Empowering Digital Transformation Now

Online Roundtable on Energy Digital Transformation

Capgemini

mPrest

AGENDA

TOPIC	SPEAKERS
Welcome	Randy Cozzens, *EVP Capgemini* Corey McGuire, VP Sales North America
Power Utilities Operating in the New Normal	Randy Cozzens, *EVP Capgemini*
Digital Grid Edge and DERMS case studies	Ron Halpern, *Chief Commercial Officer mPrest*
Lessons learned from Vector's journey and live DERMS demo	Rory Lewis, *Director, Utility Solutions mPrest*
DERMS as a service	Ron Halpern, *Chief Commercial Officer mPrest*
Q&A	Randy Cozzens, *EVP Capgemini*

Randy Cozzens
EVP, Energy, Utilities and Chemicals

Capgemini

Randy leads Capgemini's Energy, Utilities, and Chemicals market unit in North America.

Capgemini's industry and account teams develop and nurture client relationships; understand the clients' critical business issues; and architect innovative, fit-for-purpose solutions to drive tangible business value relative to the critical business issues.

MEng, Clemson University
MBA, Duke University – Fuqua School of Business
BS, United States Military Academy at West Point

Ron Halpern
CCO

Ron Halpern is an accomplished senior executive, experienced in the power utility, Industrial IoT, enterprise software and telecommunications industries.

Halpern currently serves as mPrest's Chief Commercial Officer. Previously, Halpern held executive management roles in established companies and startups including Executive Vice President of Sales at cVidya (NASDAQ: DOX); Executive Vice President of International Sales at Genband (NASDAQ: RBBN); and Client Business Executive and Division Vice President at Amdocs (NASDAQ: DOX).

Rory Lewis
Director, Utility Solutions

Director, Utility Solutions with twenty-eight years of software experience in product, sales, consulting and support across the energy and utility industries.

Working within early stage growth to Fortune 100 companies to provide operations, business and analysis solutions with a consistent focus on adding value for the customer.

Collaborative industry engagement in the definition and development of DERMS to support the transformation of distribution.

Corey McGuire
VP, Sales, North America

mPrest

VP of Sales with twenty-six years of software experience is sales, business development, and corporate strategy in the energy and utility industries.

Worked with major IOUs to implement wide scale AMI and energy management systems to bring value and benefits to both the utility and their constituents.

Corey understands the benefit of DERMS and modern energy paradigms and brings that perspective to utilities looking to reduce their carbon footprint while providing their end-user the ability to play a role in lower their individual carbon footprint.

Energy & Utility Companies: Operating in the "New Normal"

Key considerations for mitigating risk and seizing opportunity in a post-crisis world

June 2020

Operating in the New Normal Highlights

Situation pre-COVID19 crisis: Highlights of WEMO 2019

^2.3%

In 2018, global energy consumption rose—nearly twice the average rate since 2010—as driven by a robust worldwide economy.

^14%

Global renewables are the fastest growing energy source.

^4%

Fossil fuels still dominate much of the worldwide energy mix, with global coal consumption increasing 4%.

^2%

Global GHG emissions have increased, despite significant reductions in the EU.

The impact of the crisis

- A **global economic slowdown**, causing a **global decrease in GDP;**
- **Reduced global mobility** and **slowed industrial production** → **reduced oil, gas & electricity consumption;**
- **Teleworking where possible has become the norm.**

Electricity security of supply

- **More vital than ever**
- **A dip in electricity consumption;**
- **A decrease in electricity rates;**
- **Low demand ensures security of supply,** even with reduced production capacity.

*Companies need to manage revenue impacts while maintaining **customer service, employee support, reliability and safety.***

Energy & Utilities: **Immediate COVID impacts**

-4.8%
US GDP for Q1 2020

Reduced mobility leads to drop in oil, gas and electricity consumption

Electricity demand decrease

~-10-20% EU
~-5-10% US
during lockdown

Wholesale electricity prices drop (NY from $36/MWh 5-yr avg. to $17/MWh in April 2020).

In mid-April, the **WTI oil price fell below $20/barrel**. Prices dropped more, but have rebounded in May around $30.

GHG emissions: -30% during lockdown, and **globally, GHG emissions could decrease by more about 5% in 2020.**

Companies must **quickly define and enact their teleworking policies** post-crisis.

The robustness of IT systems have been tested as companies transition to teleworking: cyber-attacks have multiplied.

The impacts of the crisis: The Energy Transition

Mobility restrictions and the **sharp industrial slowdown** have had a very favorable impact on real-time GHG emissions.

~5%

Forecasted global decrease in greenhouse gas emissions in 2020, the largest decrease in emissions since WWII.

Citizens and some political parties are advocating for a **green stimulus plan leading to a more sustainable economy** with zero-carbon long-term objectives

Reallocated subsidies & reorganization of priorities

In the U.S., nearly half of the states have adopted policies or laws to decarbonize electric generation by providing financial incentives/disincentives and encouraging increasing supply of clean and renewable energy as distributed resources.

Redefinition of government priorities includes reallocation of resources to focus on:

Research   Health   Education

Subsidies granted to renewable energy could be decreased or deferred to these sectors.

The new normal after the crisis: Electric Utilities

NY

$17/MWh

Wholesale electricity prices in mid-April 2020, down from $36/MWh 5-yr avg

Electricity rates are now more than **20% lower** than usual in certain states, as driven by decreased industrial activity. **Negative impact expected on the finances of all Utilities** (top and bottom lines), with those that are already economically fragile affected most severely.

TX

$24/MWh

Wholesale electricity prices in mid-April 2020, down from $27/MWh 5-yr avg

Utilities as EDF, ENGIE and numerous others pledged not to cut supply for several months, even in the event of unpaid bills. Many major companies in North America, such as Duke Energy, PSE&G and Nova Scotia Power, have pledged to halt disconnection orders due to the pandemic as well.

Solid Utilities or Oil and Gas companies should prepare for M&A opportunities

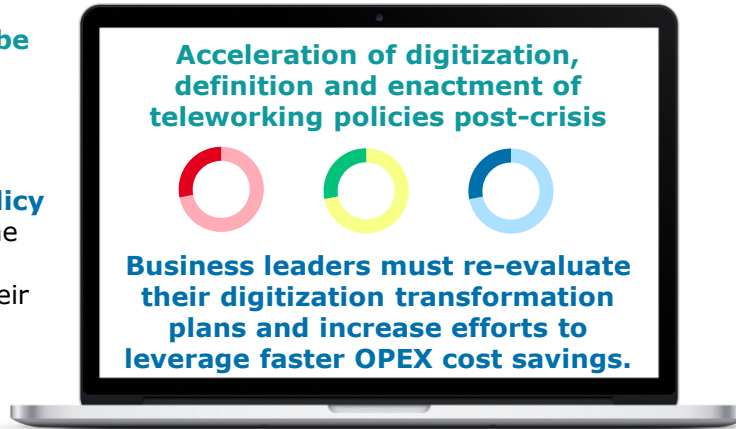**Energy companies will need to account for more price volatility**

Utilities must anticipate short-, medium- and long-terms load curve shifts and evaluate change intensity.

# The new normal after the crisis: New ways of working and living

Office working may no longer be full-time

Need for companies to establish a teleworking policy that addresses the needs and preferences of their employees while maintaining high standards for productivity, efficiency and quality.

Acceleration of digitization, definition and enactment of teleworking policies post-crisis

Business leaders must re-evaluate their digitization transformation plans and increase efforts to leverage faster OPEX cost savings.

Industrial assets

Factory/plant closures & relocation of production of critical components within the supply chain to be closer to the customer

Utilities must be attentive to the magnitude and the consumption impacts of these two opposite transformation triggers.
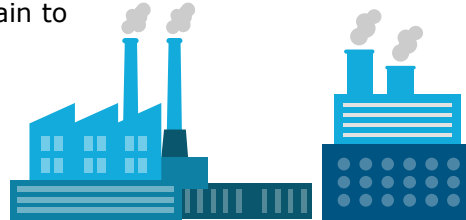
Energy consumption

In many countries, social distancing measures will be relaxed progressively, while travel will remain restricted. The transportation sector is likely to be affected for many months, contributing to long-lasting revenue and margin decreases for Oil and Gas companies.

Oil and Gas Companies must adapt the retail part of their value chain to reflect new consumption patterns and accelerate their diversification.
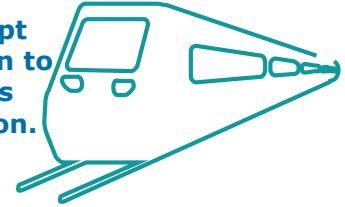
Utility outlook

The footprint of renewables and distributed generation continue to grow and utilities must accelerate incorporating them into the electric value chain.

Innovation will enable **agility** so utilities can continue to provide reliable and safe electricity while maintaining customer service, employees, and shareholders.
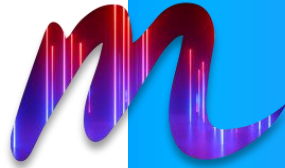
Online roundtable on Energy Digital Transformation.

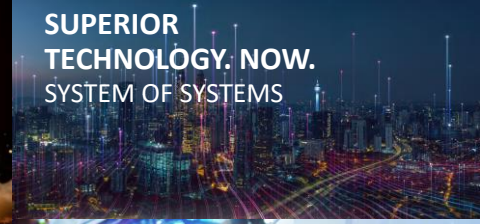June 17, 2020

EMPOWERING DIGITAL TRANSFORMATION NOW.

REAL-TIME ORCHESTRATION & OPTIMIZATION SOFTWARE

UNPARALLELED REAL-TIME & MISSION-CRITICAL EXPERTISE

SUPERIOR TECHNOLOGY. NOW.
SYSTEM OF SYSTEMS

EMPOWERING INDUSTRY-LEADING APPLICATIONS
DERMS | ASSET HEALTH MANAGEMENT

PRODUCTION PROVEN

JOLTING THE ENERGY INDUSTRY

**GLOBAL PRESENCE
200 PEOPLE
R&D IN ISRAEL**

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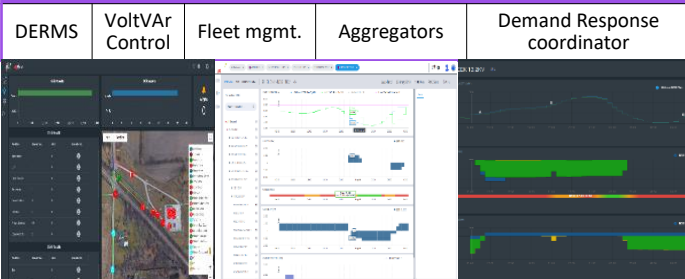# EMPOWERING THE DIGITAL TRANSFORMATION OF LEADING ENERGY COMPANIES WORLDWIDE

THE INTELLIGENT GRID SYSTEM OF SYSTEMS
A SUITE OF ENERGY APPLICATIONS

PRODUCTS & APPLICATIONS

DIGITAL GRID EDGE MANAGEMENT

DERMS	VoltVAr Control	Fleet mgmt.	Aggregators	Demand Response coordinator

ASSET HEALTH MANAGEMENT

THM	URD	Critical Substation Assets

SMART CITY & CRITICAL INFRASTRUCTURE

Integrated Operations Center	CIP	Major Event

SYSTEM OF SYSTEMS PLATFORM

Core Infrastructure Building Blocks

Unified UI Infrastructure					
Workspace Management	Selection Management	Multi-Display Synchronization	Permissions	GIS View	Smart Table View

Data Analytics platform

Data management engine			Data integrity layer							
Rule based engine	Analytical rules	AI & ML tools	Correlation	Classification	Anomaly Detection	Forecasting & Prediction	Data Integration	Data Fusion	Data Cleaning	Data Enhancing

Core Infrastructure Building Blocks

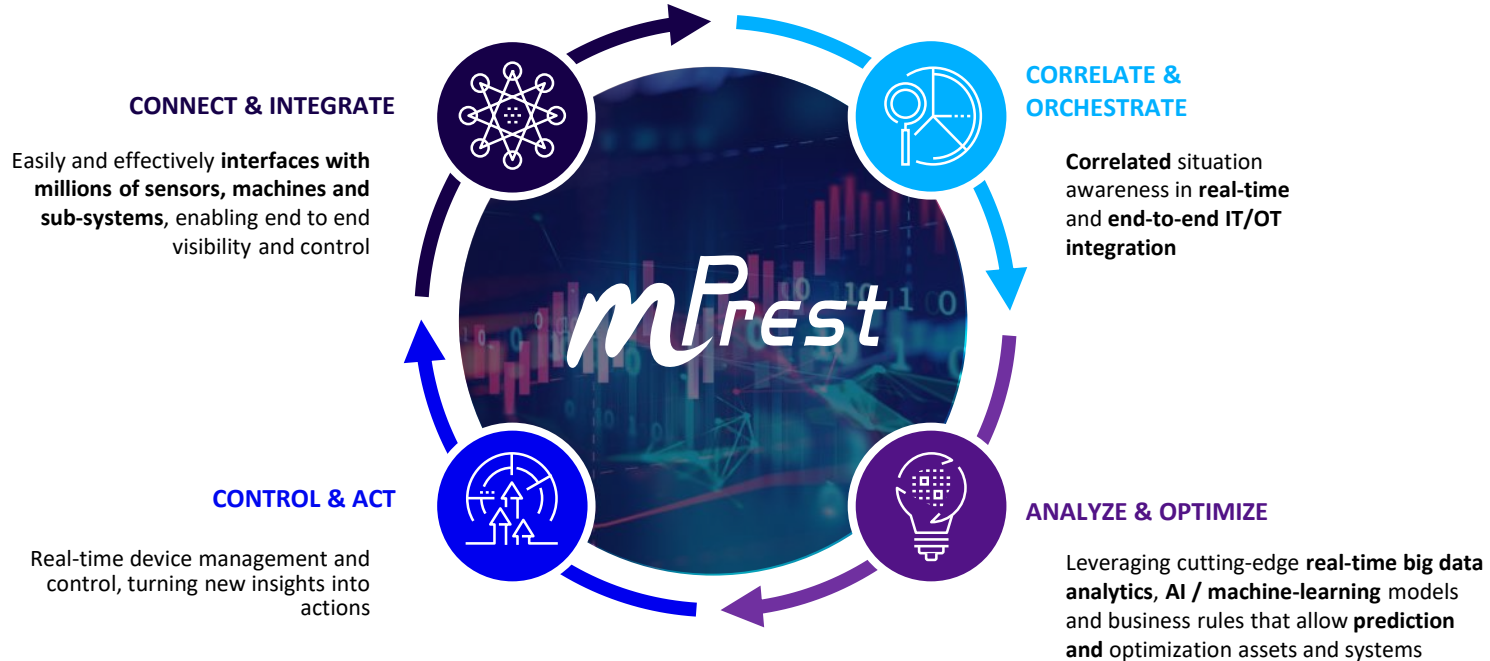| mGenie Core									
Scheduler	Message Broker	Data Store	CEP Engine	Users & Roles	Cache Management	Audit	File Management	API Management	Entities Management

mDerms

- DER focused – Visibility and Control of Generation and Load at the edge of distribution grid

- Reliable and Economic Energy – Optimized dispatch of energy within the distribution grid

- Utility and Customer Partnership – Valuing customer owned DER jointly with utility

- System of Systems – Cloud Native Microservices based Platform for Intelligent Grid Applications
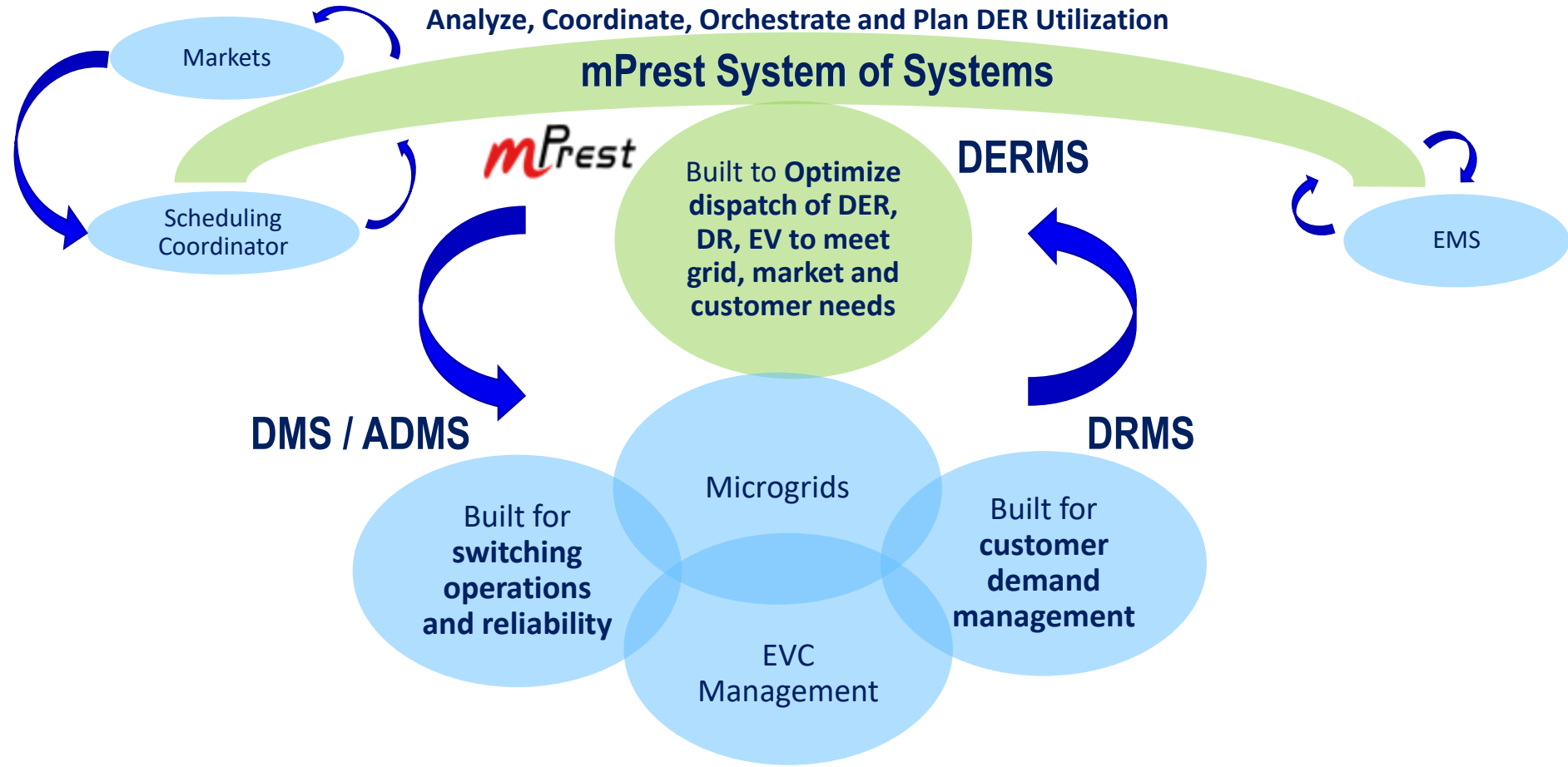
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NOW.

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ORCHESTRATION & OPTIMIZATION SOFTWARE

CONNECT & INTEGRATE

Easily and effectively **interfaces with millions of sensors, machines and sub-systems**, enabling end to end visibility and control

CORRELATE & ORCHESTRATE

Correlated situation awareness in **real-time** and **end-to-end IT/OT integration**

CONTROL & ACT

Real-time device management and control, turning new insights into actions

ANALYZE & OPTIMIZE

Leveraging cutting-edge **real-time big data analytics**, **AI / machine-learning** models and business rules that allow **prediction and** optimization assets and systems

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Primary Application Focus by Vendor – Only One Solely Focused on DERMS

Analyze, Coordinate, Orchestrate and Plan DER Utilization

mPrest System of Systems

Markets

Scheduling Coordinator

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Built to **Optimize dispatch of DER, DR, EV to meet grid, market and customer needs**

DERMS

EMS

DMS / ADMS

DRMS

Built for **switching operations and reliability**

Microgrids

EVC Management

Built for **customer demand management**

mDERMS STANDARD FUNCTIONALITY

INTERFACES

IEEE-2030.5
OpenADR2.0
SunSpec/
Modbus
DNP3.0
ICCP
IEC61850

APIs

CIM Adapter

Web Maps
Weather

GIS
SCADA/ADMS
Markets

OPTIMIZATION
DER Dispatch Plan, Storage Cost, EV Chargers, DR
Volt/VAR, Market Price Integration

MANAGE NETWORK CONSTRAINTS
Thermal and Voltage Constraints, Dynamic Topology
Forecasting for Generation and Load, Calculated Flexibility / Susceptibility,
EV Charging Forecast, Weather Integration

PROGRAM MANAGEMENT
Activate DER / Demand Response according to Business Rules

DER / EV FLEET MANAGEMENT
Connect, Group, Visualize, Manual / Scheduled Control, Simple Flexibility

OT APPS/SERVICES GIS, SCADA, WEATHER, MARKET-FEED

DER Types

Utility
PV
STORAGE
WIND
Other DG
EV
MicroGrid

Customer
PV
STORAGE
Other DG
EV
DR
MicroGrid

3rd-Party
VPP

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DERMS USE CASES

DERMS USE CASES

Optimal DER Plan Creation

DER Fleet Management

Volt/Var Control

DER Situational Awareness

Network Constraint Management Utilizing DERs

Precision Demand Response

Energy Arbitrage

Dynamic Network Topology

DER and Load Forecasts

DER Flexibility

DER Susceptibility

DER Telemetry & Control

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Optimal DER Plan Creation
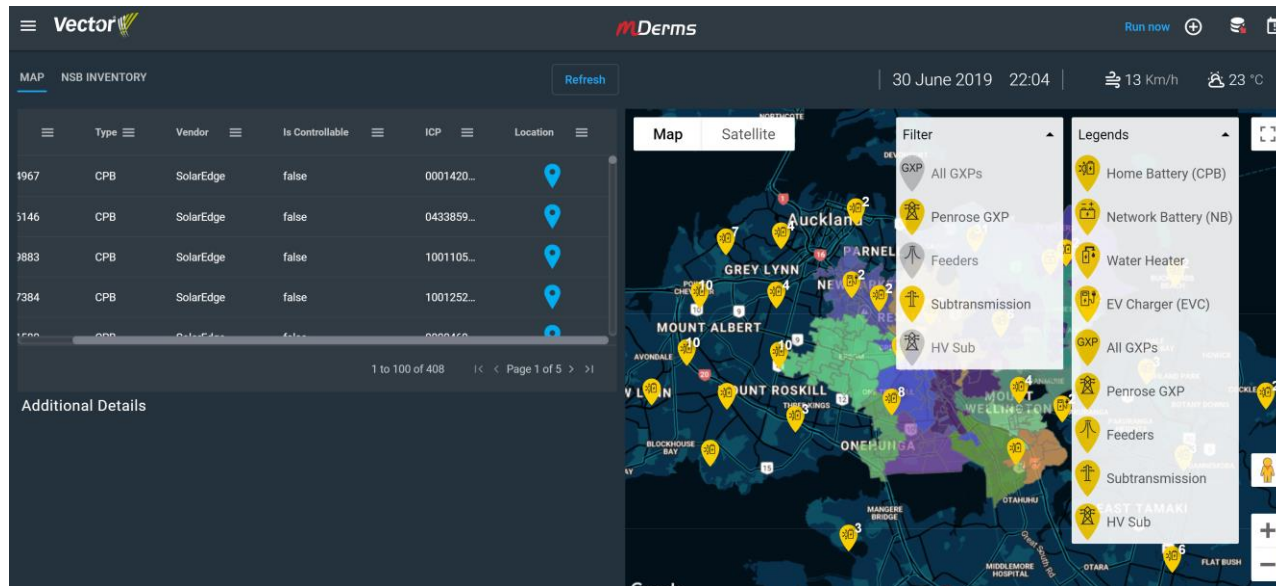
Dispatch for reliability, security, minimum cost

- Where/when market rules allow control of 3rd-party DER
- Utilize multiple DR programs: hot water, A/C, pool pumps, etc.
- Utilize CVR/VVC
- Arbitrage battery charge/discharge
- Control vars on smart inverters

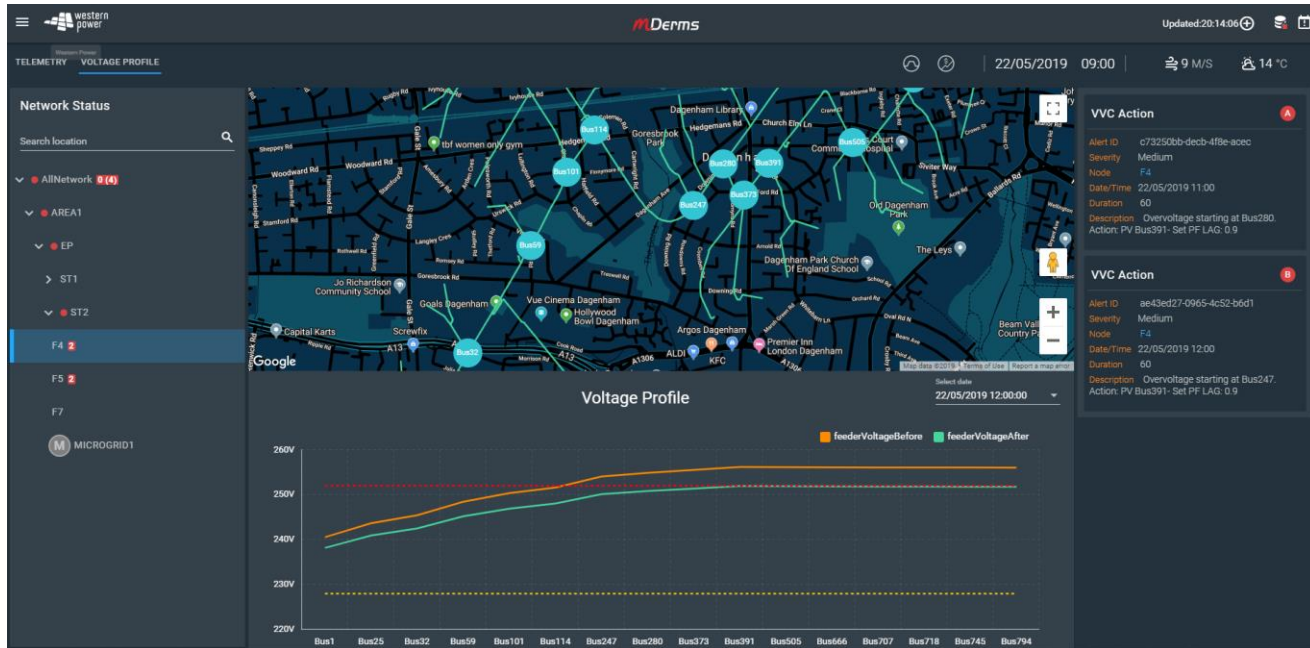- HWC, EVC, NB, CPB

DER Fleet Management

For potentially millions of DERs.

- Sort by:
  - location
  - DER type
  - Vendor
  - Controllable
  - ID
  - Comm. Address
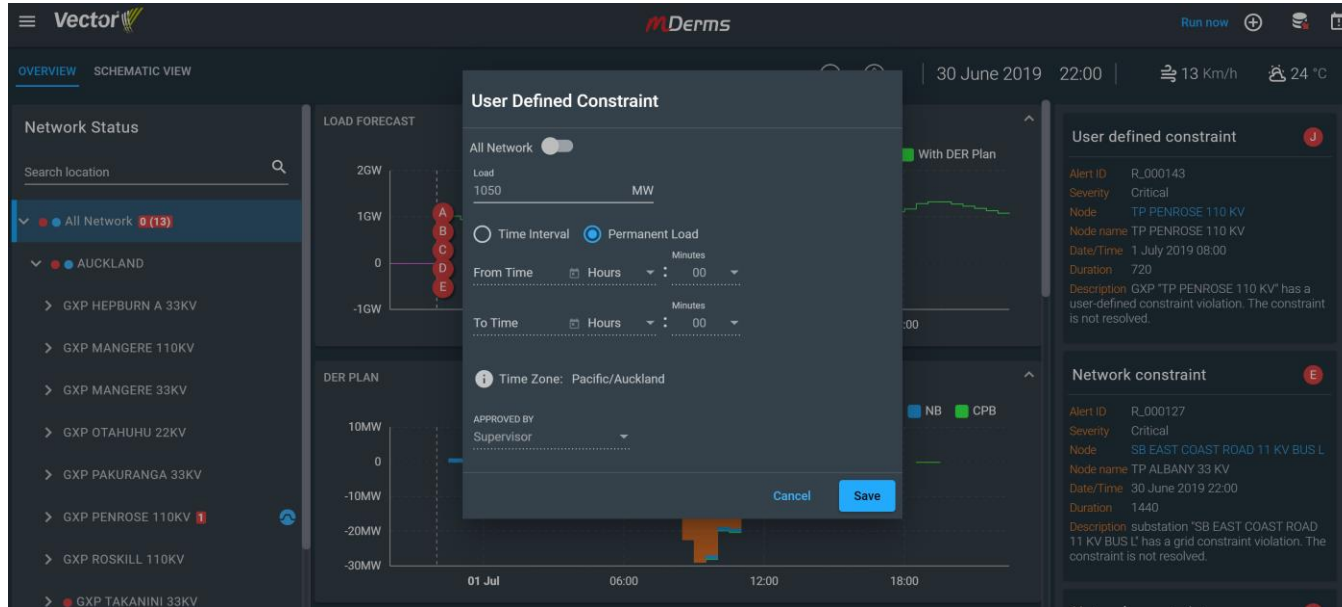- View status, business rules, et al

Volt-Var Control

- Provide DER support to centralized VVC system, if exists

- Provide primary VVC if central system doesn't exist

- Multiple objective functions:
  - CVR
  - Var Support
  - Loss Minimization
  - Voltage Limits
  - Power Factor

Network/Resource Constraint Management Utilizing DERs

For potentially millions of DERs.

- Recognize network/resources constraints

- Develop DER plan to alleviate constraints

  - DR (Load Control)

  - Network Battery

  - Customer Battery

  - EV Charge Control

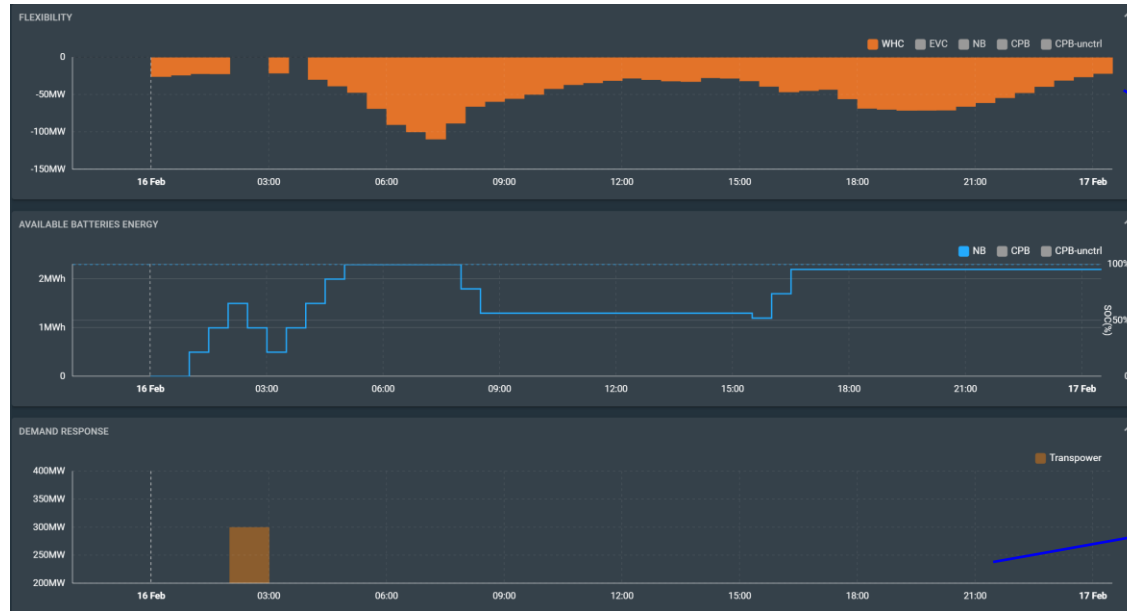- Simulation and testing of new DER/DR placement impacts

Energy Arbitrage and Usage Optimization

- Use market price and market forecast to control DER
- Charge/discharge
- Load management

- Load & Supply shape optimization

- Multi-objective optimization
  - Cost
  - GHG
  - GHG and Cost
  - Other user definable

# Precision Demand Response and DER Management

DR and DER Analysis for system or system section (area, substation, feeder)

- Availability of all DR programs ("flexibility") is viewable for the next 24 hours

- DR program can be called automatically when needed

- DR analysis is part of optimal DER plan generation

- Optimize use of DR and DER to relieve constraints at multiple locations/levels throughout the system simultaneously

Telemetry and Control
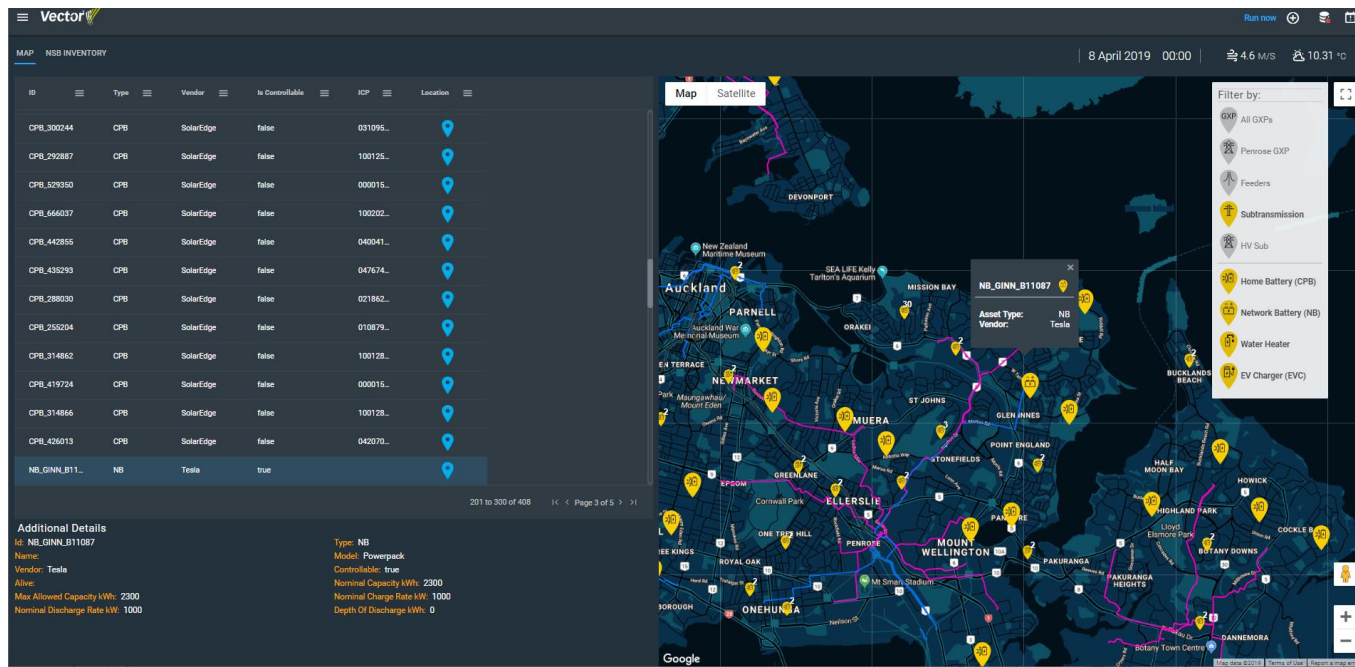
For potentially millions of DERs.

- "SCADA" for millions of points (use SCADA for utility-scale assets, DERMS for all else)

- Provides scalability into the future

- Maximizes security by not mixing low value assets with high value assets

Dynamic Network Topology

"As-Operated" Network Topology

- Analysis based on true grid conditions

- Model is synchronized to SCADA, DMS, OMS, GIS

- Analysis is enabled at sub-feeder level (switching level)

- DER connectivity enables precision plan generation at feeder level, substation level, etc.

- Note for some clients (e.g. CCAs) connectivity may be represented at a higher level (e.g. market nodal or zonal), based on availability of data from client

DER and Load Forecasts

Understand load and DER resources based on weather, business restrictions, et al:

- "Bottoms up" forecasts based on profile analysis of AMI/MDM data

- 5, 15 min, hourly, day ahead as well as short and long-term forecasts

- Detection of unregistered DERs

- High-accuracy to enable effective DERMS analysis

- Market price monitoring

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DER Situational Awareness

- High penetration of PV on a feeder may exceed the native load during specific times of day
- Certain protective devices offer no protection in a backfeed situation (power flowing into the substation)
- Analyze & alarm if near a backfeed condition; optionally charge batteries (increase load) disconnect DERs or reconfigure feeders to remediate condition
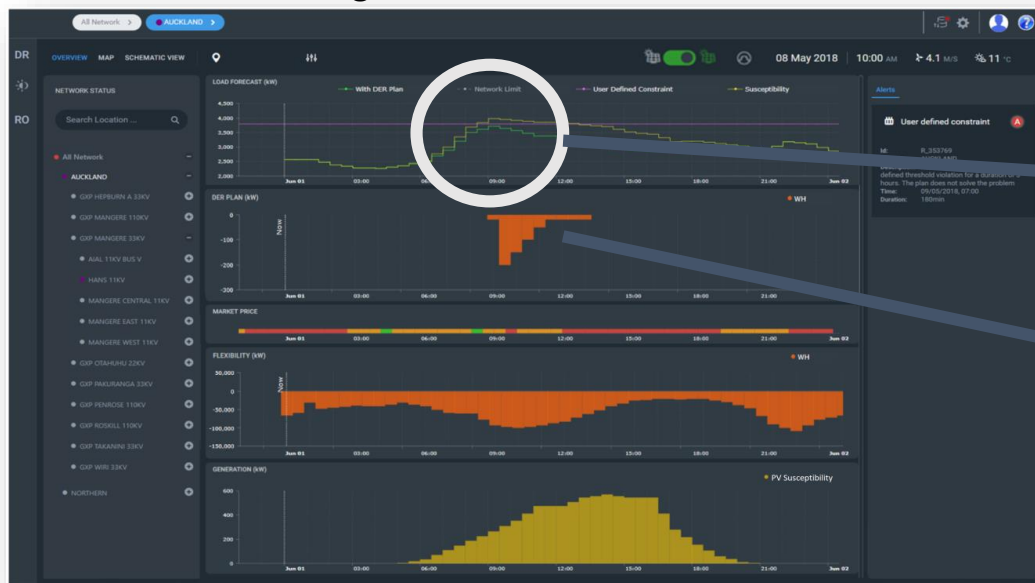
- PV generation may exceed feeder load during maximum irradiance

- Batteries charged to increase load

ADD SECTION NAME

DER Susceptibility Analysis

- Understand "behind the meter"/non-telemetered DERs and their impacts in real time, day-ahead as well as short and long-term forecasts:

  - "Phantom" load vs Apparent load. Supply resources required if DERs become de-energized due to recloser, switching events, obscuration; avoiding overloads and unexpected device tripping

  - Provide information on a per feeder basis or regional for transmission events, contingency analysis

PV with Inverters that go offline for any reason or reduce output create operational risks:
- May impact routine switching operations
- In sufficient amount, may cause overload/breaker trip
- Negative impact on SAIDI, CAIDI, MAIFI

Susceptibility Creates Resource Adequacy Risk at the supply level:
- Must be supplied by other sources
  - Often at high market price
  - Often with penalties accruing

Susceptibility/Flexibility analytics provide insight into potential DER types and placement

DER Flexibility Analysis

- Understand "behind the meter" controllable DERs and their impact in real time , day-ahead as well as short and long-term forecasts:

  - Charge state of batteries, available watt/vars from smart inverter devices; amount, duration and location of load that can be shed. Can be used to help regulate voltage, address system constraints, achieve VVC objectives, meet capacity requirements

  - Provide information on a per feeder, substation or regional basis

PV, batteries with Smart Inverters that stay online during events, DR programs
- May be used to arbitrage demand and energy
- May be used to redefine and reshape supply side contracts and resources
- May be used to address system constraints
- May be used for var support
- May support VVC objectives
- May be used to identify likely locations for new DR and DER placements

mDERMS
CUSTOMER USE CASES

SELECTED PROJECT REVIEWS

SCE
Southern California

CUSTOMER PROFILE

- One of the largest utilities in North America
- \> 5 million customer accounts
- \>300,000 Residential Solar Installation
- 3600 new PV installations per month

CHALLENGE

- No control room visibility into "phantom load" (PV-supplied demand) on feeders
- Switching plans create unexpected load values

PRODUCTS & SOLUTIONS

- Analyze circuits and PV contribution to true load ("Susceptibility")
- Enable switch plans to reflect actual pick-up values during load transfers and other activity

Why mPrest Was Selected

- Ability to solve phantom load problems in a production environment
- Capability to merge front of meter and behind the meter assets into topology-aware analysis

Competition

- SGS, Siemens, GE

ROI

Actual ROI not calculated yet. However, w/o system, phantom load can burn feeders and transformers

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Atlanta, Georgia

CUSTOMER PROFILE

- Vertically Integrate IOU serving Georgia, Alabama and Mississippi
- 4.27 million electric customers

CHALLENGE

- BTM-connected electronic var injection devices
- Var devices not monitored or controlled
- Integrate edge-var devices with grid devices (caps, tap) for feeder voltage profile control

PRODUCTS & SOLUTIONS

- Integrate edge devices with distribution model to provide volt-var control
- System of Systems integration with GIS, ADMS, SCADA

Why mPrest Was Selected

- Distributed edge VVC solution
- System-of-System architecture to create virtual platform for data analytics
- As-operated model awareness for analysis

Competition

- Oracle, GE

ROI

"Stacked Value" ROI for Southern Company (group), based on publically available information, was calculated at over $20M/year

Indianapolis Power & Light, Indianapolis, Indiana

CUSTOMER PROFILE

- Vertically Integrated utility serving Indianapolis, Indiana and surrounding area

- 480,000 customers

BUSINESS NEEDS

- Integrated Volt-Var control including DER and grid devices
- Thermal limit mitigation utilizing DER
- DER dispatch optimization with wholesale market

PRODUCTS & SOLUTIONS

- mDERMS

RESULTS ACHIEVED

- Integrated control and optimization for distribution voltage (previously 3 separate systems)
- Integration to SCADA, OMS, Capacitor control, wholesale market, demand response, EVSE
- State estimation for substation transformer LTCs
- DER Plan generation for as-operated network

Vector Limited – Auckland, New Zealand

CUSTOMER PROFILE

- New Zealand's largest electric distribution company with:
  - 1.2 Million customers-2.5% annual growth
  - Auckland and the surrounding area
  - Underground distribution at near capacity

CHALLENGE

- Gaining visibility and managing DERs connected to the grid:
- Rising peak demand, coupled with a reduction in average demand
- Existing network not designed to manage DERs
- Alternatives were investing in costly new infrastructure

PRODUCTS & SOLUTIONS

- "System of Systems" to analyze and forecast DER and Load
- 24-hour DER plan to mitigate system constraints, DER dispatch
- Non-wires alternative to system upgrades

Why mPrest Was Selected

- Integration of 10 separate subsystems (SCADA, GIS, DR, Cloud services for controlling DERs), in four weeks
- Demonstrated use cases and integration to multiple platforms in weeks
- Many use cases still only available from mPrest today (2.5 years later)

Competition

- Siemens, ABB, GE, Schneider, OSI, SGS, AutoGrid, Enbala

ROI

- Avoided billions of $$ in non-wires alternative reconstruction cost

Rome, Italy

enel
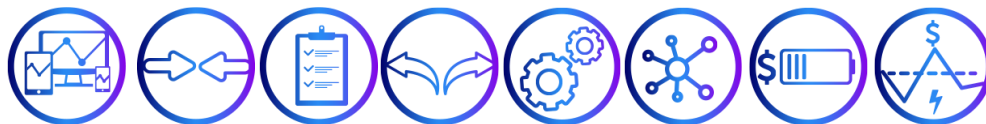
CUSTOMER PROFILE

- World's largest distribution utility
- 70 million electric customers

CHALLENGE

- Manage PV and grid-scale sodium network battery
- Interface directly to DERs using 61850
- Integrate with external aggregator using open ADR
- Integrate external forecasts

PRODUCTS & SOLUTIONS

- mDERMS for grid topology awareness
- Provide DER situational awareness to TSO and DSO
- Manage active and reactive power for DERs
- Enable islanding mode of operation for DERs

Why mPrest Was Selected

- mPrest was the only vendor able to meet production requirements and provide grid topology awareness
- mPrest was the only vendor able to meet aggressive project schedule

Competition

- Schneider, Siemens, AutogGrid, Enbala

ROI

Main use case is Non-wires alternative. As such, not investing in DERMS would drive significant investment in civil engineering, substation and feeder investments which would be billions.

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Avacon Netz Gmbh

Lower Saxony, Saxony-Anhalt, Hesse and North Rhine-Westphalia

CUSTOMER PROFILE

- Subsidiary distribution company of e.on in Germany.
- e.on is the largest distribution utility in Europe
- > 40,000 customer-owned DERs

CHALLENGE

- Analyze DR program for controllable heaters and create minimal-cost dispatch plan
- Avoid over-utilization of DR while minimizing spot market power purchases

PRODUCTS & SOLUTIONS

- mDERMS platform with individual load forecast based on weather and historical usage

Why mPrest Was Selected

- mPrest was the only vendor able to meet production requirements and provide grid topology awareness
- mPrest was the only vendor able to meet aggressive project schedule

Competition

- AutoGrid, Enbala, SGS

ROI

- From a single subsidiary, e.on expects that ROI would be 5M euro/year

CitiPower & Powercor Australia - Melbourne, Victoria, Australia

CUSTOMER PROFILE

- Largest Electric Supplier in Victoria

- >1.1 million Residential & Commercial Customers

- 140,000 RTS installations

CHALLENGE

- Automate the Demand Response Process

- Manage and Schedule A/C Load

- Mitigate Local Constraints

- Provide Platform for Growth in Number and Variation of DER Types

PRODUCTS & SOLUTIONS

- mDERMS Platform to Analyze, Schedule and Control DR

- Growth Capability to Add DER Types and High Quantities of DERs

Why mPrest Was Selected

- CPPC Stated mPrest is the Only Vendor to Meet Their Requirements and Provide Grid Topology Awareness

- Full cloud deployment capabilities and cloud production reference

Competition

- **Short List: GE, SGS**

ROI

- Recent win

- Mentioned as reference, as it is over cloud.

- ROI will be calculated with customer

mDERMS DEMONSTRATION

Questions?

Thank
You

Your journey with Capgemini mPrest

Capgemini & mPrest Value Proposition

- **End to end suite of grid modernization products and services**
- **System of Systems Platform**
- **High Value Applications**
- **Integration Services**

How Do We Deliver?

- **Strategic planning**
- **Use cases selection**
- **Pilots definition**
- **Architecture planning**
- **Project management**
- **Deployment & installation**
- **Customization & Integration**
- **UAT management**

Our differentiators

- **System of systems** - End-to-end orchestration, situational awareness and optimization of front-of-meter and behind-the-meter grid edge assets
- **DERMS analytics and plans integrated with asset health and fleet status**
- **Dynamic system topology awareness**
- **Production Proven**
- **DaaS, DERMS as a Service**
- **Flexibility**
- **Rapid integration**

mDERMS NOW!

- **Applications suite** for distribution and transmission utilities and energy companies to manage their energy systems
- **Optimization** of the management of DERs against existing loads and better channel energy to areas of high demand and away from areas of high supply, alleviate stress on the system, enhance operational efficiencies and improve reliability
- Acting as **an intelligent grid management system-of-systems**, mDERMS also integrates with third party DR, VPP and microgrid management systems, as well as with SCADA/DMS/ADMS systems
- End-to-end **front-of-the-meter and behind-the-meter visualization and integrated processes**

11 Use Cases
to Harness the Power of DERMS

- Dynamic Network Topology
- DER Situational Awareness
- DER Susceptibility
- DER Flexibility
- Network Constraint Management utilizing DERs
- Precise Demand Response Management
- Volt/VAr control
- DER Fleet Management
- Energy Arbitrage
- Asset Management integration
- Optimal DER Plan Creation

Built on

- Easily scalable '**System of Systems**' using a **microservices-based** architecture
- Software implementation **on-premise**, in the **cloud** or in a hybrid environment
- **Smart integration** with any current or future operational system or application, to deliver real-time, **end-to-end visibility and control** over critical systems
- **Actionable insights** that allow optimized **IT and OT integration** and management