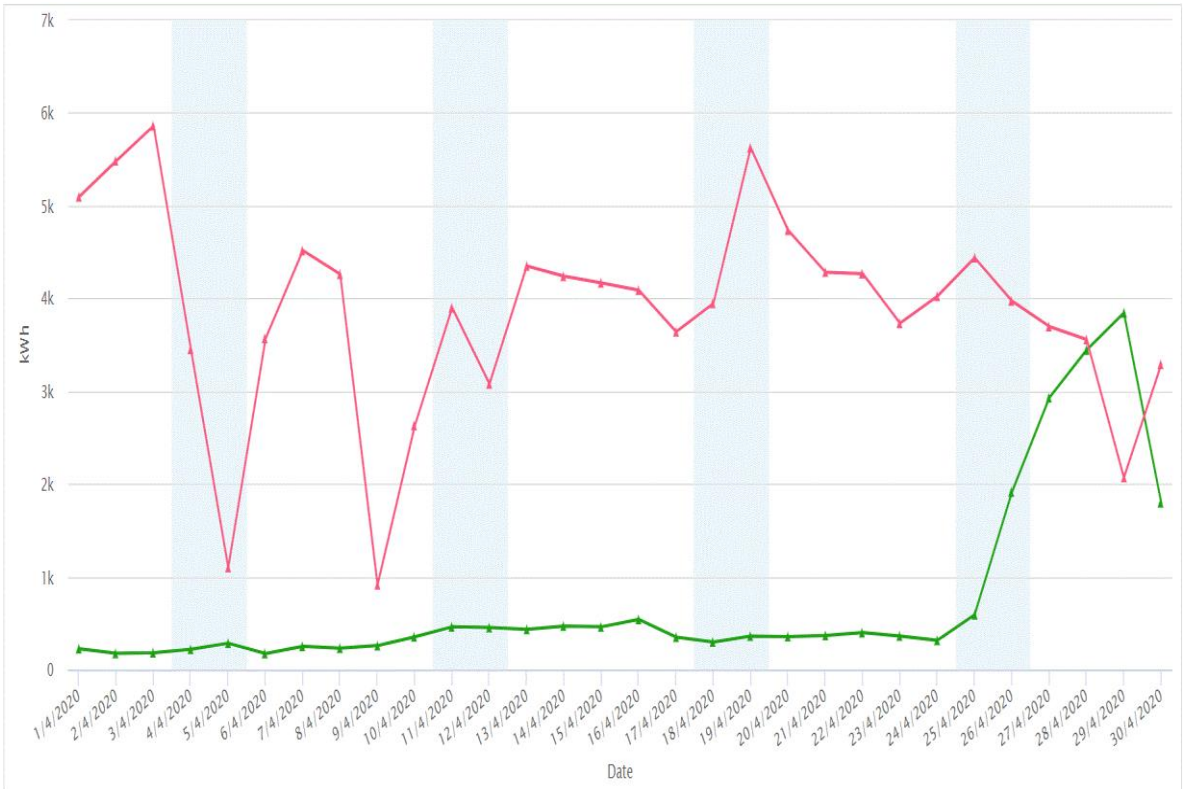


Action (COVID – 19 Trends Water)

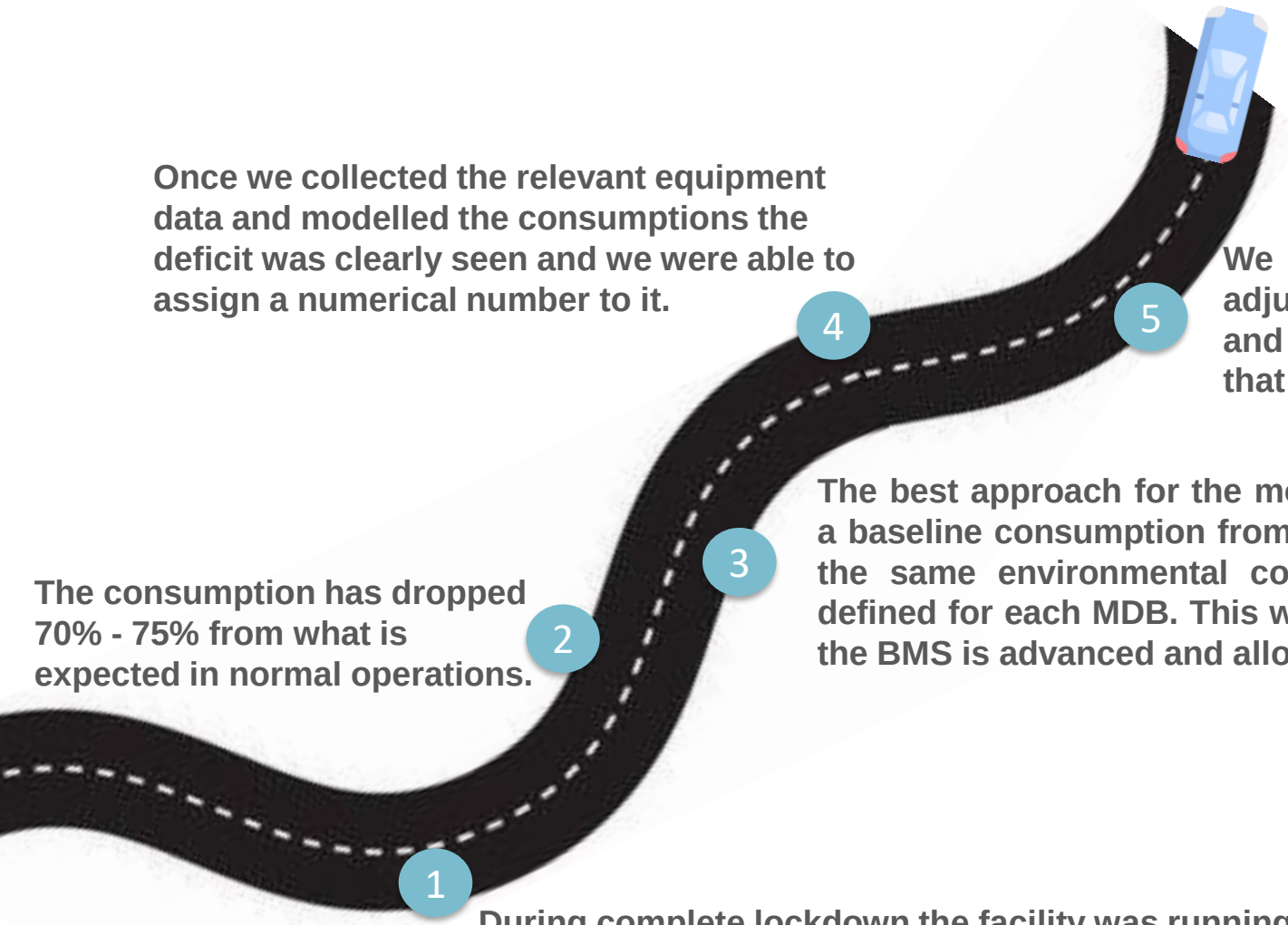


Advance (Sub-metering Level)





Learn:



$$Savings = (Adjusted\ Baseline - Reporting\ Period) \pm Partially\ Shutdown\ Equipment$$

1. During complete lockdown the facility was running at 15% of its capacity.
2. The consumption has dropped 70% - 75% from what is expected in normal operations.
3. The best approach for the most accurate outcome is to establish a baseline consumption from the most recent MDB readings with the same environmental conditions. The equipment load was defined for each MDB. This was viable for Mall of the Emirates as the BMS is advanced and allows for this data collection.
4. Once we collected the relevant equipment data and modelled the consumptions the deficit was clearly seen and we were able to assign a numerical number to it.
5. We established a numerical deficit (non-routine adjustment) due to the partial shutdown of equipment and deducted that from the routinely adjusted baseline that already took into account the drop in footfall.

Conclusion

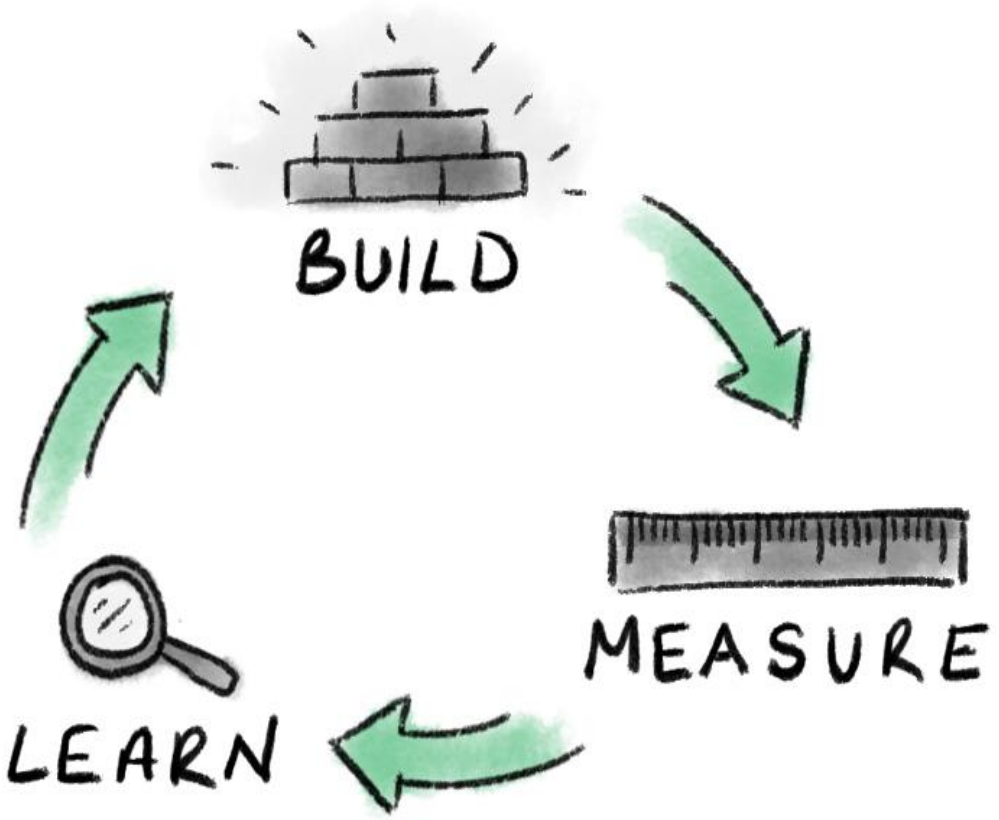
1. As this is unprecedented we have opted for the most factual approach.

2. This was possible due to IoT.

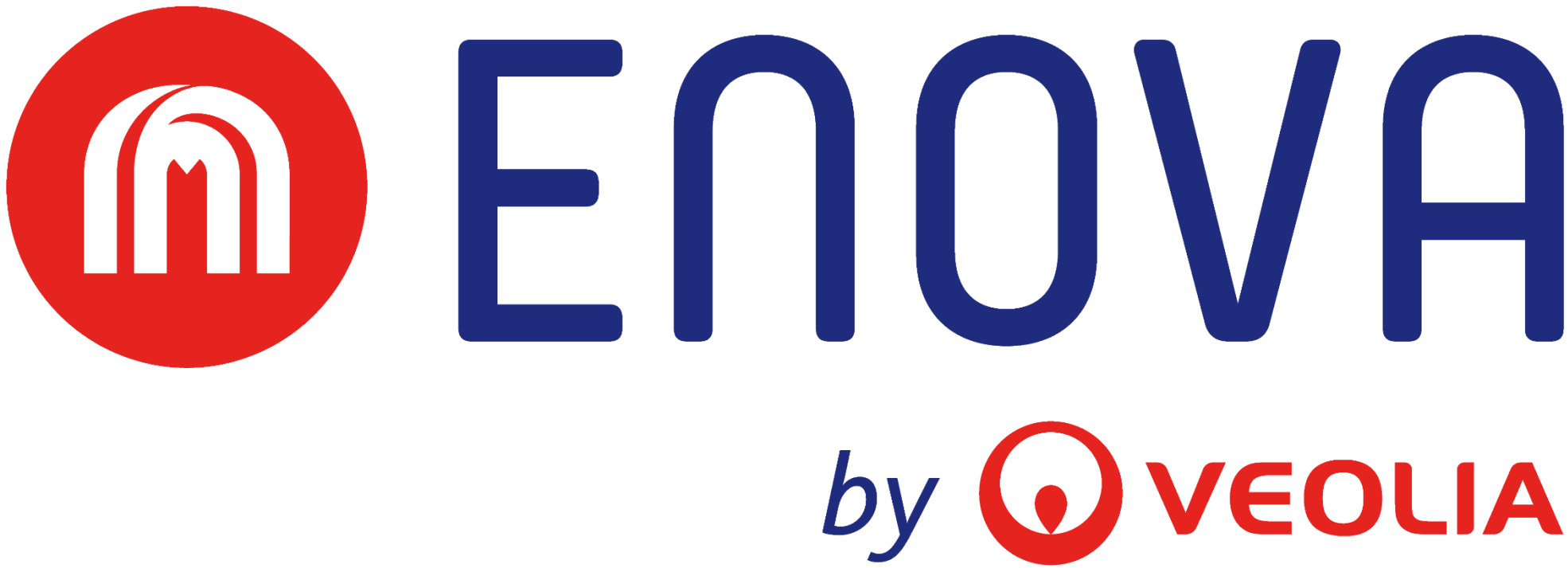
3. We identified non-routine effects compared to previous data collected.

4. We adjusted for the routine & non-routine factors.

5. Next! Redefine the new norm.



ENOVA by VEOLIA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CEBC Clean Energy
Webinar Series
Webinar #7

Impact of COVID-19 on ESCO M&V Activities

Case Study: Hotel

Gaurav Soni
Project Assurance Manager – O&M and M&V
ENGIE Smart4Power

Impact of COVID 19 ESCO M&V Activities

4th June 2020

ENGIE Smart4Power profile

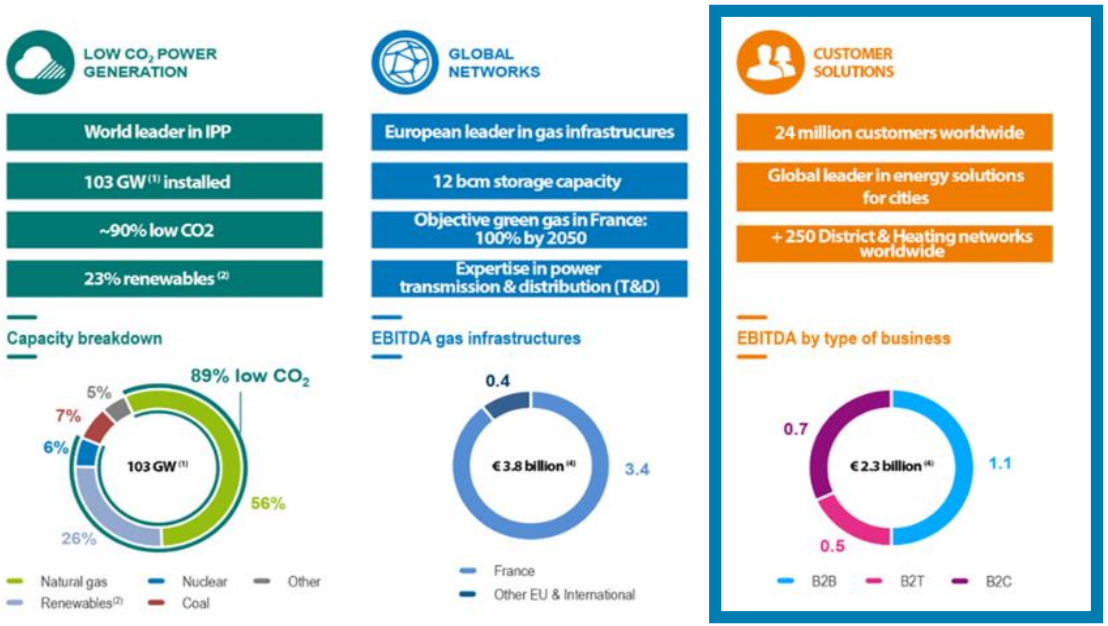
ENGIE: A Global Energy Actor

Activities in 70 countries

60 Billion Euro Revenues (2019)

160 000 Employees

25 % owned by the French State



Energy Efficiency is part of Customer Solutions

SMART4POWER
Empowering Energy Efficient Solutions

As part of **ENGIE**, **Smart4Power** is a leading provider of energy efficiency solutions for commercial, residential and industrial facilities. Since its inception in 2012, it has conducted 200+ energy audits and implemented over **40 efficiency projects** that have generated accumulated savings **exceeding AED 50 million.**

Smart4Power is headquartered in the UAE, has an office in Saudi Arabia, and runs projects in most of the GCC countries.

Turn-Key for Commercial and Government buildings &Industrial:

From financing till implementation of Energy Savings Solutions and Guaranteeing of Savings

Energy Audit → **Energy savings Implementation** → **Monitoring & Verification**

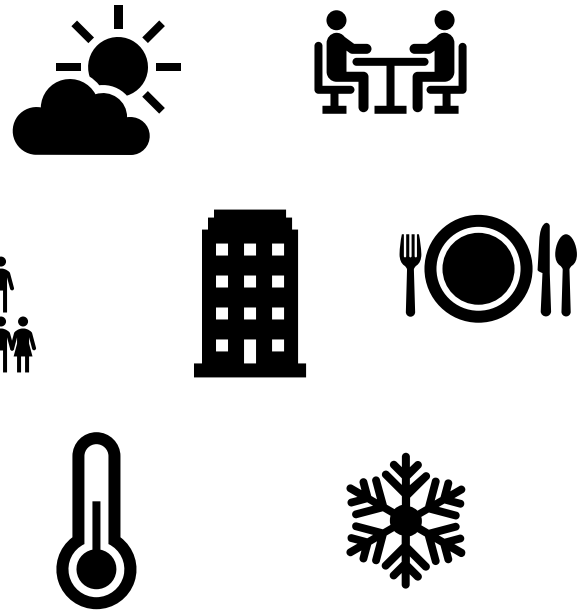
- Energy Audit: Identifies the best opportunities for savings
- Energy savings Implementation: Turn-key energy savings solutions implementation
- Monitoring & Verification: Monitors energy savings after implementation

2

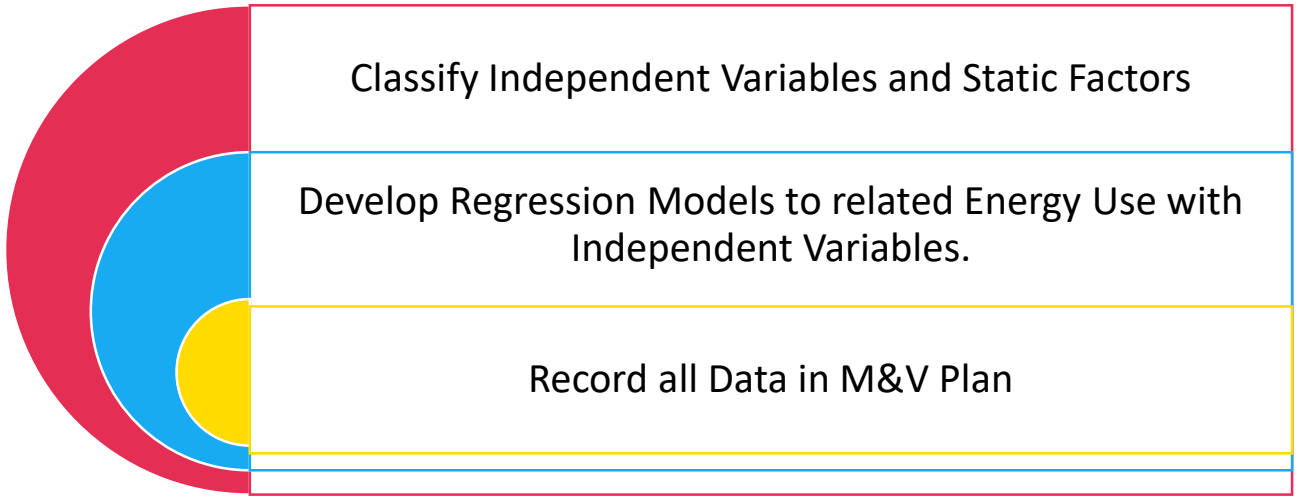
Importance of identification of right Independent Variables and Static Factors

Parameters affecting Energy Consumption of the facility

- List all Factors that affect the Utility Demand and Consumption
  - Occupancy
  - Weather (CDD)
  - Building Utilization
    - Conditioned Space / Total Floor Area
    - No of Guest rooms and Types
    - No of Banquet Halls , Restaurants, Kitchens, Gym
  - Setpoints
    - Guest room Setback
    - Pool(s)
    - Hot Water
    - Domestic Water Tank
    - Common Areas
  - Ventilation Rates
  - Connected Load



Having all factors included in M&V Plan allows you to adjust for any changes in the Static Factor



Baseline Adjustment strategy

For Option A

- Simple calculation – No NRA – e g. Lighting retrofit –Operating Hours are estimated and hence no change.

For Option B/C – Long term Contracts

- **If Post retrofit > 6 months**
  - Use reporting period data to create regression Model – Efficient Performance Model (EPM)
  - Compare Adjusted Baseline Energy against Predicted using EPM
  - Difference provides “projected cost avoidance” under “Business as usual scenario”
  - Use Submeter data to calculate variation from Annual Equivalent period.
- **If Post retrofit < 6 months**
  - Use Submeter / Quarter hourly data to develop advance analytical model to make relevant adjustments for subsystem energy use.
  - Suspend- extend contract

If no Proper documentation of Static Factors

- Discuss with client using most effective way to calculate the impact and arrive at amicable solution.
- Suspend / extend contract until Business returns to usual .

Case Study : Hotel in UAE

Case Study : Upscale Hotel In Dubai Marina

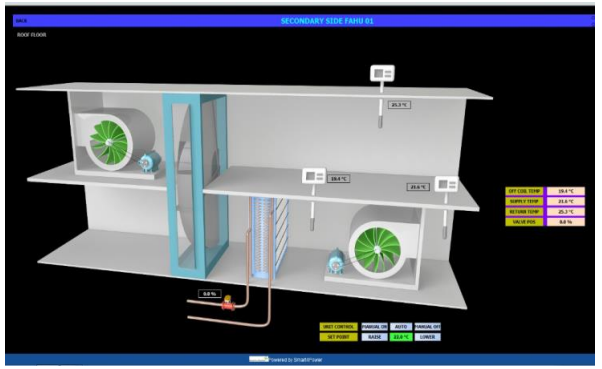
About Hotel

- The hotel is located in Dubai Marina and started operations in Nov. 2015
- Total Building area: 28,865 sqm
- The hotel consists of Basement + Ground +32 floors featuring 485 guest rooms with different categories
  - Superior Suites :- 241 rooms
  - Junior Suites :- 120 rooms
  - Grand Suites :- 124 rooms
  - Interconnecting room :- 50 rooms
  - Disabled room :- 4 rooms
- The hotel also features 2 restaurants, 1 gym and a swimming pool

ESPC

ECMs Installation Completed Sep 2018

- Chiller Plant Manager
- Wet Wall System
- FAHU Optimisation
- VFD on Exhaust and Makeup fans for Kitchens.

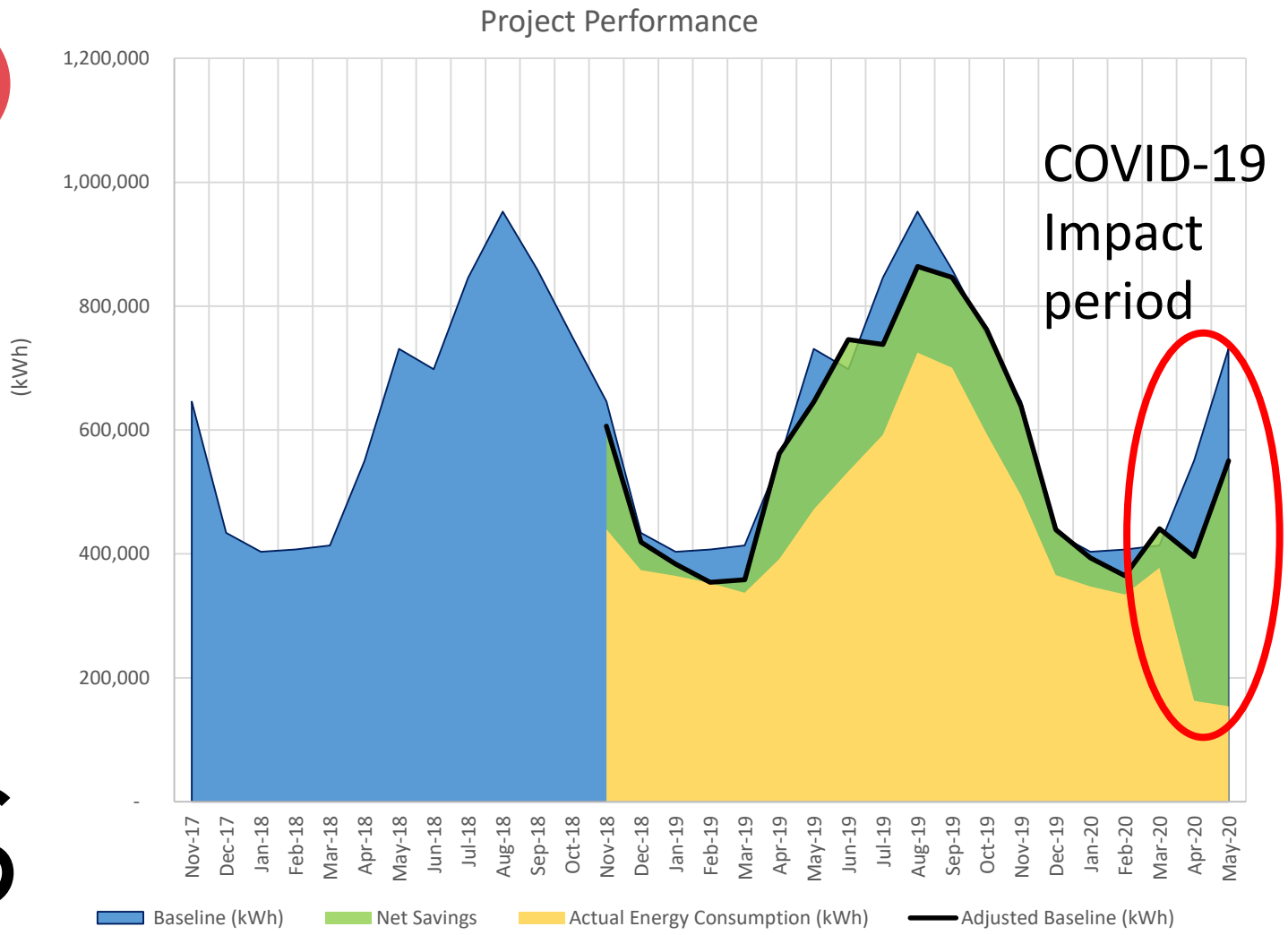


Case Study : Upscale Hotel In Dubai Marina

Current Situation

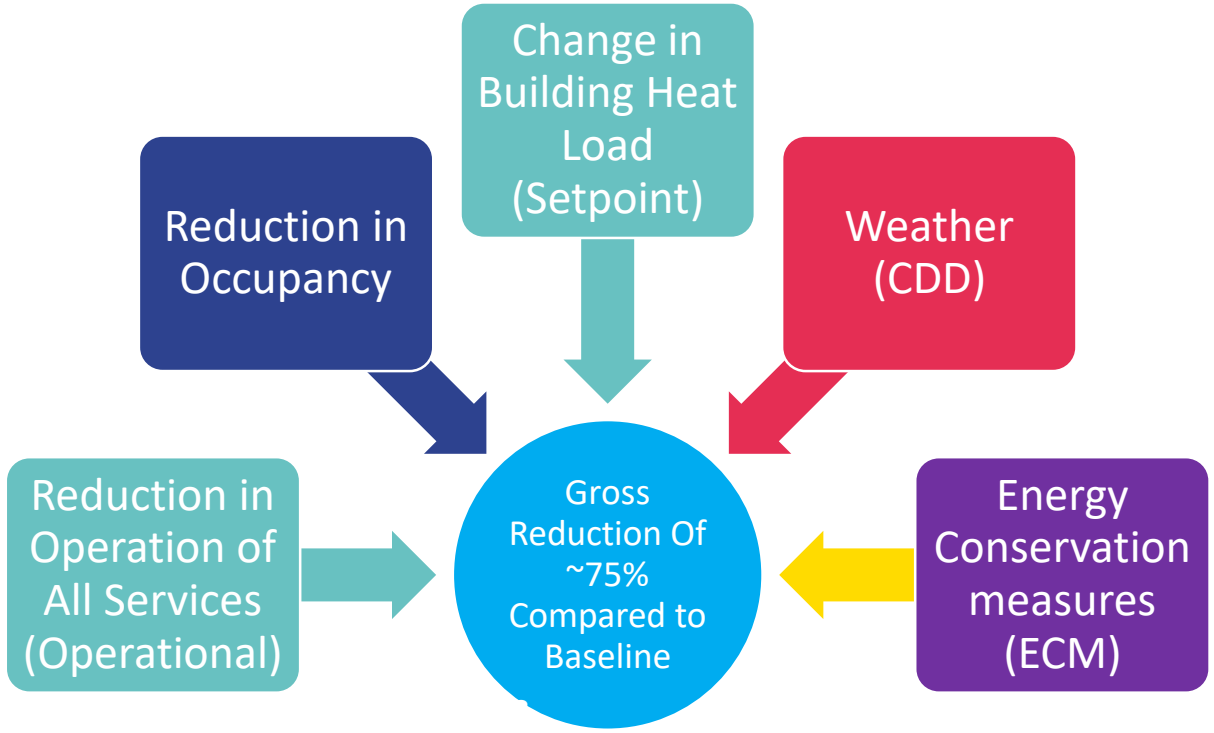
- Facility is closed since March 25.
- HVAC system operational to maintain Healthy state of Interiors.
  - Setpoint Increased from 24°C to 27°C
  - Guestroom FCU operational
  - Fresh Air operation reduced to 8 Hours.
- ECM's in operation
- 75% reduction in Bill to Bill Energy Consumption
- 74% Net savings Calculated using Regression Model

Can this NET savings be claimed????,….NO! $$



Case Study : Upscale Hotel In Dubai Marina

Reasons and Baseline Adjustment



Occupancy and Operations

Use of Submeter data

Weather

Use of Coefficient of regression for CDD.

Impact of ECM

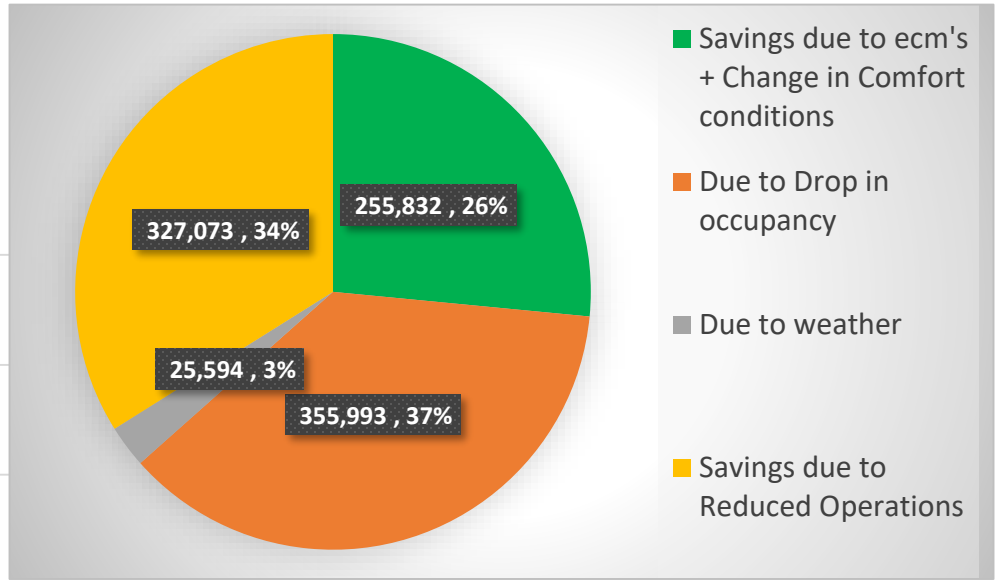
Use of Post retrofit Energy Use model (EPM)

Change in Setpoint

Substitution of CDD with Higher Base temperature (24 from 21) in EPM Model

Case Study : Upscale Hotel In Dubai Marina

Savings calculation



Clients in Commercial

Hospitality / Health

JUMEIRAH GROUP

RIXOS HOTELS

GRAND HYATT

WYNDHAM HOTELS AND RESORTS

THE RITZ-CARLTON® HOTEL COMPANY, L.L.C.

THE FIRST GROUP

Dusit Thani

RAK HOSPITAL

Real Estate / Retail

DP DUBAI PROPERTIES

DUBAI INVESTMENTS دبي للإستثمار

العثيم مول AL OTHAIM MALL

بنك أبوظبي الأول FAB First Abu Dhabi Bank

صندوق أبوظبي للتنمية ABU DHABI FUND FOR DEVELOPMENT

Government

ترشيد TARSHID الشركة الوطنية لخدمات كفاءة الطاقة The National Energy Services Company

Dubai Airports

Etihad Energy Services

QUEEN ALIA INTERNATIONAL AIRPORT مطار الملكة علياء الدولي

Education

innoventures education

RAFFLES WORLD ACADEMY

كلية دبي DC DUBAI COLLEGE U.A.E.

DIA

Clients in Industrial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Thank You

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Q&A

CEBC Clean Energy Webinar Series
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"The Impact of COVID-19 on ESCO M&V Activities"

Lia Webster
Sr. Engineer / Principal
Facility Energy Solutions &
Chair of the IPMVP Sub-Committee on Advanced M&V, **EVO**

Amin El Najjar
Director
Operations for Dubai & Northern Emirates, Oman, Lebanon and Egypt
ENOVA

Gaurav Soni
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ENGIE Smart4Power

Iwan Walters
Partner, **Eversheds Sutherland**
Board Member,
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