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ARRIS Group, Inc. Supplemental Letter Docket No. 17-AAER-12 Low-Power Mode & Power Factor

Additional submitted attachment is included below.

September 11, 2017

California Energy Commission
Docket Office, MS-4
1516 Ninth Street
Sacramento, CA 95814-5512

Re: 17-AAER-12 (Low-Power Mode & Power Factor)

ARRIS Group, Inc. (ARRIS) hereby submits this letter to supplement the record in the California Energy Commission's Invitation to Participate in the Phase 2 Appliance Efficiency Pre-Rulemaking for Low-Power Mode and Power Factor. Specifically, ARRIS provides additional information to support its statement in its initial comments that imposing broad Power Factor standards on devices that are not federally regulated (*i.e.*, devices with capacitive inputs, but not devices with inductive inputs) would have a distorting effect on the overall Power Factor for the home.[1]

As ARRIS discussed in its comments, households typically include both products with a capacitive input and products with an inductive input.[2] These two categories of devices must be considered in tandem, on a whole-home basis, to get an accurate measure of the overall Power Factor in the home.

To illustrate this point, ARRIS performed tests to measure Power Factor of products with capacitive and inductive loads in an accredited laboratory using fully calibrated equipment. ARRIS first measured the Power Factor of a motor-driven drill (i.e., inductive input) and a set-top box (i.e., capacitive input) separately, and then measured the combined Power Factor of these products. When measured independently, the motor-driven drill had a Power Factor of 0.218, and the set-top box had a Power Factor of 0.437. However, when both products were used together, as products with both capacitive and inductive inputs would be used together in a typical home, the overall Power Factor was 0.39. This shows that adding a capacitive switch mode power to an existing inductive load provides some cancellation of the inductive load, and results in an overall better Power Factor than the average Power Factor of the two products as measured separately.

This type of balancing of inductive and capacitive inputs is widely practiced with networks and higher-powered devices to achieve better Power Factor. Devices with inductive inputs typically have higher power consumption than devices with capacitive inputs, causing networks to trend toward inductance. Inductive loads distort the generated waveform of voltage

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[1] As the Commission recognized in its discussion around the Power Factor issue, most products that consume more than 50 Watts are regulated at the federal level, and are outside the scope of this proceeding. California Energy Commission, Phase 2 Pre-Rulemaking Invitation to Participate Presentation, Slide 95 (May 11, 2017), http://docketpublic.energy.ca.gov/PublicDocuments/17-AAER-05/TN217523_20170510T135340_Invitation_to_Participate_Presentation.pdf.

[2] *See* Comments of ARRIS Group, Inc., Docket Nos. 17-AAER-11 & 17-AAER-12, 3-4 (filed June 16, 2017).

and current by causing the current waveform to lag behind the voltage waveform. In response, network managers will typically add capacitance to a network (typically at the building level) to correct for this distortion and bring voltage and current back in to phase, which improves the overall Power Factor of the network. Similarly, switch mode devices distort the generated waveform with a discontinuous capacitive load.[3] Low-powered switch devices with capacitive inputs such as set-top boxes and small network equipment typically improve the overall Power Factor of the home by partially correcting for the inductive inputs of other devices in the home. However, for devices with higher-powered capacitive inputs, usually used commercially, manufacturers typically add inductance to the input circuit to improve the Power Factor.

If the Commission were to require Power Factor correction only for capacitive input devices like small network equipment, such an approach would skew the balance of capacitive and inductive loads, causing the overall power in the home to become more inductive, and resulting in a worse overall Power Factor for the home. As ARRIS explained in its comments, this would lead to utilities having to generate more energy than needed for the home, while having no impact on the customer's energy usage or bills. It would also lead to higher retail equipment costs for consumers.

For these reasons, ARRIS requests that the Commission decline to set Power Factor standards or impose additional reporting obligations.

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Please contact me if you have any questions regarding this matter.

Sincerely,

/s/ Jason E. Friedrich
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Vice President, Government
& Regulatory Affairs
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[3] Products with capacitive loads typically draw current for between five and twenty-five percent of the duty cycle. These products affect the overall load of the network during the time they draw current.