



Measuring What We Cannot See

Electrical safety in Lebanon's solar transition, and the case for a National Observatory

FISUEL Seminar and GAM 2026 – Rome, 7–8 October 2026

Outline

- 1 Lebanon and its electricity crisis
- 2 The solar transformation in numbers
- 3 Legal and technical framework
- 4 Evidence: electrical safety barometer and burn data
- 5 The data gap
- 6 Proposal: a National Observatory
- 7 How to start, and our ask

What we aim to present

A fast-changing electrical landscape, a framework still being implemented, and no way to measure electrical safety at national level.



Show

How solar and storage reshaped Lebanon's electricity in a few years.



Test

What the evidence says about the framework, standards and injuries, and where data is missing.



Propose

A National Observatory for Electrical Safety and a practical way to start.

Central question: can Lebanon see its electrical-safety system?

Lebanon at a glance



10,452 km²

area, on the eastern
Mediterranean coast



5.85 M

inhabitants (2025)



\$26 B

GDP in 2024, about
\$4,470 per person



-98%

value lost by the Lebanese
pound since 2019



≈4 h/day

public electricity (EDL),
currently



51%

of electricity from private
generators (2023)



44%

monetary poverty in 2022,
up from 25% in 2019

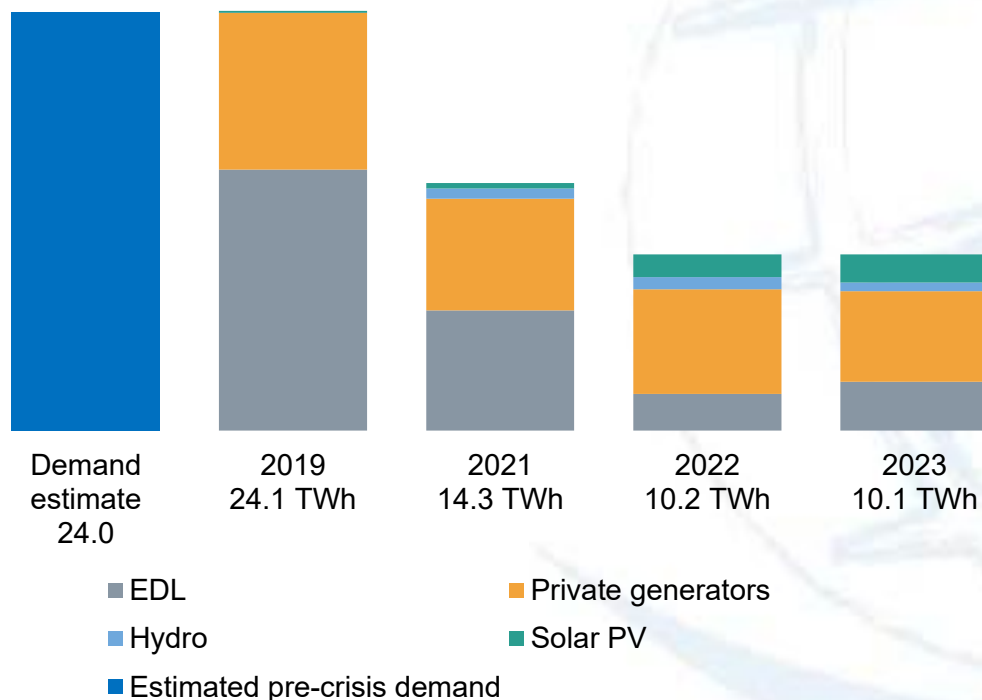


-6.4%

projected GDP change in
2026 after renewed
conflict

Sources: World Bank (Open Data; Lebanon Economic Monitor, Summer 2026); EDL report of 13 July 2026; LCEC Solar PV Status Report 2023; US State Department (poverty).

Electricity supply before and after the crisis



24,000 TWh

annual demand estimated before the crisis (EDL and MoEW planning, 2019)



14,984 TWh

delivered by EDL in 2019, about 62% of that demand

Sources: EDL data via AUB-IFI (2019); EDL/MoEW planning (demand); LCEC 2023 report (2021–23). 2019 EDL includes hydro.

Years of blackouts

2019

Crisis begins; EDL still delivers 15.0 TWh

2020

EDL supply drops to 12.4 TWh

Jun–Oct 2021

Below 4 hours a day, then a nationwide blackout

2022

About 1–2 hours a day on average; tariff reform in November

Aug 2024

EDL announces its fuel reserves are exhausted

2026

7–9 hours in February; now about 4 hours a day

Solar and private generators filled the gap left by the public grid.

Sources: EDL data via AUB-IFI; LCEC; EDL report of 13 July 2026; press and encyclopedic reports.

EDL: a public monopoly under strain



>90%

of generation and
distribution assets
controlled by EDL



≈60%

collection rate on billed
electricity



≈40%

technical and non-
technical losses



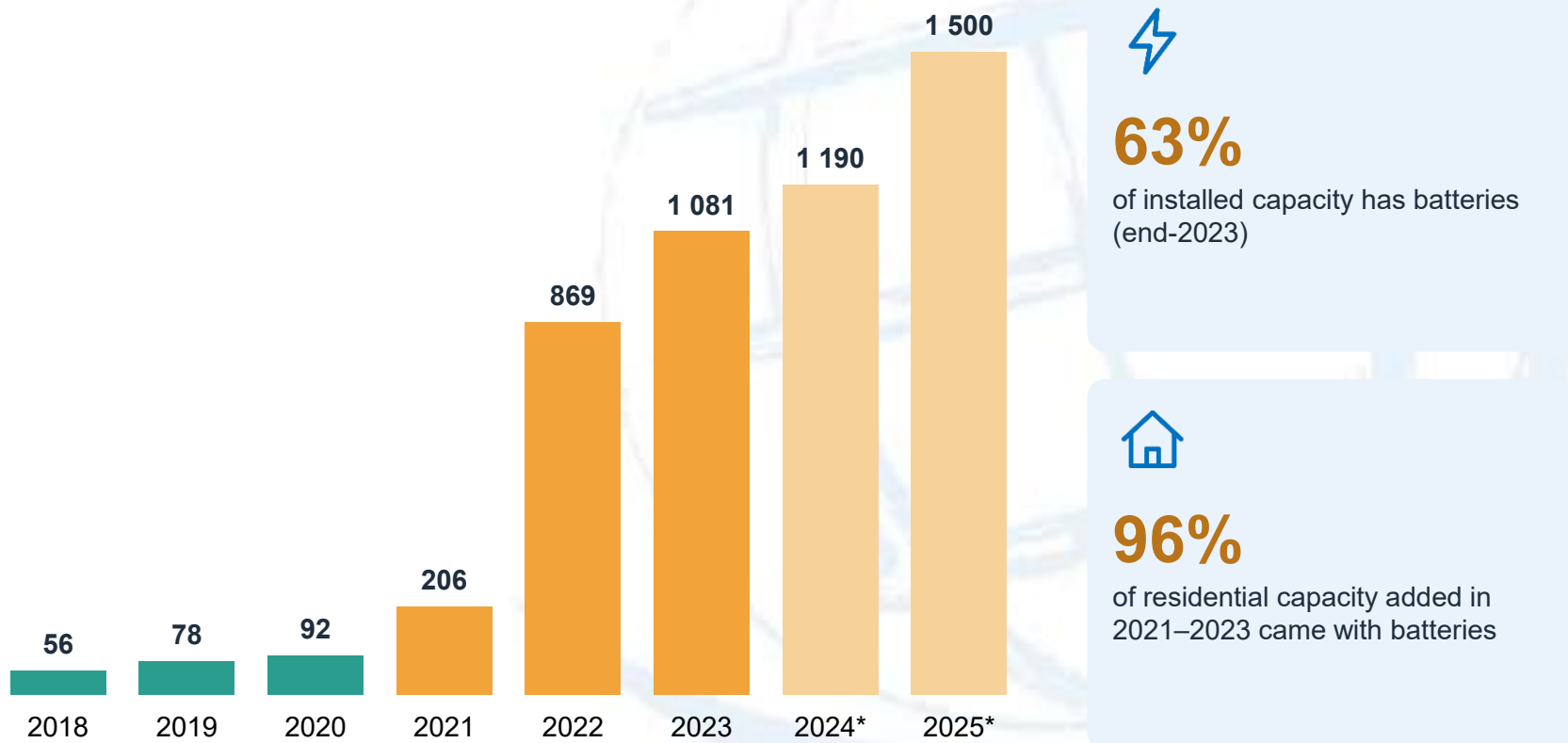
≈4h/day

public supply today

Private generators fill the gap: about two-thirds of demand, through some 7,500 local operators.

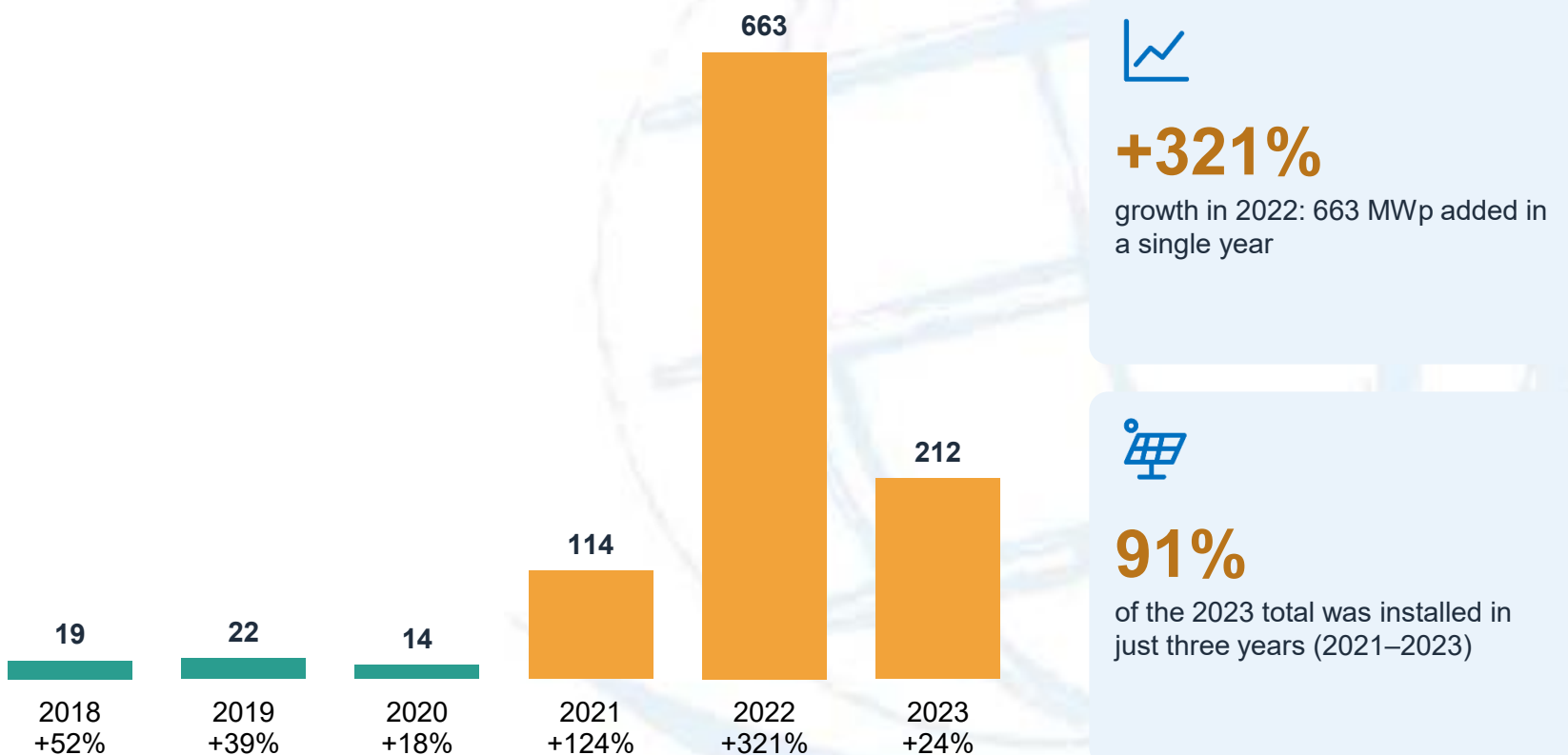
Sources: ERA (Dr. S. Mortada), LEAD 2026, OEA, 2 Oct 2026; EDL (July 2026).

Solar changed the grid in seven years



Cumulative MWp. Sources: LCEC Solar PV Status Report 2023; NREAP 2025–2030 (2024); ERA, Oct 2026 (end-2025 estimate). *Provisional or estimated.

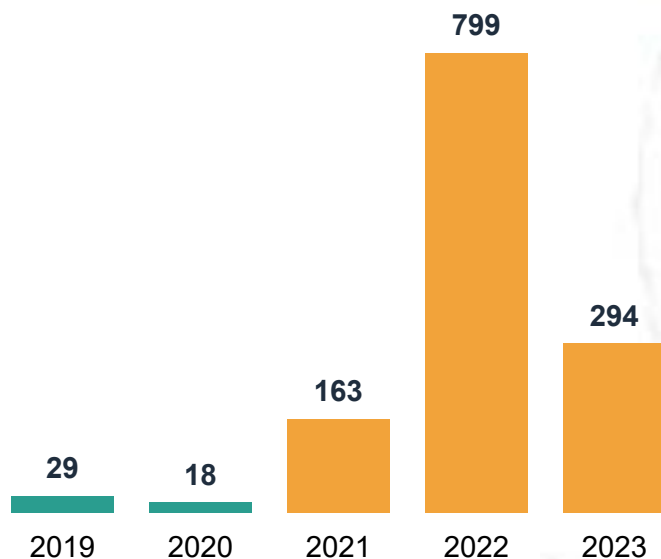
Yearly growth: the 2021–22 boom



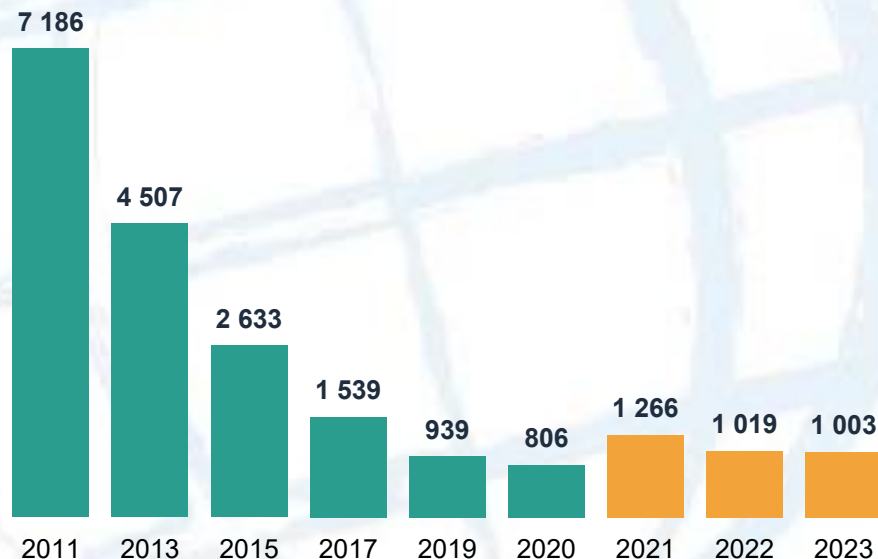
Source: LCEC Solar PV Status Report 2023 (April 2025). Annual additions (MWp) estimated from customs import logs; percentages are growth of cumulative capacity.

Falling prices, rising investment

Annual investment (\$ million)



Average turnkey price (\$/kWp)

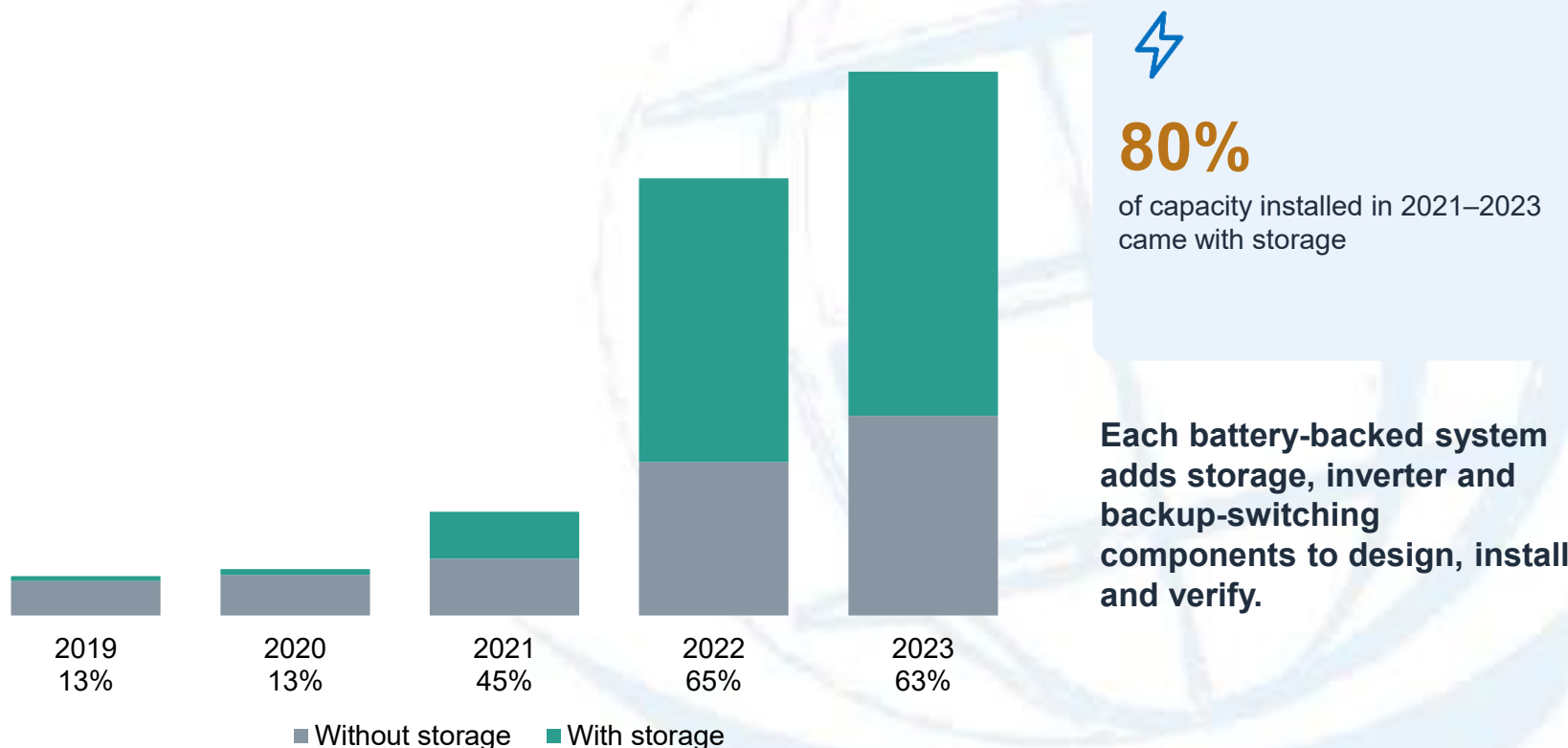


Turnkey price down 86% since 2011; about \$1.4 billion invested by 2023.

Source: LCEC Solar PV Status Report 2023. Investment is an LCEC estimate; turnkey price shown for selected years.

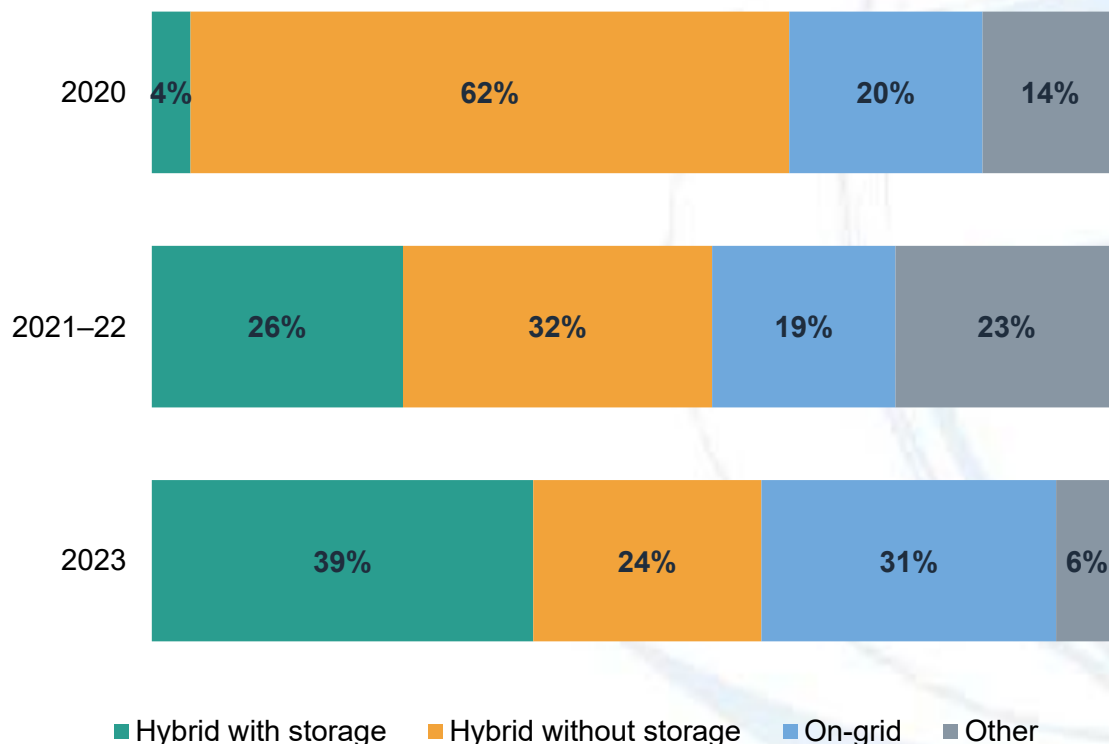
Batteries: from 13% to 63%

Cumulative MWp; label = share with storage



Source: LCEC Solar PV Status Report 2023 (April 2025). Cumulative MWp; label = share with storage.

Hybrid, multi-source systems dominate



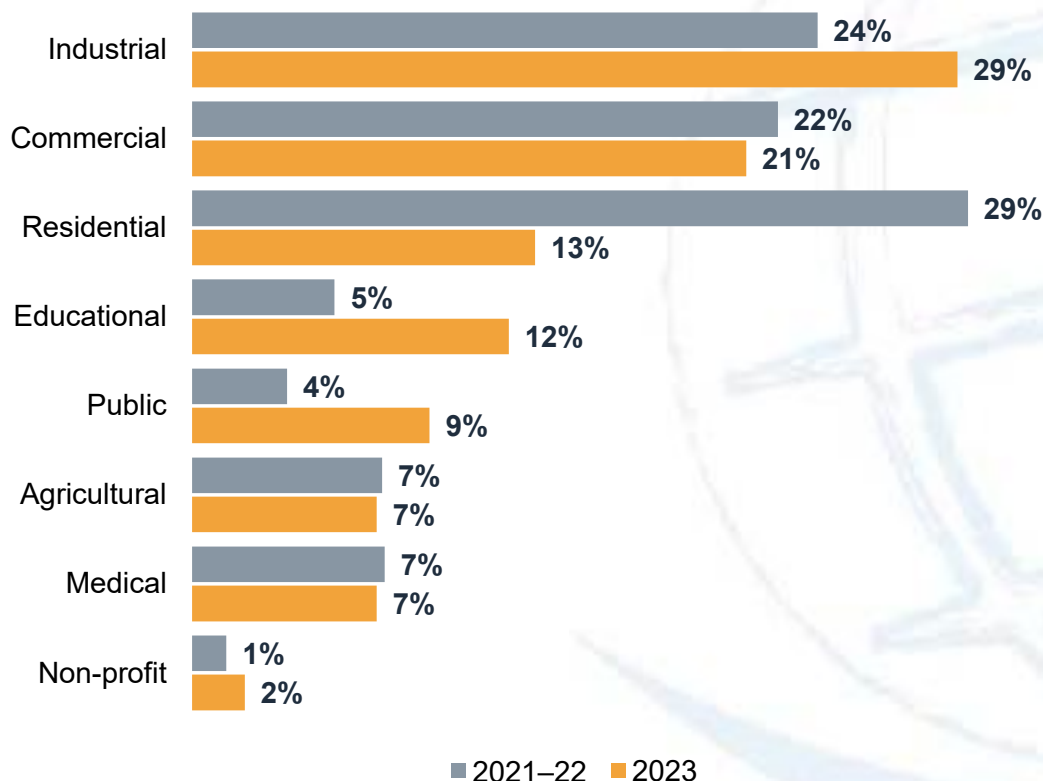
63%

of 2023 capacity is hybrid: grid + diesel generators + PV, with or without batteries

Several energy sources feed one installation, so safety depends on how they are combined and switched.

Source: LCEC Solar PV Status Report 2023 (April 2025). Share of installed capacity, power-generation systems of the 58 surveyed companies.

Who installs solar



≈19%

of 2023 capacity is in hospitals and schools (medical ≈7%, educational ≈12%)

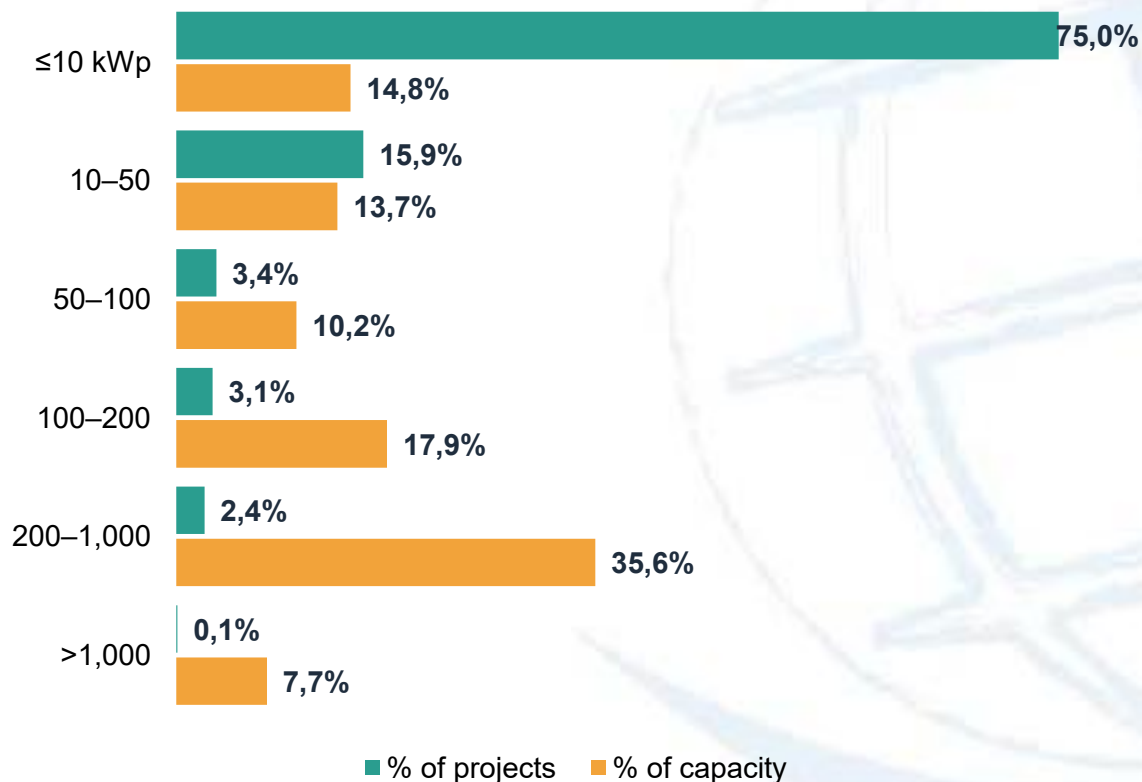


13%

residential share in 2023, down from 29% in 2021-22

Source: LCEC Solar PV Status Report 2023 (April 2025). Share of capacity, surveyed companies.

Many small systems, a few large ones



75%

of projects are 10 kWp or smaller,
but only 15% of capacity



43%

of capacity sits in the 2.5% of
projects above 200 kWp

Source: LCEC Solar PV Status Report 2023 (April 2025). 6,303 projects (156.7 MWp) of surveyed companies, 2021–2023.

The building blocks exist



Law 462/2002

Sector framework with safety provisions (Arts. 6, 12, 22, 26, 29). Regulator appointed only on 11 September 2025.



Law 318/2023

Distributed renewables: net metering and peer-to-peer trading up to 10 MWp. Enacted in December 2023.



LIBNOR standards

IEC-based, including NL IEC 60364-6-61 (initial verification of new installations) and PV product standards.

The challenge is implementation, verification and data.

Microgrids: ERA's draft safety tests

Draft v1.0 · 29 July 2026 · out for consultation

8 cumulative tests · 10 MW cap · \$4,000 fee



Technical suitability

Feasible, safe, reliable and standards-compliant, with proper protection, monitoring, control and operations.



Network compatibility

Must not compromise network safety, stability, power quality or future interconnection.



Consumer protection

Safe, reliable service with proper metering, transparent tariffs and complaints handling.

Evidence from an observatory and OEA expertise could feed these tests.

Source: ERA (Dr. S. Mortada), LEAD 2026, OEA, 2 Oct 2026. Consultation draft, not final.

Standards: products versus installations



Adopted by LIBNOR

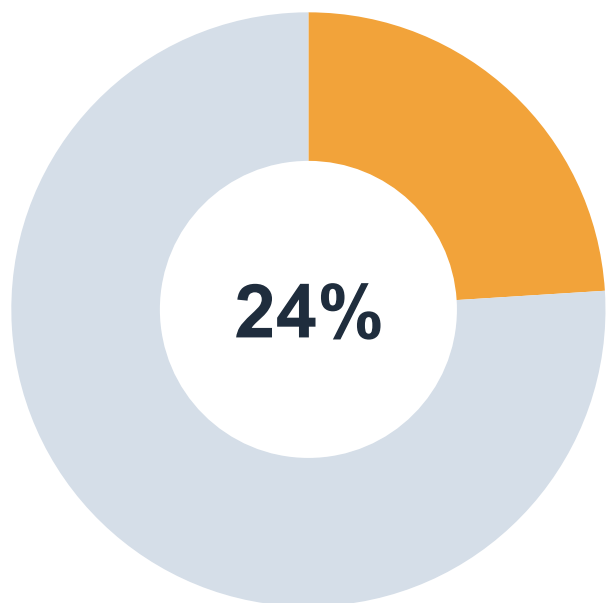
- PV modules: IEC 61215, IEC 60904-1
- Utility interface: IEC 61727
- Initial verification of new installations: NL IEC 60364-6-61



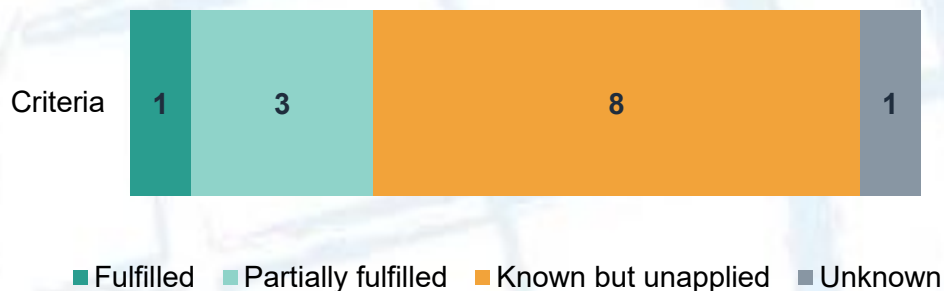
Need to be adopted

- IEC 61730: module safety
- IEC 60364-7-712: PV installations
- IEC 62446-1: commissioning and inspection (excludes storage)
- Inverter and battery safety standards

World Electrical Safety Barometer – WESB score 24%



13 weighted criteria, residential electrical safety



A weighted institutional score, not the share of unsafe installations.

Source: World Electrical Safety Barometer (WESB), an ICA Europe initiative supported by FISUEL; Lebanon assessment.

Severe injuries, incomplete records

1.9%

36 of 1,907 burn admissions were electrical (30 analysed)

63.3%

needed surgery; 20% amputation

17 days

median stay (mean 25.7)

10%

mortality (3 deaths)

Place of accident recorded

36,7%

63,3%

Voltage recorded

63,3%

36,7%

■ Documented ■ Missing

Source: Moukawam et al., Int Wound J 2025;22:e70732. Single centre; not a national incidence.

Information exists, in silos



Hospitals and burn unit



Civil Defense



LCEC (solar data)



Ministry and ERA



LIBNOR (standards)



OEA and engineers

No national indicators

No single system consolidates these sources. Even solar capacity is estimated from customs import logs and company surveys. About 7,500 neighbourhood generator operators run unlicensed, unregulated networks (ERA).

A National Observatory: measure, analyse, coordinate



Collect

Incidents, injuries, fires and installation defects from reliable primary sources.



Analyse

National indicators, recurring hazards and trends over time.



Coordinate

Regulators, utilities, OEA, hospitals, emergency services and universities.

Data

Analysis

Prevention

Regulation

Improvement

Not an inspection authority. Precedent: France's ONSE (1995) produces statistics only.

How it could start



Phase 0 – Agree

Working group and MoU among partners. A small set of indicators and a minimum data set: cause, voltage class, place of accident.



Phase 1 – Pilot

Sentinel hospital reporting, standard incident classification by Civil Defense, defect reports from engineers, PV installation data.



Phase 2 – Publish

Annual national barometer and recommendations to LIBNOR and the ERA.

Proposal for discussion: host, legal basis, funding and medical-data protection are still to be decided.

Roles: OEA and partners



OEA and engineers

- Qualification and continuing education
- Design practice and technical guidance
- Standards work with LIBNOR
- Field observations and defect data



Stakeholders

- ERA, Ministry, LIBNOR: rules and standards
- LCEC: solar and storage data
- Hospitals and Civil Defense: injuries and incidents
- Universities: analysis and training

Adapt international models to Lebanon's context.

What we ask of FISUEL

- 1 Methodology and indicator templates
- 2 Twinning with an existing national observatory
- 3 Support for a Lebanese pilot
- 4 Lebanon in the next barometer cycle, with data

Not another isolated institution: a coordinated ecosystem, with a neutral observatory consolidating the evidence.

Questions and discussion

MERCI - THANKS



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