VI CONGRESO
SMART GRIDS
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"AUTOCONSUMO COMPARTIDO BASADO EN UN SISTEMA BLOCKCHAIN"

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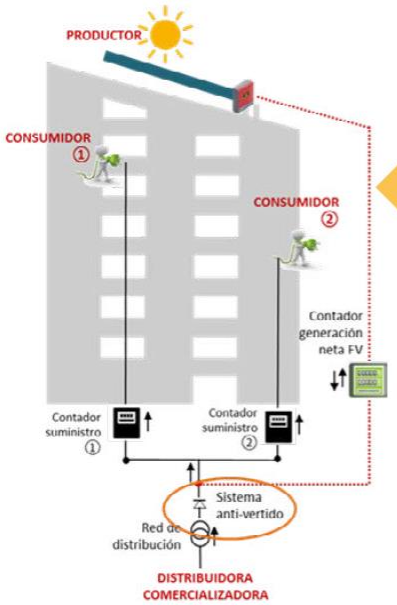
AUTOCONSUMO



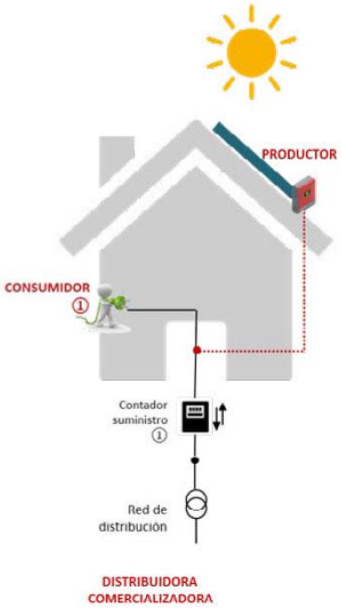
#A

Instalación de autoconsumo colectivo
SIN excedentes

Si, en esta configuracón, se elimina el sistema antivertido, la instalación pasaría a ser CON excedentes y también podría acogerse al mecanismo de compensación.

#B

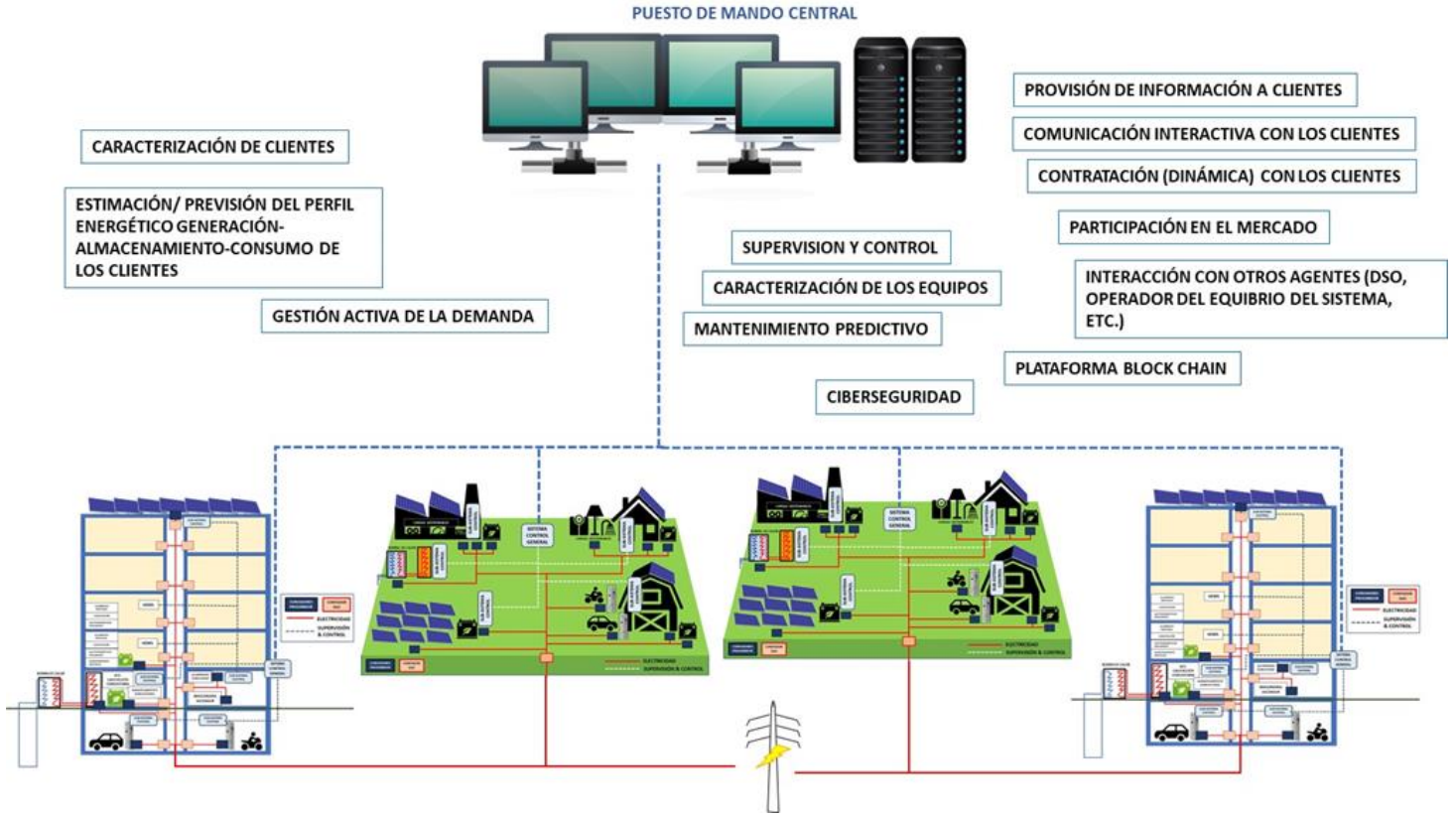
Instalación de autoconsumo individual
CON excedentes



Fuente: IDAE

AIGECO

- Agregador Inteligente de Generación y Consumo eléctrico con la participación activa del cliente → Proyecto Hazitek Estratégico 2018



BLOCKCHAIN = SISTEMA DISTRIBUIDO

Renewable and Sustainable Energy Reviews 100 (2019) 143–174

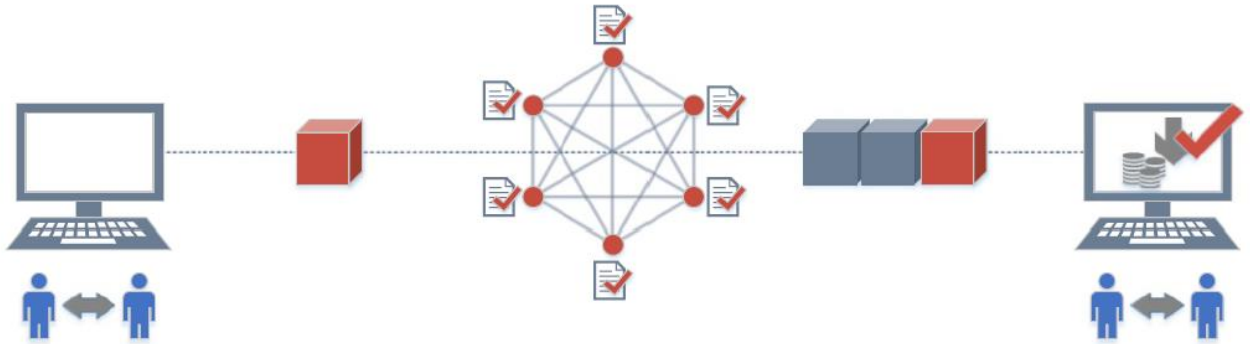
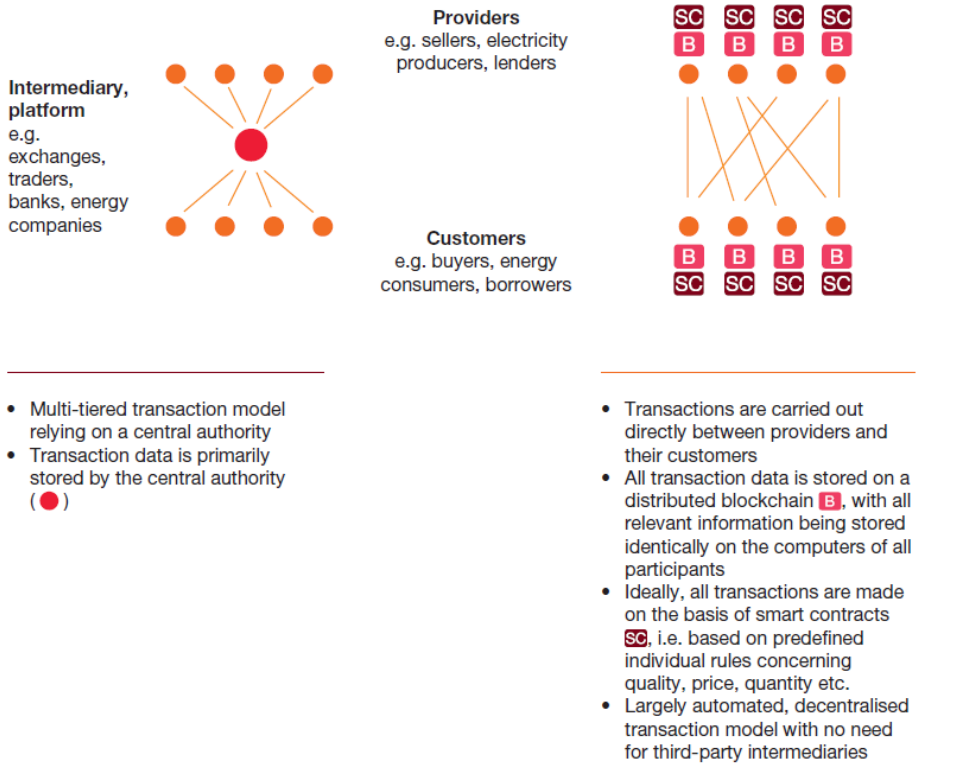


Fig. 2. Visual representation of a blockchain transaction: users agree on a transaction which is included in a block, its validity is confirmed by distributed nodes of the network and the block is added to the growing chain of blocks before transaction is confirmed and payments finalised.

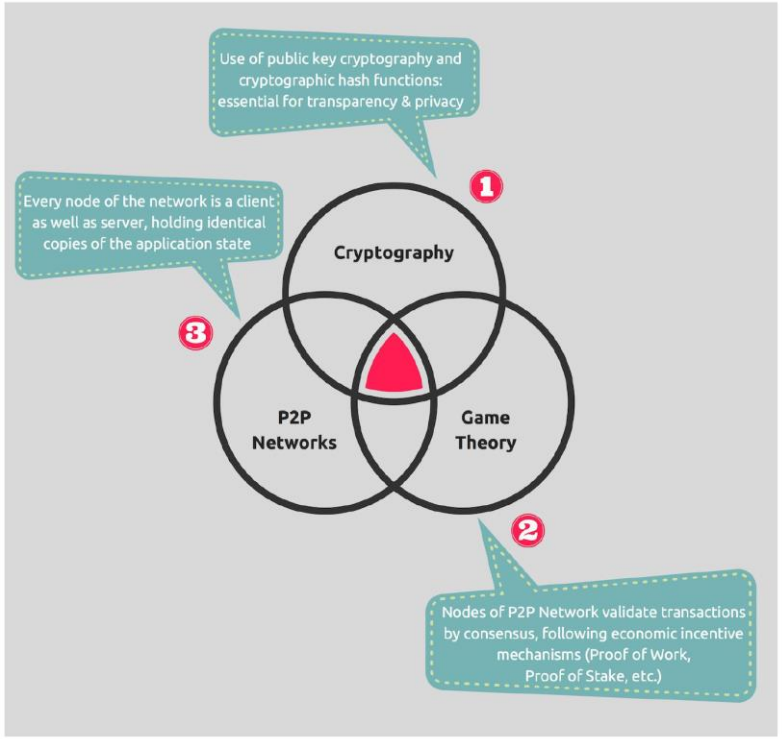
Fuente: "Blockchain technology in the energy sector: A systematic review of challenges and opportunities"c

Figure 1: How blockchains change the way we transact

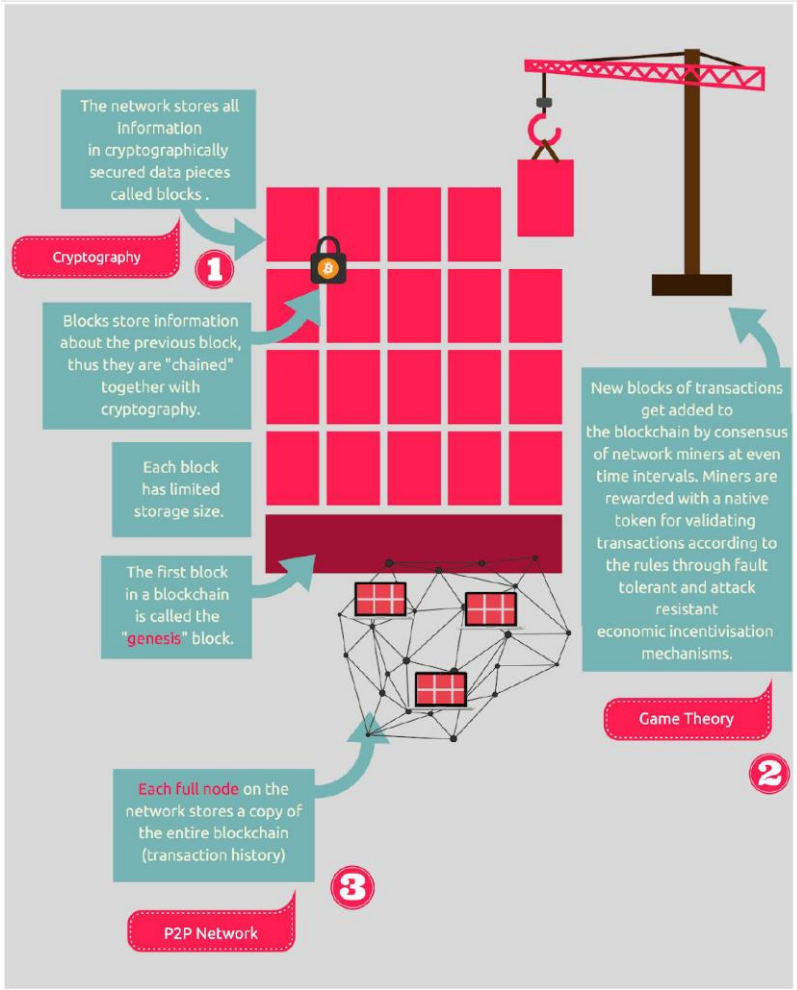


Fuente: "Blockchain – an opportunity for energy producers and consumers?", PwC

BLOCKCHAIN – TECNOLOGÍAS



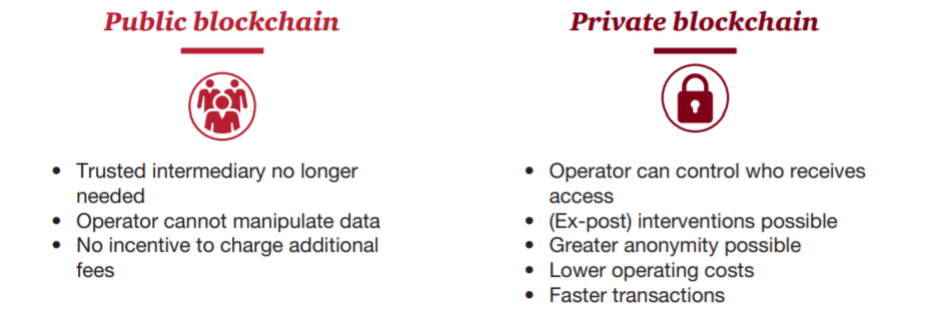
Combination of 3 Technologies
Source: Blockchainhub.net



Why is it called a Blockchain?
Source: Blockchainhub.net

SISTEMAS BLOCKCHAIN: PERMISSIONED .VS. PERMISSIONLESS

Figure 7: Comparison of public and private blockchains



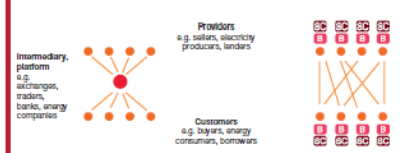
Fuente: "Blockchain – an opportunity for energy producers and consumers?", PwC

	PUBLIC	PRIVATE
Access	Open read/write	Permissioned read and/or write
Speed	Slower	Faster
Security	Proof of Work Proof of Stake Other consensus Mechanisms	Pre-approved participants
Identity	Anonymous Pseudonymous	Know identities
Asset	Native Asset	Any Asset

Public vs Private Blockchains
Source: Chris Skinner's Blog

BLOCKCHAIN Y LA ENERGÍA

Figure 10: Overview of possible blockchain use cases in the energy sector

Applications with a focus on transactions and smart contracts (automated execution of transactions)		*Applications with a focus on documentationof ownership*	*Applications with a focus on distributed transaction records*
Decentralised energy transaction and supply system  • *Decentralised buying/selling of energy (primarily electricity)* • *Special opportunities and use cases for prosumers* • *No supplier-switching process Cryptocurrency integration*	***Other smart contract applications,*** *e.g. in the fields of electric mobility, smart devices*	***Register recording ownership and current state of assets (asset mgmt.)***	***Metering and billing of electricity consumption***
		Guarantees of origin, certification of renewable energy	***Metering and billing ofheat use***
		Guarantees of origin, certification of emission allowances	***Billing ofelectric mobility ("roaming")***

Fuente: "Blockchain – an opportunity for energy producers and consumers?", PwC

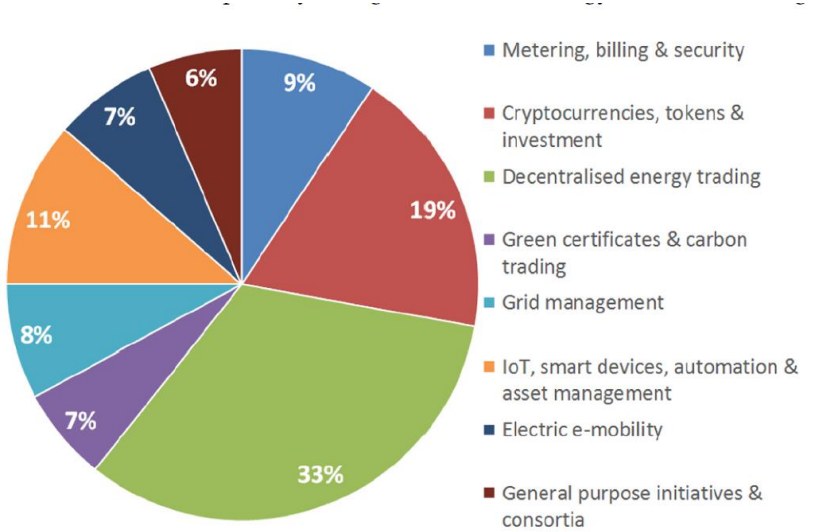
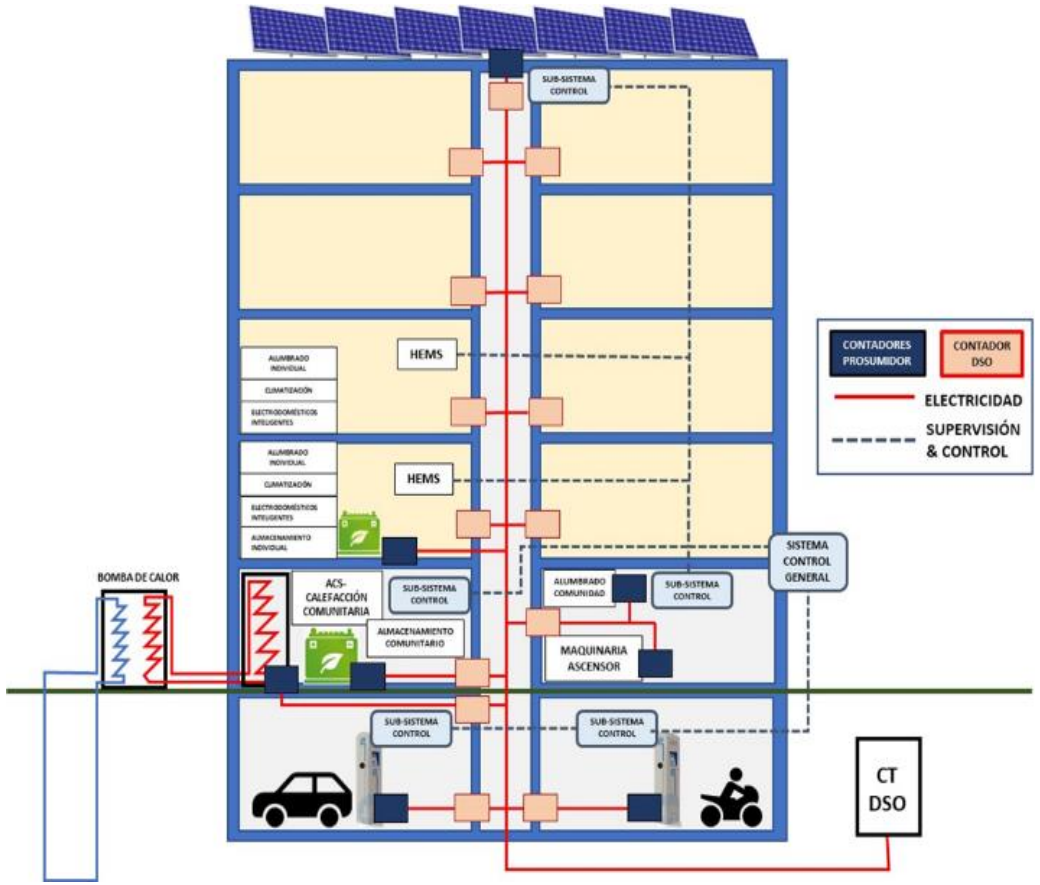
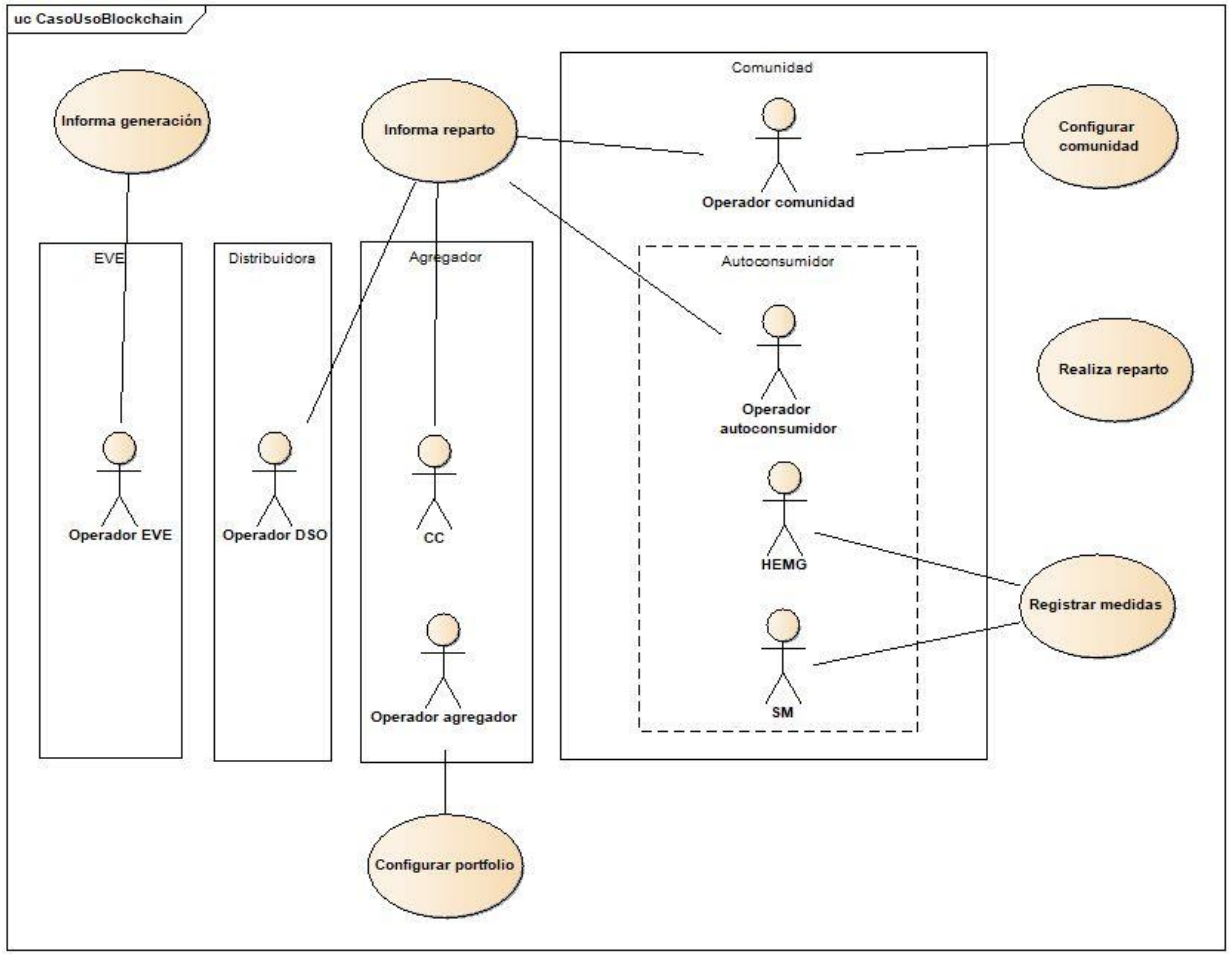


Fig. 7. Blockchain use case classification according to their activity field: results derived from a study on 140 blockchain initiatives in the energy sector being pursued by a large number of companies, startups and research institutions.

Fuente: "Blockchain technology in the energy sector: A systematic review of challenges and opportunities"

AIGECO – AUTOCONSUMO COMPARTIDO





AIGECO – RED PRIVADA BASADA EN HYPERLEDGER FABRIC

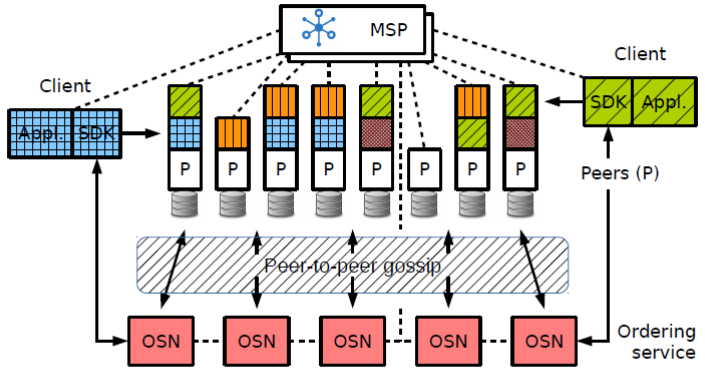


Figure 3: A Fabric network with federated MSPs and running multiple (differently shaded and colored) chaincodes, selectively installed on peers according to policy.

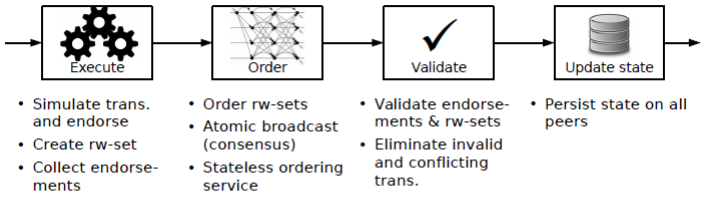


Figure 2: Execute-order-validate architecture of Fabric (*rw-set* means a readset and writeset as explained in Sec. 3.2).

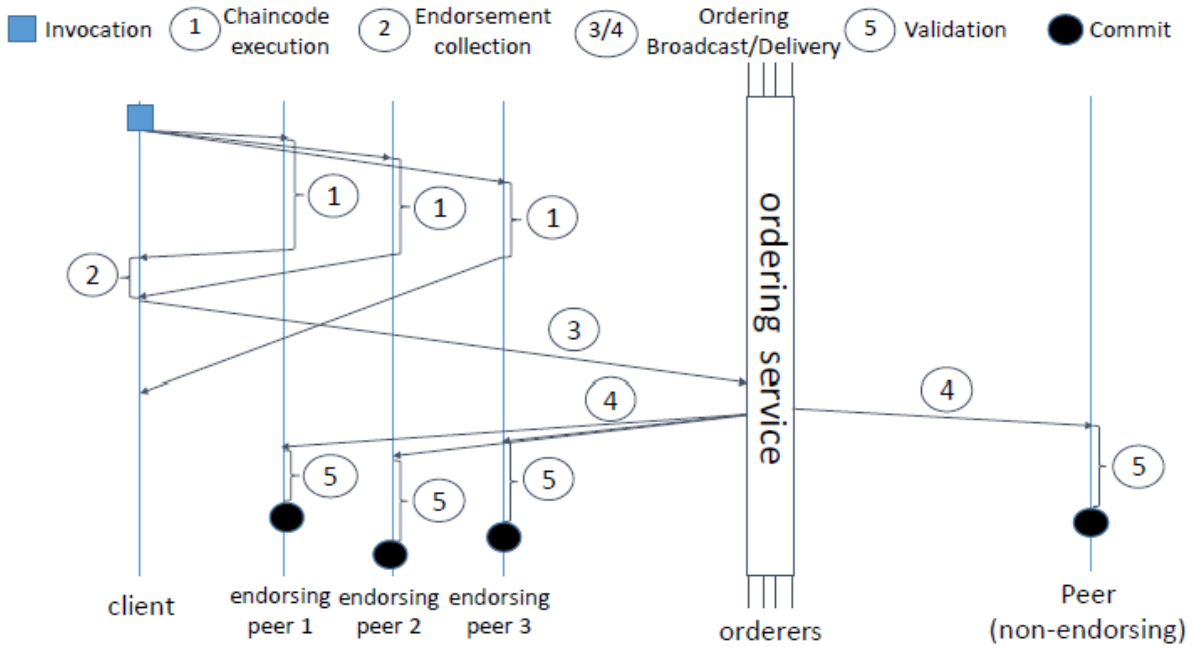
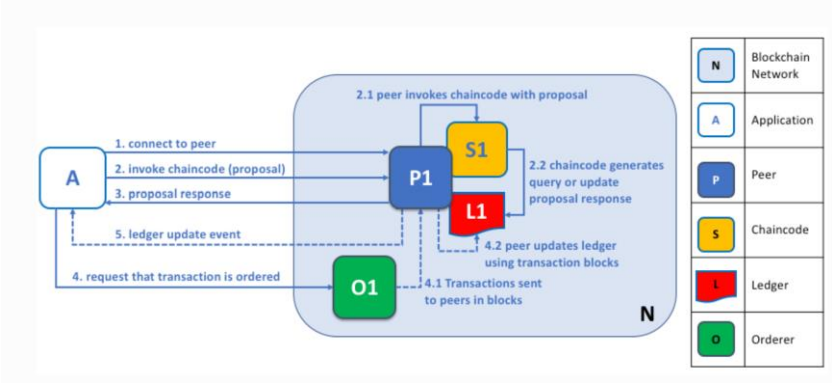
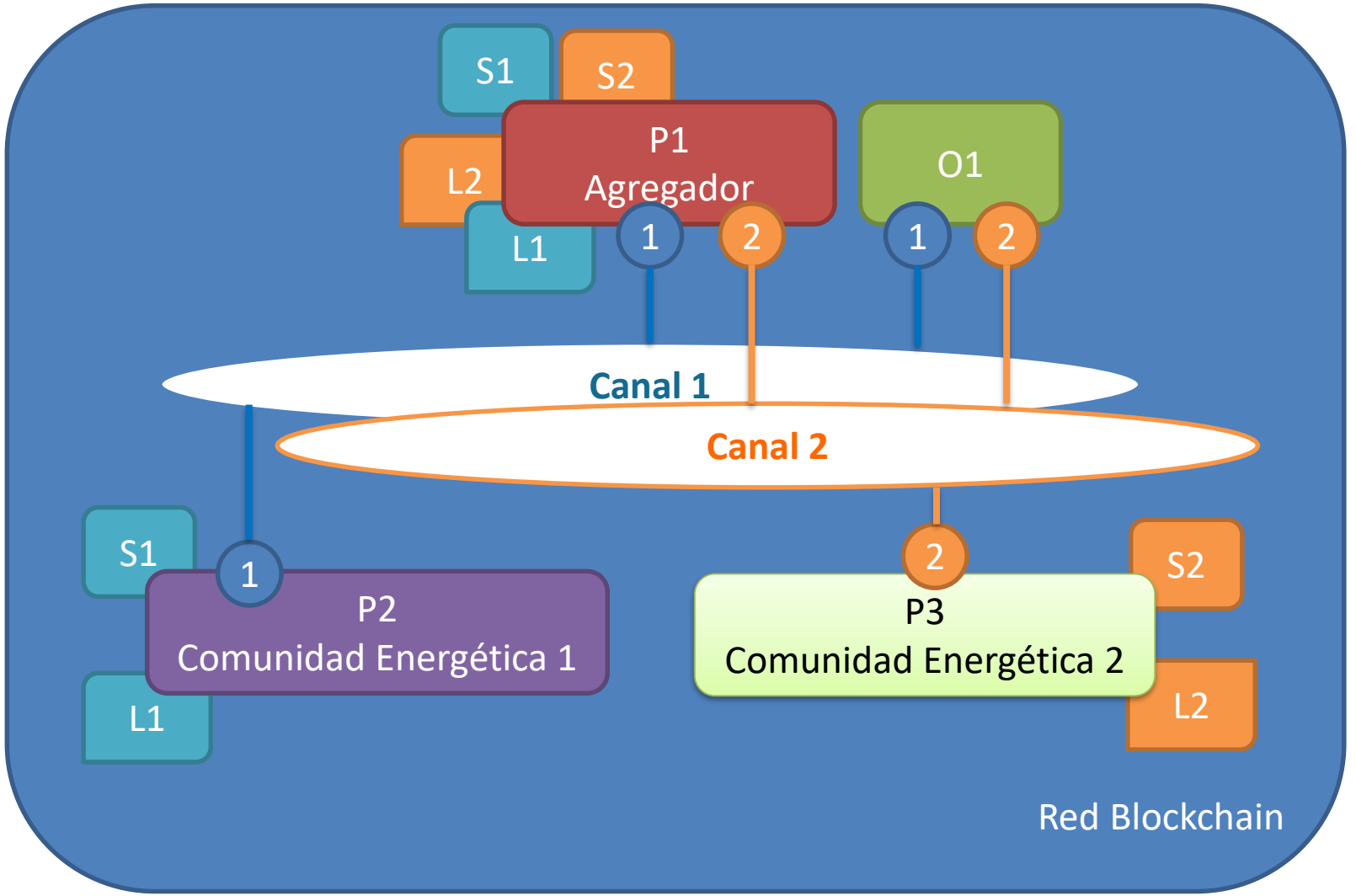


Figure 4: Fabric high level transaction flow.

Fuente: "Hyperledger Fabric: A Distributed Operating System for Permissioned Blockchains" (IBM)

AIGECO – SMART CONTRACTS





CONCLUSION

- Un sistema BLOCKCHAIN privado puede servir de base para registrar de forma transparente tanto las medidas de generación y consumo como los intercambios reales de energía que se realicen entre los distintos autoconsumidores, asegurando la integridad, trazabilidad y confidencialidad de la información intercambiada entre todos los agentes.

- La tecnología BLOCKCHAIN es una de las tecnologías que pueden desempeñar un papel muy relevante en este proceso de digitalización de los mercados de energía eléctrica.

Proyecto AIGECO: HAZITEK ESTRATÉGICO 2018-19

Coordinación técnica: tecnalia Inspiring Business