

FROM PV-ONLY TO A CO-LOCATION WITH BESS

A STRUCTURED PATH TO THE OPTIMAL
BESS INTEGRATION CONCEPT —
INCLUDING DEVELOPMENT TO RTB

GREENTECH
WHITEPAPER

INTEGRATING A BESS — BUT HOW?

How do you turn a ground-mounted PV project — in development, under construction, or already in operation — into a permitted, technically feasible and economically viable co-location project with a battery energy storage system (BESS)? This whitepaper outlines the typical approach: from an initial potential assessment, through a robust decision basis, to developing the selected target concept all the way to Ready-to-Build (RtB).

EVERY PROJECT IS DIFFERENT

No two PV plants — and no two co-location projects — are the same. Starting point, permitting pathway, grid framework and technical boundary conditions vary significantly from project to project.

What matters, therefore, is not a one-size-fits-all solution, but a structured, project-specific definition of the key constraints and degrees of freedom — covering land and contractual setup, the planning and permitting route, grid connection and metering concept, and the technical integration approach. Only by considering these elements together can a technically and economically sound design be developed, including the final BESS sizing.



A TWO-PART APPROACH

The process is structured into two consecutive phases:

1.

CO-LOCATION ANALYSIS:

Is adding a BESS feasible — and if so, what is the technically and economically optimal co-location configuration?

This question is addressed through a co-location analysis. The analysis starts by structuring the project's specific boundary conditions (e.g., land and contractual setup, permitting pathway, grid connection and metering concept, and technical integration constraints). The outcome is a robust decision basis including a comparison of multiple sizing and revenue scenarios participation options, and a clear recommendation on next steps.

2.

PROJECT DEVELOPMENT:

Development of the selected target variant to RtB.

If desired, the target variant derived from the co-location analysis is taken forward into project development and progressed consistently through to RtB. This includes defining and executing the appropriate permitting pathway and preparing authority-ready submissions — typically covering planning/land-use requirements and the building permit process, including the required permit-ready technical documentation. In parallel, grid and technical readiness are progressed (grid application, metering concept, cable routing and integration planning). This is how a recommended configuration becomes a permitted and implementable co-location project.

1. KEY STEPS IN THE CO-LOCATION ANALYSIS

PROJECT INTAKE AND DATA BASE

The process starts by structuring the project status and data base: available PV documentation (development, construction or operation), permitting status, grid documents, generation profile and key economic assumptions. Based on this, the sizing options and revenue scenarios to be assessed are defined.

LAND AND CONTRACTUAL SETUP

Next, the feasible land options and the existing site setup are reviewed from a project perspective. The focus is not only on space availability, but also on how the site is currently intended to be used and which topics typically need clarification or adaptation for a hybrid configuration (e.g., terms, access rights, boundary definitions, and shared-use provisions).

PLANNING AND BUILDING LAW (ASSESSMENT AND IMPLICATIONS)

The permitting framework is then mapped: can the BESS integration be permitted under the current planning/land-use framework, or are modifications and additional approvals required? From this, the likely permitting requirements, project-specific supporting documents, and design-relevant parameters (e.g., sealing/imperious area, building heights, noise and fire safety) that can influence feasibility and system layout are derived.

GRID CONNECTION, METERING CONCEPT AND TECHNICAL INTEGRATION (HIGH-LEVEL CONCEPT)

In parallel, the grid connection situation is assessed — including capacity limits, technical requirements and timelines — as well as the resulting metering concept logic. On this basis, a high-level grid integration concept for the storage system is developed (layout/topology approach, AC coupling and routing concept) that consistently reflects the identified constraints.

SIMULATION, VARIANT COMPARISON AND RECOMMENDATION

Only once the key boundary conditions are understood with sufficient confidence are multiple design and commercialisation variants simulated and evaluated.

The outcome is a transparent variant comparison including robustness checks (sensitivities). Based on this, a clear recommendation is provided on which co-location variant is economically attractive and, at the same time, realistically implementable from a permitting and grid perspective.

If the co-location analysis result is positive, it yields a recommended target variant including the sizing, the project-specific constraints that shaped the recommendation, and a clear overview of the steps required to reach RtB.

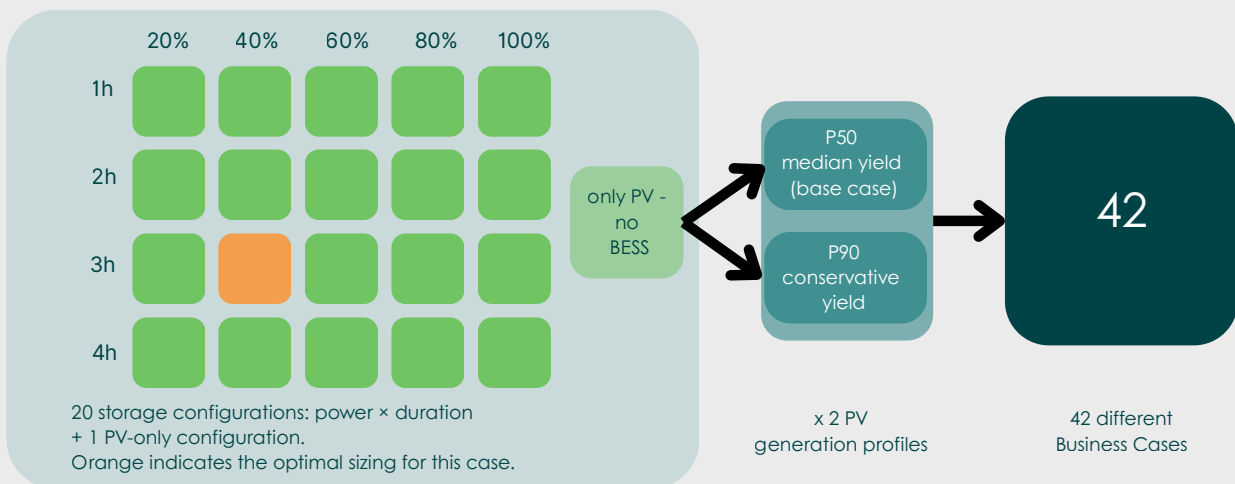
On this basis, the subsequent project development can implement the co-location variant in a structured way through to RtB.



BACKGROUND: DETERMINING THE OPTIMAL STORAGE SIZE (EXAMPLE)

To derive a robust recommendation from the boundary conditions, the following approach is applied: Rather than evaluating a single battery configuration, a defined variant grid of BESS power and duration is calculated (e.g., different power shares relative to the grid connection combined with different storage durations in hours) and the results are compared using project KPIs. To strengthen robustness, the evaluation is typically run against at least two generation assumptions (e.g., P50/P90). The outcome is not only an “optimum”, but also an understanding of how sensitive project value is to over- or under-sizing. Finally, the target configuration is translated into a design that is realistic and procurable (e.g., aligned with standardised components and transformer sizes).

Example



Graphic: own illustration based on a joint case study by phelas and greentech, available at <https://www.phelas.com/de/insights/customer-stories/greentech-co-location>

2. KEY-STEPS IN CO-LOCATION PROJECT DEVELOPMENT

PROJECT STEERING AND COORDINATION OF INVOLVED PARTIES

Roadmap, schedule and coordination with authorities, the grid operator, and external experts/service providers — in close alignment with the client. Communication with landowners is typically led by the client; technical input and structure are provided.

SUPPORT IN ADAPTING LAND LEASE / USAGE AGREEMENTS

Support in adapting or supplementing existing lease and usage agreements so that the BESS integration (e.g., land use, project setup, remuneration logic) is reflected in a project-appropriate way. Legal review, negotiation and execution are always performed by the client and/or their legal counsel.

PERMITTING MANAGEMENT (PLANNING/BUILDING LAW) INCLUDING TECHNICAL DOCUMENTATION

Implementation of the appropriate permitting route (e.g., amendment of local planning instruments or alternative approaches), and preparation/coordination of complete, authority-ready submissions for preliminary approvals and/or the building application — including consistent technical documents and concept design.

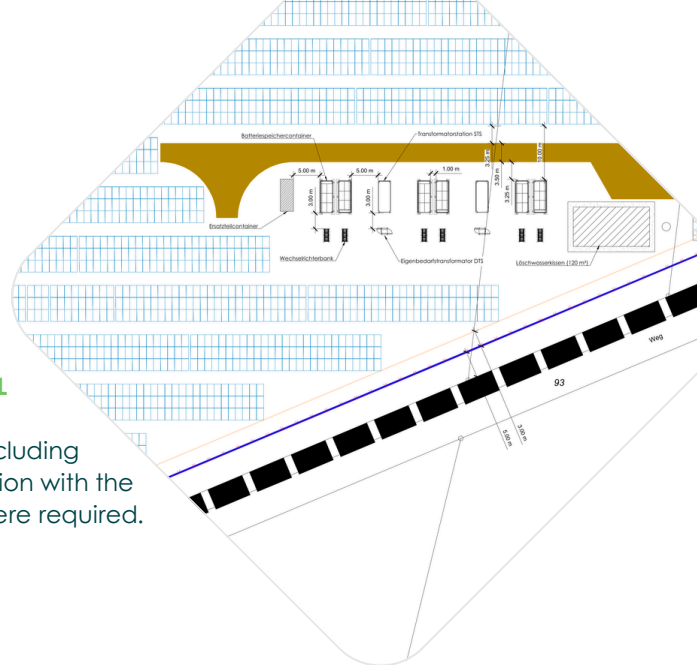


STUDIES, SURVEYS, CONCEPTS

Identification, commissioning and coordination of all required external contributions, depending on the specific project requirements.

GRID CONNECTION AND CABLE ROUTING INCLUDING TECHNICAL DOCUMENTATION

Extended grid application, technical grid connection design including routing design and single-line diagram, and ongoing coordination with the grid operator; support with the grid connection agreement where required.



RESULT

The result is a permitted and implementable co-location project at RfB stage, with a clear roadmap and robust documentation across the critical interfaces. Work packages are always defined on a project-specific basis.

Technical support is provided to the client — especially at the interfaces of permitting, grid, and technical documentation coordination — and, if requested, additional experience is brought to topics that often become decisive in practice (e.g., preparing lease adaptations or coordinating with municipalities and authorities). Legal reviews and contract execution remain with the client and their legal counsel.

BACKGROUND:

TYPICAL CHALLENGES IN THE CO-LOCATION PROCESS

PV-ONLY FRAMEWORKS OFTEN NEED TO BE UPDATED FOR CO-LOCATION (CONTRACTS / PLANNING LAW).

Many projects have lease/usage rights and planning designations that were originally structured for PV-only. For integrating a BESS, these foundations often need to be adapted or supplemented so the project setup remains clean from both a permitting and contractual perspective.

PV REVENUE LOGIC DOES NOT TRANSFER 1:1 TO HYBRID PROJECTS

In PV-only, revenues can often be modelled with a limited set of assumptions. With a BESS, the assessment becomes significantly more differentiated and variant-driven (more markets, more operating logics, more parameters).

GRID AND OPERATIONAL CONSTRAINTS DEFINE COMMERCIAL OPTIONS AND BESS SIZING.

Capacity limits, metering concept requirements and, where applicable, ramp-rate constraints or temporary limitations determine which revenue options are practically accessible on a given site (e.g., balancing services: yes/no). These constraints can materially shift the economically sensible sizing — which is why variants are compared systematically.



ABOUT GREENTECH

As a solar and storage specialist, greentech brings together know-how across the full value chain — from project development and engineering to construction, operations and power marketing.

This allows us to combine the decisive perspectives for co-location projects in one place: permitting strategy, technology, grid connection, revenue strategies, and project economics.

Note: This whitepaper is provided for general information only and does not constitute legal, tax or investment advice. Statements on permitting feasibility, grid connection and economic performance depend on the specific project and location and must be assessed case by case with the relevant stakeholders and professional advisors.

WANT TO LEARN MORE?

Please contact us to discuss your project.

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