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## **Solutions for digital interaction of a resilient energy community in a service-oriented framework**

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### **Abstract**

*Energy communities are emerging entities which need their own Information and Communication System. Resilience is a key metric of such communities, and it has to be implemented for both energy supply versus public network outages and for its information system versus cyber-attacks, acting as cyber-citadels which have to resist external malicious attacks while having also digital interactions with external entities. The paper presents solutions for a resilient energy community with appropriate implementations of digital interaction for data exchange, in order to acquire external energy service for specialized companies and to deliver also information and communication-related services for external users. Principles of a Contractual Data Protection Regulation are presented, as an adaptation of data protection tailored for automated energy services and based on secure data exchange. The principles are verified in a demonstration project which has also external entities with digital interaction.*

**Keywords:** *energy communities, energy services, cyber-security*

### **References:**

1. D. A. Perez-DeLaMora, J. E. Quiroz-Ibarra, G. Fernandez-Anaya and E.G. Hernandez-Martinez, "Roadmap on community-based microgrids deployment: An extensive review", *Energy Reports*, vol. 7, pp. 2883-2898, 2021. [CrossRef](#) [Google Scholar](#)
2. J. C. Olivares-Rojas, E. Reyes-Archundia, J. A. Gutiérrez-Gnecchi, I. Molina-Moreno, J. Cerda-Jacobo and A. Méndez-Patiño, "A transactive energy model for smart metering systems using blockchain", *CSEE Journal of Power and Energy Systems*, 2021. [View Article](#) [Google Scholar](#)
3. A. Shrestha, R. Biswokarma, A. Chapagain, S. Banjara, S. Aryal, B. Mali, et al., "Peer-to-peer energy trading in micro/mini-grids for local energy communities: a review and case study of Nepal", *IEEE Access*. [View Article](#) [Google Scholar](#)

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4. J. Milanezi, J. P. da Costa, C. G. Robson de Oliveira Albuquerque, A. Arancibia, L. Weichenberger, F. Lucio Lopes de Mendonça, et al., "Data Security and Trading Framework for Smart Grids in Neighborhood Area Networks", *Sensors*, vol. 20, pp. 1337, 2020. [CrossRef](#) [Google Scholar](#)
5. I. Nwankwo, M. Stauch, P. Radoglou-Grammatikis, P. Sarigiannidis, G. Lazaridis, A. Drosou, et al., "Data Protection and Cybersecurity Certification Activities and Schemes in the Energy Sector", *Electronics*, vol. 11, pp. 965, 2022, [online] Available: <https://doi.org/10.3390/electronics11060965>. [CrossRef](#) [Google Scholar](#)
6. General Data Protection Regulation, [online] Available: <https://gdpr-info.eu/>. [Google Scholar](#)
7. T. GAJEWSKI, "Towards Resilience", *European Cybersecurity Strategic Framework „Ante Portas – Security Studies*, vol. 1, no. 14, 2020. [Google Scholar](#)
8. P.E. Roege et al., "Metrics for energy resilience", *Energy Policy*, 2014, [online] Available: <http://dx.doi.org/10.1016/j.enpol.2014.04.012>. [CrossRef](#) [Google Scholar](#)
9. A. Sundararajan, A. Chavan, D. Saleem and A. I. Sarwat, "A Survey of Protocol-Level Challenges and Solutions for Distributed Energy Resource Cyber-Physical Security", *Energies*, vol. 11, pp. 2360, 2018. [CrossRef](#) [Google Scholar](#)
10. N. A. B. J. C. Saxena, "State of the art authentication access control and secure integration in smart grid", *Energies*, 2015. [CrossRef](#) [Google Scholar](#)
11. [online] Available: [https://ec.europa.eu/info/aid-development-cooperation-fundamental-rights/your-rights-eu/know-your-rights/freedoms/protection-personal-data\\_en](https://ec.europa.eu/info/aid-development-cooperation-fundamental-rights/your-rights-eu/know-your-rights/freedoms/protection-personal-data_en).
12. C. Marnay et al., "Microgrid Evolution Roadmap", 2015 International Symposium on Smart Electric Distribution Systems and Technologies (EDST), 08-11 September 2015. [View Article](#) [Google Scholar](#)
13. Smart and local reneWable Energy DISTRICT heating and cooling solutions for sustainable living, [online] Available: <https://www.wedistrict.eu/>. [Google Scholar](#)
14. [online] Available: <https://atos.net/en/>.
15. Technical University of Moldova, [online] Available: <https://utm.md/en/>. [Google Scholar](#)
16. Nobel Grid project deliverable D3.4 Smart meters architecture and data model analysis, [online] Available: <https://ec.europa.eu/research/participants/documents/downloadPublic?documentds=080166e5af5403d3=PPGMS>. [Google Scholar](#)
17. M. Böswetter, PRIVACY AND SECURITY BY DESIGN: THE SMART METER GATEWAY IN GERMANY, [online] Available: [https://iea.blob.core.windows.net/assets/d9cb9df6-9b66-4474-8905-8951ceaa1634/3.DENA\\_Germany\\_Boswetter%2CMathiasPSF3DENWorkshop25-](https://iea.blob.core.windows.net/assets/d9cb9df6-9b66-4474-8905-8951ceaa1634/3.DENA_Germany_Boswetter%2CMathiasPSF3DENWorkshop25-)

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[02.pdf](#). [Google Scholar](#)**

18. *Protection Profile for the Gateway of a Smart Metering System (Smart Meter Gateway PP)*, 2014, [online] Available:  
[https://www.commoncriteriaportal.org/files/ppfiles/pp0073b\\_pdf.pdf](https://www.commoncriteriaportal.org/files/ppfiles/pp0073b_pdf.pdf). [Google Scholar](#)