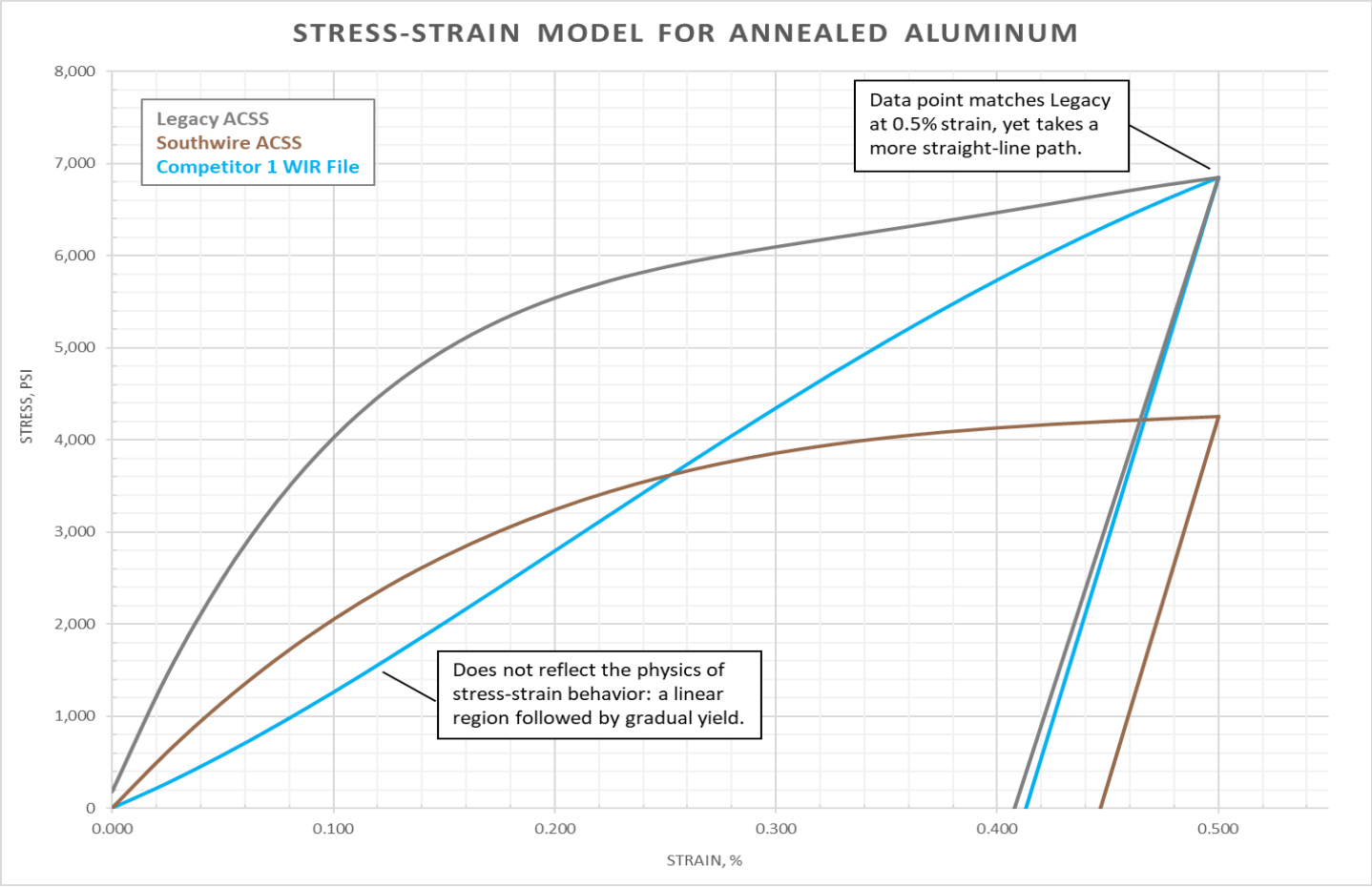
An Analysis of Manufacturer WIR Files

Analysis of recent publicly available competitor WIR files has revealed cause for concern over their accuracy. These WIR files show no relation to empirical data (stress-strain test results) and actually predict overperformance of the conductor. Predicting overperformance of conductors can lead to clearance violations or remove vital safety margin intended for other inaccuracies/unknowns of the line design and installation.

Refer to the two graphs below for an analysis of annealed aluminum data contained in WIR files.



The following are observations of the first graph, which depicts annealed aluminum from ACSS conductor:

1. Testing has shown that significant performance advantages are gained with post-annealed ACSS (Southwire process) compared to pre-annealed ACSS (Legacy process). A lower yield stress results in much less thermal sag, better positioning Southwire ACSS as a high-temperature, low-sag conductor.

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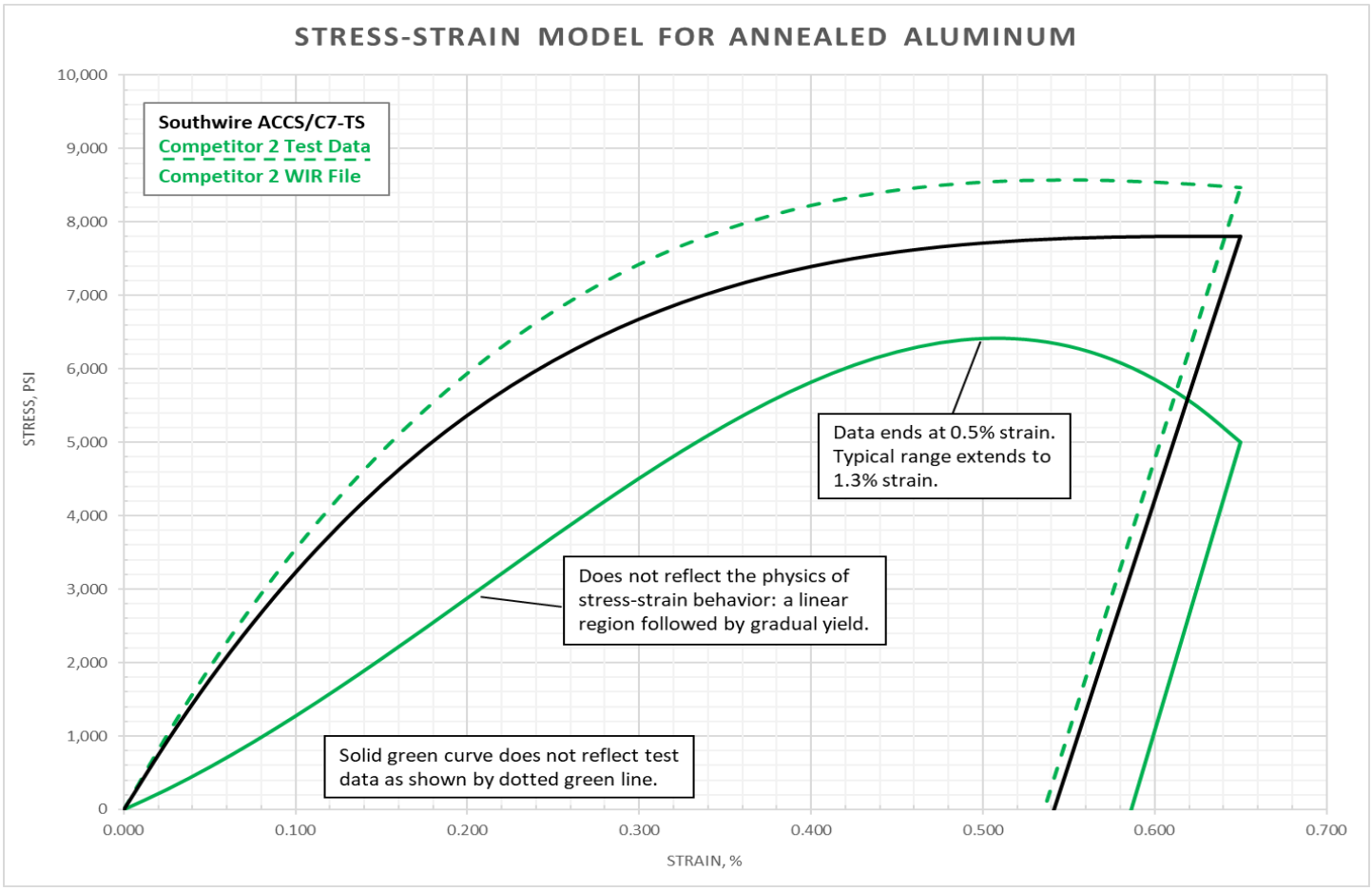
2. The Competitor 1 curve seems to include the 0.5% strain Legacy data point but takes a much more direct path to that data point.
3. The Competitor 1 curve is concave at low stresses and has an inflection around 0.25% strain. Although unseen in the Competitor 1 curve, the physics of stress-strain behavior requires a near-linear region followed by gradual yield of the material. As an example of properly shaped stress-strain curves, consider both the Legacy curve and Southwire curve shown in the graph.



Regarding the second graph, which depicts annealed aluminum from composite core conductors:

1. The annealed aluminum curves from Southwire ACCS/C7-TS and Competitor 2 Test Data agree quite well. Unfortunately, the curve found in Competitor 2 WIR files does not accurately reflect its corresponding test data.

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2. The Competitor 2 WIR file curve starts to drop off at 0.5% strain, which indicates the end of its valid data range. Typical stress-strain tests of composite core conductors yield results out to 1.3% strain, which provides the necessary range for sag-tension modeling.
3. The Competitor 2 WIR file curve is concave at low stresses and has an inflection around 0.25% strain. Although unseen in the Competitor 2 WIR file curve, the physics of stress-strain behavior requires a near-linear region followed by gradual yield of the material. As an example of properly shaped stress-strain curves, consider both the Southwire ACCS/C7-TS curve and Competitor 2 Test Data curve shown in the graph.

Southwire encourages line designers to view with skepticism the stress-strain coefficients contained within WIR files and demand that the publisher of the WIR file provide traceability from actual test data. It is common for designers to obtain hundreds of manufacturer-provided WIR files from a publicly available database. The convenience of such a database is very appealing and seemingly helpful in modeling overhead lines; however, that convenience is masking the deep concern that should be raised over the accuracy of those WIR files. Surprisingly, not all WIR files are built the same. Southwire delivers proven conductor performance through actual test data, while others use theory to overpromise and underdeliver.

Southwire has been testing its conductors for years to ensure recent-production stress-strain and creep data is available to customers. At Southwire, we strive to provide data that depicts actual conductor behavior. Accordingly, we use test data from our own mechanical lab at the Cofer Technology Center when developing Southwire WIR files. Southwire has spent years developing a proprietary protocol for releasing “Southwire Certified” stress-strain charts to the industry. We are the only producer of certified stress-strain charts developed using current test data, meaning you can have confidence in the accuracy of your line design when using Southwire conductor.

Southwire has updated its Southwire Certified WIR file database after performing countless stress-strain and creep tests on Southwire ACSR and ACSS conductors. You can request this database at https://overheadtransmission.southwire.com/sag10/wir-files/.

The Southwire WIR file database now has over 200 ACSR conductors (including ACSR/TW and ACSR/VR2) and over 350 ACSS conductors (including ACSS/TW and HS285 strengths). We have also included a new Southwire Verified folder that includes over 120 ACSR/AW and 120 ACSS/AW conductors (including TW constructions). Southwire Verified stress-strain charts are developed using recent Southwire test data and empirical data for aluminum-clad steel core.

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Southwire WIR files for C[7]® Overhead Conductor, Southwire's newest stranded carbon fiber composite core, high-temperature low-sag (HTLS) offering, are available at https://www.powerlinesystems.com/cables-southwire-c7. These WIR files are also based on data from Southwire tests.

Southwire WIR files for MaxStorm® Overhead Conductor are available on the PLS-CADD website at https://www.powerlinesystems.com/cables-southwire-maxstorm.

Conductor behavior will change among different conductor manufacturers due to differences in material, equipment, and manufacturing methods. Accordingly, we recommend use of manufacturer-specific conductor data for line designs. Southwire expressly prohibits use of Southwire Certified WIR files for conductor from other manufacturers, as the results may not properly represent the conductor behavior. For non-Southwire conductors, please contact the conductor manufacturer for design information.

The data contained in Southwire Certified WIR files is confidential and proprietary to Southwire Company, LLC and is for use in association with Southwire products only. Please do not disclose, distribute, or copy these files without the express written consent of Southwire Company, LLC.