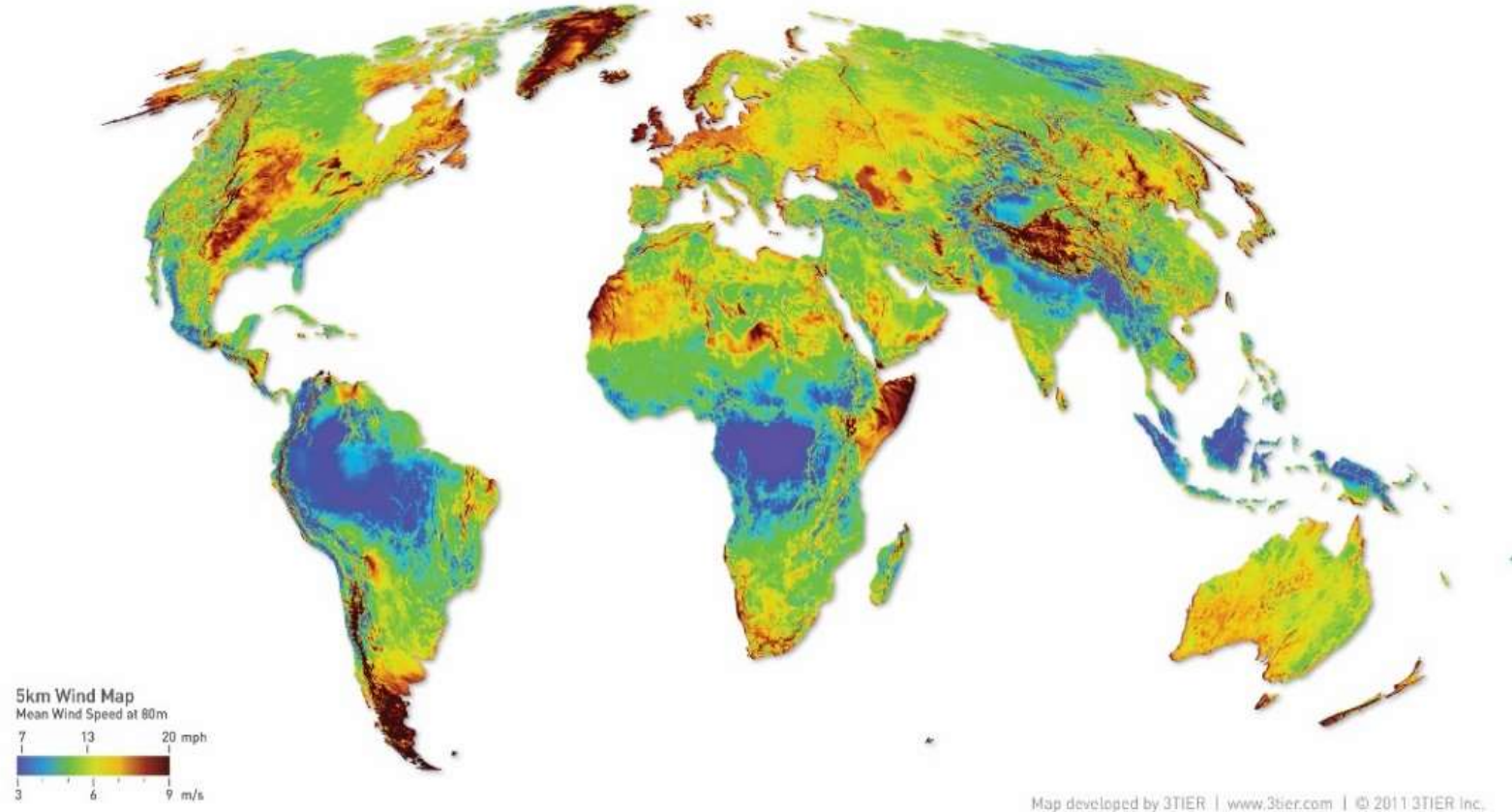


SMART WIND INTEGRATED MINI-GRID



Smart Grid Market 50.65 Billion USD by 2022, CAGR of 19.4%
2017 Source: www.marketsandmarkets.com

Industrial IoT Market worth 195.47 Billion USD by 2022
2017 Source: www.marketsandmarkets.com

By 2020, the global telecom industry is estimated to deploy some 390'000 off-grid and some 790'000 bad-grid towers, a 22% resp. 13% increase from 2014 Source: Green Power for Mobile www.gsma.com Dec. 2014

Diesel Generator Market worth 16.96 Billion USD by 2020

2017 Source: www.marketsandmarkets.com

Renewable Energies in the Digital Society

- ▶ **2013: Foundation of SWIRL SA & SWIRL SeCS**, a Luxembourg Ltd Partnership
- ▶ 2014: First customer installation site on a Water Tower (L), successful IEC 61400-2 Engineering / Design Certification (C-DA) Certificate for ESTREYA L wind-turbine
- ▶ 2015: Development of cost competitive ESTREYA Lx, component & remote control system engineered to IEC 61400-2. Successful operation on DNV-GL certification site (North Germany)
- ▶ **2016:** Extensive global decentralized RE market study in EU, Africa, China and India. Industrial alliance with a ISO 9001 certified manufacturing/assembly site and engineering network in Belgium. Luxembourg winner of www.impact2.eu 2017
- ▶ **2017:** Successful Certification by DNV-GL of Power Curve according to IEC 61400-12-1 including machine learning. Successful Noise Evaluation according to IEC 61400-11:2012. Scale-up business development, first projects (Cabo Verde, rural & MNO CEMG) First LOI for 30 CEMG systems from CV Utility.
- ▶ **2018:** Build Licensing Business scaling up by addressing two significant B2B RE market needs:
- ▶ **IPP & RE infrastructure supplier for rural/industrial & MNO hybrid CEMG. Start: EU, MENA, West & South Africa.** First Project: create a hybrid CEMG assembly, sales & service subsidiary organisation in Cabo Verde for West African Business. Build Hybrid CEMG Services Network M2M & M2Web, secure industrial cloud and service alliances using patented Application Program Interface (API (Syneola/SWIRL) Prepare for Blockchain & crypto-currencies.

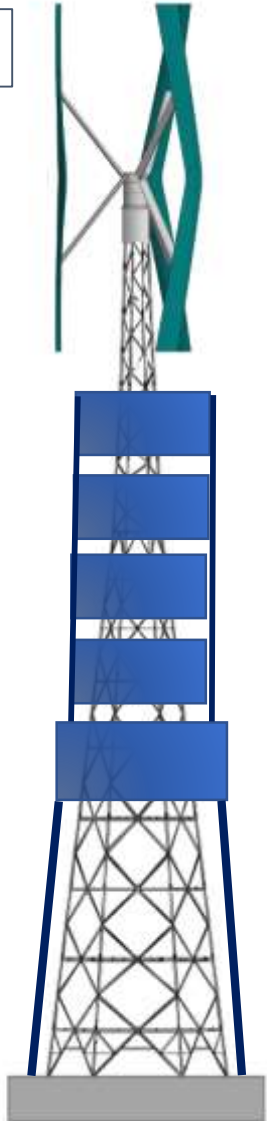
Clean, Efficient, Inclusive

SMART WIND INTEGRATED MINI-GRID



The USP: The SMART Lx3PV HYBRID CEMG

*



Wind: ESTREYA Lx3
2.5 kW nominal, 5 kWp
IEC 61400-12-1 Machine Learning
Certified Power Curve
IPR on PV coating of WT blades

*

PV: Vertical configuration:

- **SWIRL IP for Hybrid CEMG**
- **Cleaner in snowy & dusty conditions**
- **Higher kWh/year/site**
- **Less CAPEX/m² (wiring, m²)**
- **Less OPEX (cleaning)**
- **PV: 10 to 30 kWp**
- **Various suppliers (EU, Africa)**
- **Add further RE, biogas, hydro, thermal**

POWER TOWER
Highest kW/m²
Highest kWh/m²

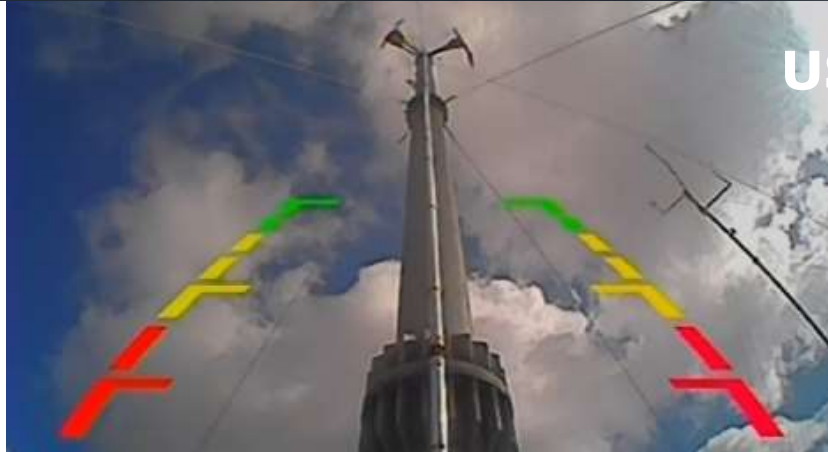


*



*** i-depot filed**

SMART WIND INTEGRATED MINI-GRID



US

Game changing IP

Site specific solar & wind system learning

IEC 61400-2 certified machine learning production curve and production data logging

“SMART HYBRID CEMG”

MULTILEVEL SEMIOTIC USER INTERFACE WITH COGNITIVE CAPABILITIES

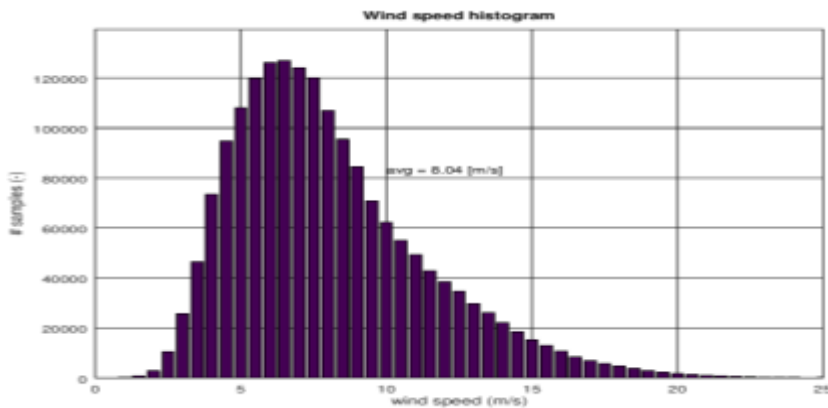
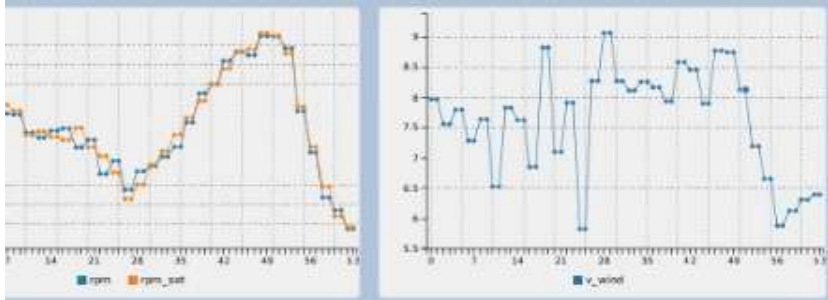
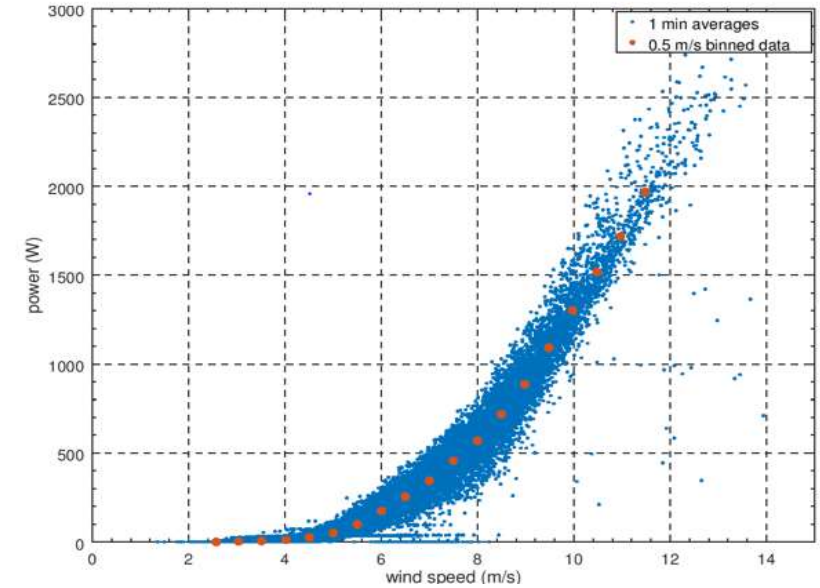
Operator



CEMG



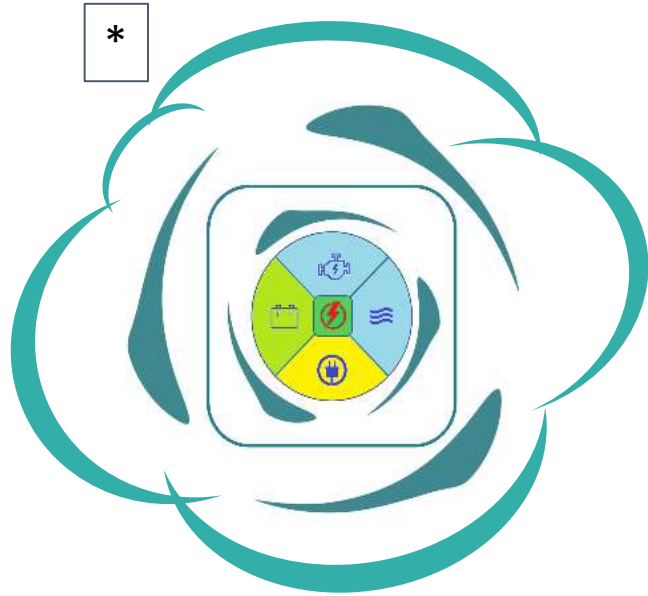
User



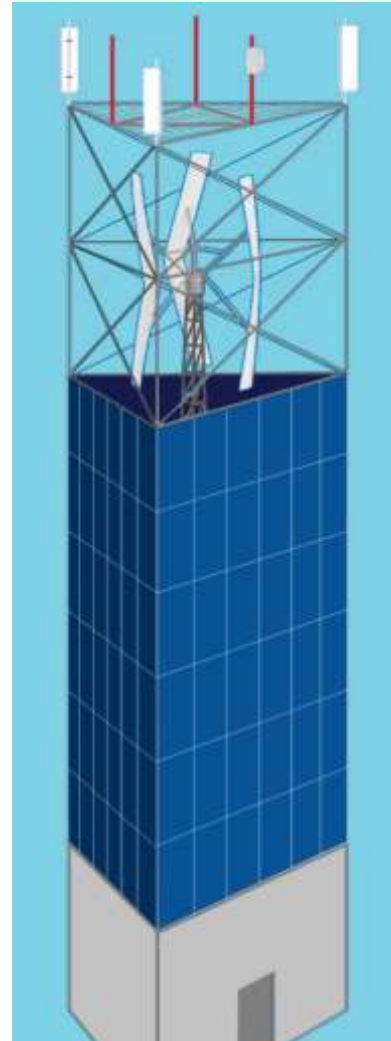
SMART WIND INTEGRATED MINI-GRID



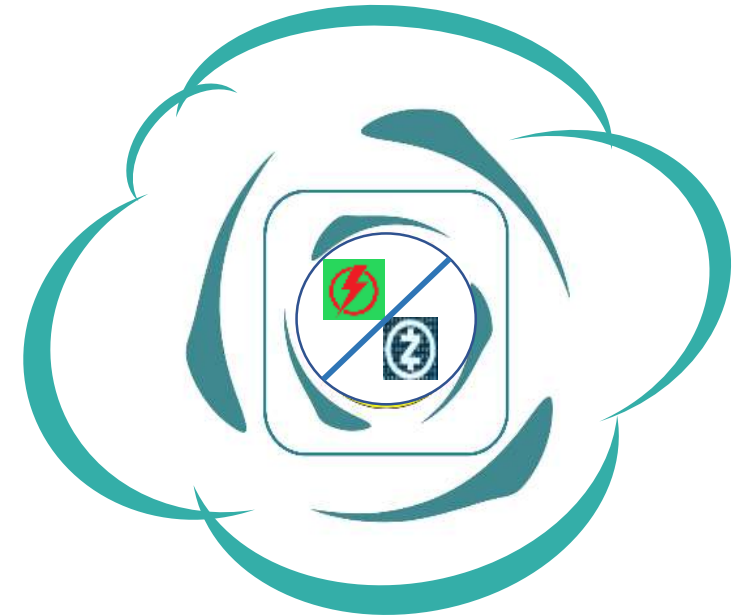
Network/Enterprise Asset Management



**Clean Energy Production
Selective Optimisation
Wind/PV Machine learning
M2M, M2Web
Optimal value creation**



SMART CEMG



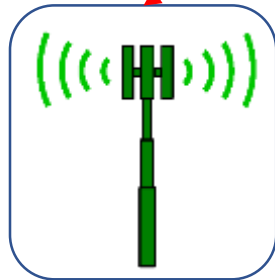
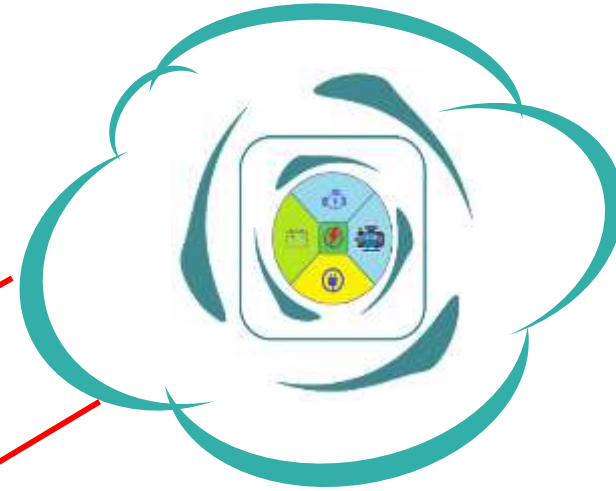
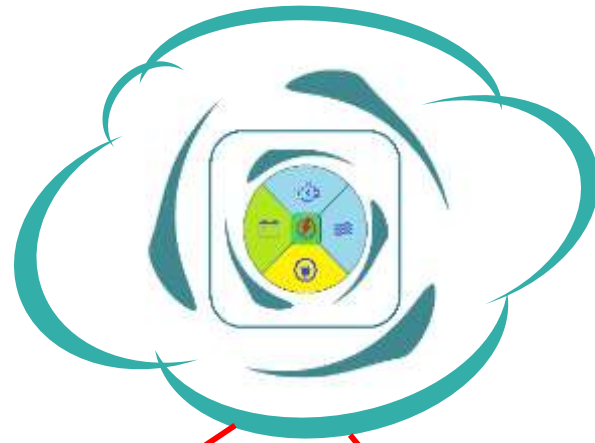
**Clean Energy Use
Selective Optimisation
Consumption/Storage
Machine learning, M2M, M2W
Optimal value exploitation**

* API & related SCADA/Cloud:
Patented structure

SMART WIND INTEGRATED MINI-GRID



Complementary B2B Business Cases
High Lifetime Customer Value
IPP & Energy Service



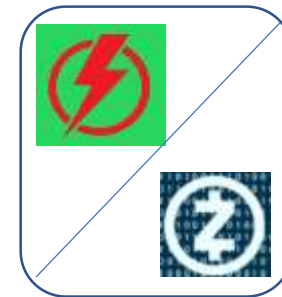
Communication



Electromobility

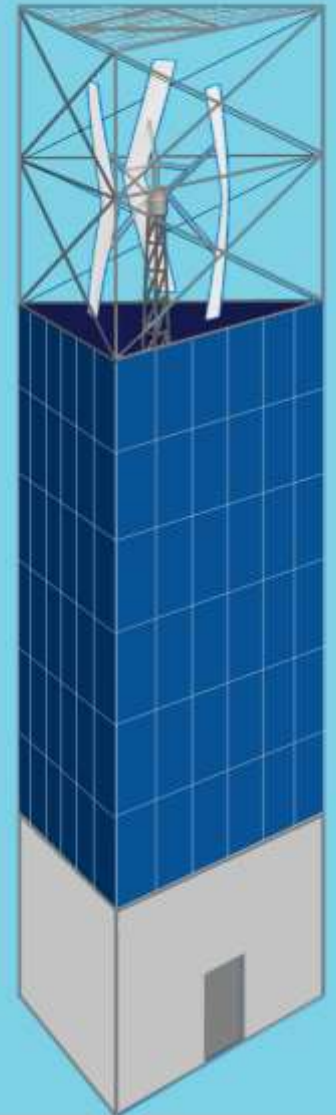
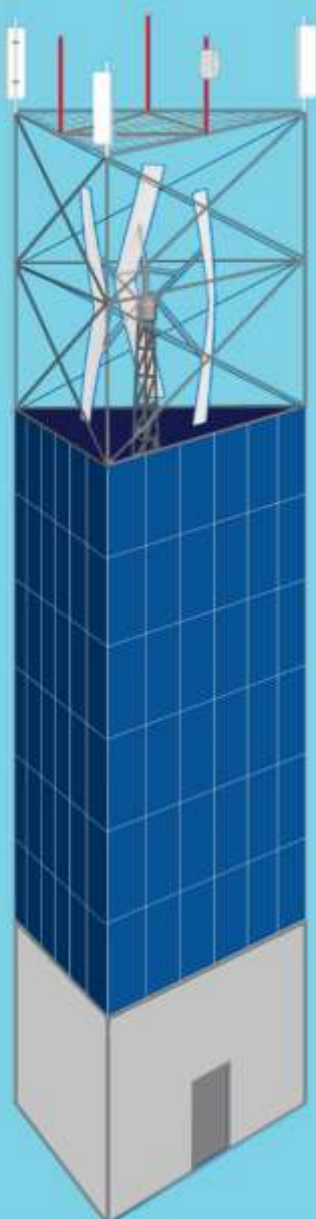


Rural CEMG Networks



**Network
Valorisation**

(Start: 2017/2018)



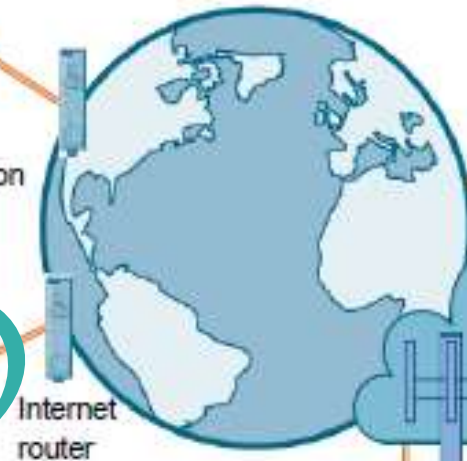
SMART WIND INTEGRATED MINI-GRID



**REGIONAL
DIAGNOSTIC
SERVICE CENTRES
(DeC infrastructure
RAAS, PAAS, IAAS)**



Internet connection



Internet
router

**SWIRL Cloud
(DeC)**

SIEMENS

Ethernet



Mobile
wireless
network

**LOCAL SMART CEMG
SELECTIVE DEPLOYMENT
GEOLOCALIZATION
MACHINE LEARNING
PREDICTIVE MAINTENANCE
IPP/PPA INTERFACE
RAAS, PAAS, IAAS**



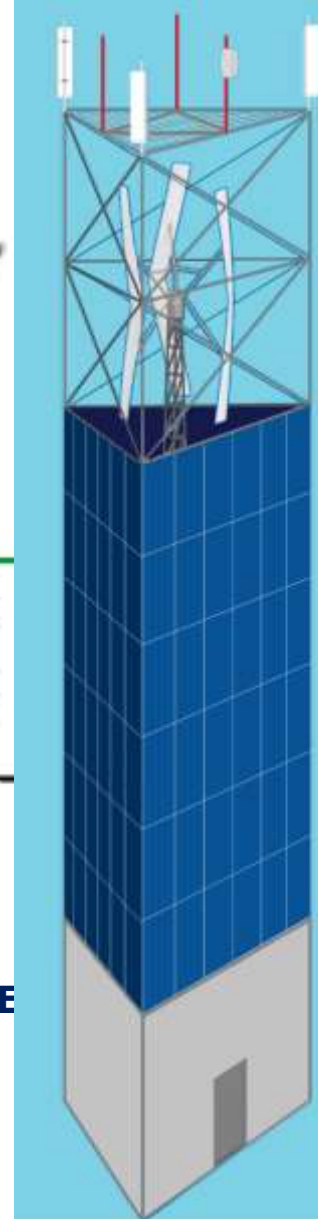
**DATA CENTER
LUXEMBOURG
RAAS, PAAS, IAAS**



SCALANCE S615



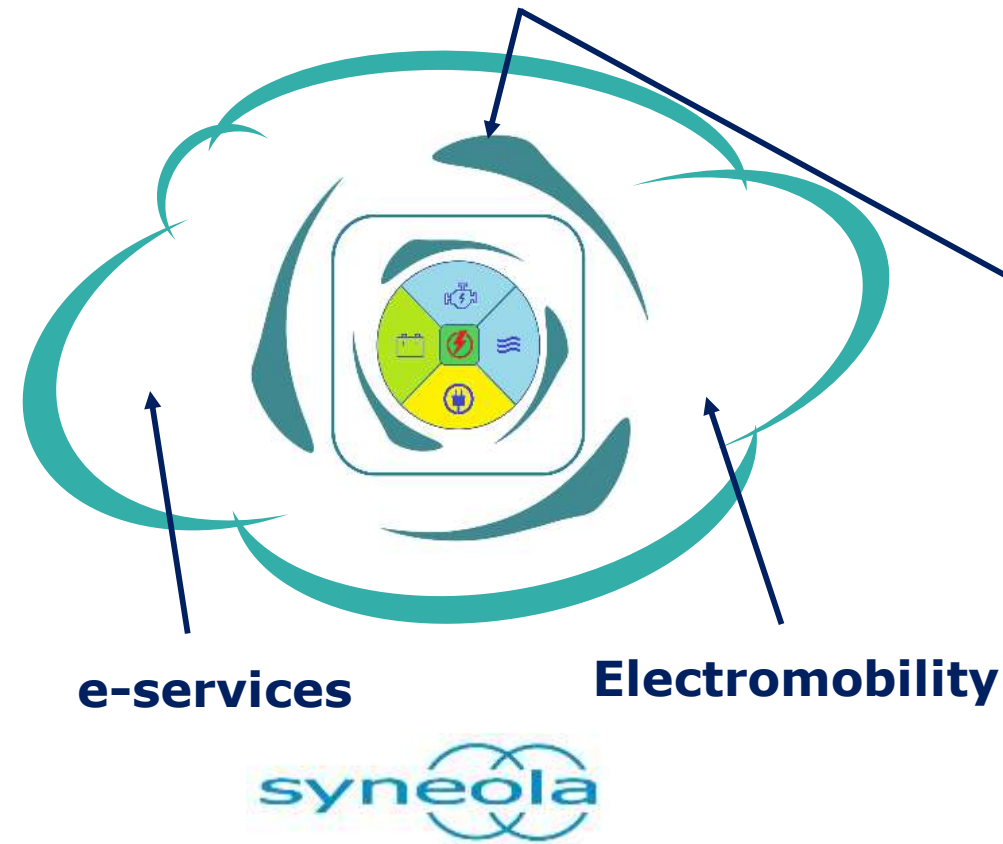
M800



SMART WIND INTEGRATED MINI-GRID



Secure Islanding Clean Energy Grid Networks also on islands



Potential Services on SWIRL Syneola Cloud



SMART WIND INTEGRATED MINI-GRID



SUPPLY CHAIN

ISO 9001 & ISO 9100 Production

Airfoils



SOBELCOMP SPRL

**Mechanic Precision Components
CAPAUL SA**



**Electrical, Control System & Cloud Network
Systems Integrator**



**API/Machine
learning**



**Inverter
Rectifier**

SIEMENS

**S7
SINEMA Cloud**

ISO 9001 & IEC 61400-2 Engineering



Structural Engineering

**GM, IPR, Purchasing,
Project management**

**Control & Remote
monitoring software**

**Application engineering
API Development**

www.swirl.energy

**Direct Sales / Licensing
Local subsidiary companies**

**Commissioning &
after sales service**

**Asset Management
IPP & 3rd party networks**



Jeff Theis



**Jose Sierra
Engineering & Service**

CanadianSolar **SOLITEK** & local suppliers

Smart Wind Integrated Renewables Luxembourg The SWIRL Board Team



SWIRL SA
Joseph Hess
GM
Business development



TACS SA
Karl Horsburgh
Finance
Business cases

**International
Complementary
Integrity
Commitment**

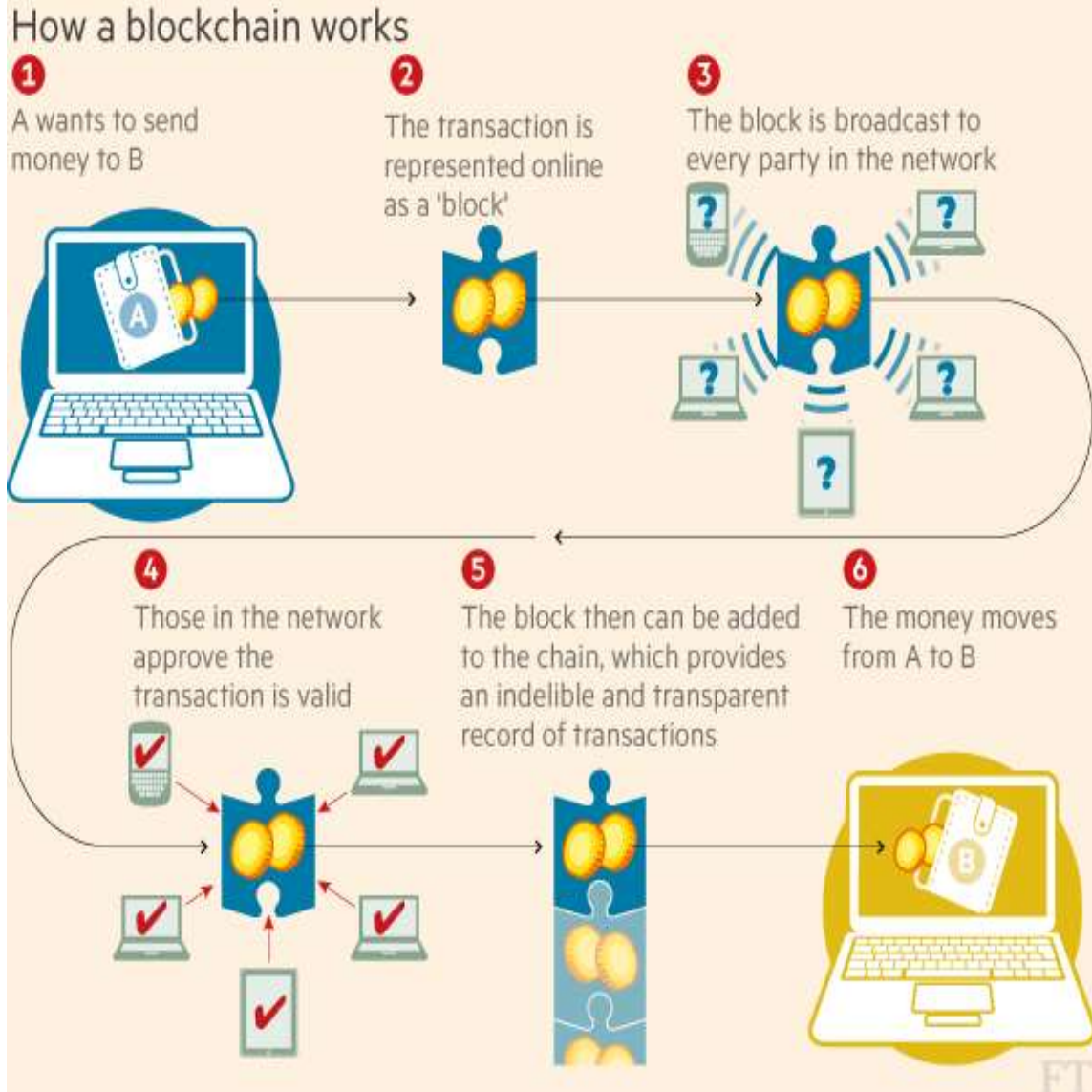


PGII SA
Pierre Girault
Business Development



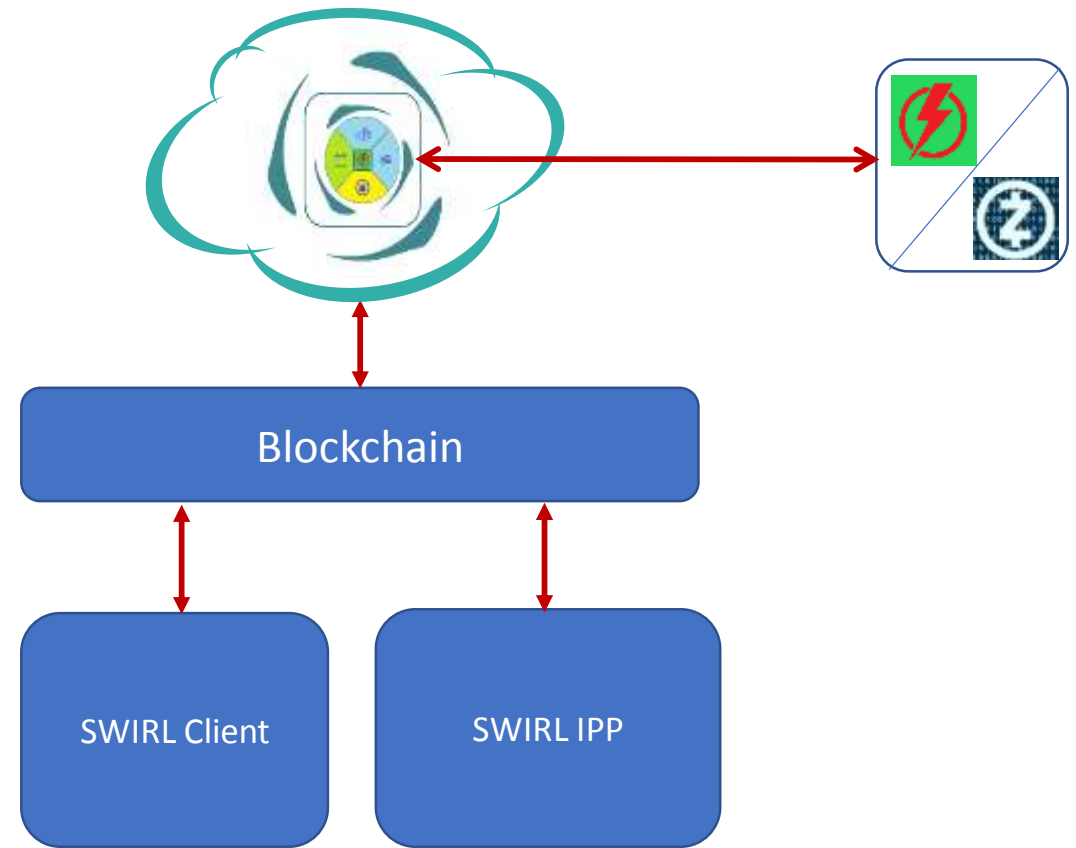
SWIRL SA
Myriam Muller
Communication

SMART WIND INTEGRATED MINI-GRID



IP Expansion

2018: SWIRL CEMG API as Cloud Interface to Blockchain for M2M & M2Web secure transactions incl. crypto-currency



BUSINESS MODEL: ECONOMY - ECOLOGY - SOCIETY

