Presubmission enquiry

Mature V3 | Nature Energy Perspective proposal | Not sent

Subject: Perspective proposal — Mapping the scales of instability in inverter-rich power systems

Dear Editors,

I propose a Perspective on an evidence-aware scale framework connecting power-system mechanisms to appropriate modelling studies and regulatory questions. The proposed contribution is an organizing workflow, not a new stability solver or category: mechanism, characteristic scale, evidence, model scope and next study remain explicitly linked.

The synthesis builds on the extended IEEE stability classification, impedance/control literature and four contrasting public cases: South Australia 2016, Great Britain 2019, Odessa 2021 and ERCOT's October 2009 series-compensated Type-3 wind SSCI event. The Continental European separation of January 2021 is a boundary comparator, showing that wide-area consequences are not uniquely converter-driven. The cases overlap; Great Britain's plant resonance is not reduced to a pure inertia narrative, and Odessa's several responses are not labelled one PLL/SSCI mechanism.

Four integrated conceptual figures compare existing methods, trace causal chains, specify study requests and propose a falsifiable reader evaluation. Numerical screening, current-limit visualization and scenario economics are confined to the methods supplement. The scalar field is optional; no probability, Gaussian-to-resolvent theorem, calibrated trip prediction or demonstrated user benefit is claimed. Frozen numerical verification and an unmatched ANDES run are preserved with their limitations, not relabelled as matched validation.

The revised manuscript also distinguishes the scale-and-evidence framework from a conditional operating-region screen: physical inertia, virtual support and converter grid strength are separate quantities, and the sampled margins scope further studies rather than authorize dispatch or establish a universal phase-lock frontier.

I would welcome your assessment of the conceptual scope and its relevance to electricity-transition decisions. The article asks whether an explicit scale-and-evidence view improves mechanism recognition and study selection compared with conventional reports and matrices. That evaluation remains proposed. The enclosed package is an author-review edition, with source verification, licensing and final declarations still to be completed. Guidance on whether the extensive reproducibility supplement is appropriate for a Perspective would also be valuable.

Sincerely,

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Author authorization before sending

The author declares no competing interests. Confirm funding and acknowledgements, institutional and third-party rights, related dissemination and exclusivity, and approval of the exact manuscript and AI-use disclosure. No enquiry, journal submission or public DOI deposit is authorized by producing V3.

Release decision

V3 is a mature document edition, not a new validation claim. Source audits, systematic prior-art review and model-equivalent physical comparisons remain outstanding. A Nature Energy Perspective is not required to complete a proprietary-solver benchmark, but any physical accuracy claim needs adequate evidence. The journal permits up to 3,000 words, six display items and 50 references for Perspectives; these limits were checked against its content-types page on 6 November 2026 (https://www.nature.com/nenergy/content). Non-primary articles may contain only minimal new supporting data: consult the editor on the extensive numerical supplement.

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