NYSERDA On-site Resilient Power Conference

Mehdi Ganji, Ph.D., Vice President, Smart Cities, IEEE Smart City R&D Committee Chair
Willdan Group, Inc.

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WILLDAN

Agenda

01 Willdan Overview

02 Bridging the Gap Between Planning and Operation

03 Willdan’s Planning Services (Analytics)

04 Our Operational Algorithm Services

05 Case Studies

06 Questions?

Regarding NYS Marketplace

What we bring to the effort for NYS marketplace:

Pre-Analytics to determine Size-mix of Technologies	Solar Equipment & Installation	Storage Equipment & Installation	CHP Equipment & Installation	Controls Equipment & Installation	Dispatching Algorithm, Signaling, Monitoring	Systemwide Responsibility (Interface to Customer)	Design, CM & Integration
★				★	★	★	★

Audience-members we want to connect with to form a team in NYS:

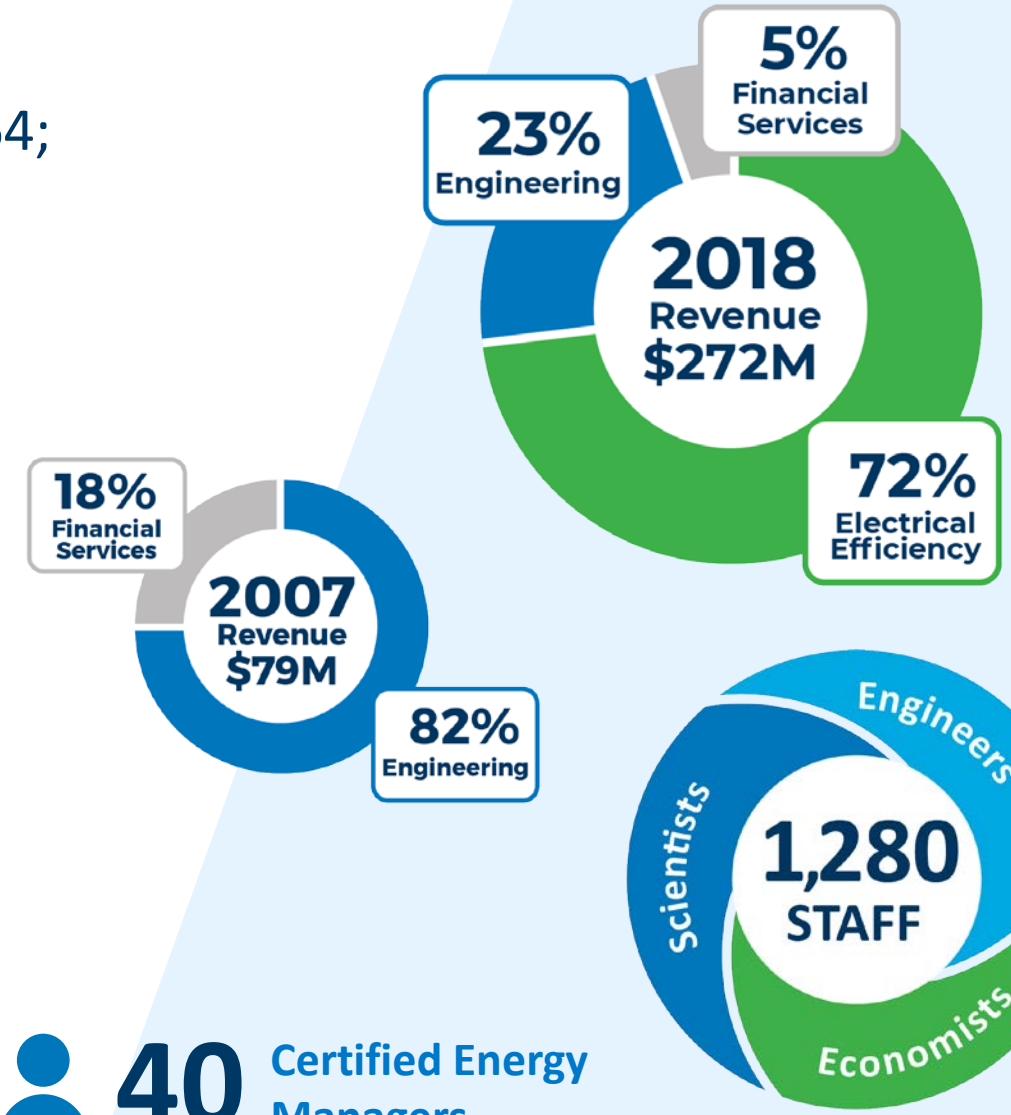
Pre-Analytics to determine Size-mix of Technologies	Solar Equipment & Installation	Storage Equipment & Installation	CHP Equipment & Installation	Controls Equipment & Installation	Dispatching Algorithm, Signaling, Monitoring	Systemwide Responsibility (Interface to Customer)
★	★	★	★	★	★	★

01

Willdan Overview

Willdan Overview

- National professional engineering firm specializing in energy efficiency, founded in 1964; publicly traded (NASDAQ: WLDN)
- 1,280 employees located in 55 US cities and 27 states
- 14,000+ projects for 800+ cities and counties
- Full-service design, engineering, construction management, performance contracting
- Energy Services Company (ESCO)
- Headquartered in Anaheim, California, with East Coast center of operations in Manhattan



150 Professional Engineers

65 LEED Professionals

40 Certified Energy Managers

Willdan's National Utility Experience - 75 Utilities | 100+ Programs

250,000+ Projects Delivered

320,000+ Customers Served

4.6M Metric Tons Greenhouse Emissions Avoided

6,000 GWH Saved

New York Presence

- **425 staff in nine regional offices – Beacon, Brooklyn, Buffalo, Kingston, New York, Pelham, NY; Edison, Newark and Woodbridge, NJ**
- **New York-licensed professional engineering design company and New York City-licensed electrical contractor**
- **Local, in-house expertise to provide:**
  - Smart grid and advanced technologies
  - Utility energy program design and implementation
  - Turnkey planning, design and construction management (design-build services and energy savings performance contracting)
  - Measurement and verification, new building commissioning and retro-commissioning

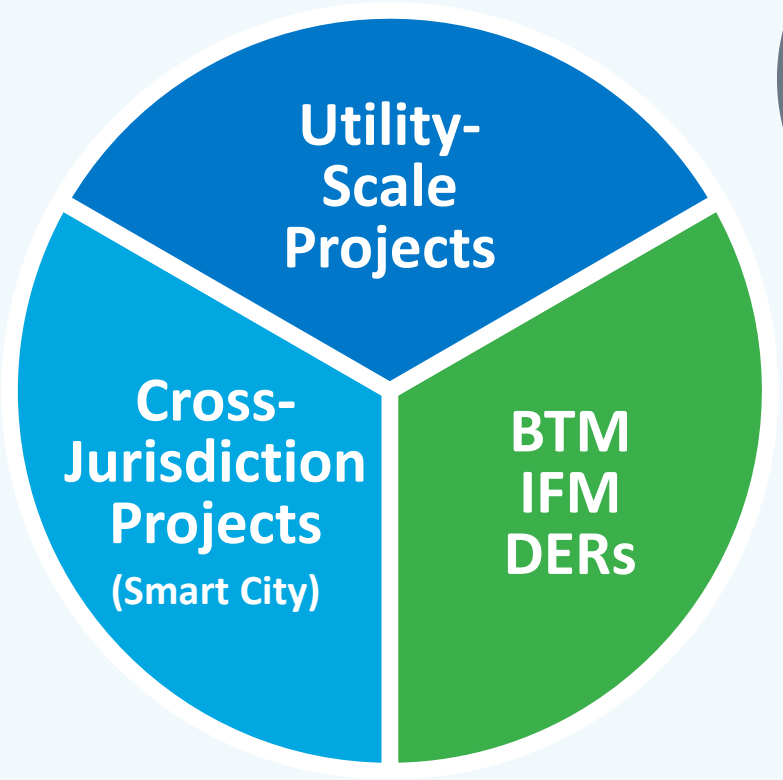
02

Bridging the Gap Between Planning and Operation

Willdan's Energy Services

Energy Efficiency
(90K Projects, 1,700 GHW Savings, 1M Tons GHG Reductions)

DERs Integration
(LoadSEER Application at PG&E and SDG&E IDROP Application at SCE and PG&E)



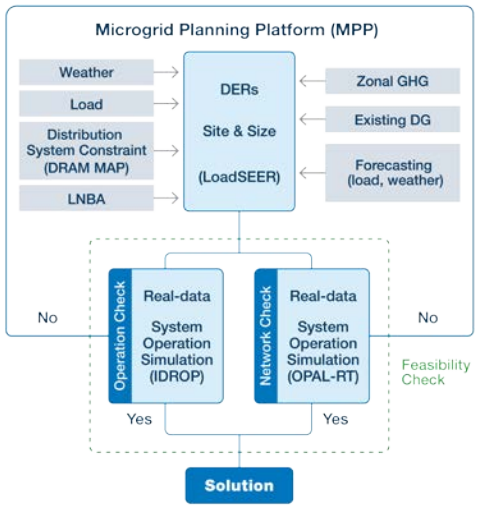
Microgrid
(IIT Campus Microgrid, Bronzeville Community Microgrid/Master Controller, 9 NY and 3 MS Community Microgrids)

Clean Energy
(WattCommons Community Solar Program Turnkey Solutions)

Willdan has over 245 MW of CHP, 10 MW of solar, and 5 MWh of battery storage projects—our work has resulted in 700 MW of energy demand reductions and 6,000 GWH of energy savings. Willdan's experience runs the gamut from industry-leading microgrid planning and development to utility-scale peaking plans to small test model fuel cells to installing wind turbines. We also bring substantial experience developing, designing, and operating utility-owned DERs.

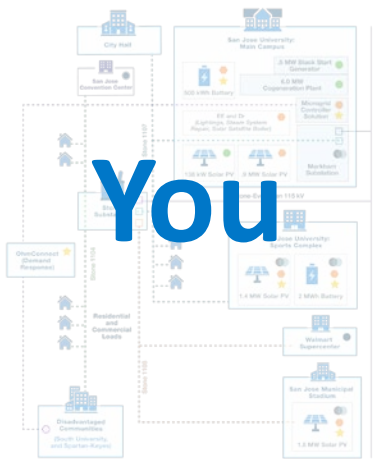
Willdan's Approach Streamlines Microgrid Development

Development

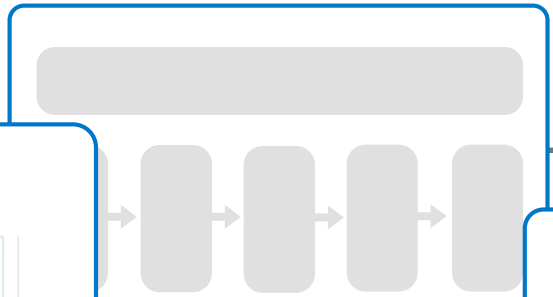


Engineering Design & Permitting

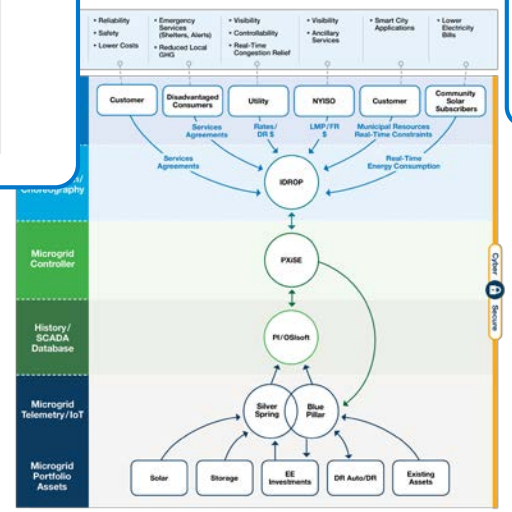
Construction



Commissioning M&V



Control Deployment



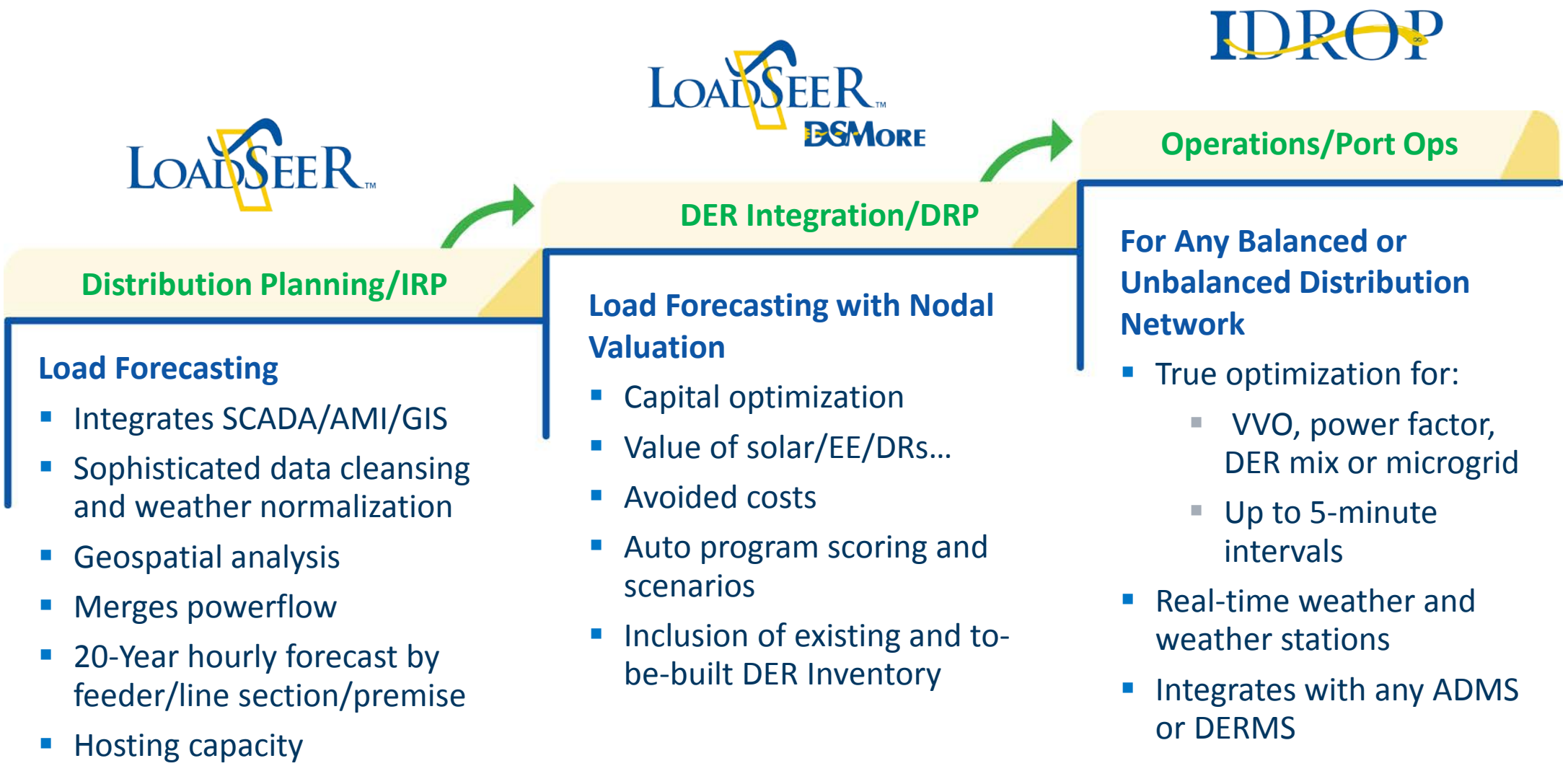
Operation & Maintenance

You

03

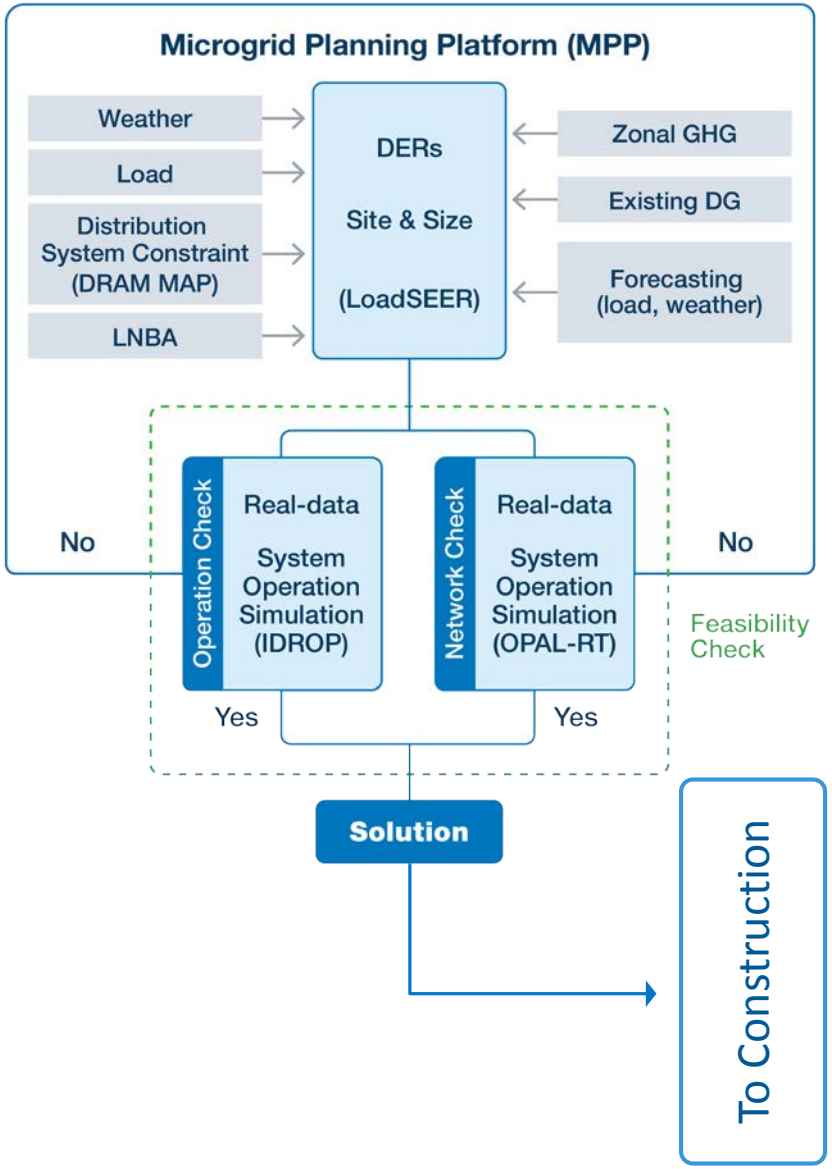
Willdan’s Planning Services

Bridging Planning to Operation-Economics and Environmental



Bridging Planning to Operation-Distribution Network Stability

- To ensure the fidelity of the proposed DER model, IDROP, Willdan's economic dispatch model, and OPAL-RT will simulate real-world operating conditions of the proposed microgrid.
- The Microgrid Planning Platform (MPP) reduces the engineering complexity and costs for both the developer and the utility and identifies the optimal mix of DERs for the microgrid to meet stakeholders' requirements.
- Once verified, the solution will become the engineering design, ready to be constructed.



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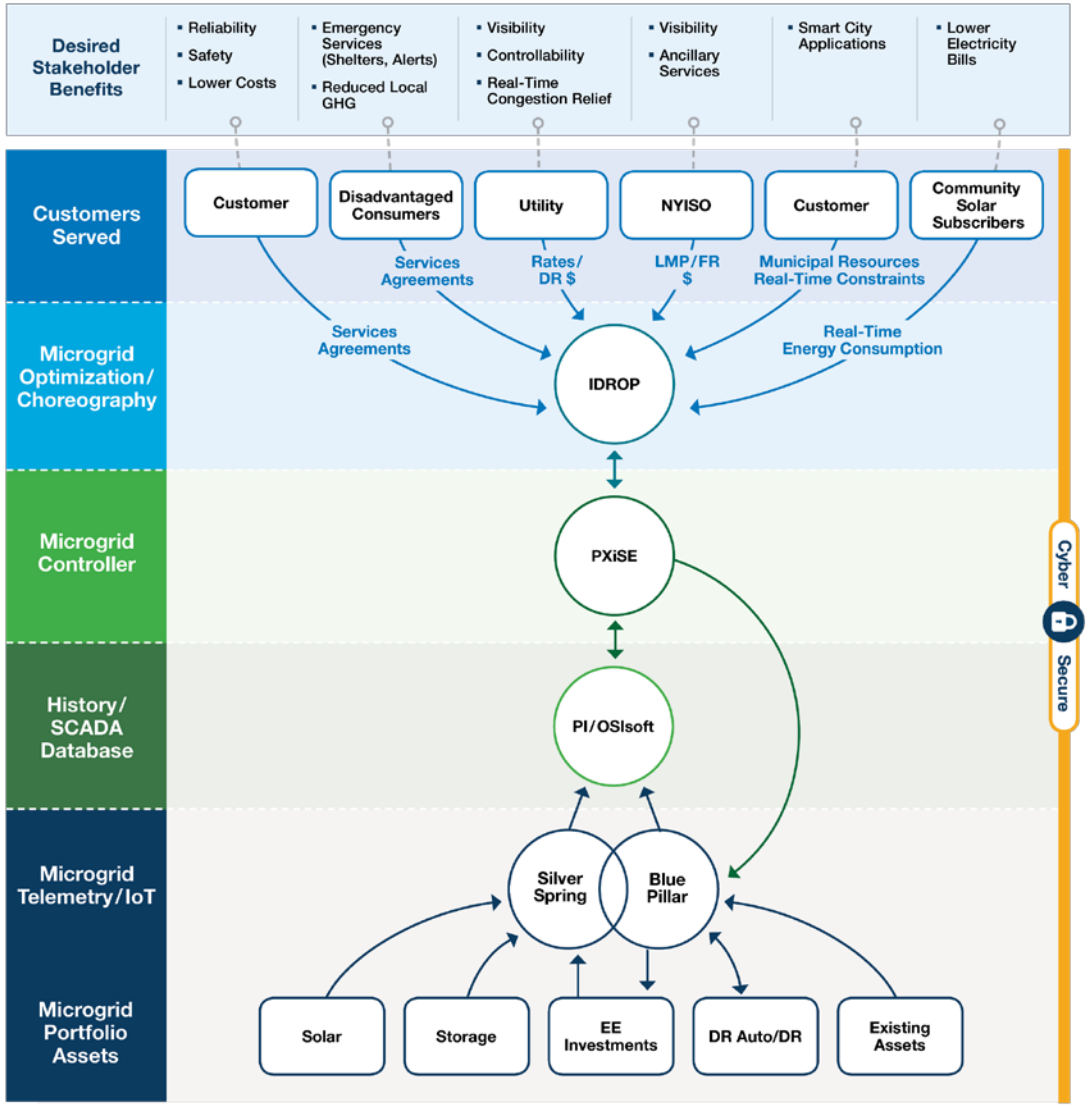
Willdan’s Operational Algorithm Services

Willdan Microgrid Analytic Framework

- Includes three major pillars:
  - Economics and Environmental
  - Distribution Network Stability
  - Data Analytics
- Enables the integration and interoperability of different systems and components—including real-time communication with the electric grid and the ISO energy market.
- Uses a standard interface and cyber-secure communications protocol.
- Unlocks the full economic value of DERs by factoring in real-time grid conditions (power flow, network constraints) and stakeholder requirements (peak-shaving, power quality, energy costs).
- Its platform capabilities can manage additional public works services, increasing the commercial viability of the controller.



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Case Studies

Case Study Index

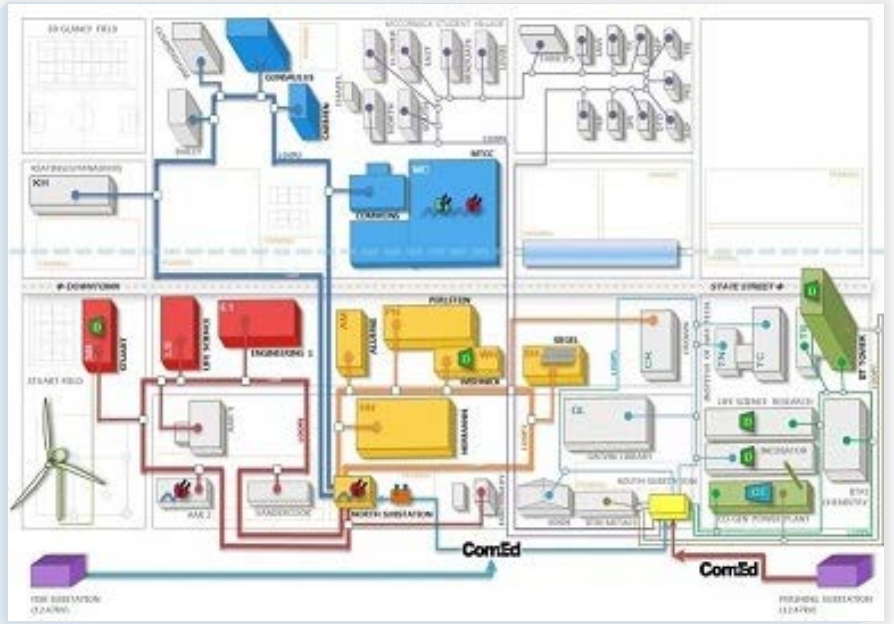
CASE STUDY TITLE	DER DESCRIPTION	PROJECT TYPE	WILLDAN'S ROLE	STATUS	RESULT	PERFORMANCE	POINT OF CONTACT
Illinois Institute of Technology Microgrid	▪ 1 MW Solar ▪ 1 MWh Battery ▪ 8 MW CHP ▪ 2.5 DGs ▪ DSM	Campus Microgrid	▪ EE ▪ Engineering Design ▪ Project Management ▪ M&V ▪ Construction ▪ Controls Deployment	▪ Operating ▪ Expanded to Bronzeville Community ▪ Empowering the Business Model	▪ $500,000+ annual savings ▪ Campus resilience	Expanded to include microgrid research and technology development	Mehdi Ganji, P.D. 415.722.0132 mganji@willdan.com
SCAQMD Bundle-Based Energy Efficiency Technology Solutions	▪ 100 kW Solar ▪ 50 kWh Battery ▪ DSM – 1.8M kWh, 30,000 therms, 41 kW peak	BTM Nanogrid, Emerging EE Technology Deployment	▪ EE ▪ Engineering Design ▪ Project Management ▪ Construction ▪ Commissioning/M&V ▪ Controls Deployment	▪ Implementation phase	▪ Expected: ▪ 31% kWh savings, 21% peak demand, 11% therms	Implementation phase	Mehdi Ganji, P.D. 415.722.0132 mganji@willdan.com
Chemehuevi Indian Tribe Community Microgrid	▪ 1.973 MW Solar ▪ 2.625 MWh Battery Storage ▪ Automated DR Capabilities ▪ VGI Services	Community Microgrid	▪ EE ▪ Engineering Design ▪ Project Management ▪ Construction	▪ Implementation phase	▪ Implementation Phase	Implementation phase	Mehdi Ganji, P.D. 415.722.0132 mganji@willdan.com
Pacific Gas & Electric	▪ Utility-wide: ▪ Solar ▪ Battery ▪ EV ▪ CHP	Utility	▪ Deploy and support LoadSEER software application	▪ Commercial application used by over 60 engineers	▪ Operational since 2011	Distribution planning, load forecasting, DER adoption, impact scenarios and circuit risk analysis	Mehdi Ganji, P.D. 415.722.0132 mganji@willdan.com
Hawaiian Electric	▪ Utility-wide: ▪ Solar ▪ Battery ▪ EV ▪ CHP	Utility	▪ Deploy and support LoadSEER software application	▪ Commercial application used by Planning, DER integration and IRP teams	▪ Operational since 2017	Test and manage locational risk of increased penetration of DER to its network	Mehdi Ganji, P.D. 415.722.0132 mganji@willdan.com

Case Study Index

CASE STUDY TITLE	DER DESCRIPTION	PROJECT TYPE	WILLDAN'S ROLE	STATUS	RESULT	PERFORMANCE	POINT OF CONTACT
Southern California Edison	▪ Utility-wide: ▪ Solar ▪ Battery ▪ EV ▪ CHP	Utility	▪ Deploy and support IDROP software application	IDROP used by SCE operations/advanced technology teams to dispatch DER intra-hour based on load and grid conditions	Operational since 2017	Rolling, near-real time DER choreography and economic dispatch engine to direct the activation, curtailment and power quality implications of a dynamic feeder environment with many types of DER	Mehdi Ganji, P.D. 415.722.0132 mganji@willdan.com
White Oak CHP Plant	▪ 4.6 MW solar mercury gas turbines ▪ 3,360 tons of chiller capacity ▪ 100,000,000 BTU/hr HTHW generators	BTM Nanogrid	▪ EE ▪ Engineering Design ▪ Project Management ▪ Construction Administration	Operational	500 days of campus-wide, uninterrupted power	GHG emission reduction, resilience, cost savings	Jim Quinn 914.954.8531 jim.quinn@willdan.com
NYCHA Geothermal	▪ Two 20-ton heat pump, using ten 500-foot-deep wells as a heat exchange medium ▪ 4,000 gallons of hot water ▪ Wireless energy modules	City	▪ EE ▪ Engineering Design ▪ Project Management ▪ Construction Management	Operational	System operating as designed	Energy, cost and GHG emission reduction	Jim Quinn 914.954.8531 jim.quinn@willdan.com
Fortune 500 Company Battery and Solar Study ***(confidential client - NYSERDA FlexTech)***	▪ 5.82 MW DC solar parking array, 1,000 kWh battery system and vehicle charging stations	Private	▪ Engineering Analysis	Study submitted to client	Analyzed technical solution, utility interconnect requirements and VDER tariff	Confidential	Jim Quinn 914.954.8531 jim.quinn@willdan.com

Willdan and Illinois Institute of Technology (IIT) Microgrid, Chicago, Illinois

- **Role:** EE, Engineering Design, PM, M&V, Construction, Controls Deployment
- **Status:**
  - Operational
  - Expanded to Bronzeville Community
  - Empowering the Business Model
- **Site Description:** Research laboratories, technology park campus, dorms, classrooms
- **DER Description:**
  - 1 MW Solar
  - 1 MWh Battery
  - 8 MW CHP
  - 2.5 DGs DSM
- **Configuration:**
  - Grid parallel normal, planned and unplanned island, safe, demand response modes
- **Results:**
  - $500,000+ annual savings
  - Campus resilience
- **System Performance:** Expanded to include microgrid research and technology development



CEC and SCAQMD Bundle-Based Energy Efficiency Technology Solutions (BEETS) for California

- **Role:** EE, Engineering Design, PM, Construction, Commissioning/M&V, Controls Deployment
- **Status:** Implementation phase
- **Site Description:** 350,000 square feet of administrative offices, air quality lab space
- **DER Description:** 100 kW solar, 50 kWh battery, DSM – 1.8M kWh, 30,000 therms, 41 kW peak
- **Configuration:**
  - DC lighting system in lab space, plug load controls, off-grid lighting
- **Results:** Expected 31% kWh savings, 21% peak demand, 11% therms
- **System Performance:** Implementation phase

Chemehuevi Indian Tribe Community Microgrid, California

- **Role:** EE, Engineering Design, PM, Construction
- **Status:** Implementation Phase
- **Site Description:** Chemehuevi Indian Tribe reservation near Lake Havasu, California
- **DER Description:** 1.973 MW solar, 2.625 MWh battery storage, data analytics and smart energy controls; automated DR capabilities; VGI services
- **Configuration:**
  - Community Microgrid - 1 MW solar for first phase
- **Results:** Implementation phase
- **System Performance:** Implementation phase

LoadSEER for Integrated Grid Planning for DER Dispatch Optimization

UTILITY	PG&E	Hawaiian Electric	Southern California Edison
	LoadSEER	LoadSEER	IDROP
ROLE	Deploy and support LoadSEER software application	Deploy and support LoadSEER software application	Deploy and support IDROP software application
STATUS	Operational since 2011	Operational since date 2017	Operational since 2017
SITE	Service area stretches from Eureka in the north to Bakersfield in the south, and from the Pacific Ocean in the west to the Sierra Nevada in the east.	The Hawaiian Electric Company and its subsidiaries provide electricity and services to 95 percent of the state's 1.4 million residents.	SCE delivers power to 15 million people in 50,000 square miles across central, coastal and Southern California, excluding the City of Los Angeles and some other cities.
DERs	Utility-wide: Solar, Storage, EV, CHP	Utility-wide: Solar, EV, DR	Utility-wide: Solar, Storage, CHP
CONFIGURATION	Utility/various distribution infrastructure	Utility/various distribution infrastructure	Utility
RESULTS	▪ Results: Operational since 2011 ▪ System Performance: Distribution planning, load forecasting, DER adoption, impact scenarios and circuit risk analysis	▪ Results: Operational since 2017 ▪ System Performance: Test and manage locational risk of increased penetration of DER to its network and as a blueprint to deployment of capital to harden the distribution network to accept DERs	▪ Results: Operational since 2017 ▪ System Performance: Rolling, near-real time DER choreography and economic dispatch engine to direct the activation, curtailment and power quality implications of a dynamic feeder environment with many types of DER

CHP Plant, Federal Research Park White Oak

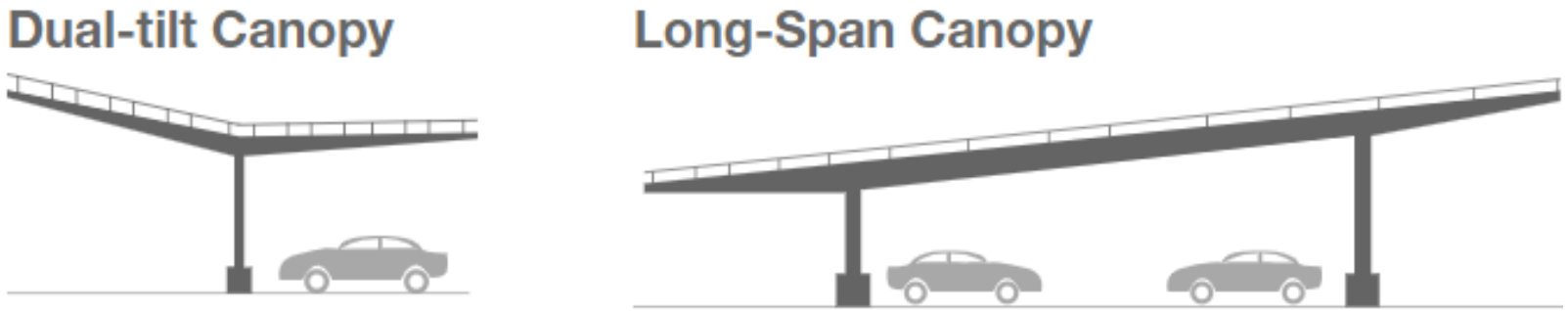
- **Role:** EE, Engineering Design, PM, Construction Administration
- **Status:** Operational
- **Site Description:** Federal Research Center at White Oak (headquarters of the Food and Drug Administration)
- **DER Description:**
  - 4.6 MW solar mercury gas turbines
  - 3,360 tons of chiller capacity
  - 100,000,000 BTU/hr HTHW generators
- **Configuration:**
  - Utility interconnection for parallel and island operation
  - Black start capability
  - Load management system
  - Sound attenuation design
- **Results:** 500 days of campus-wide, uninterrupted power
- **System Performance:** GHG emission reduction, resilience, cost savings

Geothermal Design | CM, New York City Housing Authority (NYCHA)

- **Role:** PM, engineering design (mechanical, electrical, instrumentation and controls), construction management
- **Status:** Operational
- **Site Description:** NYCHA housing complex, Manhattan
- **DER Description:** Two 20-ton heat pump, using ten 500-feet-deep wells as a heat exchange medium, 4,000 gallons of hot water storage, wireless energy modules
- **Configuration:** Replacing natural gas heating with low GHG heating
- **Results:** Operational
- **System Performance:** System operating as designed

Fortune 500 Company Battery and Solar Study
(Confidential Client – NYSERDA FlexTech)

- **Role:** Engineering analysis
- **Status:** Ongoing
- **Site Description:** Corporate headquarters and satellite campuses
- **DER Description:** 5.82 MW DC solar parking array, 1,000 kWh battery system and vehicle charging stations
- **Configuration:** Parking canopy, solar battery storage
- **Results:** Analyzed optimal technical solution requirements, financial impact, local regulatory requirements and utility interconnect requirements and tariff implications (VDER). Developed solution that embraces sustainability objectives via renewable energy for greenhouse gas reduction



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Questions?

Contact Information

- Mehdi Ganji, Ph.D., Vice President, Smart Cities, IEEE Smart City R&D Committee Chair
- Willdan Group Inc.
- 2401 E. Katella Avenue, Suite 300
- Anaheim, CA 92806
- mganji@willdan.com
- (415) 722-0132
- www.willdan.com
- Exhibit booth location
  - Booth number #1
  - See highlight on map