EXHIBIT 3
(PUBLIC)

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
ALEXANDRIA DIVISION

SECOND SUPPLEMENTAL REBUTTAL EXPERT REPORT OF JOSEPH C. McALEXANDER III REGARDING VALIDITY OF U.S. PATENT NUMBERS: 6,803,545 AND 10,420,374

RJR STRATEGIC HOLDINGS, INC. AND R.J. REYNOLDS VAPOR COMPANY
vs.
ALTRIA CLIENT SERVICES LLC; PHILIP MORRIS USA INC.; and PHILIP MORRIS PRODUCTS S.A.

Civil Action No. 1:20-cv-00393-LO-TCB

May 10, 2021

94. Dr. Fuller furthers states that the specification in the '545 Patent was inaccurate when it states "[l]ithium ion batteries are not suitable for other portable equipment, *e.g.*, cordless power tools, because these devices require a great amount of current when performing work, *e.g.*, driving a screw with a cordless electric power drill."[7] Yet, as I describe below, that was well-known and repeated throughout the prior art. The references cited by Dr. Fuller to attempt to support his statement are further discussed below.

7.1.1 Development of the '545 Patent

95. I understand that ACS was interested in using lithium batteries in their "beta" project. However, when the project started around 1990, ACS recognized that the current emphasis for lithium-ion battery technology was in "low power applications."[8] In fact, ACS recognized that "the realization of the required power densities will require significant advances over the current state-of-art and is by no means certain."[9] As such, ACS was uncertain as to whether it could in fact use lithium-ion batteries in its electrically heated smoking systems.[10]

96. In an August 16, 1990 study, ACS looked at the potential usage of lithium-ion and other battery technologies. During the study, ACS recognized that the lithium-ion technology was "only just emerging" and "intended mostly for smaller current drain devices."[11] Further, while the study showed lithium-ion batteries had improved advantages in delivering energy, ACS also found that those advantages diminished at higher rates of discharge. ACS also recognized that the lithium liquid electrolyte systems it was testing were "unsuitable for the β-articles from a safety viewpoint"

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[7] *Id.*, at ¶ 53.
[8] 1990 Document on Longer Term Development, DEF_PUB_EDVA000055476, at DEF_PUB_EDVA000055476.
[9] *Id.*
[10] *Id.*
[11] August 16, 1990 Memo, DEF_PUB_EDVA000055481, at DEF_PUB_EDVA000055482.

and that "[t]he present polymer electrolyte battery technology is inadequate for the β-program."[12] They recognized that it would be "unlikely that a battery company w[ould] have a high-energy/high-power density ambient temperature battery for [ACS'] application in five years."[13]

97. In September 1991, ACS continued running tests on both Ni-Cd and lithium-ion batteries. Those tests showed that "[t]he Ni-Cd system overwhelmingly demonstrated superiority over the lithium system for the eight-puff device."[14] Again, the testing noted that lithium-ion batteries were "undergoing a major change" and that a "more conscious effort" was being made "towards safety of rechargeable lithium cells at the expense of energy density."[15] Further, this document noted that more development was needed for a "solid polymer electrolyte" lithium battery.[16] The special features of these systems were that they were safer than the then available lithium metal anode cells. However, lithium polymer batteries were reported to require "considerable development effort to demonstrate these features" including "safety" and "cycle life."[17]

98. In 1992, ACS' pipe dream of using lithium-ion batteries continued. In testing that ACS conducted using pulse recharging, ACS recognized that "[i]mplementation of [lithium] technology is probably too far off to be considered in our first generation articles."[18]

99. Based on its testing, ACS concluded that "[l]iquid electrolyte secondary lithium batteries might provide significant reductions to the size and weight of the pack battery, but some

[12] *Id.*, at DEF_PUB_EDVA000055489-90.
[13] *Id.*, at DEF_PUB_EDVA000055490.
[14] Sep. 11, 1991 Memo, DEF_PUB_EDVA000055533, at DEF_PUB_EDVA000055534.
[15] *Id.*, at DEF_PUB_EDVA000055541.
[16] *Id.*
[17] *Id.*.
[18] April 8, 1992 Document, DEF_PUB_EDVA000055555, at DEF_PUB_EDVA000055559.

question of their safety remain[ed]."[19] ACS was looking for improvements in its technology to safely use a lithium-ion battery in its products.

100. Recognizing its inability to use a lithium-ion battery in its smoking systems, ACS again determined, due to their rate limitations and lower energy density, it was "unlikely that a small size may be ever available for a cigarette size device."[20] Meanwhile, while "li polymer" batteries seemed promising, ACS anticipated that "it may be at least 5 to 10 years with heavy developmental backing from [ACS] when this technology may be in a position to be applied for the cigarette size device."[21] Indeed, for high-energy requirements, ACS recognized that "there [was] no system currently, and nor will there be one in ten years time that will provide an all-day smoke from a cigarette size device."[22]

101. I understand that ACS brought in a consulting firm "Arthur D Little" to help with getting lithium-ion batteries to work in the project. In February 1993, Arthur D. Little provided input as to the technical issues for battery options for the beta project.[23] It compared Ni-Cd, Ni-metal hydride, and lithium-ion. It recognized that lithium-ion technology had "limitations within the timeframe of interest" and that "[s]afety of [lithium-ion] system [was] not fully demonstrated."[24]

102. By 1994, ACS considered trying to use lithium-ion batteries by reducing power requirements for its electrically heated smoking system. In one memo, Grier Fleischhauer reported that they could potentially pursue a different type of heater that could be "designed" for "higher

[19] April 13, 1992 Document, DEF_PUB_EDVA000055565, at DEF_PUB_EDVA000055567.
[20] April 23, 1992 Document, DEF_PUB_EDVA000055569, at DEF_PUB_EDVA000055570.
[21] *Id.*
[22] *Id.*.
[23] Feb. 22, 1993 Arthur Little, DEF_PUB_EDVA000055573.
[24] *Id.*, at DEF_PUB_EDVA000055579.

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