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JUNE
2023



DE CARBONISATION
SD SUSTAINABILITY
AY

Bergerat
Monnoyeur



Eneria 

Battery Energy Storage Systems

Thursday 8th of June 2023

ARE BATTERY SYSTEMS THE HOLY GRAIL ?



ARE BATTERY SYSTEMS THE HOLY GRAIL ?



THE MAIN CHALLENGES

Main Challenges

- Rapidly Expanding Renewables: Intermittent Wind – PV Energy
 - Increasing Price Volatility
 - Mismatching Energy Demand & Supply
 - Grid Limitations & Congestion
- More need of flexible assets (EU requirement -> EU RED)

Targets

- EU-targets: Cutting GHG-Emissions 55% by 2030
- SDG's : UN targets 2030
- Reduce your Carbon Footprint
- Reduce your Energy Consumption & Energy Bill -> company level
- Improve Energy Efficiency -> company level

Battery Energy Storage Systems (BESS) empower energy managers to overcome the Energy Transition Challenges

AGENDA: Batteries as a Service

The Eneria Approach



01

Market overview & outlook

Eneria Power Generation & BESS Market – BESS Market Growth

02

Battery Experience: From Microgrids to Smart grids

History – Product Line - BESS Master Control

03

Battery Systems in the Energy Transition Market

Market segments Behind The Meter & In Front The Meter

04

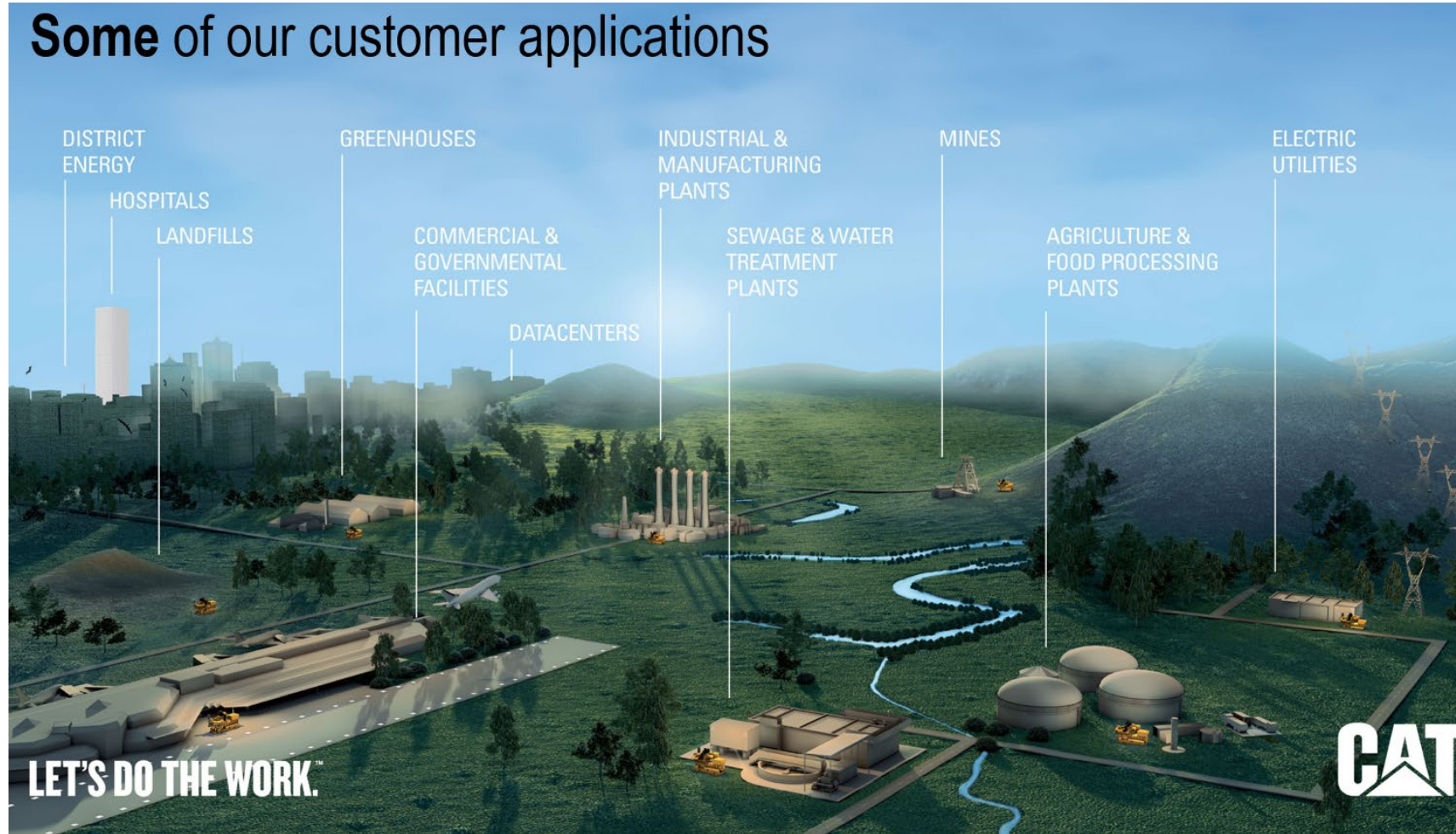
ENERIA Smart Grid 2024

Applications / Economical Feasibility

Market Overview & Outlook

ENERIA: Power Generation & BESS Market

Some of our customer applications

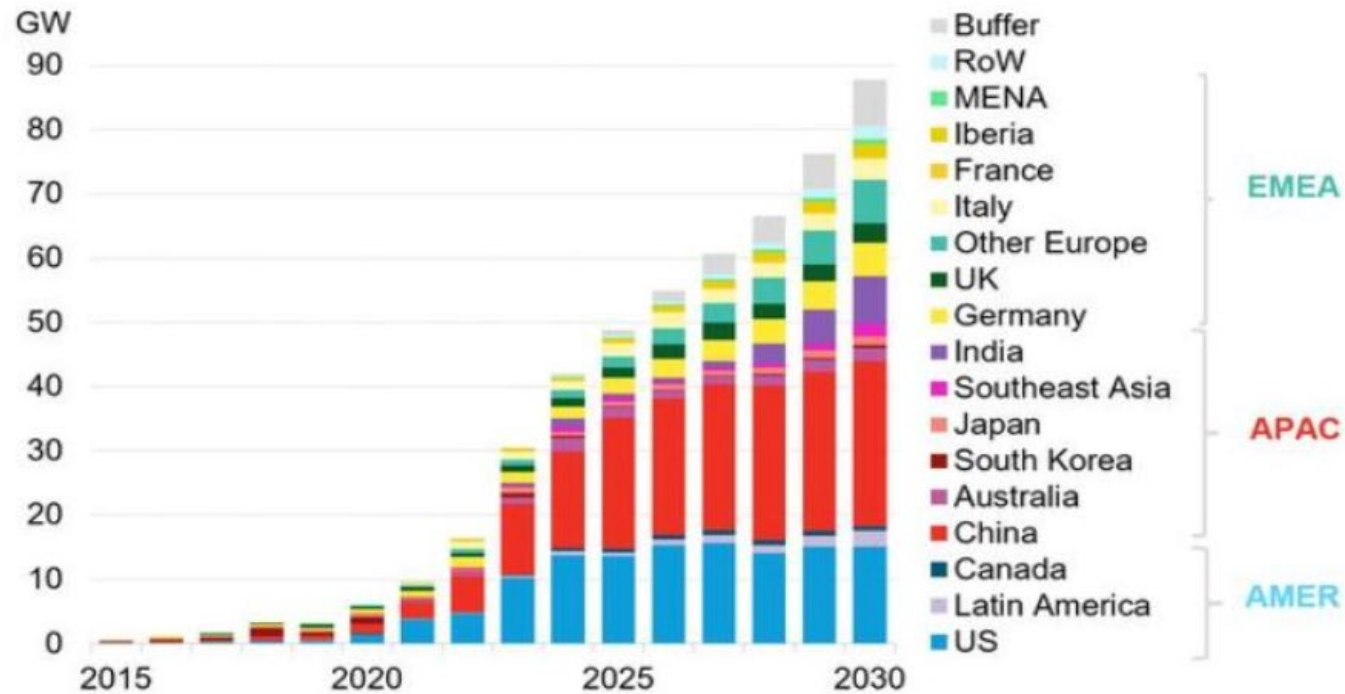


LET'S DO THE WORK.™

Market Overview & Outlook

BESS : EU MARKET Growth & Forecast

Global gross energy storage capacity additions by key market



Source: BloombergNEF

Note: MENA = Middle East and North Africa. EMEA = Europe, Middle East and Africa. APAC = Asia

Global energy storage's record additions in 2022 will be followed by a 23% compound annual growth rate to 2030

BESS technology is in continuous development: Expanding lifetime – Higher energy density

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Battery Experience: From Microgrids to Smart Grids

Cat® Hybrid Energy Solutions

2008 Mobile Military Hybrid
Develop Cat BDP50 for ESS & PV.

Variable Speed Generator Set and Renewable PV Integration

Cat BDP50
Variable Speed Power Conversion

Customer Loads

20 - 80 Hz Variable Frequency

50 or 60 Hz Constant Frequency

Solar Photovoltaic Array

Energy Storage Battery or Ultra-capacitor

Caterpillar: Confidential Green

2011 Jordan
First Commercial Installation

- 99% Reduction in Fuel Consumption
- Cat BDP50 commercial
- 4 Day Autonomy Battery System
- Generator Operation: reduced from 8,760 to just 24 hrs/yr
- 4 Year Payback Period
- Hybrid system has increased redundancy

2012 Military SAGE projects
Creation of the Cat BDP250 for ESS.

The hybrid microgrid power solution with energy storage 'was assembled by Caterpillar... successfully demonstrated in the SAGE demonstration, meeting the SAGE requirements. Write the specification revisions or new sections to focus on the non proprietary requirements and then include the statement "Provide a Caterpillar BDP-250 electrical inverter controller or equal" as the key and relatively unique component.'

US Department of Energy Report, January 2014.

<https://www.youtube.com/watch?v=1HkuDPH3e6c>

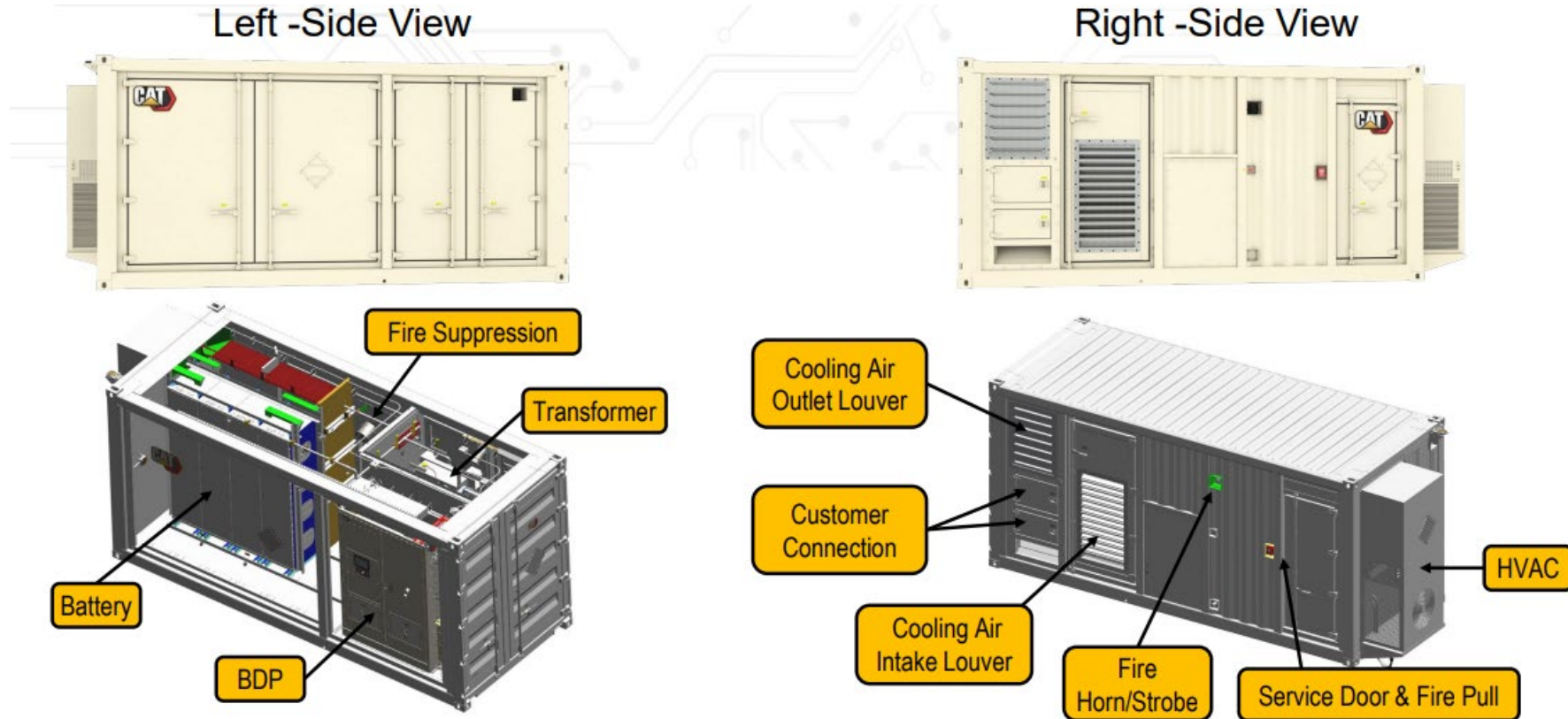
2016 Tucson Hybrid Project
Full Off-grid Renewable Hybrid High Power Quality

- 1 MW Medium Speed Gensets
- 550 kWp Cat® Solar PV Array
- Cat® Microgrid Master Controller
- 500 kW Energy Storage
- 2 x Cat® BDP250s

Battery Experience: From Microgrids to Smart Grids

BESS Product Line

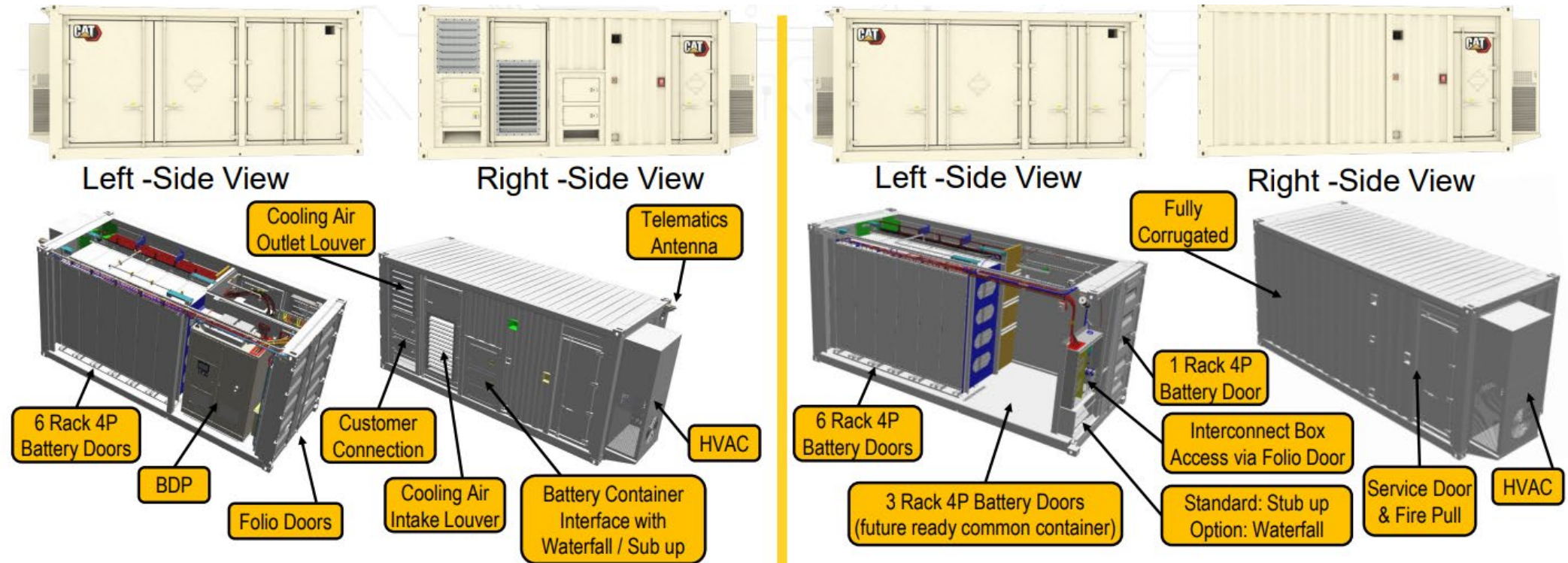
Power Grid Stabilization BESS: High Power with Fast Energy Discharge



Battery Experience: From Microgrids to Smart Grids

BESS Product Line

Energy Time Shift BESS & Energy Capacity Expansion module: Long Duration Energy Discharge

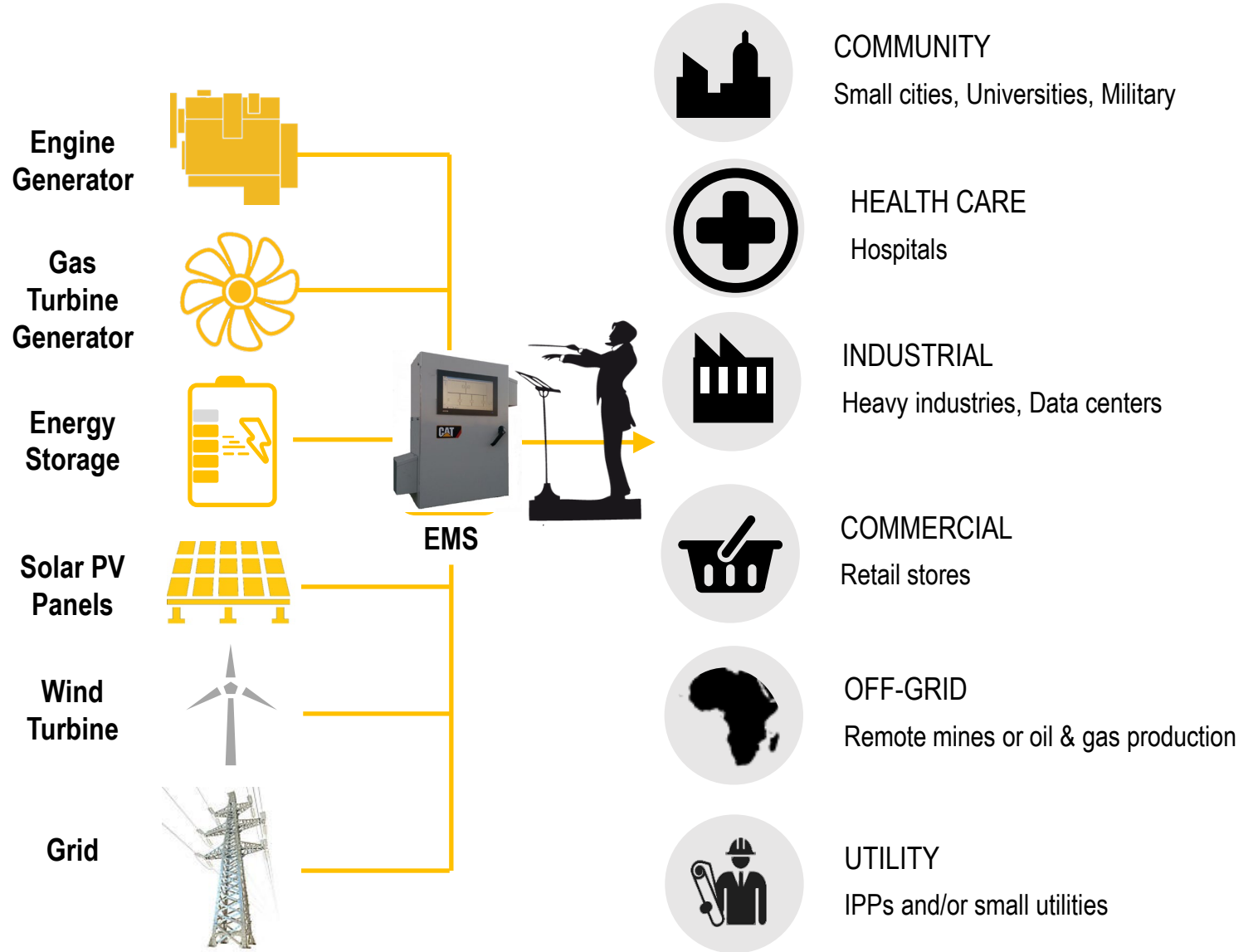


Battery Experience: From Microgrid to Smart Grids

Energy Management System (EMS)

Value to Customers, Utilities, and Society

- 1.Reduced Energy Consumption
- 2.Improved Power Quality / Reliability / Flexibility
- 3.Reduced Peak Power Demands
- 4.Improved Energy Efficiency
- 5.Ensures Continuous Energy Production
- 6.Lowest Total Cost of Operation



Yellow color = Systems offered by Caterpillar

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Energy Storage Market Segments

In Front of the Meter

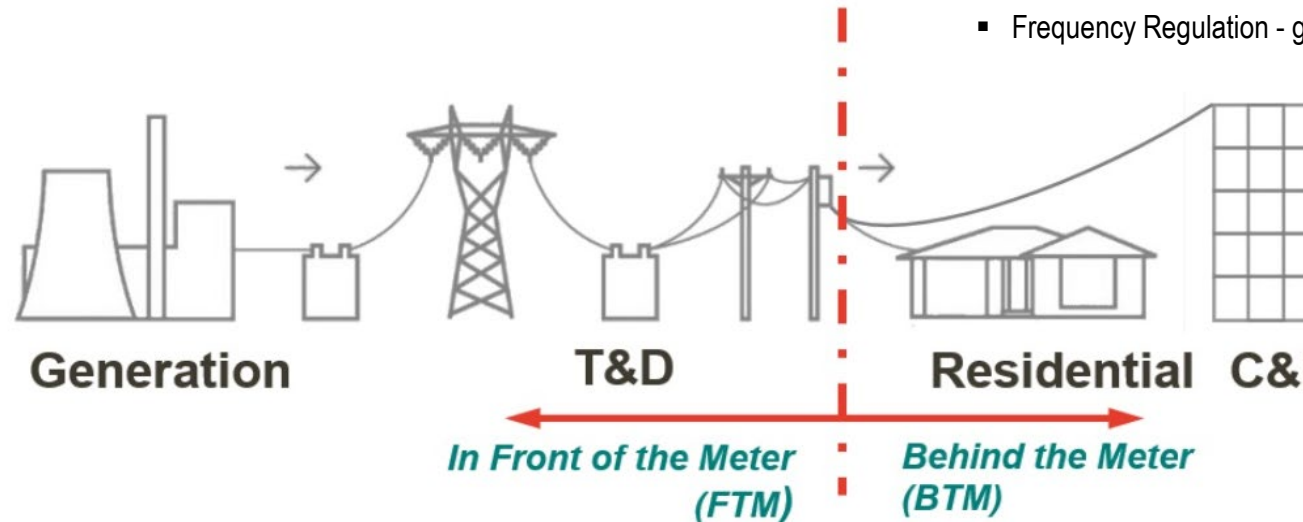
Large Scale BESS: on the utility side of the meter

- peak pricing arbitrage: DA/ID Imbalance market
- generation of capacity: CRM
- Frequency Regulation - grid support: FCR , aFRR, mFFR

Behind the Meter

Medium Scale BESS: Customer side of the meter

- Optimization of Self-Consumption (Combination with Renewables)
- Consumption Optimization by ID/DA market
- Peak shaving - Backup power
- Imbalance Trading
- Frequency Regulation - grid support: FCR , aFRR, mFFR



Battery Systems in the Energy Transition Market



FTM Applications : BESS Large Scale Battery



Bastogne EStor-Lux: 10 MW / 20 MWh

- Finance: Rent-A-Port (Ackermans & van Haaren, CFE) , BEWATT, SRIW
- project finance-backed development
 - Average balancing capacity (upwards or downwards) of 10.2 MW
 - Contributing to the stability of the Elia grid

Ruien Energy Storage: 25 MW / 100 MWh

Finance: Nippon Koei Energy Europe BV en Aquila Capital

HybriX Energy: developer of 25MW / 50 MWh projects in Flanders

TRIGGERS LARGE SCALE BESS

- Financial Revenue: by participating in ELIA auction for CRM
- Finance: Uncertainty ROI time period – Long term revenue
- Project Company: SPV
- Long permission procedure

REQUIREMENTS: LARGE SCALE BESS

- Grid connection infrastructure available at an existing Elia HV substation
- Surface needed between 1.500 – 5000 m²

Battery Systems in the Energy Transition Market



BTM Applications : BES Medium Scale Battery

Smartgrid Amsterdam:



- Transportcapaciteit beschikbaar
- Beperkt transportcapaciteit beschikbaar
- Congestiemanagement gebied
- Lopend congestieonderzoek

Project Background

- Constraint on-grid near AMS airport,
- 2 grid feeders can only accept energy from the site
- Off taker is a logistic center operator
- Client is an established Dutch PPA company

CAT solution

- 2x independent on grid Microgrids
- 2x CG132-16 Nat Gas CHP
- 2xC18 Diesel backups
- 2x Cat PGS1260 Battery
- 2x Cat Master Microgrid Controller (EMS)
- Client provided 2 x 1.5MWp solar system

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ENERIA SMARTGRID 2024

ENERGY PRODUCTION ASSETS & CONSUMERS

Assets

PV : Capacity 532 kWp - (332 + 200 Kw)

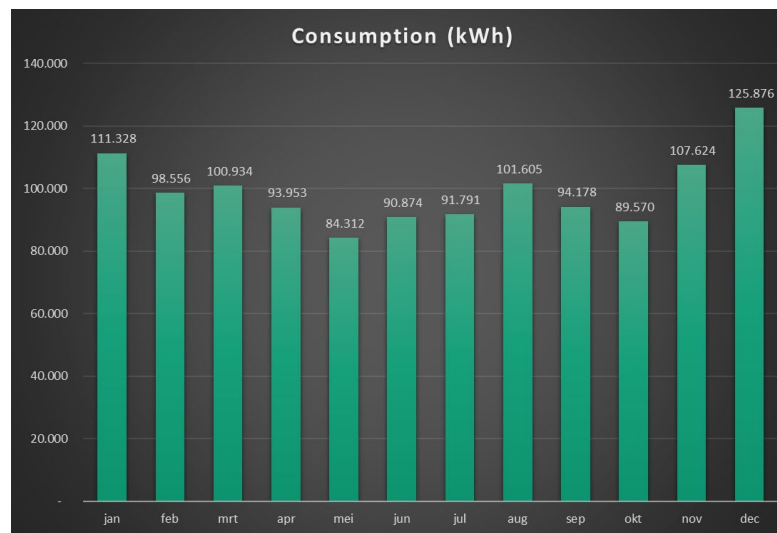
Reserved peak consumption : 650 kVA

BESS sized: 500 kW – 1.000 kWh

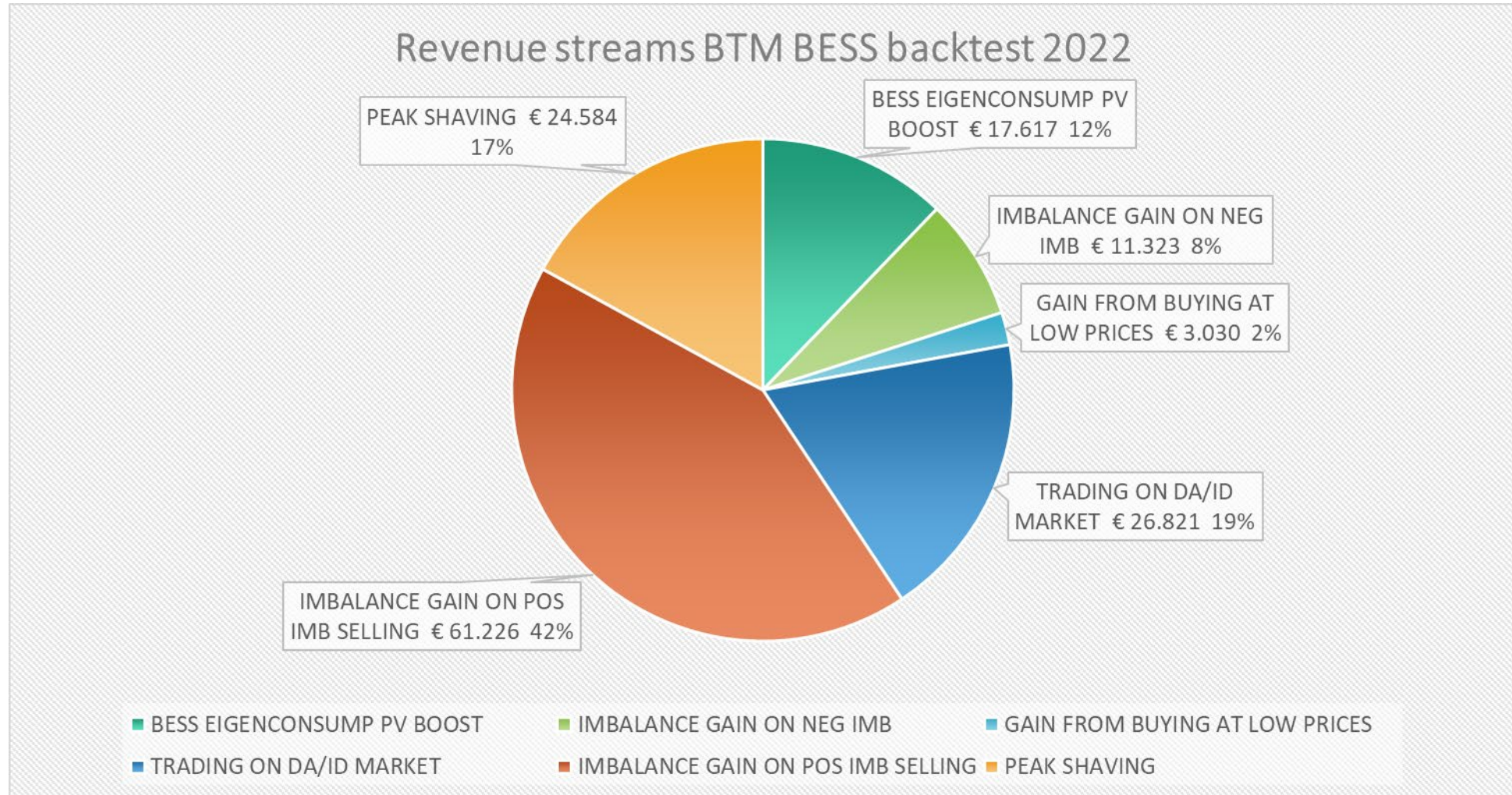
Consumers

Eneria site 2022: 1.190 MWh evenly distributed

EV-Chargers: 10 + 40 EV Chargers of 11 Kw



Business case- applications



Business Case Results

Dynamic Energy Contract is recommended: hourly market price

Business Case Results

BESS Size: 500 kW – 1 MWh

CAPEX: 650k €

Project IRR: 10,9%

Pay Back Time: 6,61 years

Lifetime: 12 years

Cashflow: 563k €

NPV: 228k € (5% discount)

Business Case in Partnership with Hybrix Energy

<https://hybrix-energy.com/>



Key Take Aways

- Bottom line: Securing your energy
- BESS & EMS with renewables and Smartgrids improve
 - ✓ max. energy efficiency
 - ✓ Reduce and optimize your energy bill
 - ✓ Create financial Benefits / Income
 - ✓ Grid support = more production of renewables
- Applications of BESS will help to obtain a building permit
- Each Business Case is project specific
- What is in for you?

Business Case Results

