

# Storage Solutions for Multi-Stakeholders at Denver's Pena Station

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Vice President of Global Sales for Microgrids and Storage Solutions

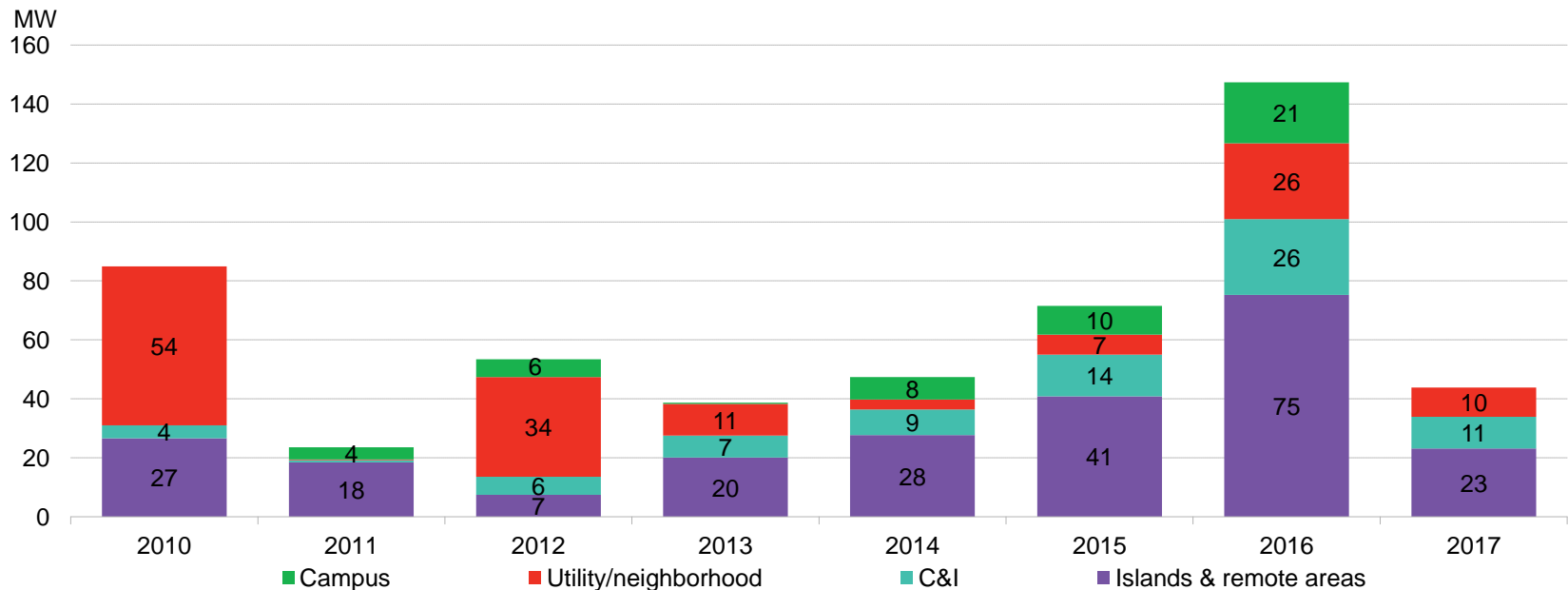


**Growth in Microgrids Worldwide**

# MICROGRID DEPLOYMENT – BY SEGEMENT

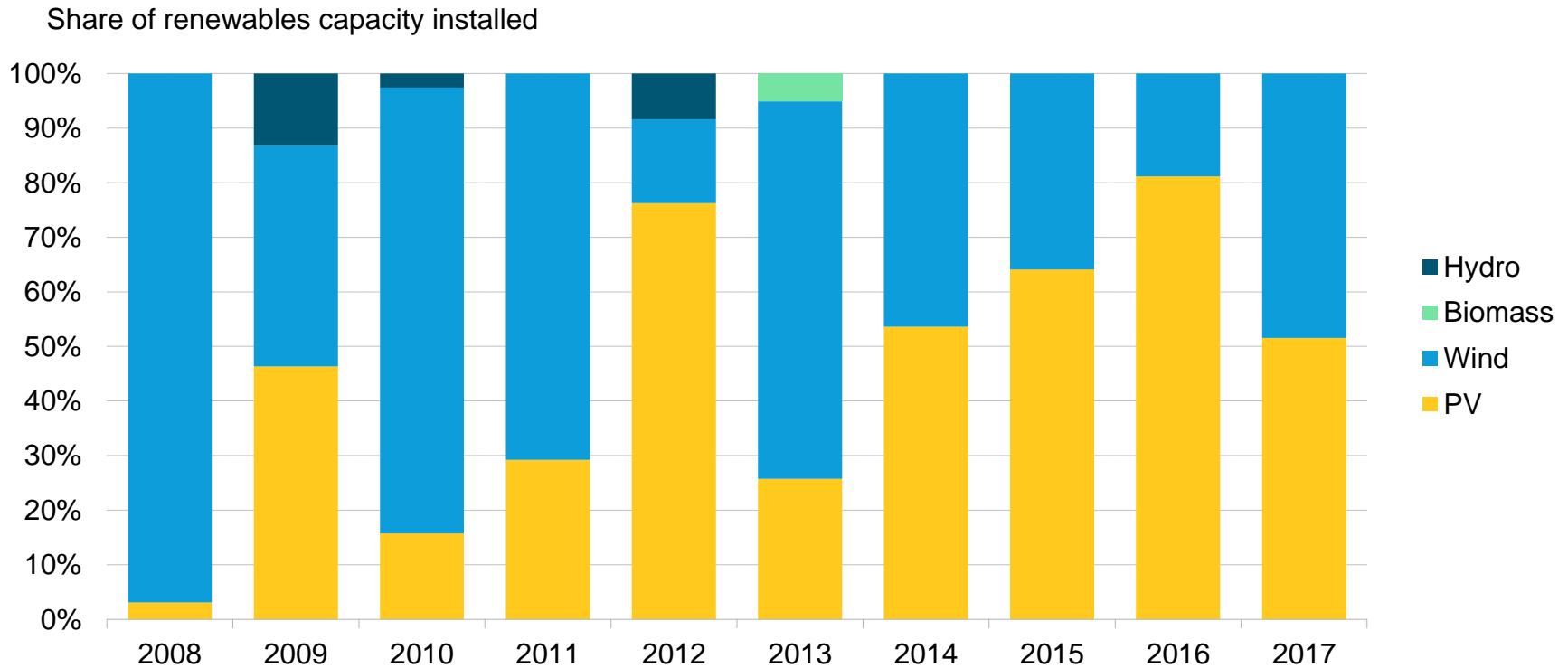
- Half of all commissioned microgrids serve islands and remote areas.
- C&I increased every year and is also leading second in the pipeline.
- Islands/remote areas and C&I customers will be the main applications.

Capacity of commissioned microgrids



*BNEF microgrid database*

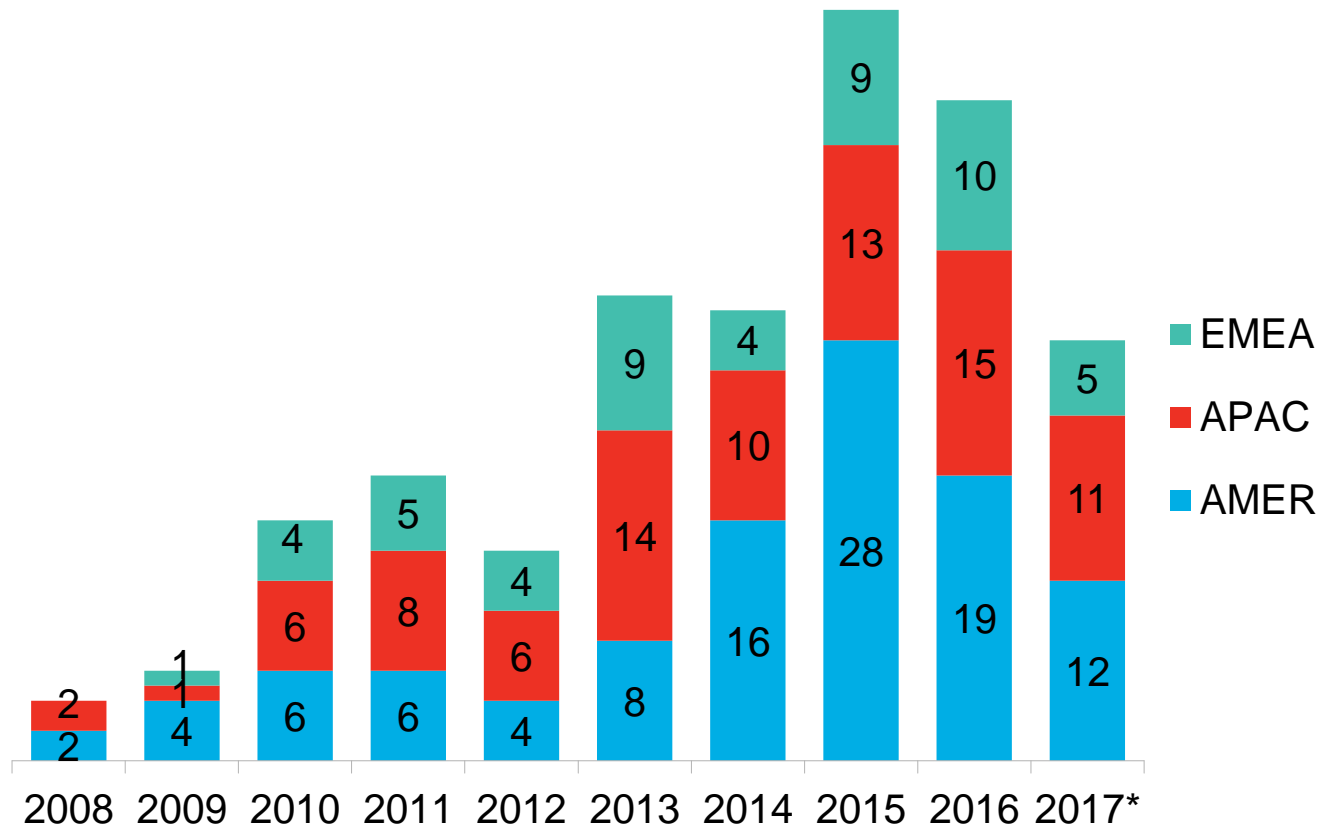
# MICROGRID DEPLOYMENTS – BY RES



*BNEF microgrid database*

# MICROGRID DEPLOYMENTS – BY REGION

- The **US has the highest amount of commissioned microgrids** which supply industrial and military campuses or work as demonstration projects.
- EMEA has only some island microgrids in Europa, but **Africa and ME have the second largest amount of projects** in the current pipeline.



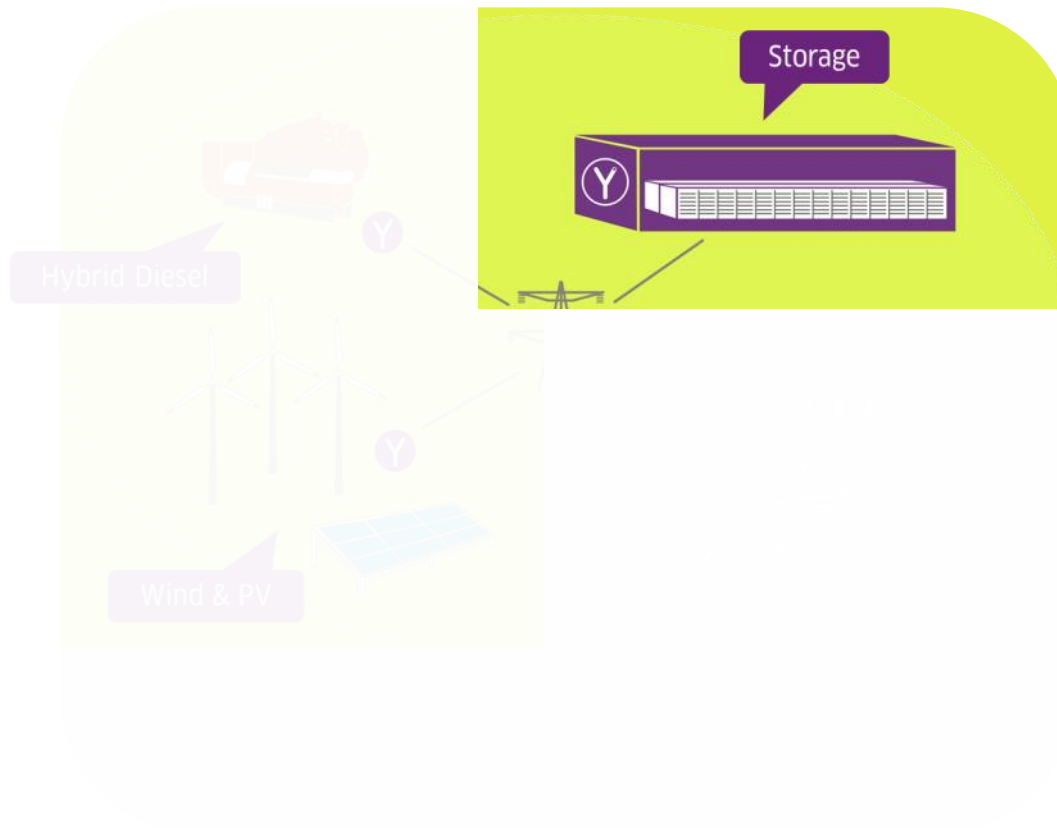
*BNEF microgrid database*





**What makes up a Microgrid?**

# WHAT MAKES UP A MICROGRID



## Storage

Batteries - balancing services for grid stability, and level out electricity production and demand

## Generators

Diesel, Gas, HFO

## Renewable Resource

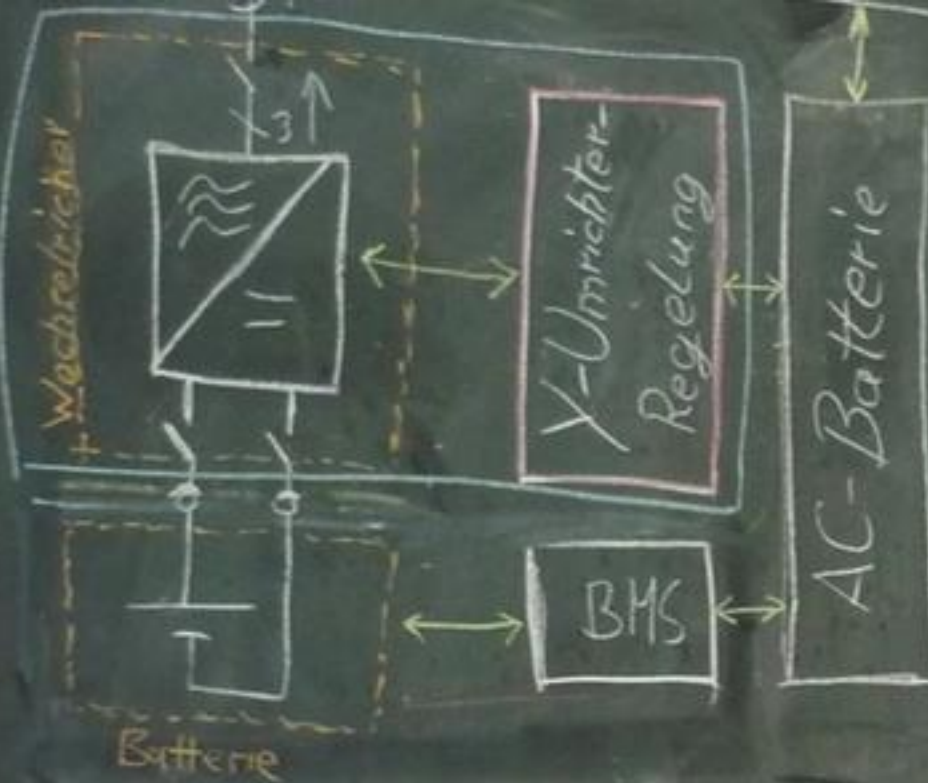
Solar PV generate electricity

## Dispatchable load

Excess energy can be used for dispatchable loads

## EMS

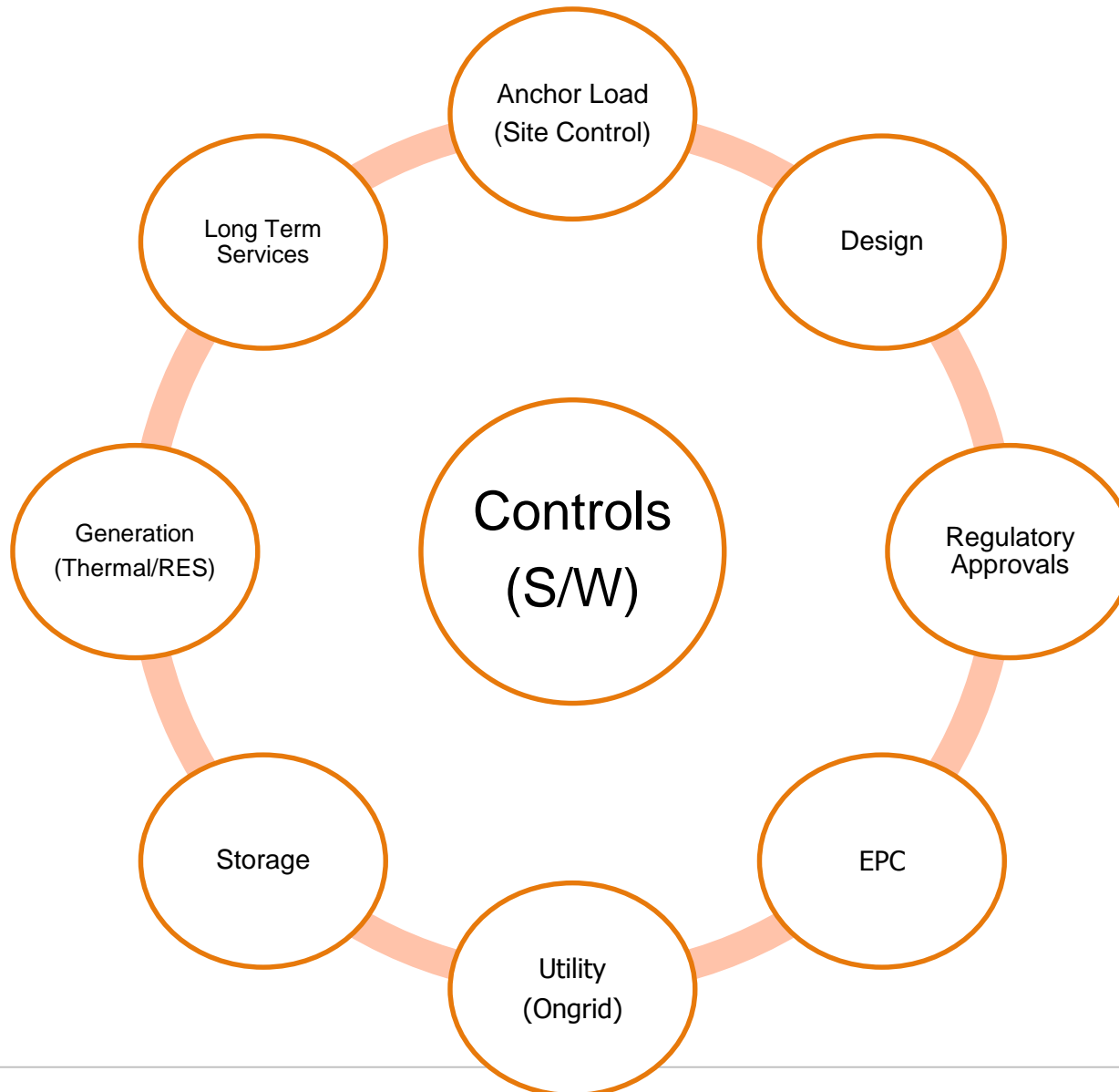
Plant dispatch manager and optimization with ability to island



**Microgrids require multiple stakeholders**



# STAKEHOLDERS...



# ...BENEFITS OF MULTI-STAKEHOLDERS

Experts by task/scope

Spreading the performance risk

Sharing the construction risk

Access to capital/financing structures

Revenue risk can be pushed to partners

Shared knowledge

Better pricing by expertise



**Panasonic HQ project with Xcel Energy**

# STAKEHOLDERS...

**Panasonic**

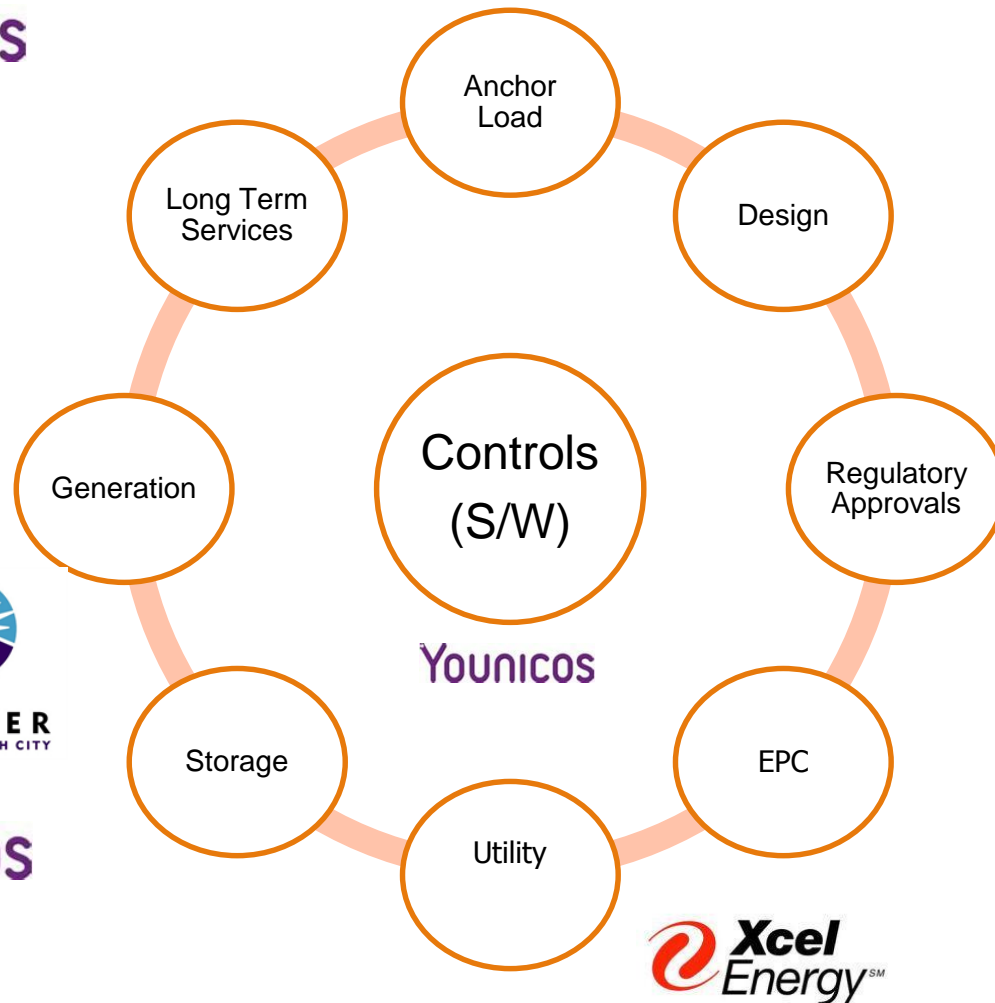
**YOUNICOS**

**Panasonic**

**Panasonic**



**YOUNICOS**



**\*Xcel Energy is lead sponsor and owner**



# PANASONIC HQ - SIZING



**Anchor Load**



**1.6MW dc Carport Solar**



**259 kw dc Rooftop Solar**



**1MW/ 2.1MWh Battery  
Energy Storage + Islanding  
Switch**

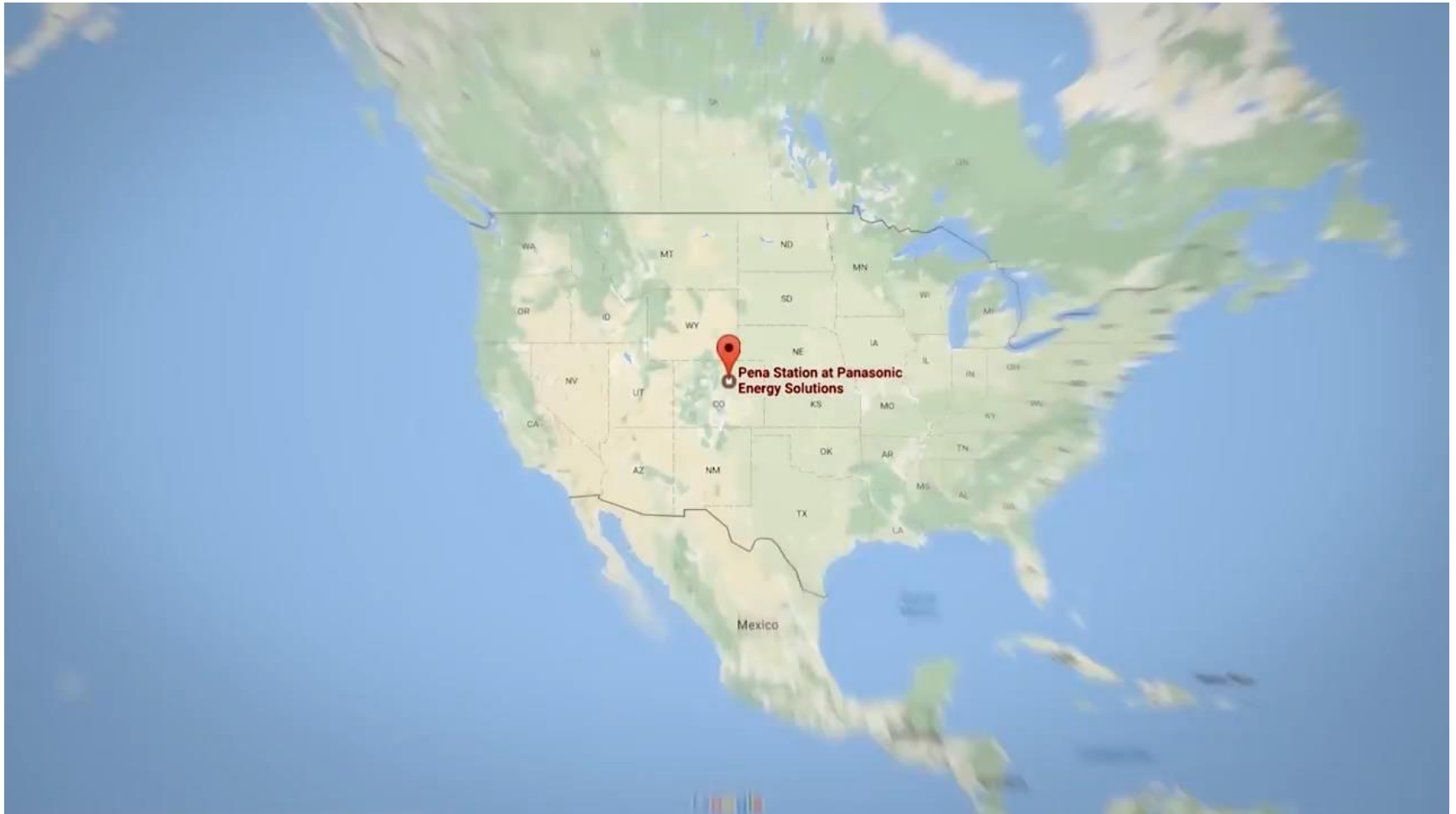
# MULTIUSE – REVENUE STREAMS

## Beyond UPS for Greater Market Impact

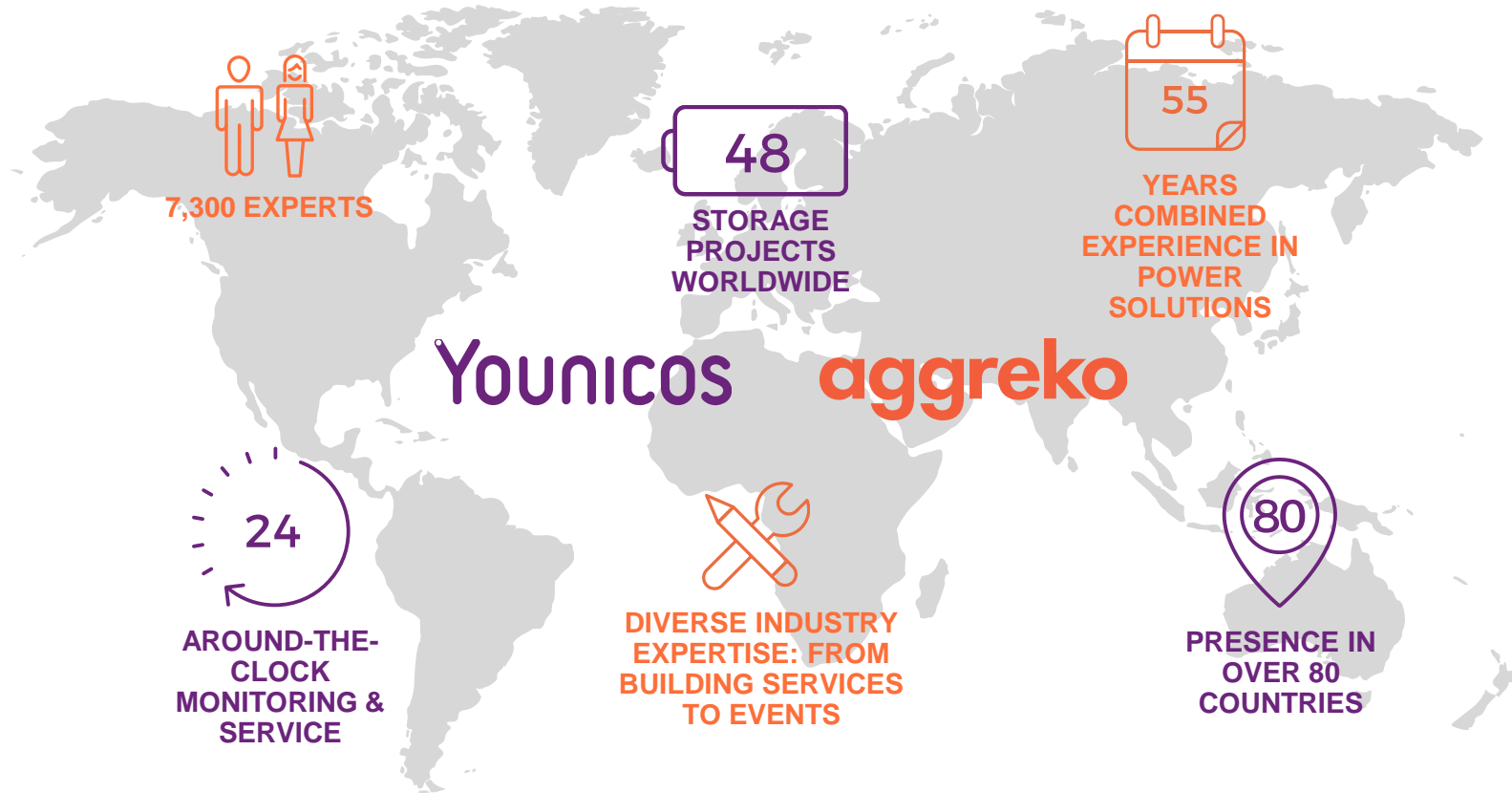
- **Frequency Regulation** as an ancillary service to the grid
- **Solar Firming & Shifting** for both collocated solar & solar penetration on feeder
- **Peak Shaving** to reduce peak demand on the feeder deferring distribution upgrades
- **Back-up Power** capability to create islanded microgrid for 24/7 operation of the Panasonic NOC
- **Energy Arbitrage** charge a low prices and discharge at high prices



# PV PLUS STORAGE MICROGRID



# GENERATION AND STORAGE FROM TWO GLOBAL LEADERS.



Aggreko owns and operates **over 9.5 GWs** mobile and modular power energy services worldwide.