



Smart Energy Network's Meeting

September 2019, Oslo

Elad Shaviv

CEO

The Israeli Smart Energy Association





Agenda

- Israel: Innovation Based Economy
- The Israeli Energy Innovation Hub
- The Changing Global Energy Market
- Examples of Israeli Innovation in Energy



Israel: Innovation Based Economy



"If an expert says it can't be done, get another expert"

David Ben Gurion

Israeli innovations



Chat



ICQ

Internet Calls



Vocaltec

Disk on Key



M-Systems

Gastrointestinal Diagnosis



Given Imaging

Drip Irrigation



Netafim

Social Navigation



Waze

Israel, Innovation Based Economy



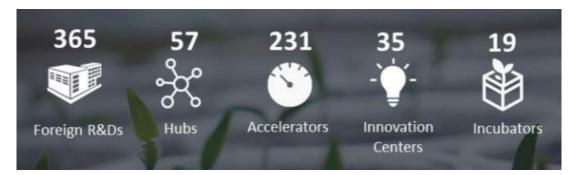
- #1 country with Nasdaq-listed companies except the U.S. and China
- #1 country in terms of VC Investment per Capita and as a % of GDP
- #1 country in terms of start-ups concentration: there's 1 start-up for every 400 people
- #1 start-up ecosystem after the US according to the 2015 Compass Global Start-up Ecosystem Ranking
- #1 country in terms of R&D employees concentration: 140 per 10,000
- #1 country in terms of high tech employee concentration: around 1 per 10 working people
- #1 in the production of scientific papers
- #1 out of 148 economies in innovation abilities, #2 in entrepreneurship and #3 in global innovation according to the 2016 IMD Competitiveness Yearbook
- #1 out of 60 leading economies around the world for technological and scientific abilities according to the annual Global Dynamism Index (GDI)

Source: Ragtime, The Investment Platform, January, 2018

Approximately 5,000 active startup companies in Israel

Result driven innovation







The Israeli Smart Energy Association

Multinational R&D & Innovation Centers in Israel



Industry/ Origin	IT, Hardware, Software & Services			Internet & Retail	Semiconductors	Finance, Banking & Insurance	Communications	Automotive, utility & Indo		Healthcare & Medical	Other Industries	Electronics
North America	DELLEMC ORACLE Symantec bmc vmware	technologies salesforce	Microsoft Hewlett Packard Enterprise Dropbox Western Digital redhat. TERADATA	Google amazon.com focebook ebay Aol. sears	QUALCOMMINATERIALS.	PayPal Bank J.P.Morgan VISA	AT&T MOTOROLA IIIIIIII CISCO. EBlackBerry AVAYA			Johnson Johnson MERCK AMGEN Edwards Scientific Abbott Cleveland Clinic	Skimberly-Clark Gartner. CocaCola P&G flex Priceline Group nielsen	Kodak \$FLIR
Europe		NetApp Property	Cadence Xerox MICRO PROCUS PASSAULT SYSTEMES KASPERSKY2	YAHOO!	TEXAS INSTRUMENTS Microsemi ARM	BARCLAYS FINASTRA Klarna. NEX	Deutsche Telekom	centrica	DAIMLER BOSCH COCI	NOVARTIS PHILIPS Medtronic Roche	Carlson Wagonlit Travel	gemalto* Description LG Panasonic SONY TOSHIBA muRata
Asia	Infosys Lenovo		TATA Tech Mahindra	Alibaba Group ORakuten	SAMSUNG BROADCOM	SOMPO	Singtel NUAWEI	CHEMCH! YASKAN		Mitsubishi Tanabe Pharma FOSUNPHARMA 類量医药 SUN PHARMA	参 Mitsui 北崎家が集団/有限公司 securi roos carour co. cos.	NEC ⊕TDK. HITACHI



The Israeli Energy Innovation Hub

The Israeli Smart Energy Association



A national, private, non-for-profit, industry association, bringing local and global players who share the interest in implementing and developing smart energy solutions to achieve economy growth through sustainable future.

■Founded: 2011

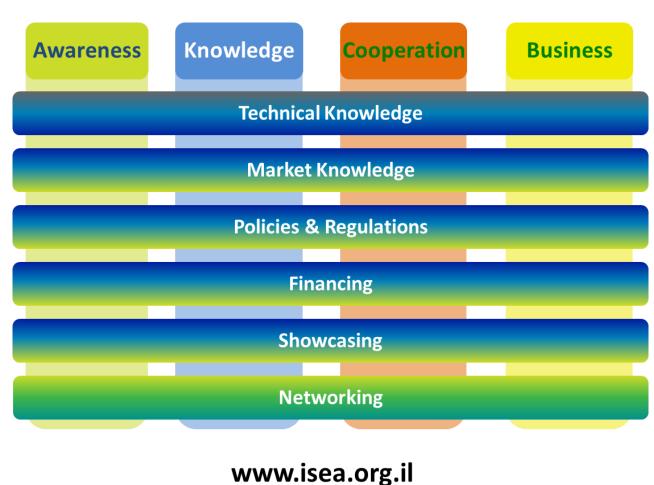
Founders: Amos Lasker, Chairman

Elad Shaviv, CEO

Community:

~1,500 people, 150 companies

- •Activity Partners:
 - ■Israeli Electric Corp
 - Ministry of Energy
 - •Ministry of Economy
 - Ministry of Science
 - ■Ben Gurion University
 - ■IDC Herzeliya
 - ■SNI (Technion)



Sample ISEA Events & Researches

I/SE/A

- ■ISEA's Israeli Smart Energy Conference (5 conferences)
- ■ISEA's Israeli Academic Smart Energy Conference
- ■ISEA's Power Utilities Business innovation Forum
- ■Tens of seminars & webinars
- Researches:
 - Roadmap for Smart Grid Deployment in Israel
 - Microgrid deployment implications for Israel
 - Clean Energy Innovation in Israel

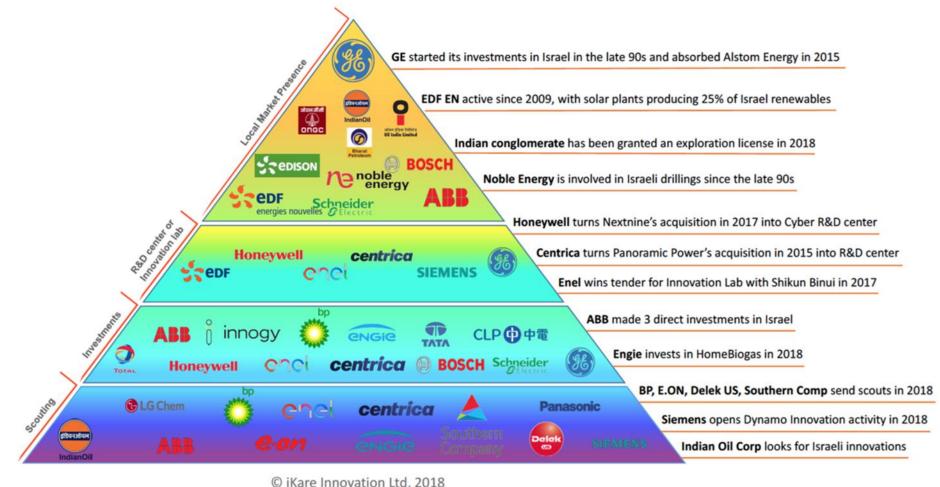


Energy Global Players Entering Israel



An Average of 20 New (foreign) R&D Centres are Established Every Year

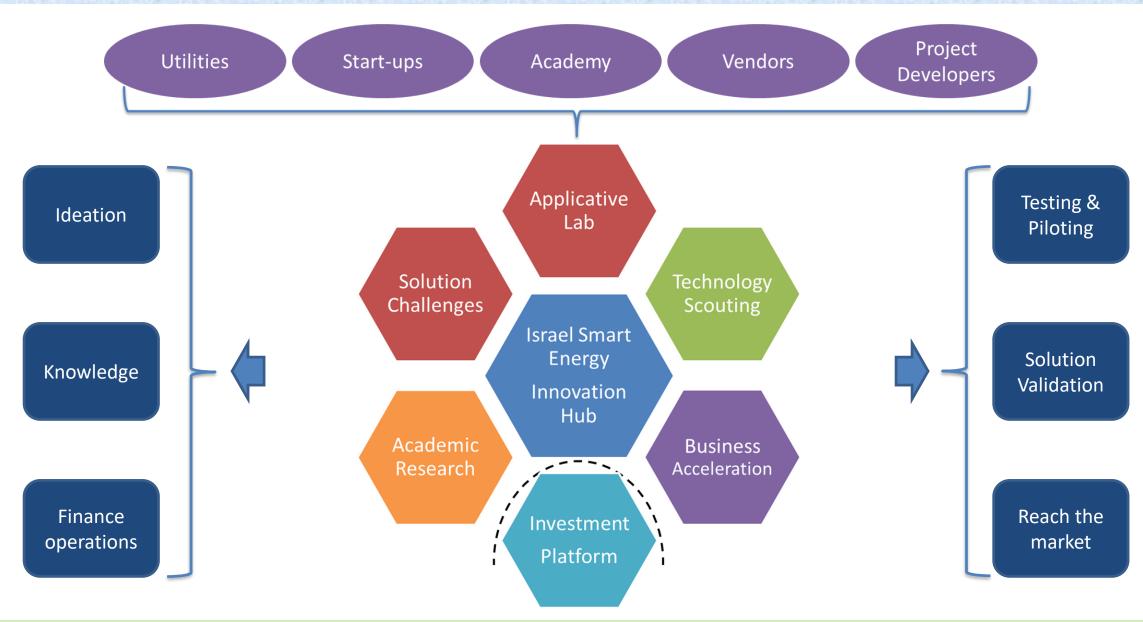
Source: Israel Innovation Authority



© iKare Innovation Ltd, 2018

ISE: Innovative Smart Energy Hub





Smart Energy Innovation Hub



The Israel Energy Innovation hub goal is to match and support leading global utilities and vendors, with Israeli entrepreneurs and researchers to jointly capture new opportunities in the disrupted energy market.

Global Members

- Power utilities
- Competitive energy service providers

- Infrastructure engineering firms
- General energy conglomerates

<u>Technologies</u>

- End Users applications
- Cyber security
- Smart cities
- · Blockchain & Energy trade
- Management & Analytics
- Internet of Things
- · Buildings & energy

- Distributed Energy solutions
- Energy Storage
- Grid modernization
- Microgrids
- Electric Vehicles
- Communications
- Core Applications

Launched Operations July 2019



Israel cooperation:

- Universities: Technion, Bar-Ilan University
- Ministries: Economy, Energy, Science
- The Innovation Authority

NYPA: New York Power Authority

- Technology Scouting
- \$2.5M Startup challenge competition

NREL: The US DoE Renewable Energy Laboratory

- Cooperate on expanding NREL's International Technology Incubation initiative to Israel
- Setting-up a mentorship program where NREL researches provides mentorship to Israeli entrepreneurs
- Provide initial review or analysis for assessment of new ventures
- Publish sponsored and un-sponsored call for research for the Hub's community
- Provide energy data dumps and other statistical information that can be used at the Hub's lab
- Host a sponsored yearly Hub event at NREL

The Israeli Smart Energy Association



The Changing Global Energy Market



Technologies

Distributed Energy Resources



Energy cloud

Markets

Flattening World







facebook.

Marketing

Internet of Things

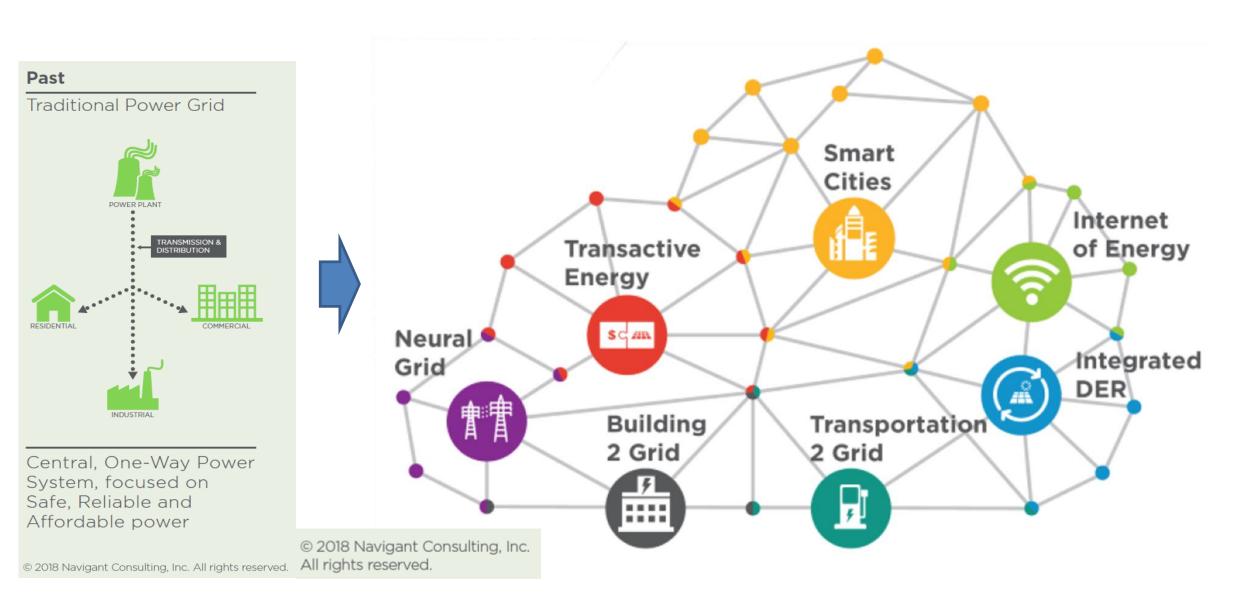




Smart Cities

The Converged Energy Cloud Market



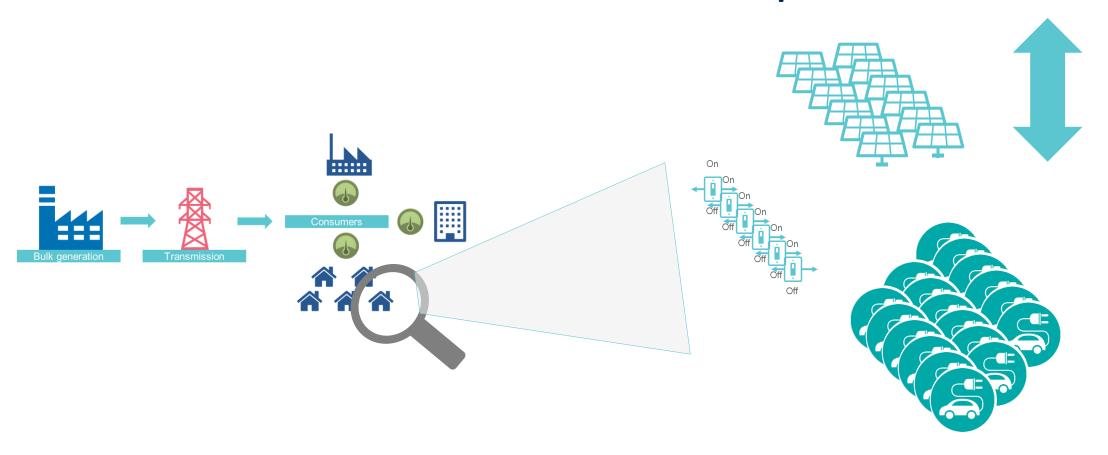


The Israeli Smart Energy Association



Rooftop solar Electrical Vehicles

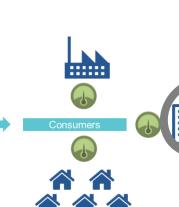
Virtual Power Plants Transportations Stakeholders



New playground at the Commercial Market







Real Estate Developers, Facility Operations



- Traditional distributed generation
- Combined heat and power
- Solar
- Wind
- District energy
- · Microgrids
- Other renewables

Energy Efficiency Load Shifting

- Performance contracts
- Energy retrofits
- Energy engineering
- Commissioning
- Retrocommitioning, continuous commissioning
- Efficient technologies
- Utility/Government programs
- Load shifting

Energy Procurement Energy Management

- Bill analysis, payment
- Energy analysis and management
- Energy procurement
- Energy consulting
- Risk management
- Energy information/software
- Commodity sales

Intelligent Buildings and Demand Response

- Demand response
- Building systems integration
- Smart controls/meters
- Utility/government programs
- Energy information/software
- · Energy analysis and management
- Internet of Things

Facility Operations and Maintenance Measurement and Verification

- Outsourced O&M
- Third-party M&V
- Continuous commissioning
- Energy information/software
- Facilities services
- Utility services
- Third-party ownership

Power Quality and Reliability Energy Storage

- Power quality and reliability
- Microgrids
- Backup power infrastructure
- Energy information/software
- Energy storage technologies

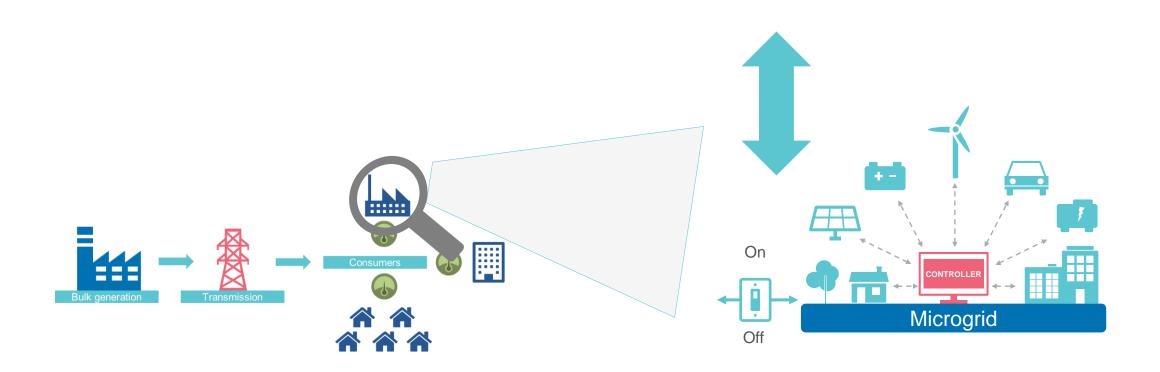
Source: FMI Coprporation, The 2016 U.S. Markets Construction Overview

New playground at the Municipal/Campus Market



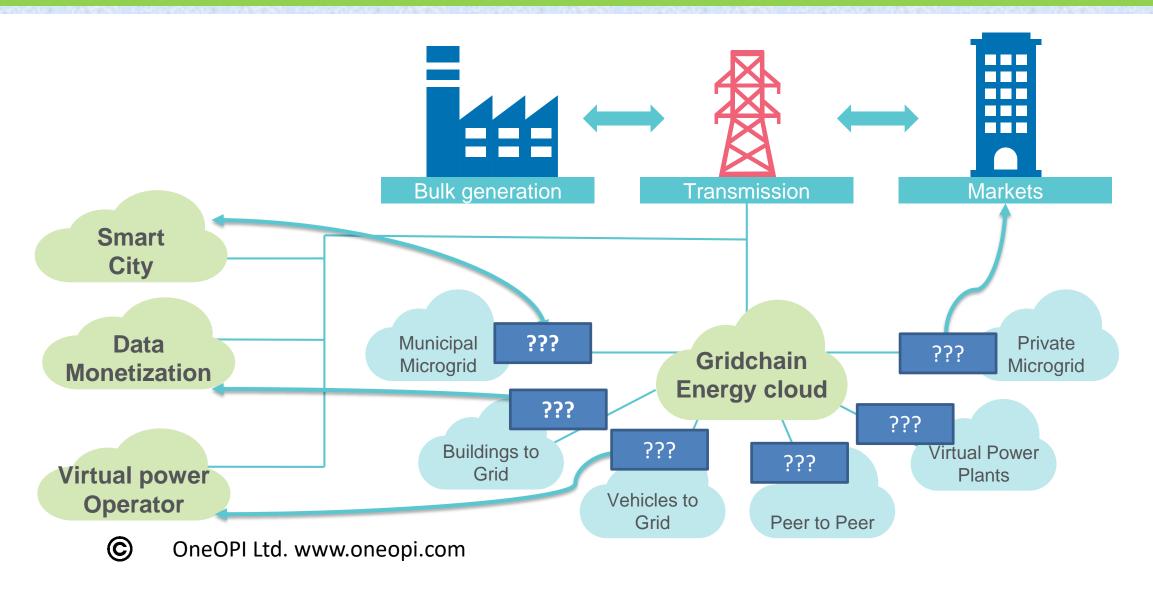
Grid tied Microgrids Smart campuses & cities

Municipalities, System integrators, Microgrid operators



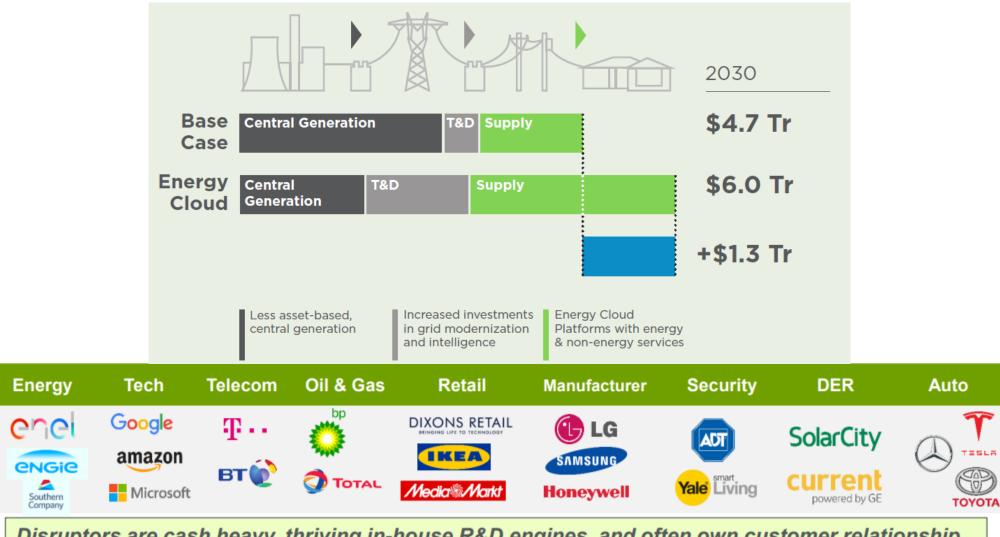
NEW PLAYGROUND – Are You Ready?





The Opportunity and Players



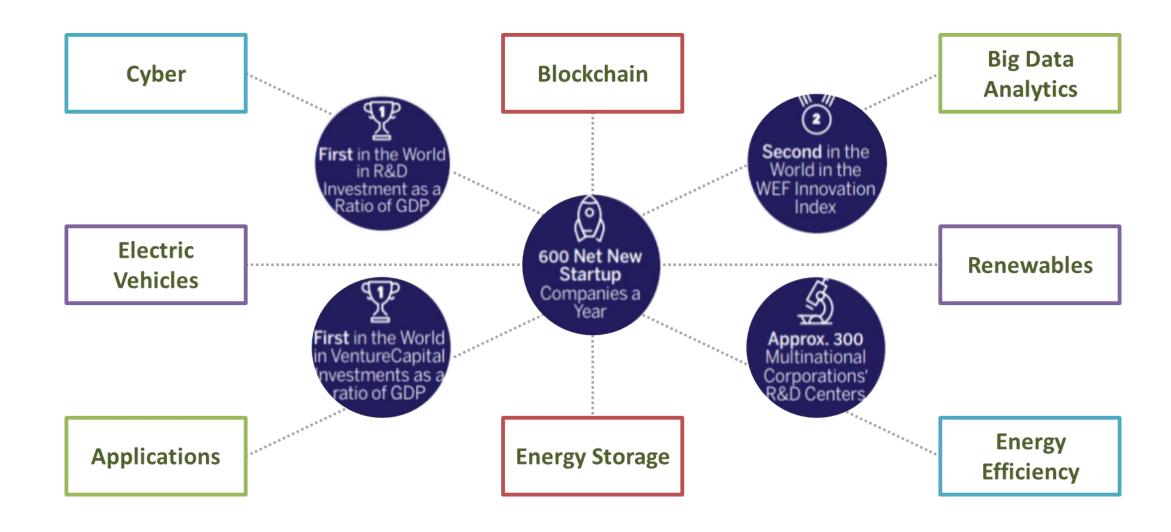


Source: Navigant

Disruptors are cash heavy, thriving in-house R&D engines, and often own customer relationship

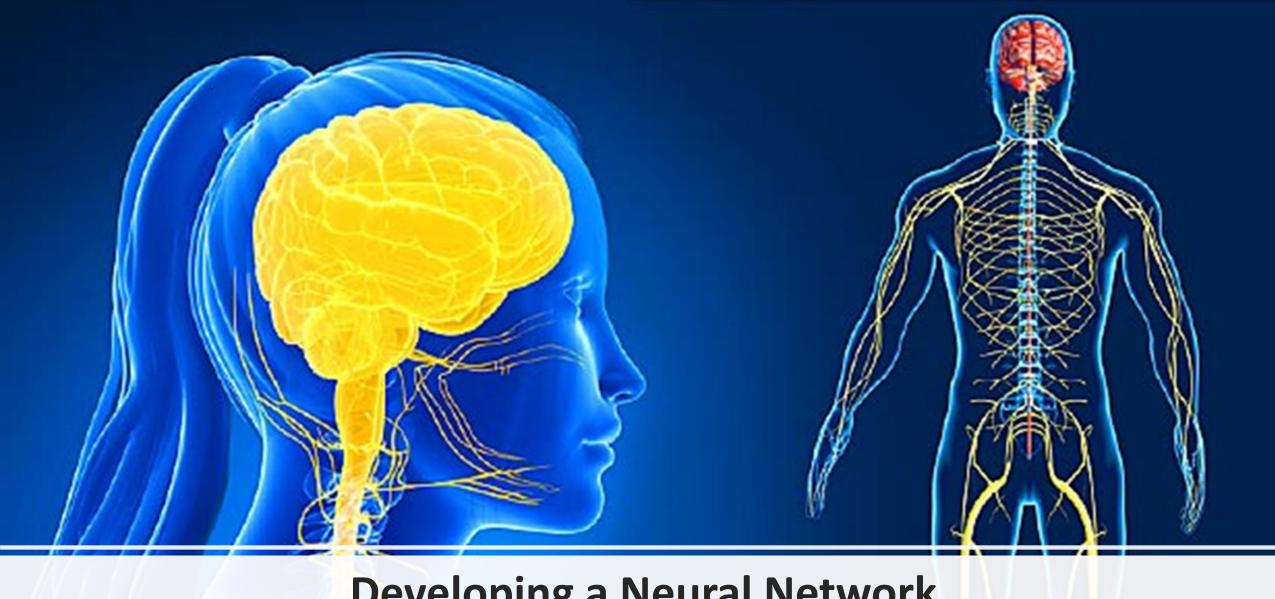
Israel's Innovation Based Industry







Examples Of Israeli Innovation in Energy

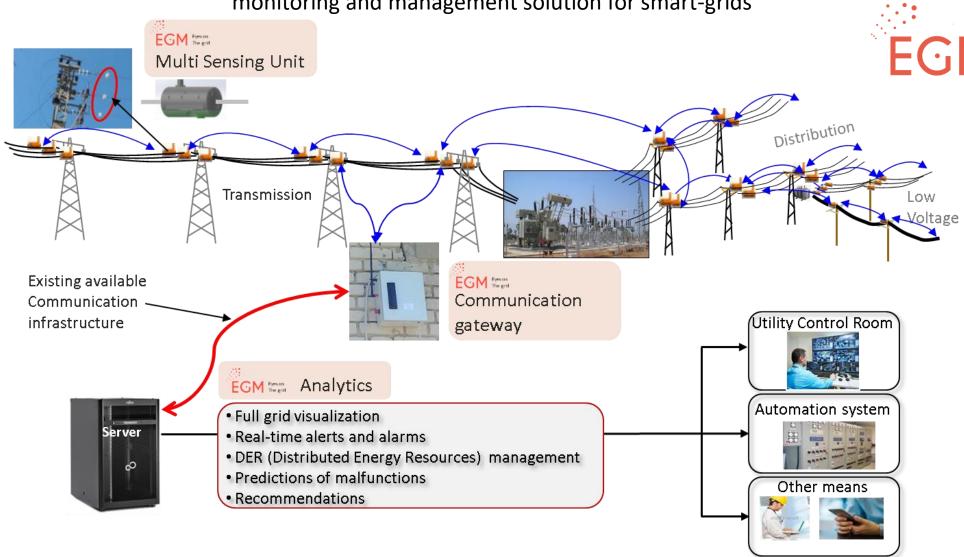


Developing a Neural Network

EGM: Converts static grids into a digitized & dynamic network



EGM solutions leverage cutting-edge IOT, Big-Data & Artificial Intelligence technologies to provide advanced electrical grid monitoring and management solution for smart-grids



FSIGHT: Platform For Distributed Grid Management







Technology – Machine learning forecasting, heuristic based optimization and peer to peer trading.

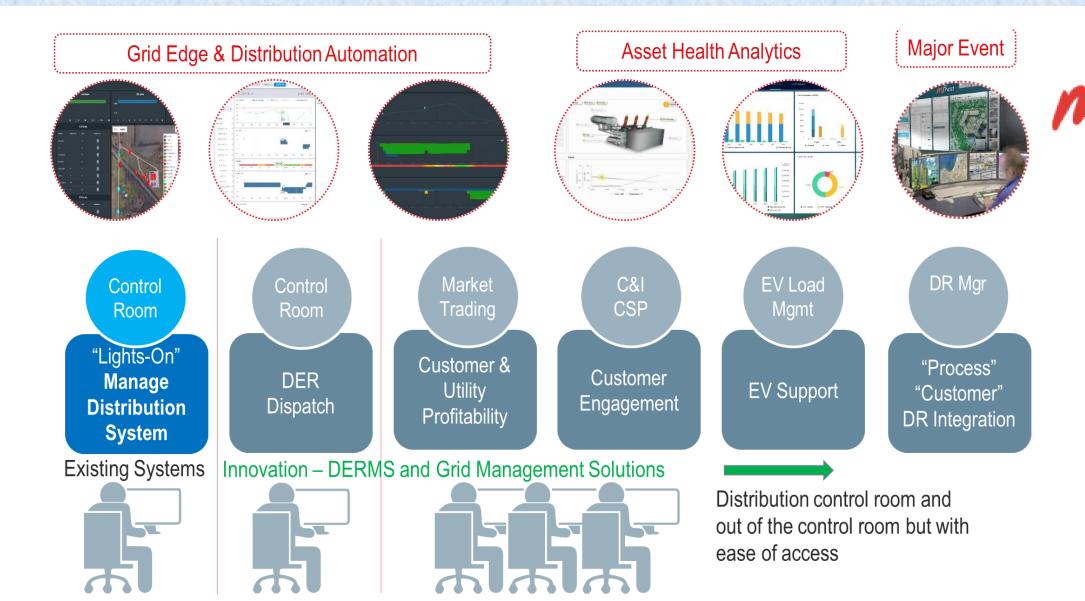
Distributed market engine - Creates autonomous local energy markets by predicting local supply & demand.

Fog architecture - Enables self organization of DER assets & communities to create resilient, scalable and efficient micro grids.

Field proven - With over 200 prosumers in dozens of commercial projects as well as the advanced distributed grid **Saves money** - Reduces energy costs, generates new revenue streams and increases renewable energy utilization.

Mprest: Defence Technology Converted to Support Energy Applications





SolarEdge Technologies – Starting Point



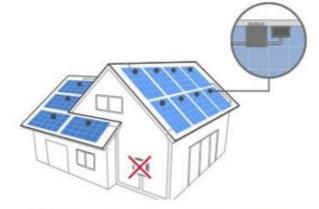
Provider of power optimizer, solar inverter and monitoring products for photovoltaic arrays.

Traditional String Inverters



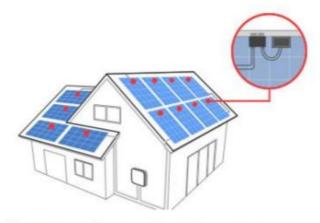
- One central inverter
- No module-level optimization
- No module-level intelligence
- × Energy loss
- × Limited roof utilization
- × No module-level monitoring
- × Safety hazards

Microinverters



- One inverter per module
- Module-level optimization
- Limited scalability
- × Cost and scalability
- × Questionable reliability
- Monitoring requires additional hardware

DC Optimized Inverter System

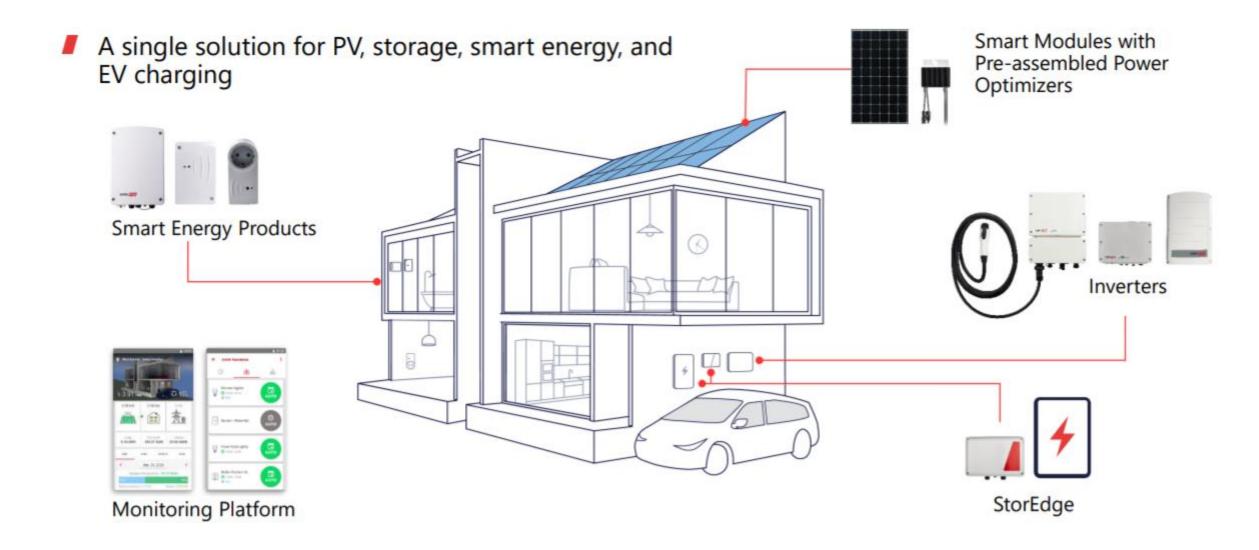


- Simplified central inverter
- Module-level optimization
- Improved scalability



SolarEdge Technologies - Expansion





SolarEdge Technologies – Global Presence



13.1GW of our systems shipped worldwide



40.8M power optimizers shipped





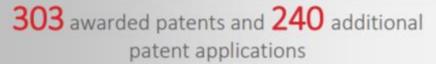




Presence in 28 countries







SolarEdge Technologies – Global Leadership



World PV Inverter Supplier Quarterly Rankings (\$ Revenues)

RANK	COMPANY				
1	SolarEdge				
2	SMA				
3	Huawei Sungrow				
4					
5	Power Electronics				
6	Fronius				
7	Delta Enphase Energy				
8					
9	ABB				
10	Omron				
88	N 195 W				

Source: IHS PV Inverter Market tracker Q2, 2019

World Single Phase PV Inverter Suppl Share Estimates (MW Shipments)

RANK	COMPANY				
1	SolarEdge				
2	SMA				
3	Growatt Omron Enphase Energy Ginlong				
4					
5					
6					
7	Goodwe				
8	Fronius				
9	Panasonic				
10	Delta				

Source: IHS PV Inverter Market tracker Q2, 2019

