SOLARGIS

Browser-Based, High-Fidelity PV Plant Modeling with High-Resolution Terrain

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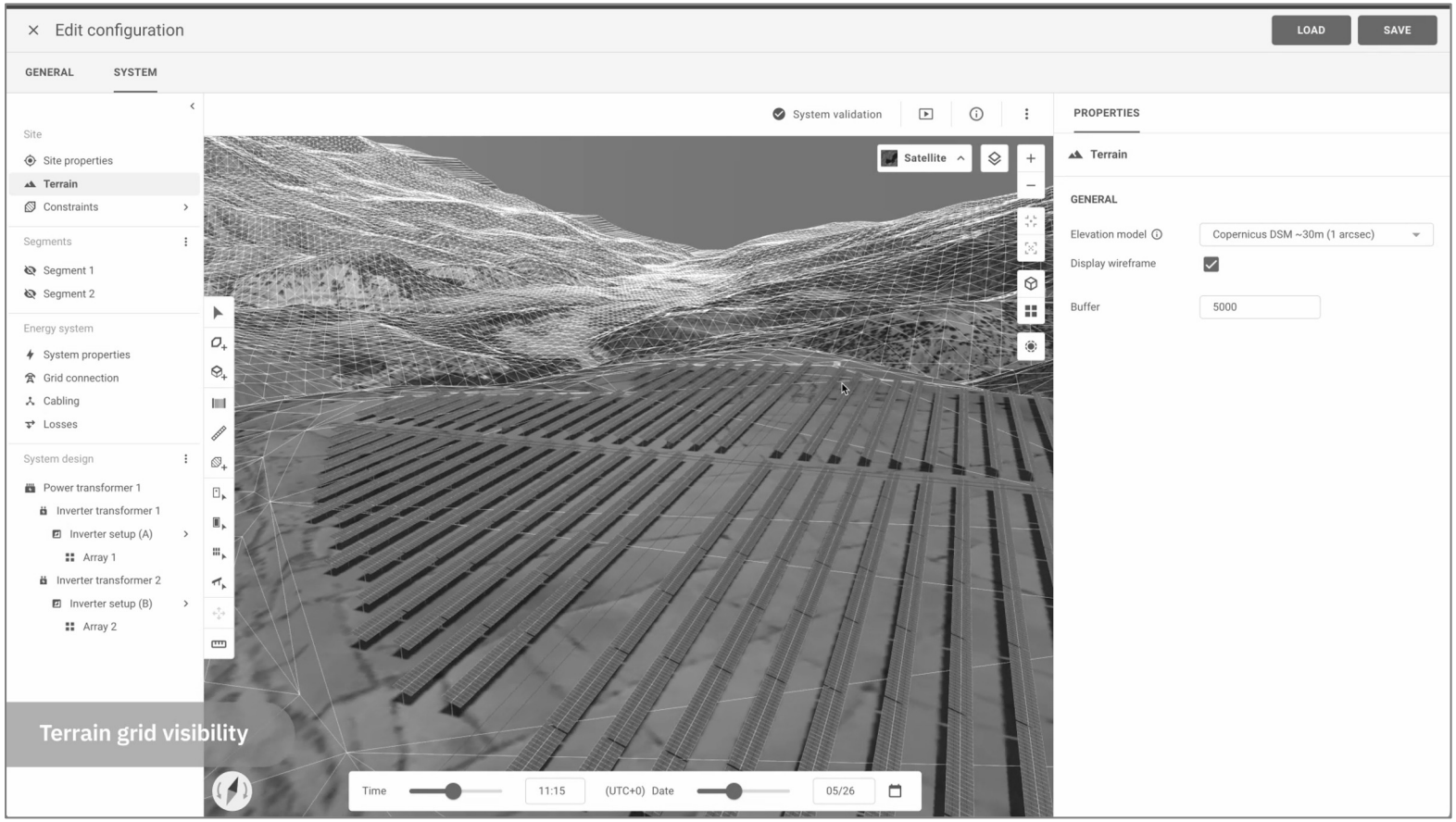
Product Owner

Solargis Evaluate | web based one-stop-shop



Customers keeps asking

"Can I upload my own terrain?"

Why custom / high-resolution terrain matters

Custom terrain in web app is not easy

Everything that desktop GIS/CAD has built in, in webapp needs to be developed from the ground

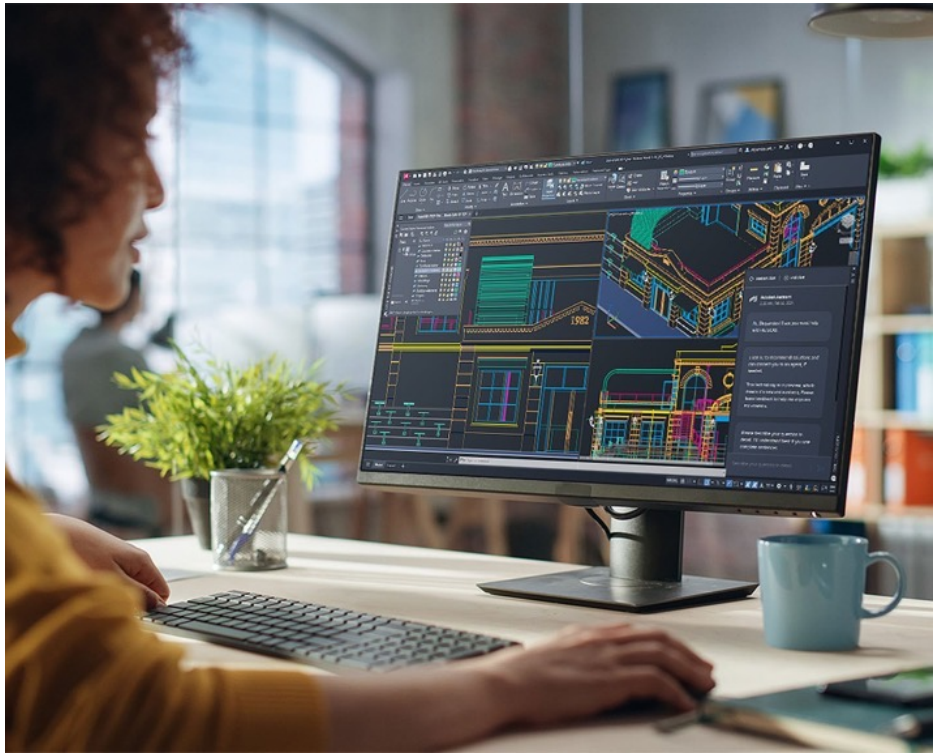
Web ≠ Desktop

Large file handling

Direct storage & GPU access

Full device performance potential

Competing for resources with other open tabs



Custom terrain in web app is not easy

Spatial context must be stable
- no LoD swaps for terrain, or the geometry jumps.

Custom terrain in web app is not easy

Browser memory limits →

~1 million triangles*

This is your “triangle budget”

WebGL context loss occurs above this limit

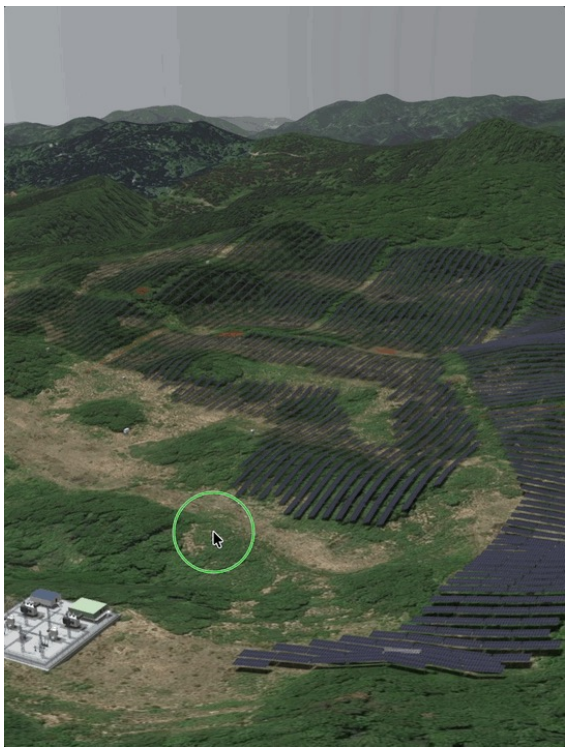
* depends on the user device and running parallel services

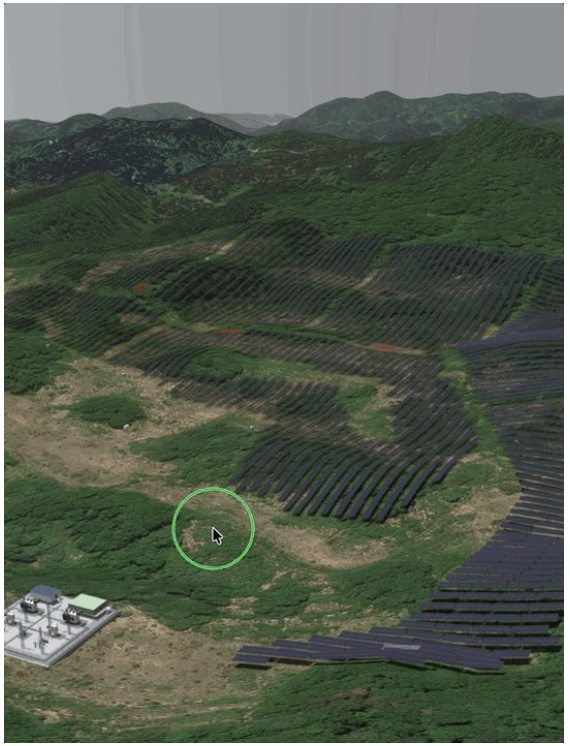
Custom terrain in web app is not easy

Smooth interaction needs

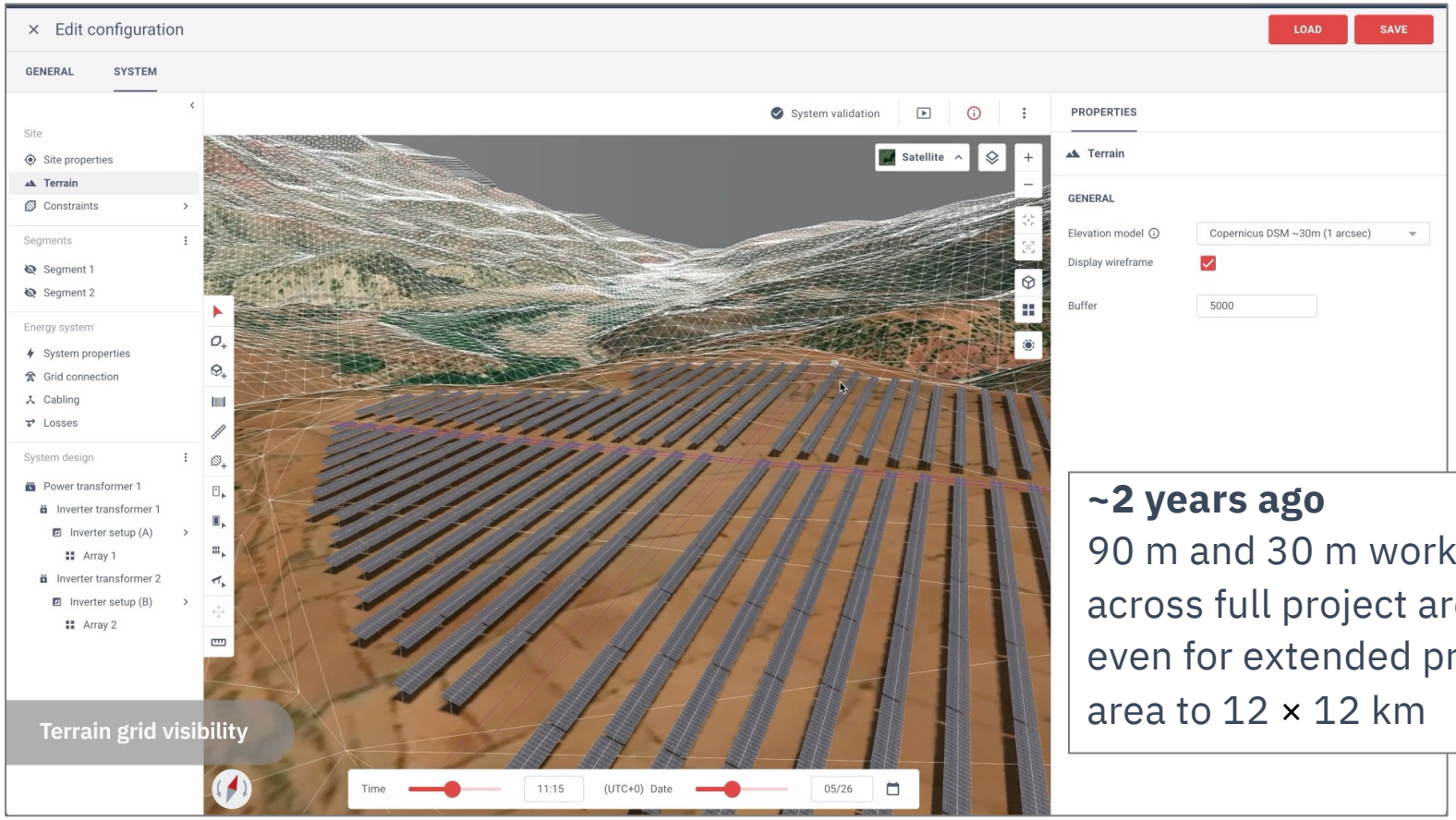
>25 FPS

sustained frame rate.





We started with regular grids



~2 years ago

90 m and 30 m worked across full project areas, even for extended project area to 12 × 12 km

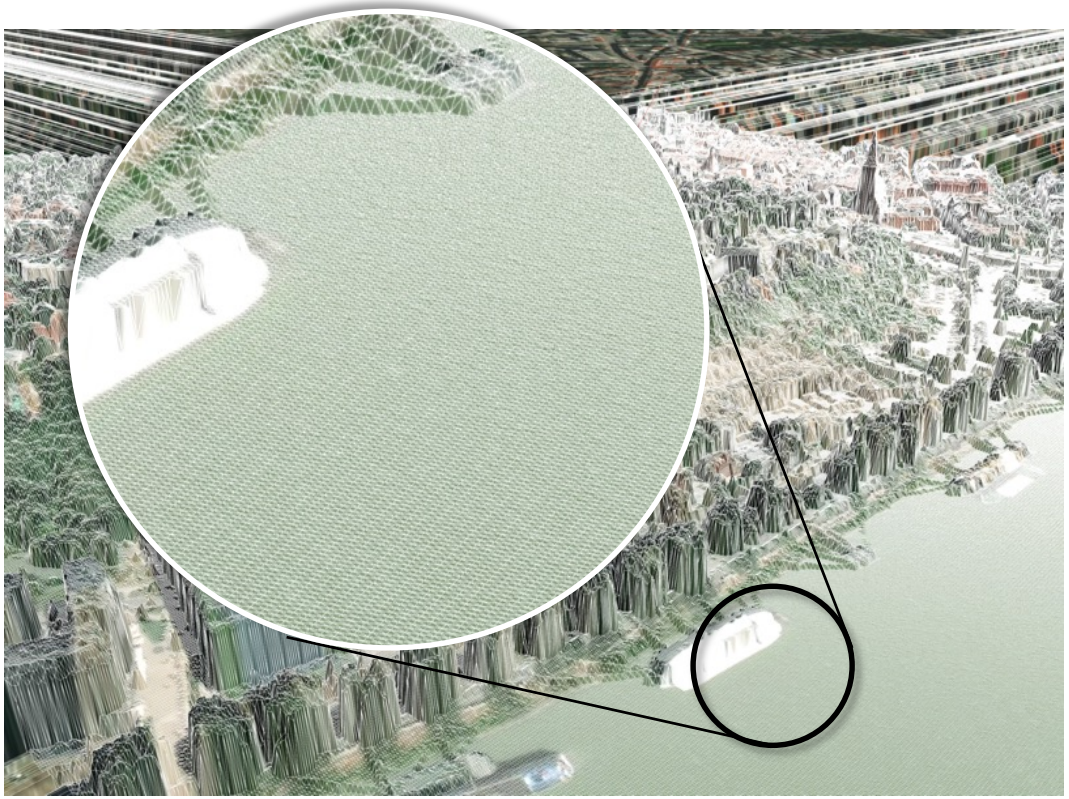
Experiments with 1m spatial resolution

1 m raster — only 1.5 × 1.5 km worked before instability

At full project size, the browser couldn't hold it – even without PV system

The problem with regular grids

Same triangle density everywhere — flat fields “cost” as much as steep slopes



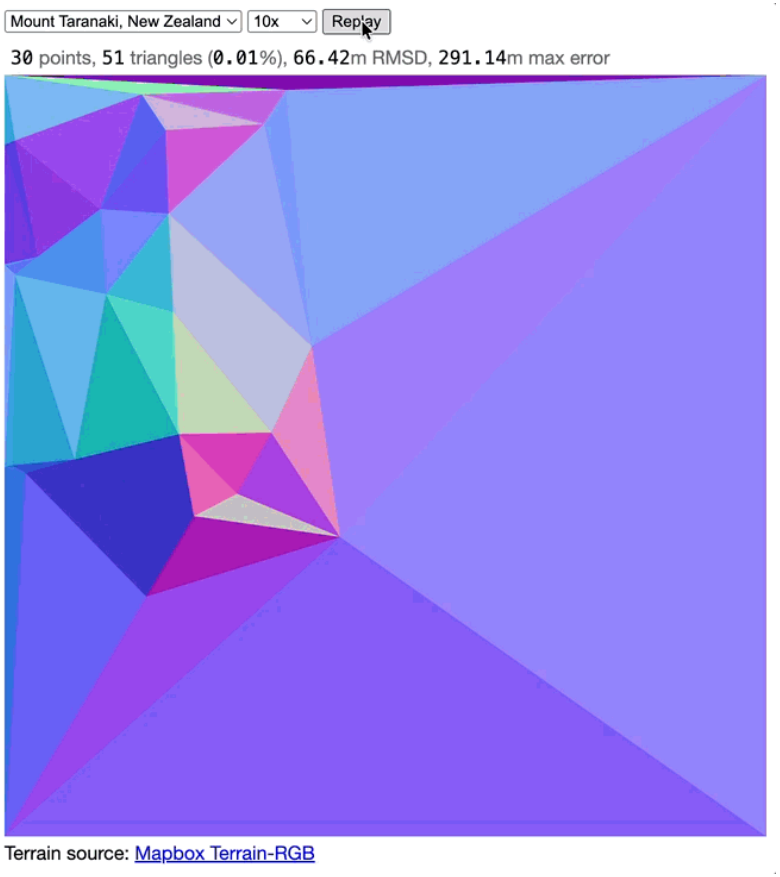
Adaptive triangulation: detail where it matters

TIN preserves morphological edges — dense where terrain varies, sparse where it doesn't

We didn’t write our own - Delatin works

Delatin takes an elevation raster, returns an optimized TIN

- *Open-source project by **MapBox** employee*
- ***JavaScript** version + **Python** port*
- *Two driving parameters*



Source: https://github.com/mapbox/delatin

Two numbers shape every mesh we generate

300k triangles

- Set by 25 FPS browser floor
- Calibrated against legacy tested 30m grid baseline
- Hard limit – if reached before accuracy target
- Reserve for table geometry, supporting structures and other objects in scene

0.20 m max error

- Below typical PV construction tolerance
- Post grading is ± 5–15 cm
- Pile placement: ± 1–3 cm
- Below 0.2 → no yield improvement

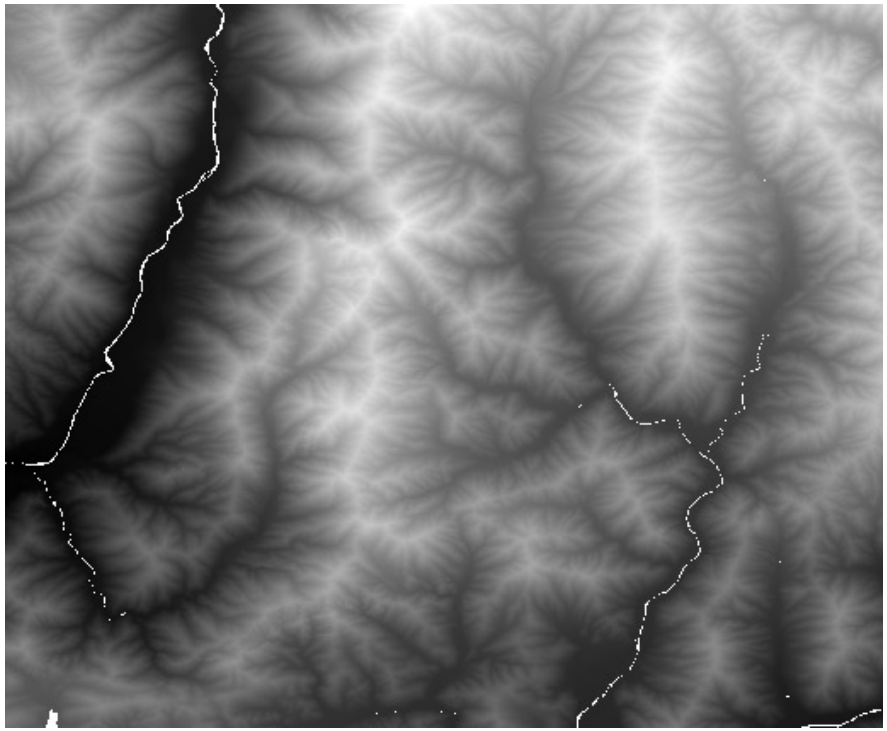
Adaptive triangulation: detail where it matters

Next step

Getting customer terrain into the app

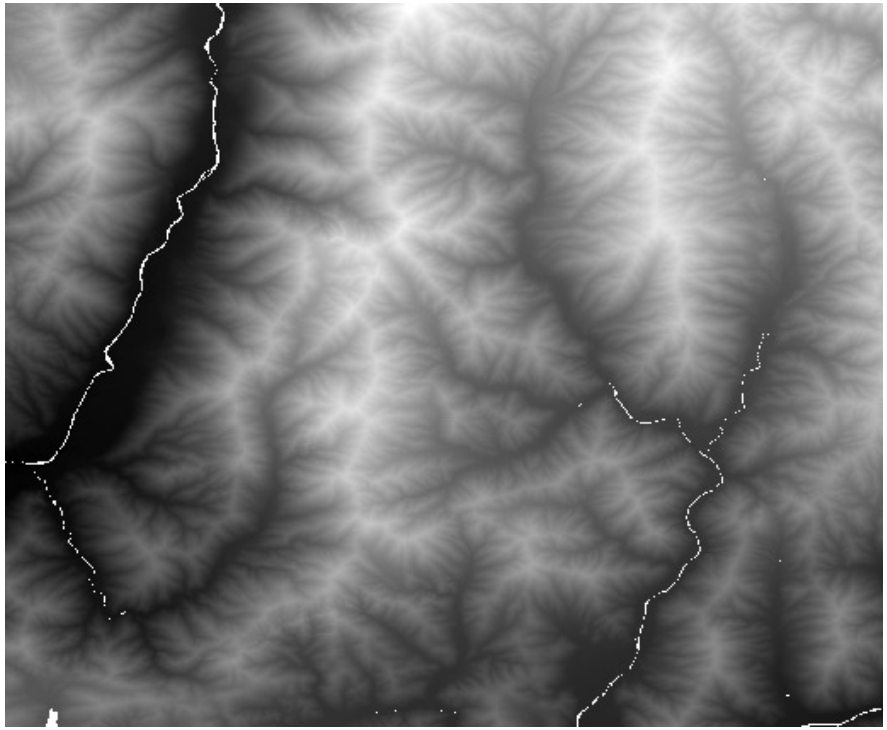
Getting customer terrain into the app

- We accept GeoTIFF
  - Single-band elevation
  - In meters
  - Max file size 250 MB
  - Max dimensions 20,000 × 20,000 px
  - Any pixel resolution that can fit into dimensions and file size
  - Unlimited scene area – will be clipped to project extent



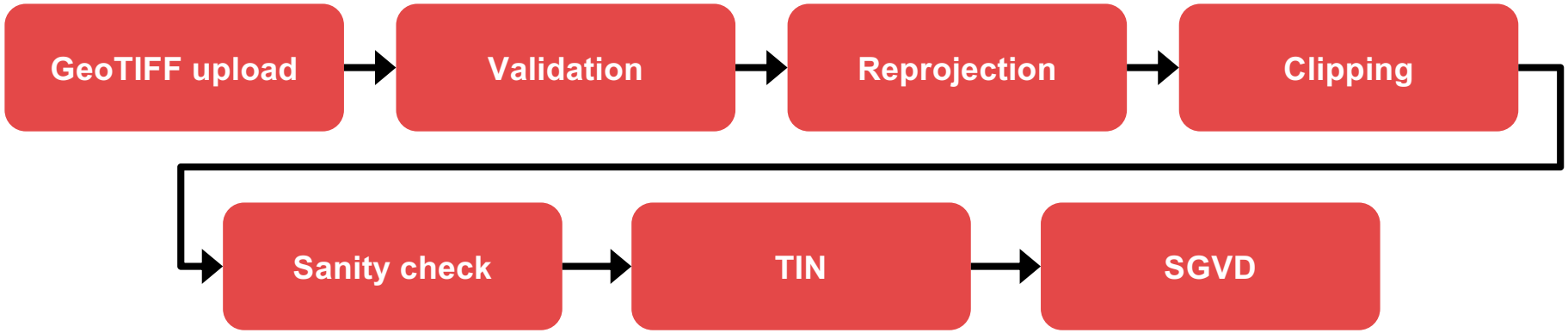
What can go wrong?

- Invalid file format
- Multi-band raster
- Missing CRS
- Unsupported CRS
- No data values
- Elevations out of range
- Out of project extent
- Inconsistent values

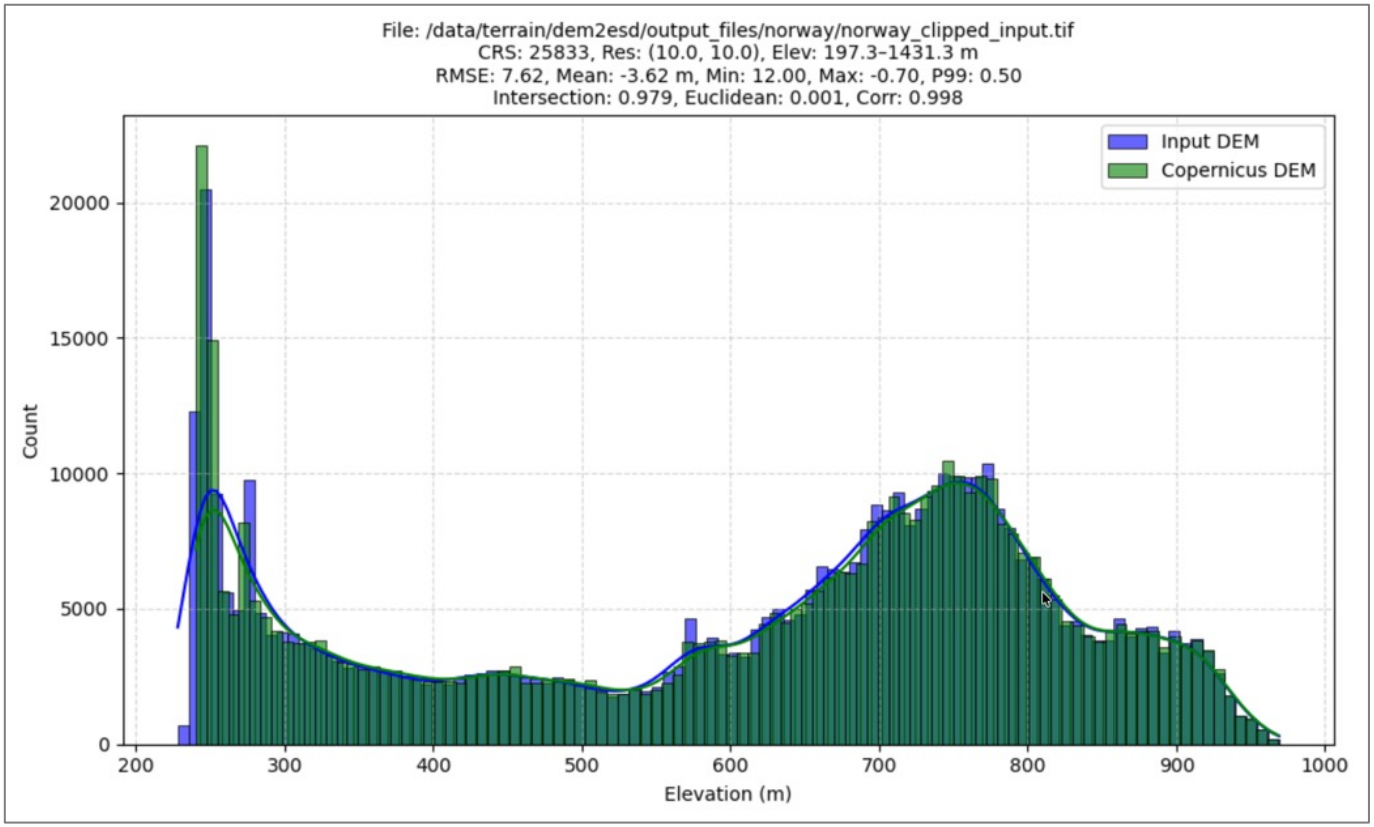


Server-side processing pipeline

Usual processing time ~1-5 minutes



Statistical comparison catches what structural validation can’t



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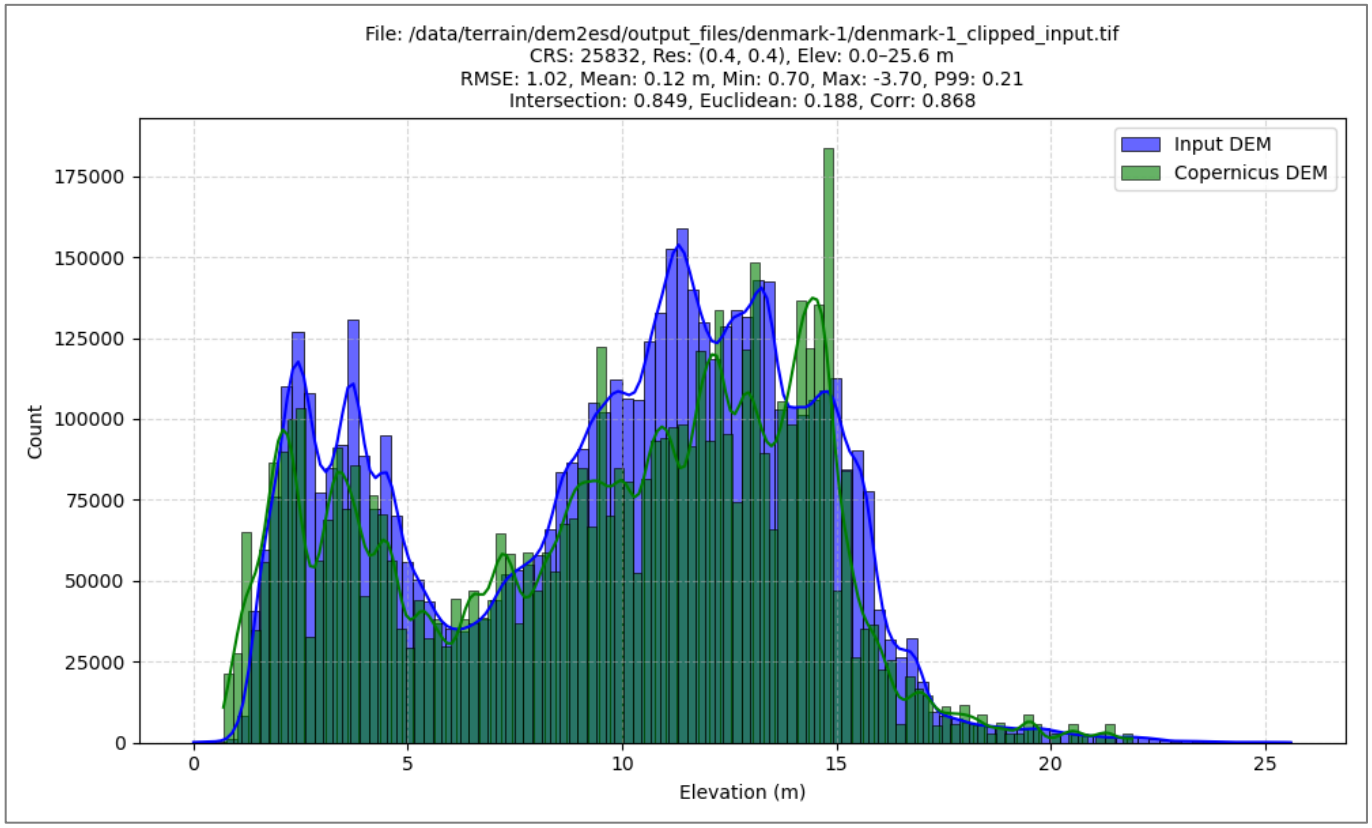

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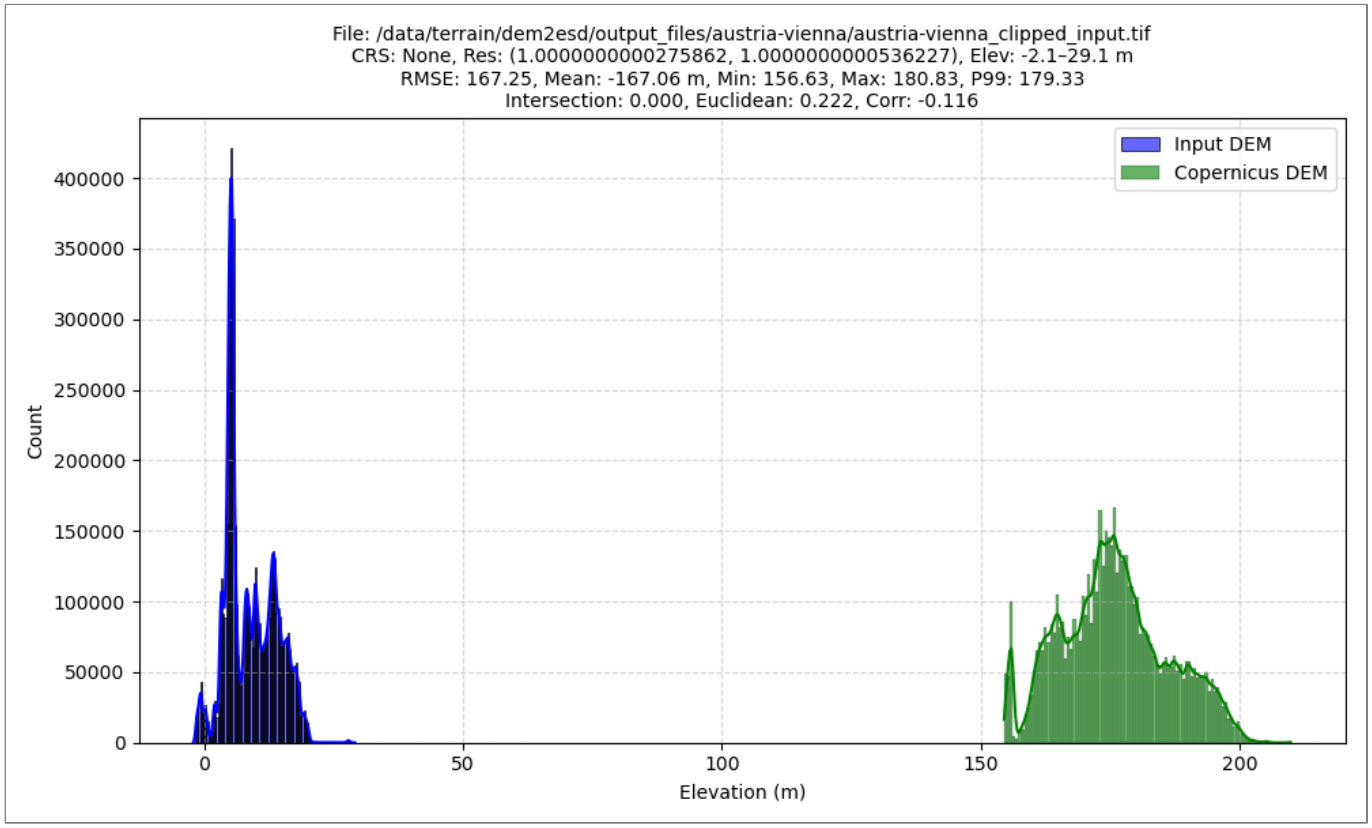

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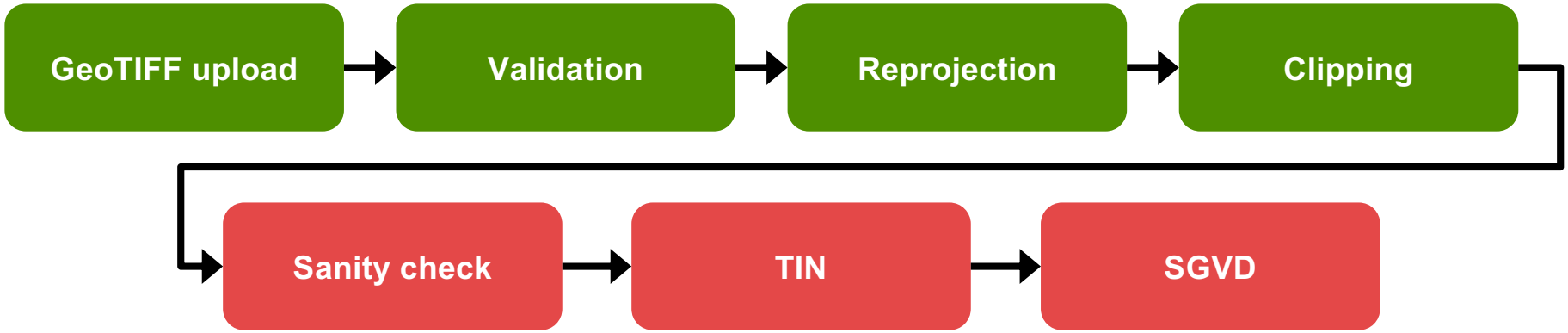
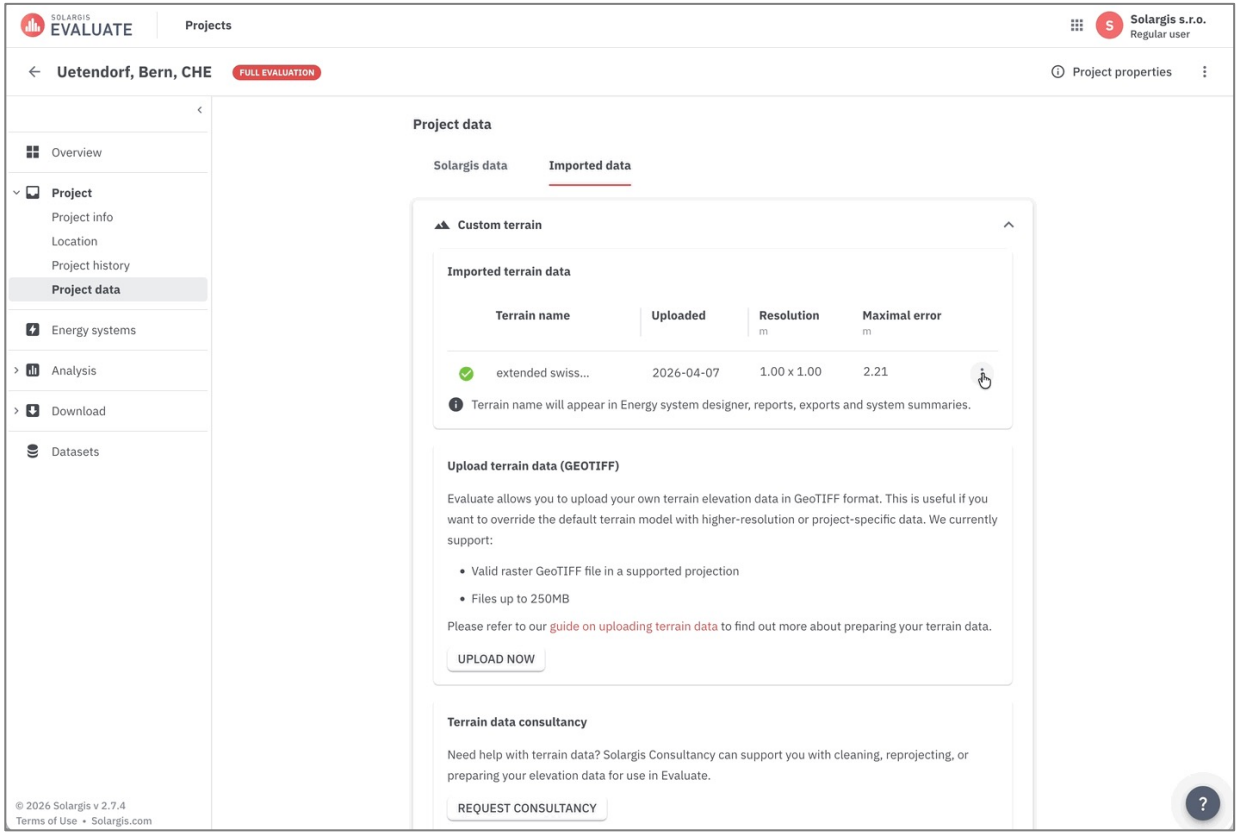


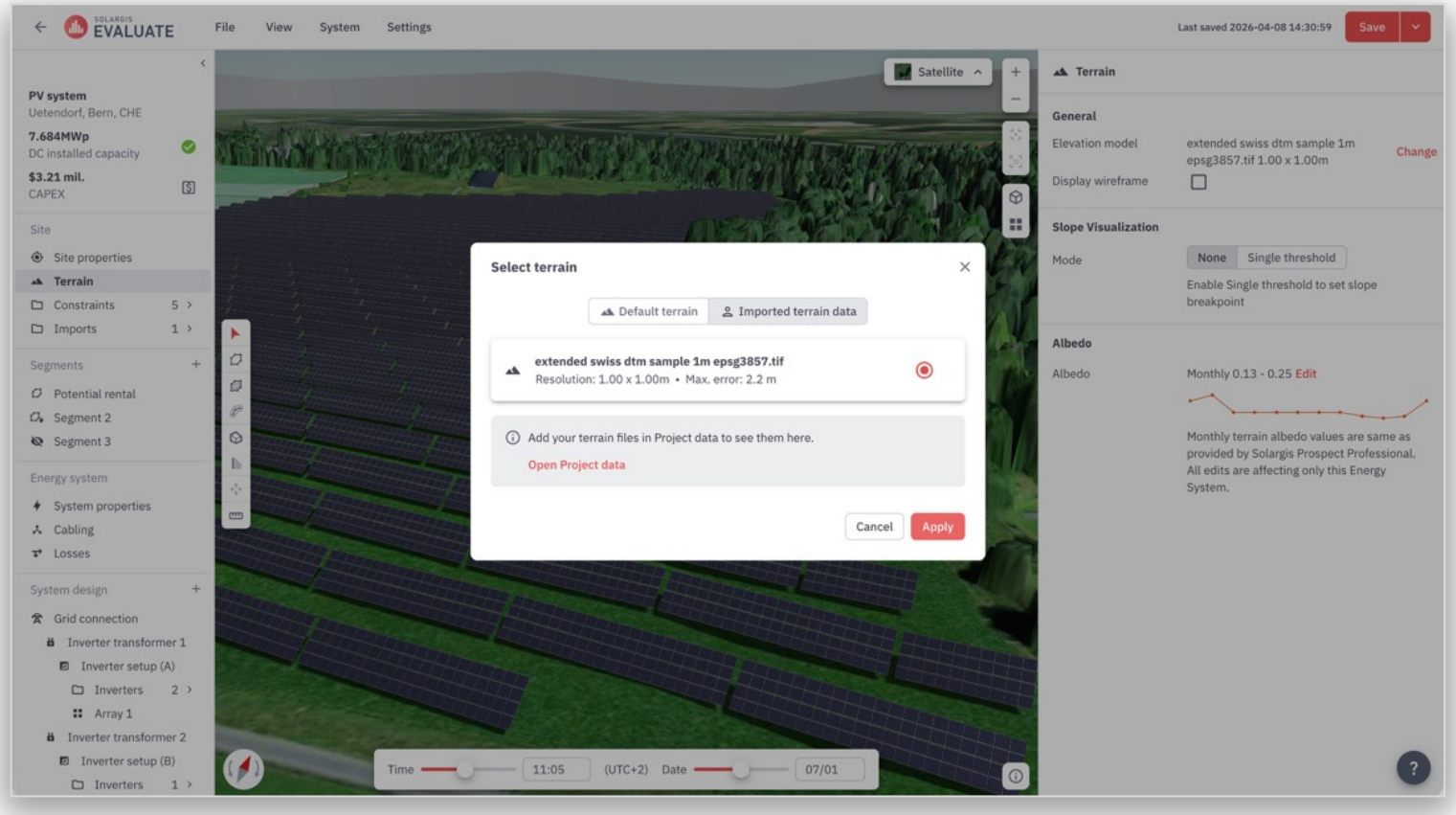
The user gets an essential info

- Achieved max error
- Number of triangles

- Download optimized mesh
- Download original tiff



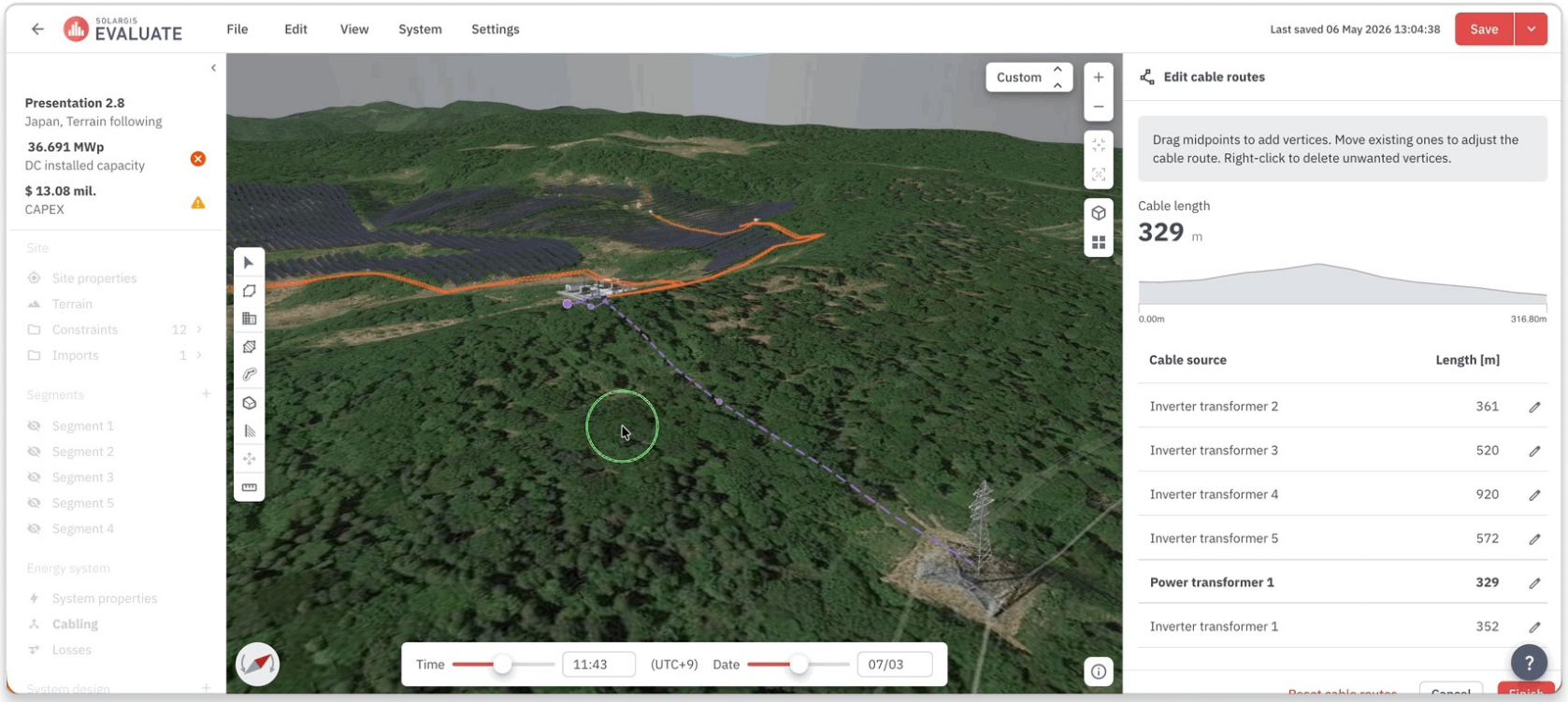
Custom terrain appears in terrain selector



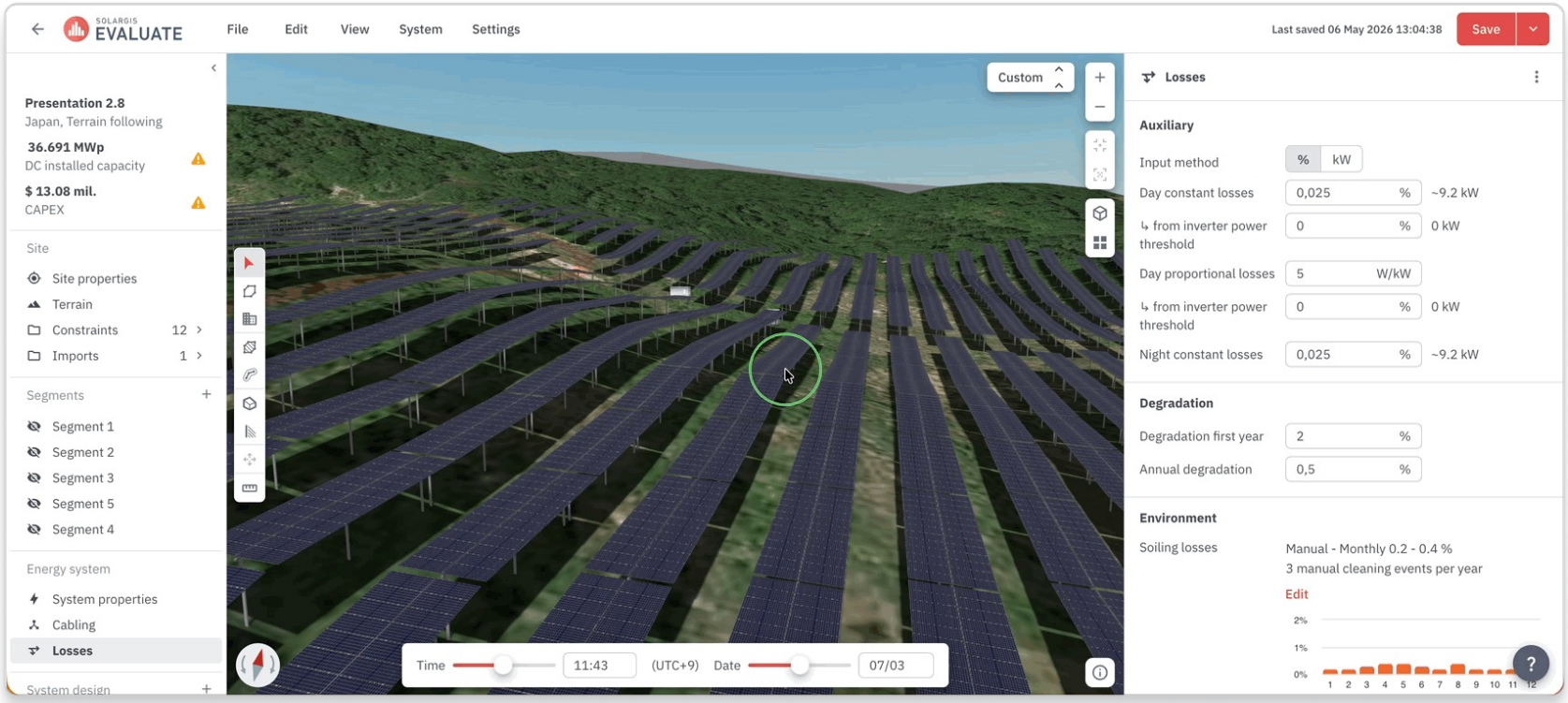
Finally

Leveraging custom hi-res terrain in PV modelling

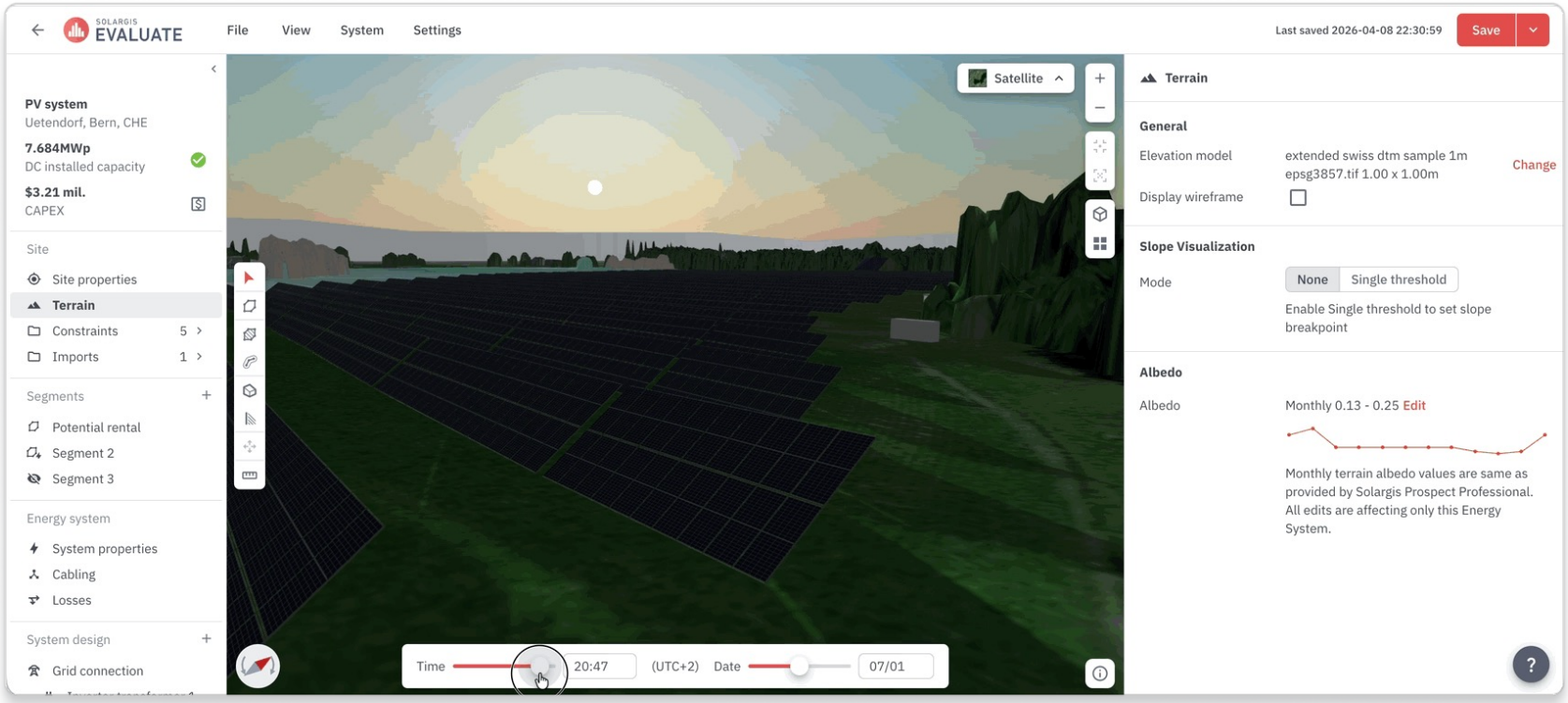
3D cable routes and lengths



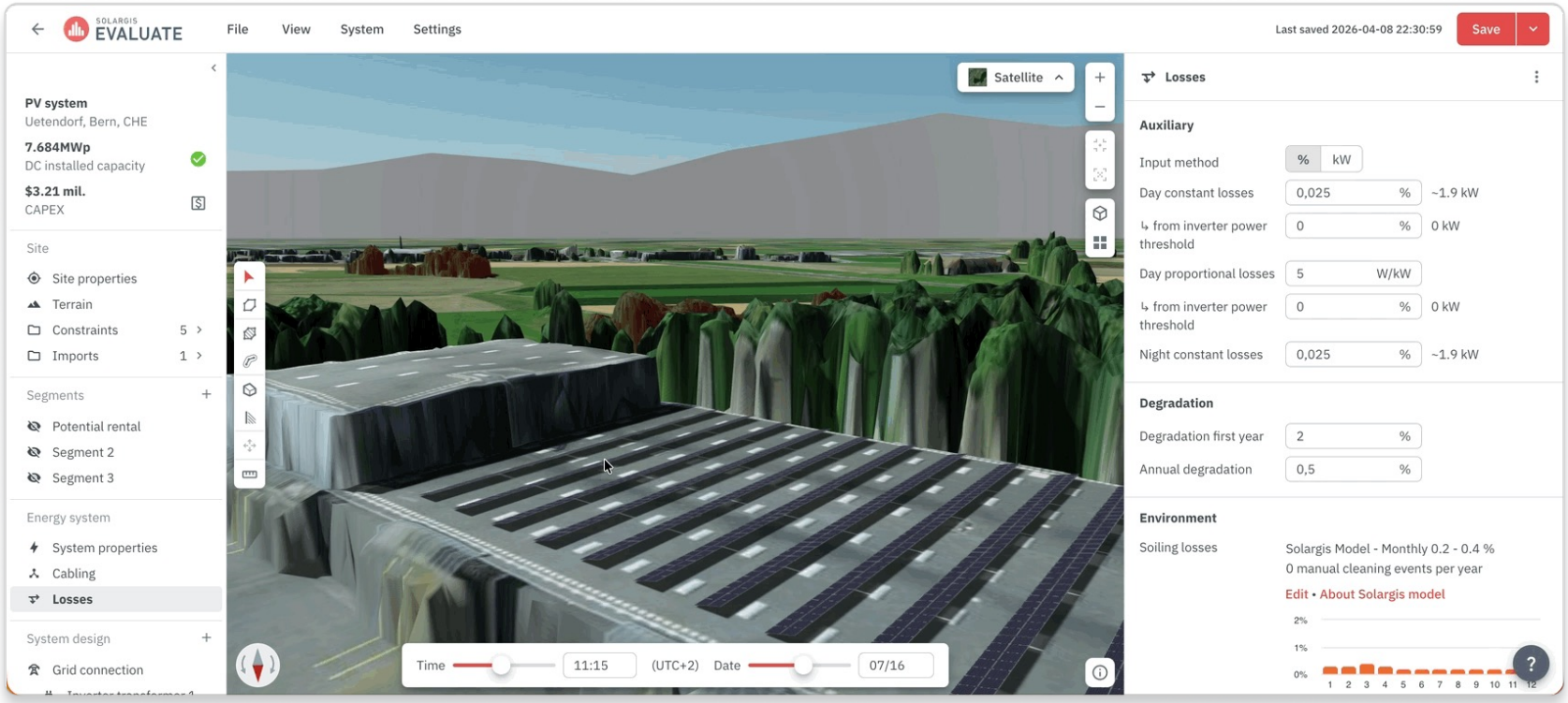
Trackers placed on undulated terrain



Near-shading by Digital Surface Model



Utilizing drone footage for rooftop projects



“Can I upload my own terrain?”

Yes. And here’s what it took.

Thank you.

Tomáš Sasko
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solargis.com