

# EXHIBIT D

Rough Draft

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I N T E R - O F F I C E      C O R R E S P O N D E N C E

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To: Bernle LaRoy

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Subject: Battery Development Strategies for 1994

Short-Term Goal - 2 years or less

Conventional Battery Systems

Current BETA prototype - 4N50AAA (4.7cc / 14g)  
Eight puffs @ 20Ws / charge

Further development - Eight-puff battery

Contact at least three suppliers of cylindrical Ni-Cds for availability of cells and who would be able and willing to work on development contracts with PM. Currently, Sanyo is the only supplier of N50AAA. However, Panasonic and Toshiba could also make that configuration if required. The immediate need from these manufacturers are:

- (1) Request deliverable N50AAA size by 1994 ( 300,000 to 500,000).
- (2) Request development undertakings (2 to 5 man-year) to reduce weight/volume of N50AAA by 20 to 25%.
- (3) Request improved design of category (2) using metal hydride negative electrode with some small but further improvements in the size.

Extensive interfacing with each manufacturer and battery development testings will need to be made on (2) and (3) to determine level of improvement in performance and safety. It may only be necessary to identify one able and willing manufacturer initially. But one back-up is necessary who can take over from where one manufacturer left-off in the development program. This may be costly, but will prove to be more worthwhile in terms of guaranteed delivery of the product on a timely basis.

"Mother Pack"

Current mother pack today can be 6-Ni-Cd of appropriate capacity (72-84g/23-30cc). Current Ni-MH are not available in a configuration other than "AA" and "C" sizes. If they were available, then the Ni-MH would give a reduction in weight and volume of about one-third over Ni-Cd.

Li-Ion battery System

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This is an exciting new system currently being commercialized by Sony Energytec for cellular and cordless telephone applications. Because of the rate limitation imposed on this system by the conductivity of the non-aqueous electrolyte, this system is not advantageous for an eight-puff device since the size reduction is negligible. This remains to be evaluated once more data is available. However, it has been projected that a larger pack than what might be for an eight-puff may be sufficient to power an all day smoke at 20Ws energy. The projected size is 50-60% of the current available size (40g/16.8cc). The "AA" size which may be available has been requested through Jewett Automation. This may be more than adequate for the mother pack. Unfortunately, smaller configurations are unavailable but development plans with a number of Japanese battery companies may help bring about this need. This system holds the highest promise for the lithium power source. If enough attention is paid to this technology right away, then the right battery may be available by 1994 for an all day smoking device. The potential for this system is there for use as an all day smoke or as the mother pack by 1994.

Long-Term Goal - >> 2 years

#### Li-Ion Battery

As described above, this appears to be the best system for the long-term effort today and can provide an all day smoke in a reasonably small size (20g/8cc). However, with the rate limitation and lower energy density than conventional lithium rechargeables, it is unlikely that a small size may be ever available for a cigarette size device.

#### Li Polymer Electrolyte battery

This system holds the highest promise for an all day smoke in a cigarette size device providing 10Ws is the energy requirement. The snag is that it is unclear where this technology is going. Developmental effort is not aimed at making small size cells. Much of the effort is aimed at making batteries for lap-top computers or other larger applications. However, initial results on the laboratory scale indicates that this system is capable of rates as high as 50C and with excellent cycling characteristics. It is anticipated that it may be at least 5 to 10 years with heavy developmental backing from PM when this technology may be in a position to be applied for the cigarette size device. A humongous R & D task is required in the meantime. For an energy requirement greater than 10Ws, there is 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. The energy requirement has to be reduced for a pleasing subjective in order to realize the ultimate goal.

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