The Digital Layer and the Future of Energy

Digitalisation & Solar in Mexico

Septemeber / 2019

Invenergy

We are innovators building a sustainable world.

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Invenergy is the world's leading privately held sustainable solutions provider. We take sustainable power and water infrastructure projects from drawing board to reality, serving utilities, leading global brands and public sector partners. This is the foundation of a diversified sustainable solutions platform that also includes:

Invenergy Services

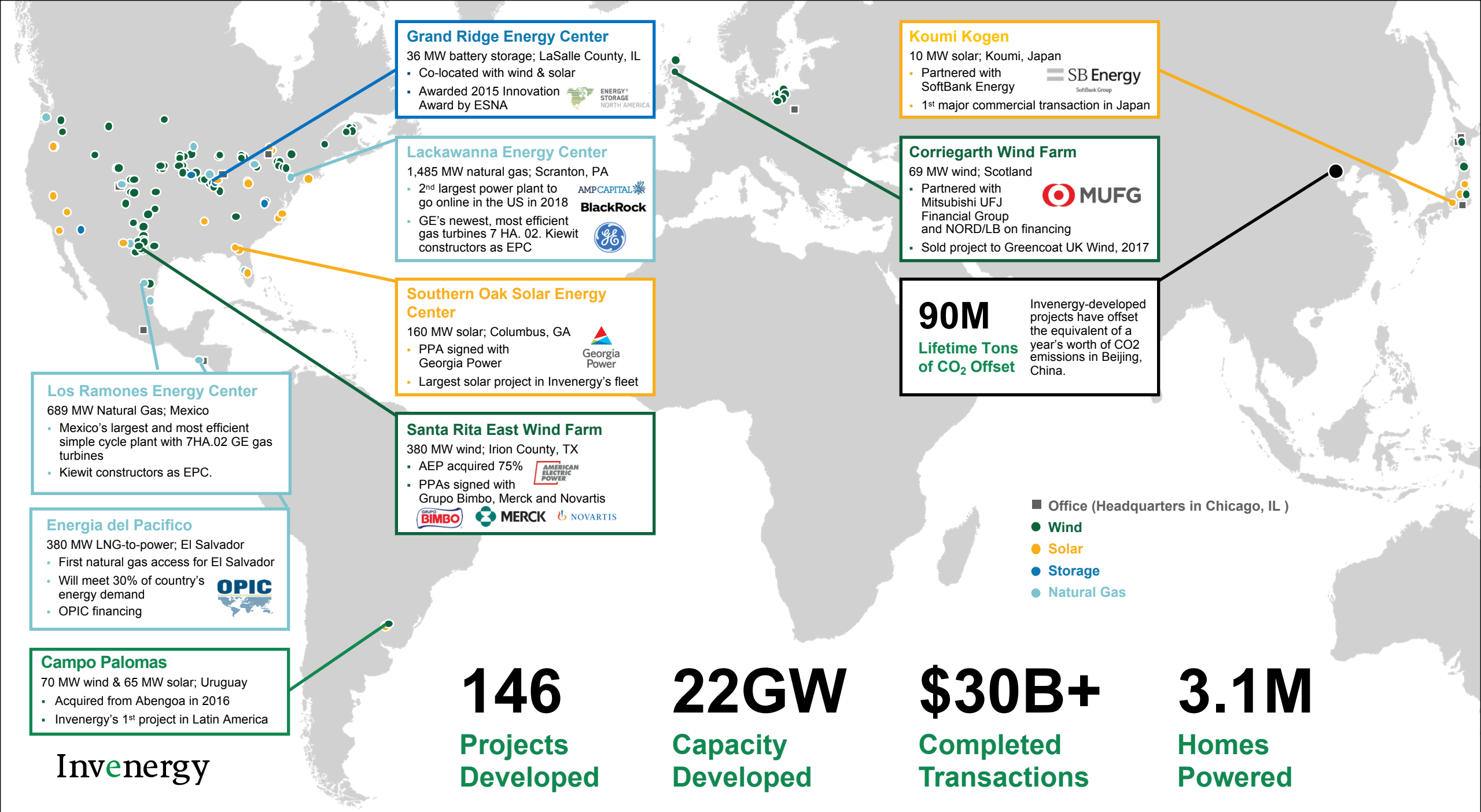
Invenergy Services performs award-winning asset management and operations with an owner's mindset, for Invenergy-developed projects and for other asset owners.

Invenergy Integrated Solutions

Invenergy Integrated Solutions provides tailored solutions for large energy users designed around their highest-value needs and aligned with their interests.

ENERGIZE VENTURES

Invenergy is the founding partner of Energize Ventures, which invests in digital solutions that drive affordability, reliability and security for energy and industry.



Grand Ridge Energy Center

36 MW battery storage; LaSalle County, IL

- Co-located with wind & solar
- Awarded 2015 Innovation Award by ESNA

ENERGY STORAGE NORTH AMERICA

Lackawanna Energy Center

1,485 MW natural gas; Scranton, PA

- 2nd largest power plant to go online in the US in 2018
- GE's newest, most efficient gas turbines 7 HA. 02. Kiewit constructors as EPC

AMP CAPITAL · BlackRock · GE

Southern Oak Solar Energy Center

160 MW solar; Columbus, GA

- PPA signed with Georgia Power
- Largest solar project in Invenergy's fleet

Georgia Power

Santa Rita East Wind Farm

380 MW wind; Irion County, TX

- AEP acquired 75%
- PPAs signed with Grupo Bimbo, Merck and Novartis

AMERICAN ELECTRIC POWER · GRUPO BIMBO · MERCK · NOVARTIS

Los Ramones Energy Center

689 MW Natural Gas; Mexico

- Mexico's largest and most efficient simple cycle plant with 7HA.02 GE gas turbines
- Kiewit constructors as EPC.

Energia del Pacifico

380 MW LNG-to-power; El Salvador

- First natural gas access for El Salvador
- Will meet 30% of country's energy demand
- OPIC financing

OPIC

Campo Palomas

70 MW wind & 65 MW solar; Uruguay

- Acquired from Abengoa in 2016
- Invenergy's 1st project in Latin America

Koumi Kogen

10 MW solar; Koumi, Japan

- Partnered with SoftBank Energy
- 1st major commercial transaction in Japan

SB Energy (SoftBank Group)

Corriegarth Wind Farm

69 MW wind; Scotland

- Partnered with Mitsubishi UFJ Financial Group and NORD/LB on financing
- Sold project to Greencoat UK Wind, 2017

MUFG

90M

Lifetime Tons of CO_2 Offset

Invenergy-developed projects have offset the equivalent of a year's worth of CO2 emissions in Beijing, China.

- Office (Headquarters in Chicago, IL)
- Wind
- Solar
- Storage
- Natural Gas

146
Projects Developed

22GW
Capacity Developed

$30B+
Completed Transactions

3.1M
Homes Powered

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Invenergy's Partnership with Energize Ventures

ENERGIZE VENTURES

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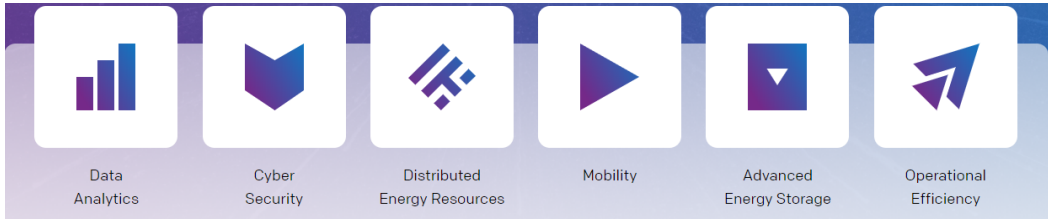
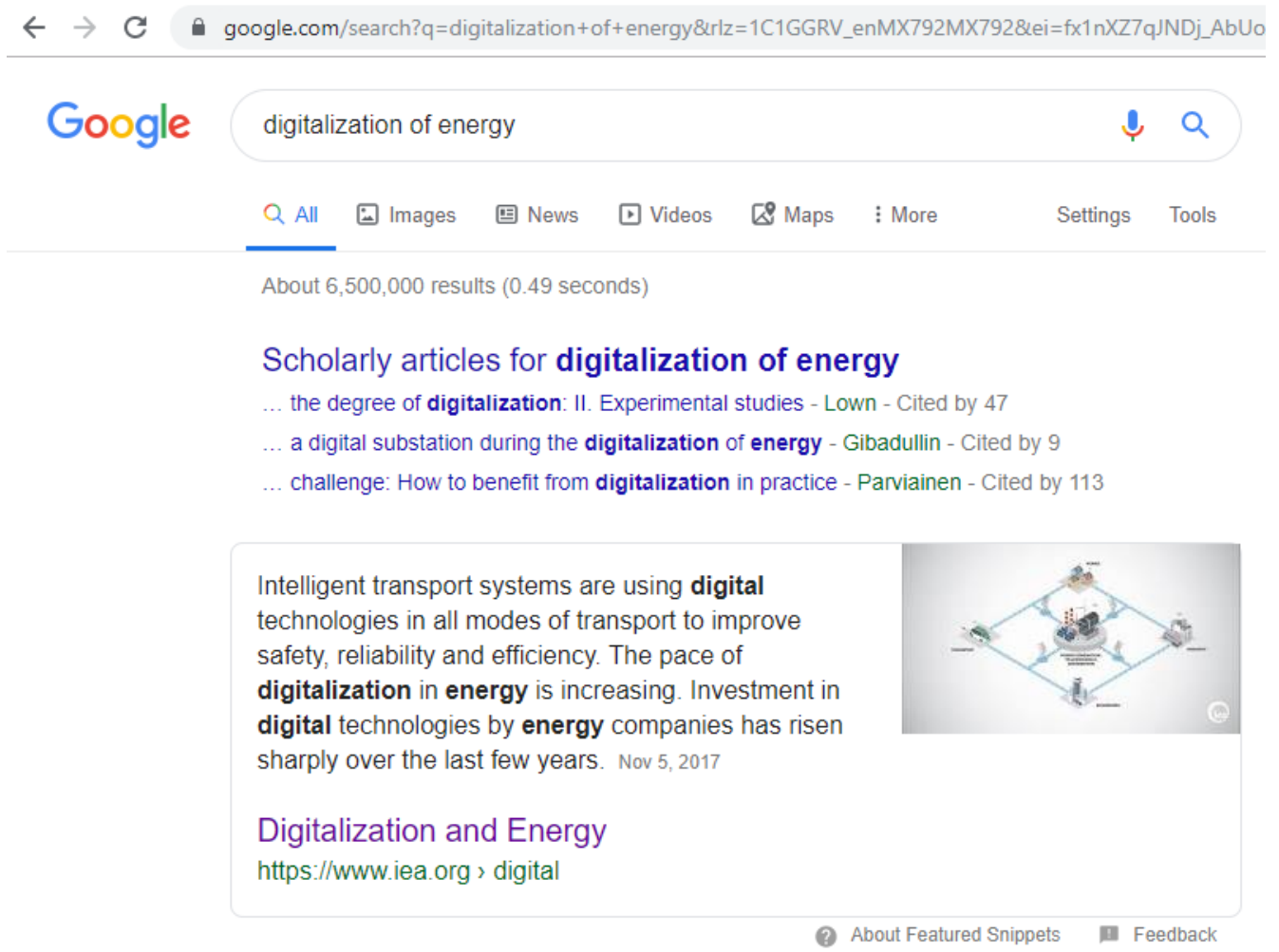


Energize Ventures has $150 million capital commitments from Invenergy, General Electric, Schneider Electric, WEC Energy Group. The Fund has invested in 9 companies that improve efficiency and aid in cyber security.

As the anchor partner, Invenergy remains closely tied to the Fund. Michael Polsky, Founder and CEO of Invenergy, and Jim Murphy, President and COO of Invenergy, are members of the Fund's investment committee and help steer the direction of Energize Ventures.

What does ‘digitalization of energy’ even mean?

Is it the ‘internet of energy’, ‘energy blockchain’ or something else entirely?



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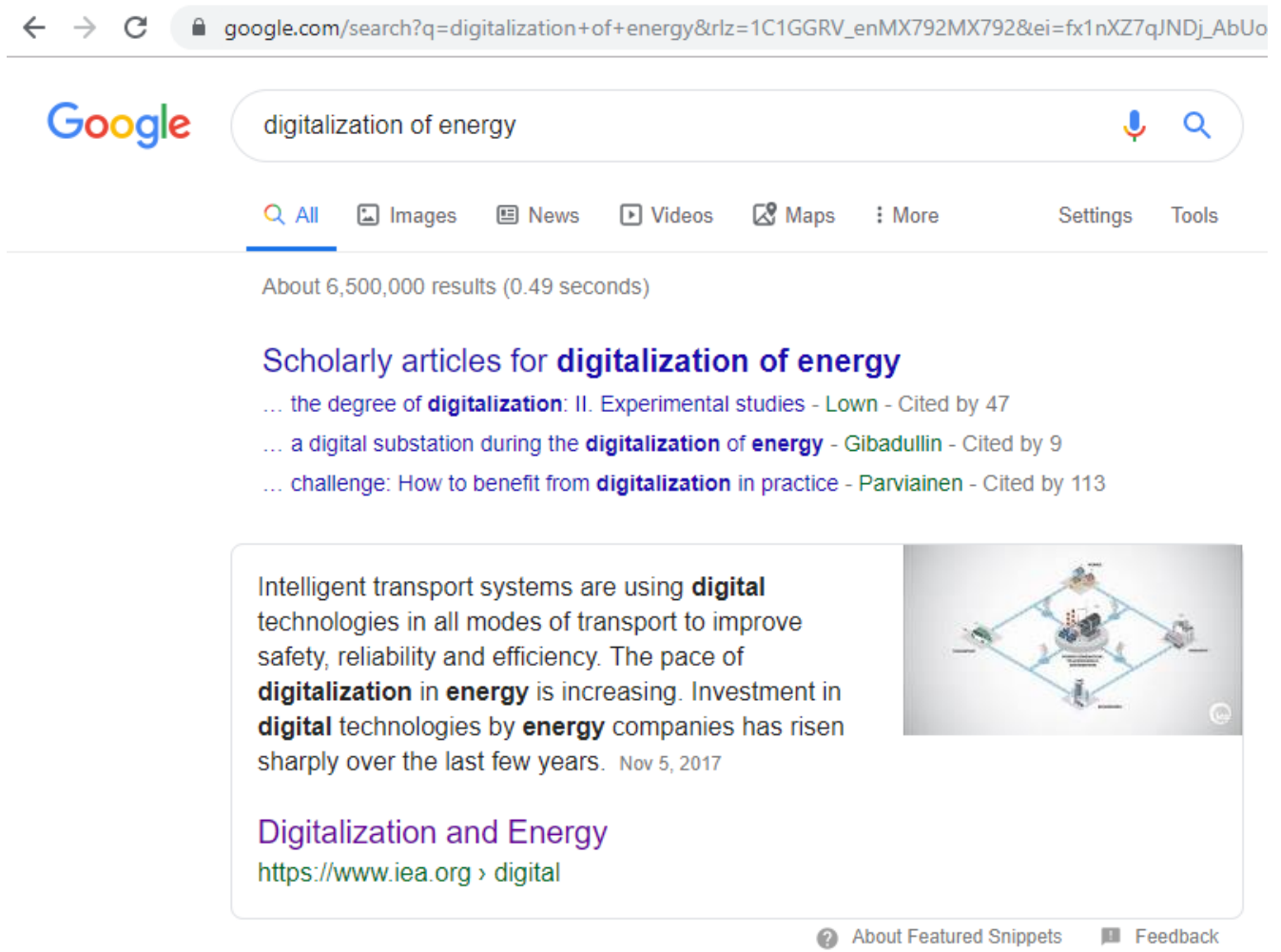

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Digitalizing Energy since the 1980s…

Digital technologies have enabled the operation of wholesale power markets, mainly via optimization software and merit dispatch

What's up with digitalization?

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Phases of Digitalization

Phase 1 – Market Operations	Phase 2 – Asset Management & Optimization	Phase 3 – Market Disruption	Phase 4 – End users
• Optimization and Dispatch • Market Information • Power market transactions	• Operational Efficiency • Millions of data points for monitoring • Predicitve analytics and O&M	• New types of assets • New products dependent on fast signales (fast-frequency regulation) • More real-time visibility	• Merchant demand-response • Dynamic price signals

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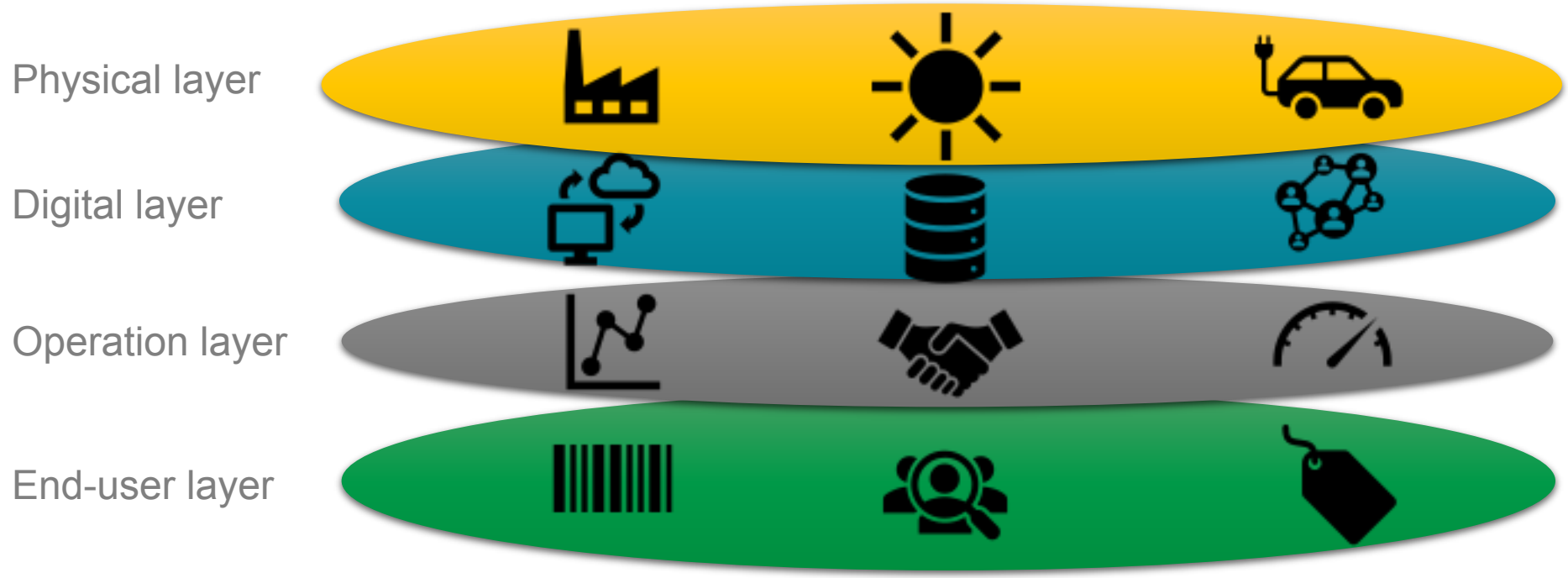
Between the Physical and Operational Layers



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If data is valuable, then who owns it matters…

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From big data to individualization of information?

- Who owns the data for an individual connected meter?
- What can we learn from a specific industrial or residential customer?
- Should a company be able to monetize it?

The Promise of Digitalization and where we are now

The promised advantages of digitilazation are many:

- Connected
- Intelligent
- Efficient
- Reliable
- Sustainable

But today we already face information access restrictions.

As an industry, and evolving market, we need more market and system data (Sistema de Información de Mercado, Modelo de Red), better analytical tools and more efficient market models (incorporate VER forecasting into dispatch)

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Policy and Regulatory Questions

- Cybersecurity?
- Data ownership?
- Privacy?
- R&D/Industrial/Innovation policies?

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We're building a sustainable world.

Join us.