RENMAD LATAM 2021

RENEWABLES & STORAGE

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Powering a Sustainable Future

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FRV-X

Business Models for Energy Storge

ATA INSIGHTS Webinar

March 9th 2021

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NEW BUSINESS DEVELOPMENT MANAGER LATAM, FRV-X

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FRV Worldwide

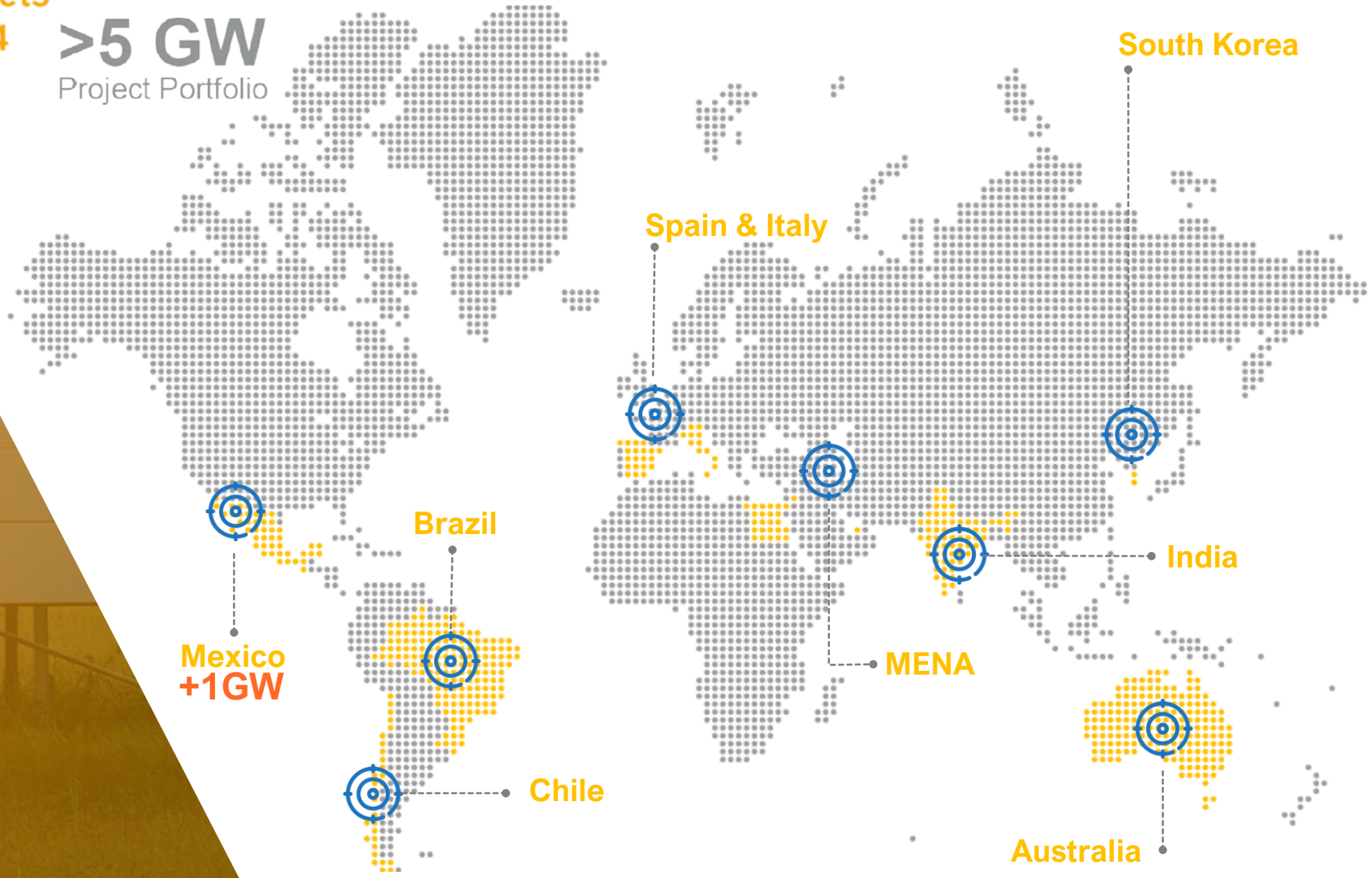
Abdul Latif Jameel ENERGY

+ USD 4B
Expected Investments in fixed assets until 2024

5
Continents

>40
plants

>5 GW
Project Portfolio



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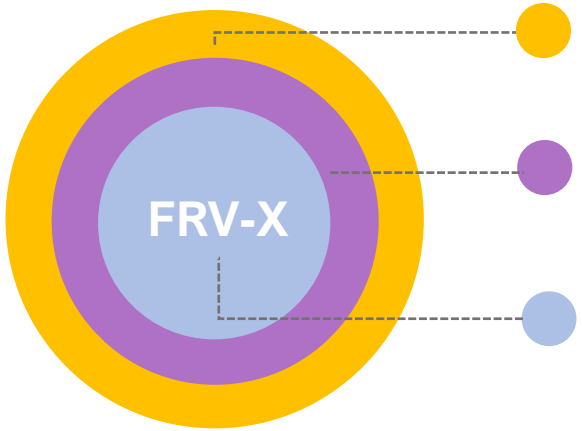
Introducing frvx

FRV^{X} believes a truly energy transformation must provide access to affordable clean energy supply to all consumers across the production landscape. We integrate state-of-the-art technology to achieve this.

By enabling access to tailor made cost-effective energy solutions to all our customer, FRV strives to become the most important platform for clean energy projects in the world and to improve the efficiency of the overall energy system.

At FRV Group we aim to be at the forefront of the global energy transition to a low carbon economy. With offices all around the world, 10-years experience in the renewable industry, presence in 5 continents and over 5GW of energy projects in our portfolio, we are now launching FRV-X as our commercial technology platform able to create innovative solutions across the energy landscape.



- +5GW Grid-Scale Projects
- Over USD 3.2 billion in Project Financing
- In-house Technology Hub for innovative solutions

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Energy Storage and Business Models

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The Energy Transition

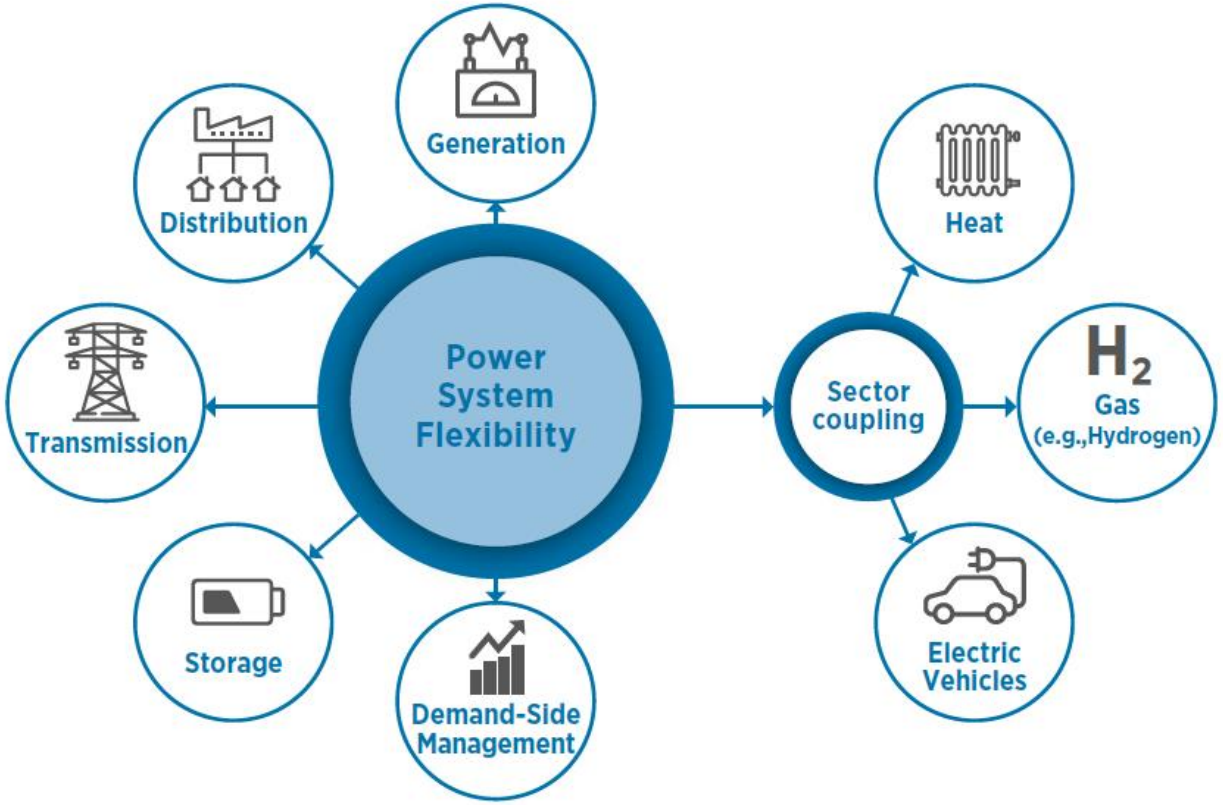
Energy storage is a key flexibility resource to balance the system

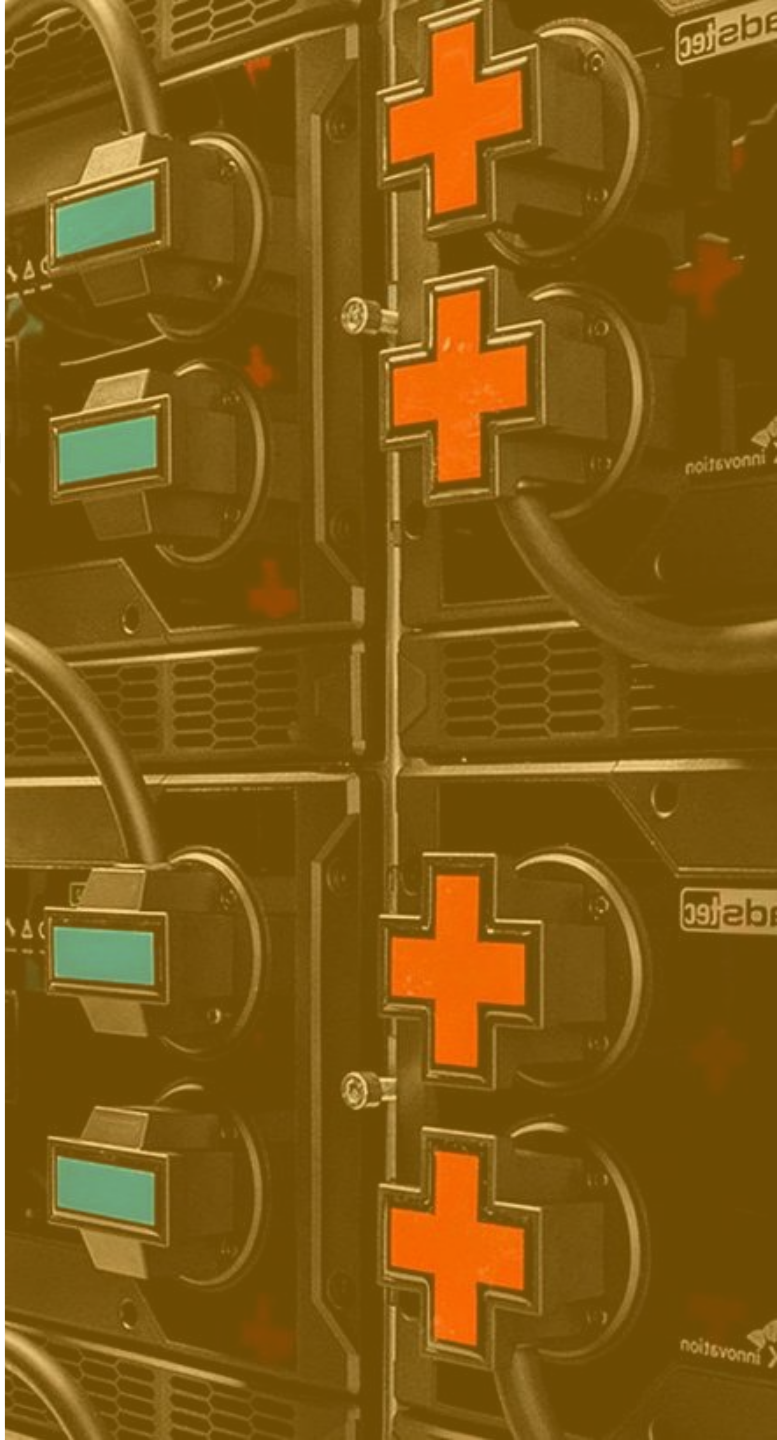
DRIVERS OF ENERGY TRANSITION

- Ecological decision & Decarbonized generation
- Increase Resiliency, Security, Efficiency
- Cost reduction

FACTS

- More intermittent sources
- More distributed generation
- Intermittency, low inertia, congestions





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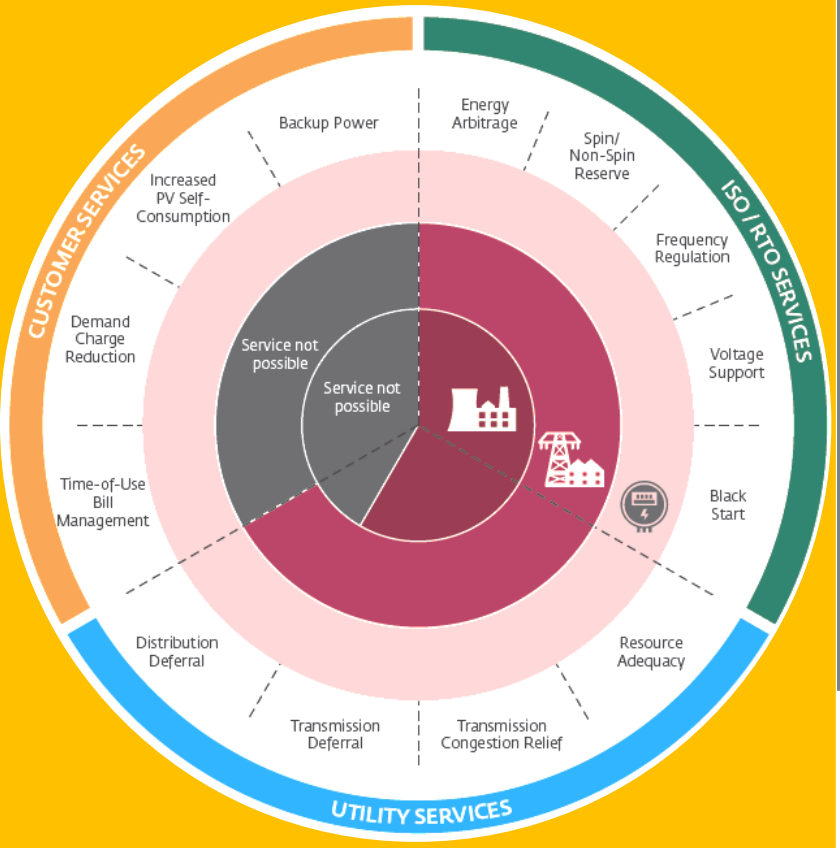
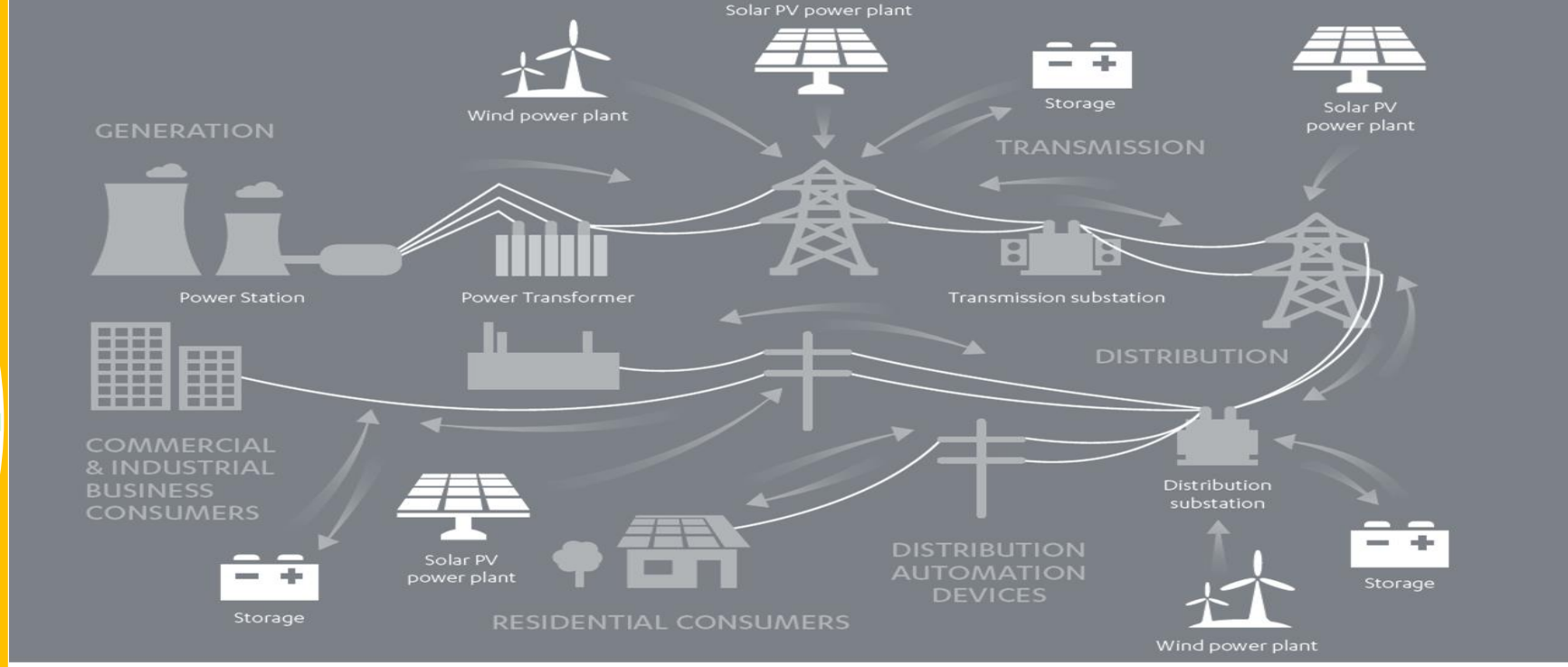
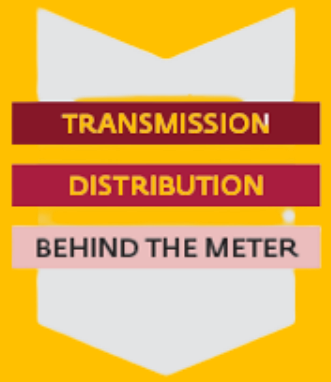




Batteries can provide up to 13 services to three stakeholder groups



Battery Energy Storage can provide flexibility at all levels of the value chain

Generation Level	T&D	Supply	Seasonal storage	Energy time shift	Supply capacity	
T&D Transmission and Distribution	T&D	Stability	Frequency Regulation	Load Following	Smoothing/ Ramp.	Operating Reserves
	T&D	Quality	Voltage Support	Congestion Mitigation	Reliability Back-up	Black Start Capabilities
Demand Side Residential or Commercial & Industrial Customers	Demand	Economy	Demand Shifting	Peak Shaving	Demand Charges	
	Demand	Resiliency	Islanding operation	Outages Mitigation	Black Start	
Off-Grid customers	Demand	Autonomy	Fuel Saving	RES Penetration		

Revenue Stacking

"**Software** is the missing link on grids that are transitioning to a more renewable-based generation"

Yesterday

Grid-scale

Grid-stability compliance for Renewable Plants & Black Start

Operating as part of a Generation Plant under the same regime applicable to it (Arbitrage and Curtailment Avoidance)

Behind-the-meter

Time-of-use (ToU) Management

Demand Charges Management

Back-up (UPS)

Solar PV Boosting

Reactive Power Compensation

Today

Grid-scale

Ancillary Services

Fast Frequency Response

Arbitrage / PV Shifting / Curtailment

Transmission Congestion Relief

System Capacity Back-up

Behind-the-meter

Energy Trading

Demand Side Response

Tomorrow

Grid-scale

Distribution Deferral

Synthetic inertia

Long-term storage auctions

Balancing Mechanism

Behind-the-meter

Virtual Power Plants

Peer-to-peer energy trading

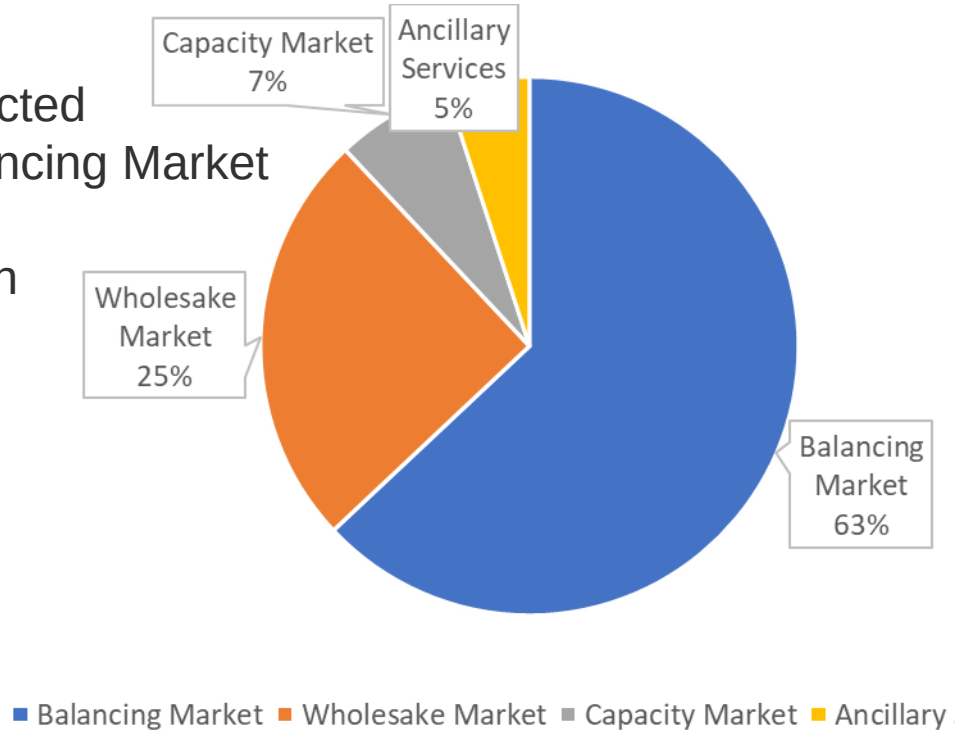
Blockchain transactions

Real Application Challenges

UK Holes Bay - Stacking

Background & Overview

- **Type:** Stand-alone grid-connected
- **Revenues:** Wholesale & Balancing Market
- **Location:** Holes Bay, UK
- **BESS**: Li-ion 7.3MW/14.6MWh
- **Network:** SSE 11kV
- **CoD:** Q2 2020



- Project get its revenues from the participation in the UK electricity market on the following segments: (1) Balancing Market (BM) (estimated ~63% of total revenues); (2) Wholesale market (~24%); (3) Capacity Market (~7%) and (4) Ancillary Services (~6%).

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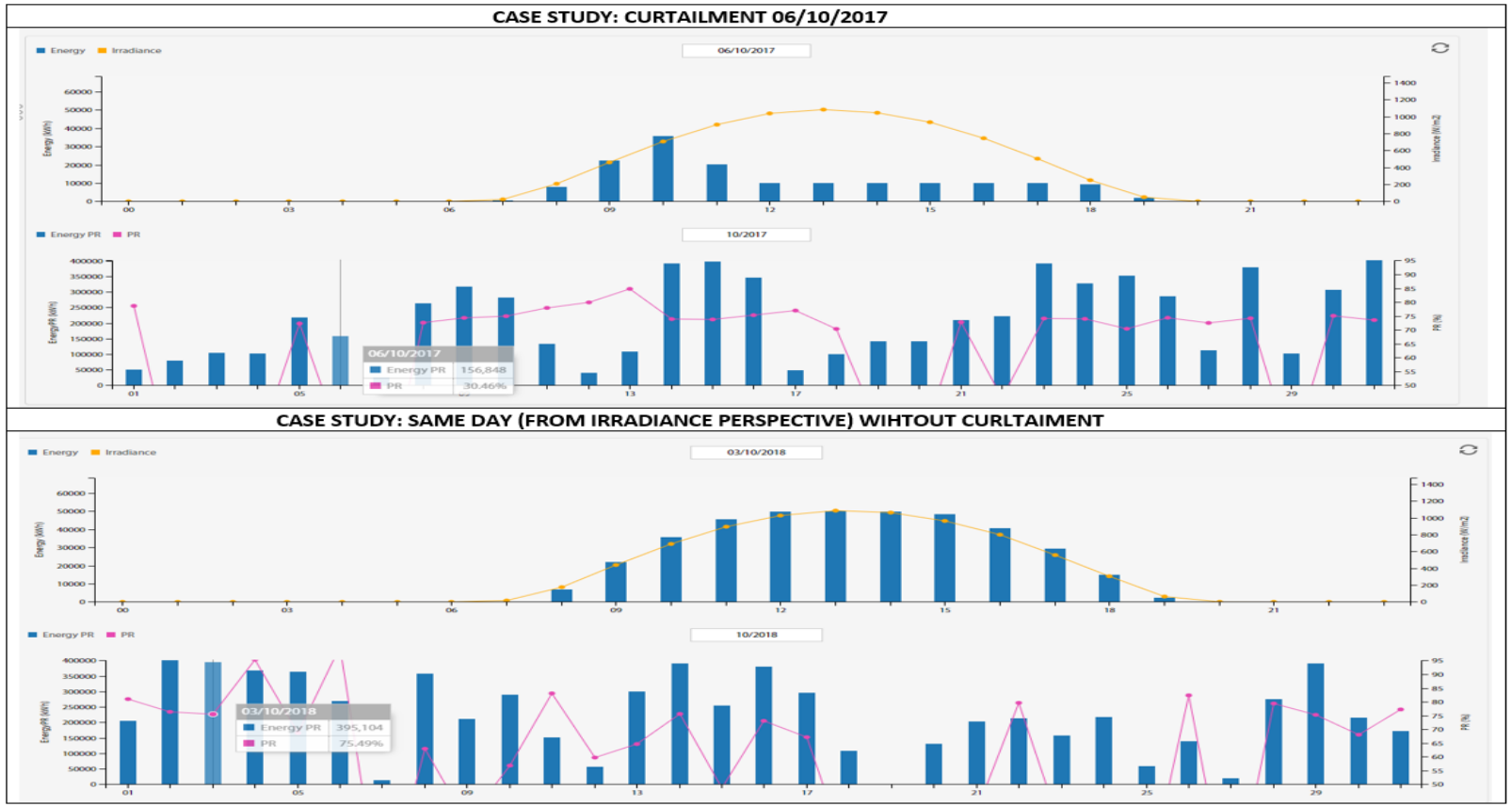
Uruguay – Solar Curtailment

For 2017, Cost of Solar Curtailment raised up to **US$ 905,113**, and this only takes into consideration the cost of undelivered energy. Total energy that was curtailed for the same period was **9,090 MWh.**

Curtailment mitigation + Arbitrage + Frequency Management



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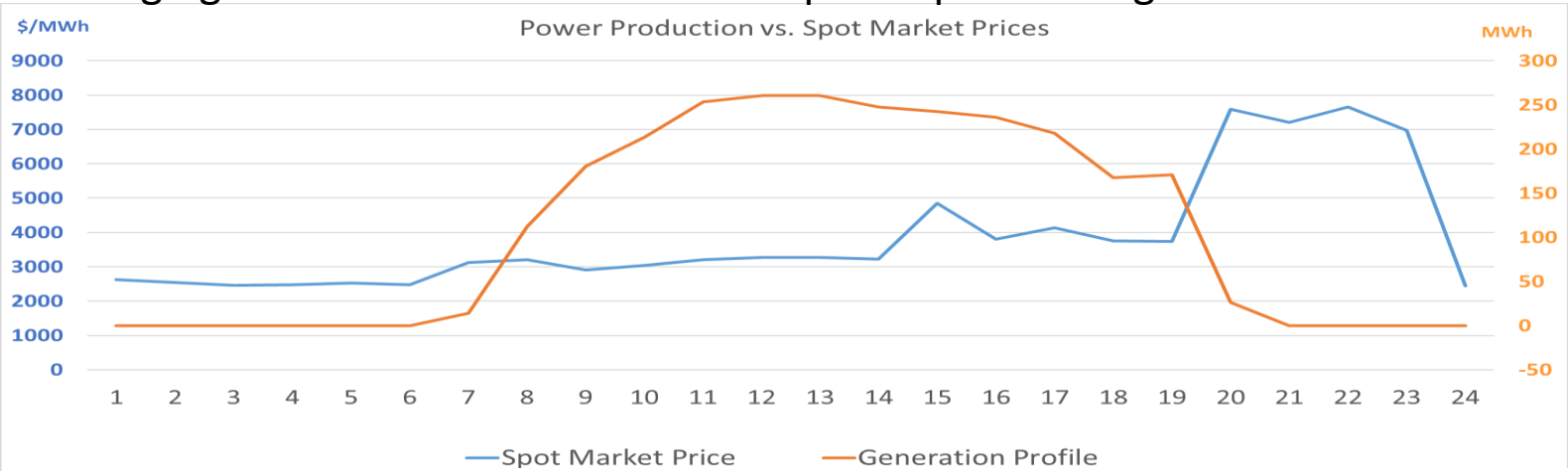
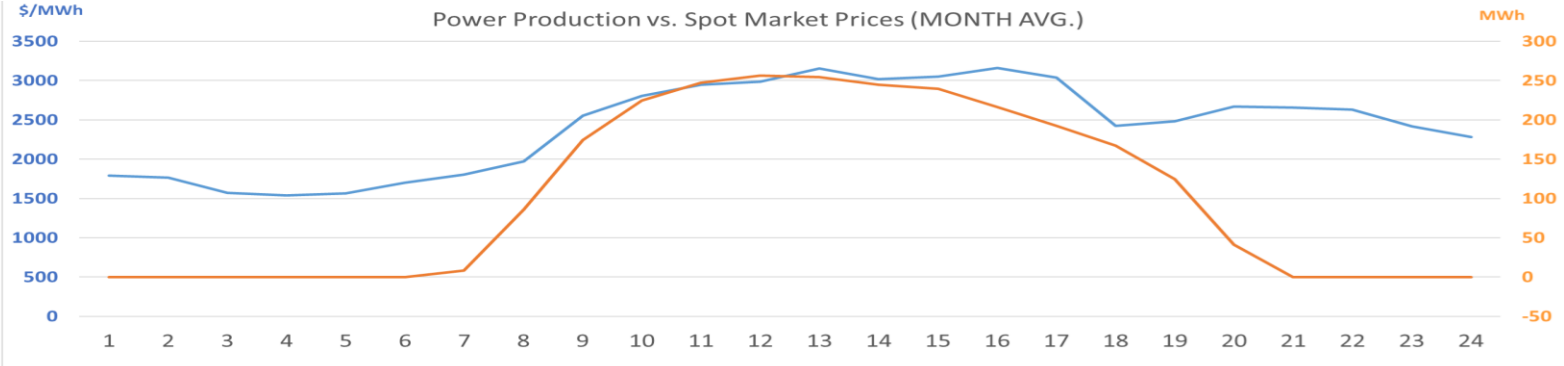
Mexico – PV Shifting

A BESS could charge from Solar PV when Spot Market energy prices are low and discharging at a different time where the price-spread is higher.



However, most of the time the solar plant would be producing at the highest market prices, hence the battery would not be fully utilised for this purpose.



This could change in the future as the renewable penetration levels in Mexico impact the market signal.

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Powering a Sustainable Future

Energy Storage-as-a-Service

Mexico

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C&I Energy Billing System

In Mexico, energy prices can be 85% higher than in the State of Louisiana, USA.

CFE Suministrador de Servicios Básicos

CFE Suministrador de Servicios Básicos
Río Ródano No 14, Colonia Cuauhtémoc, Alcaldía Cuauhtémoc,
Código Postal 06500, Ciudad de México.
RFC: CSS160330CP7

Typical C&I Energy Consumer
Industrial Plant under CFE supply
REAL ENERGY BILL

TOTAL A PAGAR: **$1,832,873.00**
(UN MILLON OCHOCIENTOS TREINTA Y DOS MIL OCHOCIENTOS SETENTA Y TRES PESOS 00/100 M.N.)

PERIODO FACTURADO: 31 JUL 19 - 31 AGO 19

TARIFA: GDMTH **NO. MEDIDOR:** **MULTIPLICADOR:** 700

FECHA LÍMITE DE PAGO: 13 SEP 19

CARGA CONECTADA kW: 1500 **DEMANDA CONTRATADA kW:** 1500

CORTE A PARTIR: 14 SEP 19

Concepto	Consumo actual Medida ● Estimada ●	Consumo actual Medida ● Estimada ●	Diferencia	Precio (MXN)	Subtotal (MXN)
kWh base			185,492		
kWh intermedia			426,566		
kWh punta			40,616		
kW base			1,055		
kW intermedia			1,230		
kW punta			1,135		
kWMaxAñoMovil			1,230		
kVArh			207,396		
Factor de potencia %			95.30		

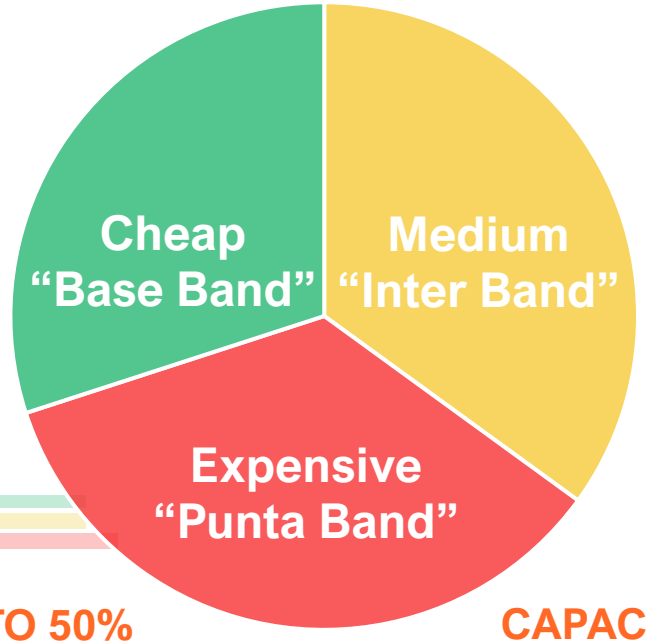
Costos de la energía en el Mercado Eléctrico Mayorista

Concepto	$	$/kW	$/kWh	Importe (MXN)
Suministro	512.44	0	0	512.44
Distribución	0	107772.6	0	107772.6
Transmisión	0	0	108539.69	108539.69
CENACE	0	0	5090.85	5090.85
Generación B	0	0	173880.2	173880.2
Generación I	0	0	724266.41	724266.41
Generación P	0	0	77779.64	77779.64
Capacidad	0	401086.3	0	401086.3
SCnMEM	0	0	3524.45	3524.45
Total	**512.44**	**508,858.90**	**1,093,081.24**	**1,602,452.58**

Desglose del importe a pagar

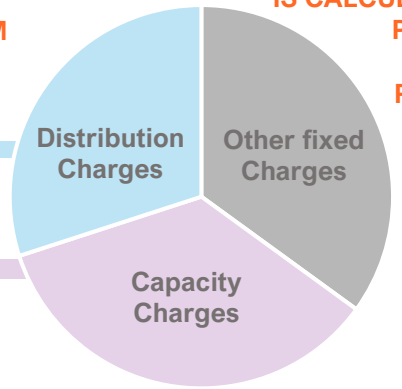
Concepto	Importe (MXN)
Cargo Fijo	512.44
Energía	1,601,940.14
Bonificación Factor de Potencia	22,434.34-
Subtotal	1,580,018.24
IVA 16%	252,802.91
Facturación del Periodo	1,832,821.15
Derecho de Alumbrado Público	51.46
Adeudo Anterior	1,838,985.47
Su Pago	1,838,985.00-
Total	**$1,832,873.08**

CFE Variable Energy Charges

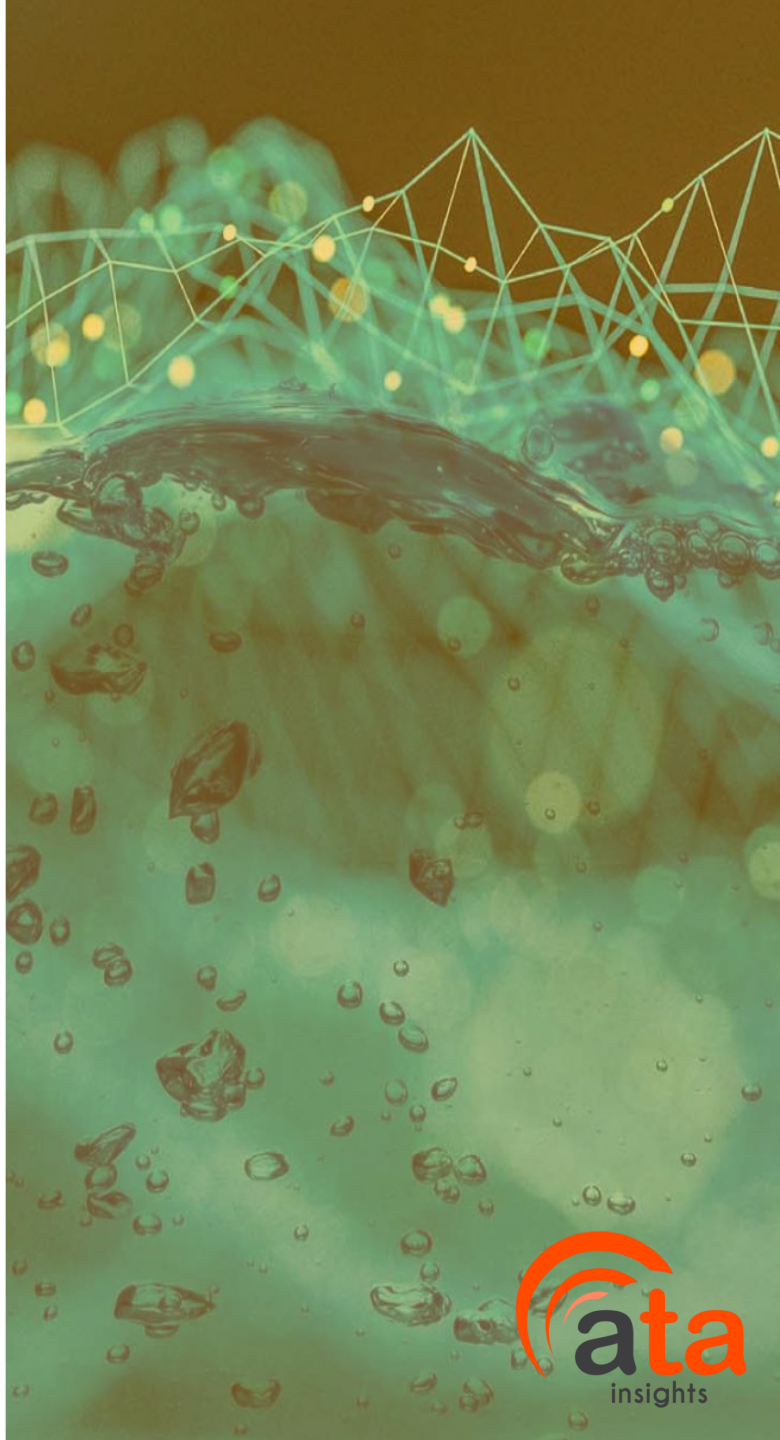


UP TO 50%
OF ELECTIRCITY BILL COMES FROM POWER CHARGES

CAPACITY
IS CALCULATED FROM PEAK POWER DEMAND IN PUNTA BAND



CFE Power Demand Charges kW



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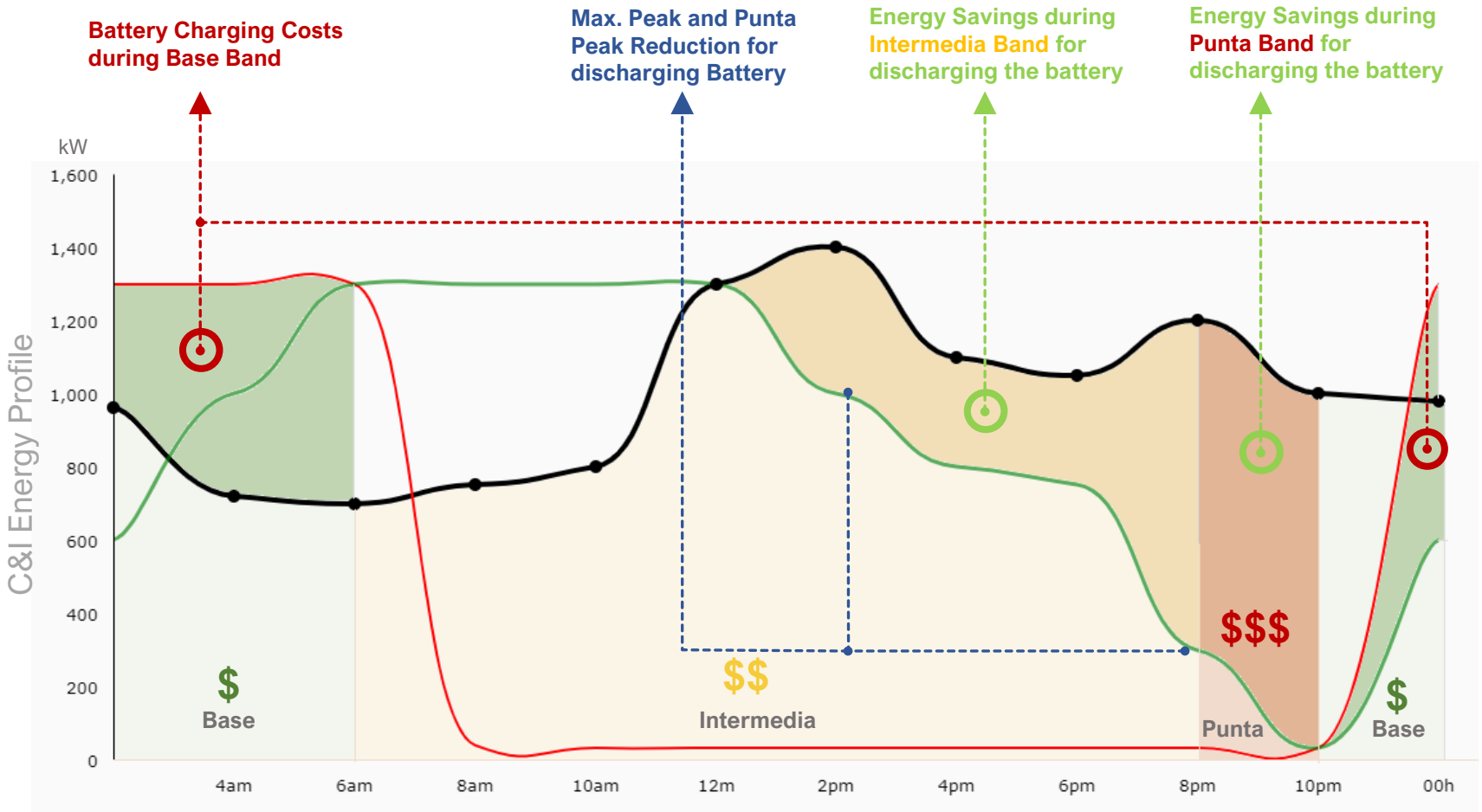
The Business Case

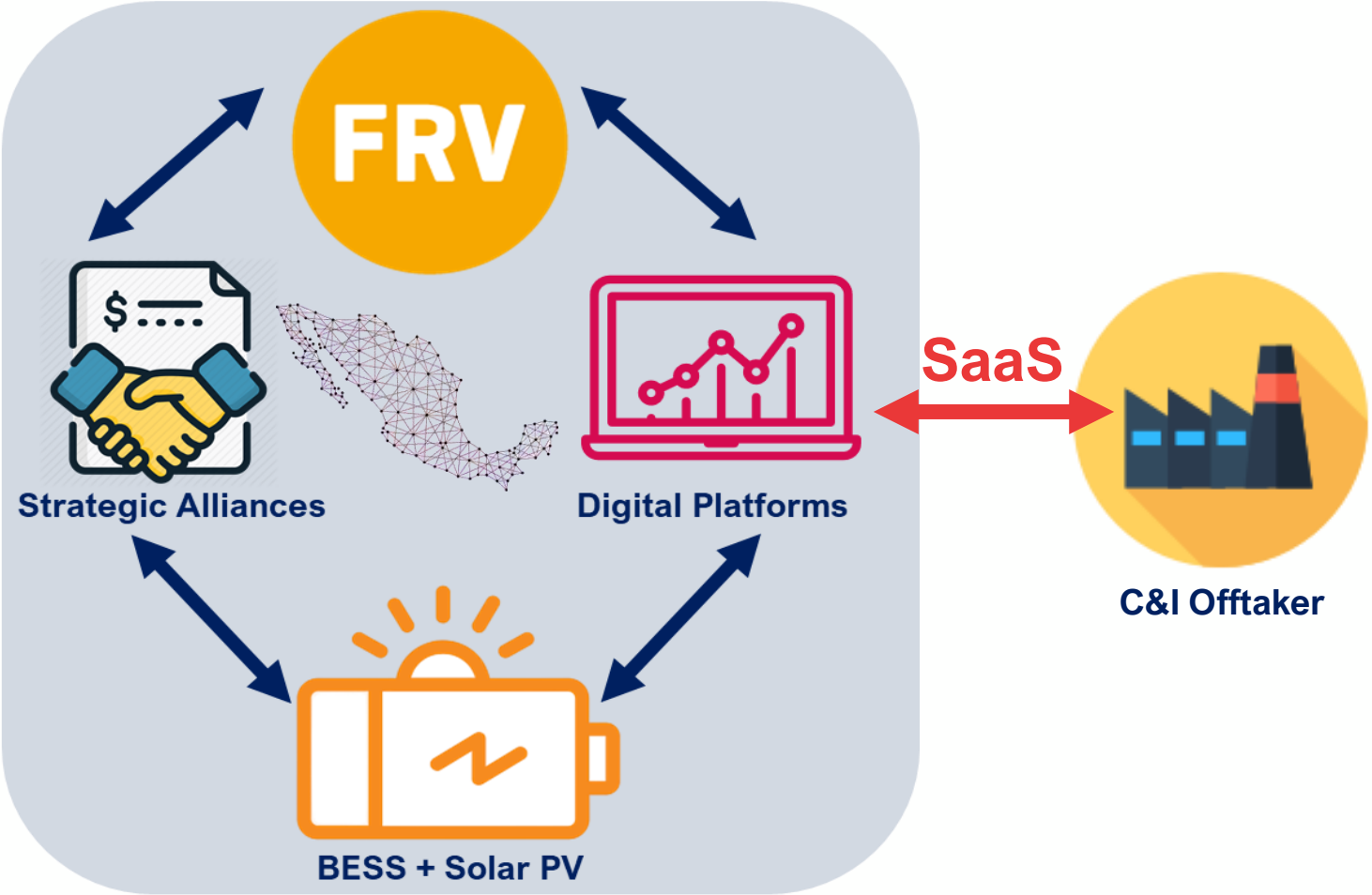
An Energy Storage System can buy energy during cheap energy periods and optimally discharge during Punta and Intermedia bands, reducing both Energy and Demand charges.

Peak Reduction Savings ($$$$) + Energy Savings ($$$) – Charging Costs ($) = NET CLIENT SAVINGS ($$$)



The SaaS Model

SaaS New Business Structure



Key Features

- SaaS will reduce Demand and Energy charges generating savings to C&I users
- The model requires zero investment or O&M fees from the service offtaker
- FRV could capitalize the assets through a flexible savings-sharing scheme
- Solar PV is optional, *ad-hoc* to project's requirements boosting SaaS potential
- The model can be upgraded incorporating VPP and DSR in future

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