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August 1, 2002

**Via Electronic Filing**

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 12th Street, S.W.  
Washington, D.C. 20554

Re: Ex Parte Presentation In the Matter of Review of the Commission's Rules  
and Policies Affecting the Conversion to Digital Television (MM Docket 00-39)

Dear Ms. Dortch:

The enclosed analysis is submitted as an *ex parte* presentation in the above docket.

In accordance with Section 1.1206 of the Commission's Rules, 47 C.F.R. §1.1206, an original and one copy of this letter, including the attachment, is being filed with your office. Please direct any questions concerning this matter to the undersigned.

Very truly yours,



David R. Siddall  
for PAUL, HASTINGS, JANOFSKY & WALKER LLP

Enclosure



July 30, 2002

**Comments of Coleman D. Bazelon and T. Christopher Borek Relating  
to Arthur D. Little, Inc.'s Assessment of the Impact of DTV on the  
Cost of Consumer Television Receivers<sup>1</sup>**

These comments have been prepared at the request of the Consumer Electronics Association ("CEA"). CEA has asked us to comment on a white paper by Arthur D. Little, Inc. ("ADL"), "Assessment of the Impact of DTV on the Cost of Consumer Television Receivers" ("ADL Study").<sup>2</sup> Particularly, CEA has asked us to address the shortcomings associated with the analytic framework relied on by ADL in projecting the impact that a Integrated Digital Receiver ("IDR") Mandate would have on future television sales, prices, and manufacturing costs and on the future penetration of integrated digital receivers into the consumer marketplace.

The ADL Study includes a number of shortcomings that undermine the reliability of its projections. Specifically, the ADL IDR Mandate projections appear to understate future television prices and manufacturing costs and overstate future televisions sales by

- violating a basic economic principle by not accounting for the impact that higher future television prices – driven by the cost of integrating digital receivers – would have in driving down future television sales;
- not accounting for the corresponding impact that fewer television sales would have on experience/sales-driven, cost-saving efficiency gains they project of IDR manufacturing costs; and

<sup>1</sup> Dr. Bazelon and Dr. Borek are both economists at Analysis Group/Economics in Washington, DC.

<sup>2</sup> The ADL Study was prepared for Maximum Service Television ("MSTV") and National Association of Broadcasters ("NAB") and finished on September 10, 2001. DTV refers to digital televisions.

- inappropriately assuming that television manufacturers can fully and instantaneously incorporate the cost-savings benefits of experience/sales-driven efficiency gains from as much as 25-fold increases in annual sales volume.

The effects of each individual shortcoming on future television sales, prices, and manufacturing costs amplify the effects of the other shortcomings. Such is the case, as well, with another apparent shortcoming, that ADL understates current IDR manufacturing costs. It follows that the cost of an IDR Mandate to television consumers and producers may be significantly more enduring than suggested by the ADL Study. Further, by overestimating future television sales, ADL has overstated its projected household penetration rates of televisions with IDRs.

#### **Description of ADL Study**

The ADL Study directly analyzes the impact that two specific IDR Mandate scenarios (a “Mandate Scenario” and a “Phased Mandate Scenario”) would have on TV manufacturing costs, TV retail prices, and DTV adoption over the 2001 to 2015 time period and compares these to a “Baseline Scenario.” Under the Baseline Scenario, DTVs are assumed to be adopted in a manner similar to past adoptions of color TVs. ADL assumes that increasing sales over time will reduce per unit costs by 25 percent each time sales volumes double.<sup>3</sup> DTV retail prices are assumed to be 80 percent above manufacturing costs.<sup>4</sup> Under ADL’s baseline projections, digital receivers cause an incremental increase in 2001 television set manufacturing costs of \$100 per unit and, with the 80 percent markup assumption, a \$180 per unit increase in retail prices. Annual DTV purchases are projected to grow from 0.21 million in 2001 to 23.32 million in 2014, the year that at least 85 percent of American households are first projected to have DTVs.<sup>5</sup>

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<sup>3</sup> ADL Study, p. 59.

<sup>4</sup> ADL Study, pp. 63-64.

<sup>5</sup> ADL Study, p. 72. The 85 percent threshold is referred to because, according to current legislation, it triggers the reallocation of radio spectrum currently utilized for the transmission of broadcast signals.

The "Mandate Scenario" considered by ADL assumes that, starting in 2004, standard definition digital receivers will be integrated into all newly produced televisions. A standard definition digital receiver would be able to receive any digital broadcast format, but would only produce a standard definition quality picture. DTV adoption rates and digital receiver costs through 2003 are projected to be identical to those in the Baseline Scenario.<sup>6</sup> Annual DTV sales are projected to be 26.5 million in 2004 and to increase 1.5 percent annually in subsequent years. Projections of future reductions in digital receiver manufacturing costs follow the same sales volume driven "learning curve" formula applied in the Baseline Scenario. Thus, starting in 2004 when annual DTV sales are projected to increase more than 25-fold, the cost of manufacturing digital receivers falls below that in the Baseline Scenario. By 2006, for example, the manufacturing cost of installing an IDR into a television set will be \$8 under the Mandate Scenario versus \$21 under the Baseline Scenario. The corresponding impact on television retail prices is projected to be \$15 versus \$38, respectively. Further, at least 85 percent of American households are projected to have DTVs by 2007 under the Mandate Scenario, 7 years earlier than under the Baseline Scenario.

The "Phased Mandate Scenario" considered by ADL assumes that, starting in 2003, all television sets with screen sizes 32 inches or larger will be produced with integrated standard definition digital receivers. In subsequent years progressively smaller television sets are required to be produced with such receivers. By 2006, it is assumed that all television sets will be produced with IDRs. By 2006, the manufacturing cost of installing an IDR into a television set is projected to be \$9 under the Phased Mandate Scenario.<sup>7</sup> The corresponding impact on television retail prices is projected to be \$16. Also, like in the Mandate Scenario, at least 85 percent of American households are projected to have DTVs by 2007. As these figures illustrate, the

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<sup>6</sup> ADL Study, p. 72 and p. 74.

<sup>7</sup> ADL Study, p. 77, for projections under the Phased Mandate Scenario.

projected impact of the Phased Mandate Scenario does not vary substantially from that of the Mandate Scenario.<sup>8</sup>

### Comments On ADL Approach

ADL considered a variety of permutations in testing the robustness of its analysis, including variations in sales volume, cost, and price assumptions. As a result, ADL concludes that the results of its analysis “are not overly sensitive to the key assumptions.”<sup>9</sup> However, the ADL Study does not test all key assumptions and includes a number of shortcomings that undermine the reliability of the projections they make regarding the impact of an IDR Mandate.

One shortcoming of the ADL Study is that, although the installation of IDRs will result in higher television prices, the ADL projections do not factor in the effect higher television prices would have in driving down television sales. In the Baseline and both Mandate Scenarios, ADL projects total television sales (digital and analog) to be 25 million units in 2000 and to grow at an annual rate of 1.5 percent. That is, the total number of televisions projected to be sold annually in the three scenarios is identical.<sup>10</sup> Yet, under both Mandate Scenarios, a substantial number of television sets are projected to be more expensive than they would be under the Baseline Scenario, simply because of the required installation of IDRs. For example, 26.5 million television sets are projected to be sold in 2004. Under the Baseline Scenario only 1.6 million television sets include IDRs while, under the Mandate Scenario, all 26.5 million sets sold include an IDR.<sup>11</sup> ADL assumes that the approximately 25 million television sets that make up difference would be purchased even though the retail price of those sets is projected to be \$23.40

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<sup>8</sup> The slower adoption of IDRs under the Phased Mandate Scenario is somewhat offset by its one year earlier start.

<sup>9</sup> ADL Study, p. 13.

<sup>10</sup> ADL Study, p. 61, and note that DTV sales are  $25 \cdot (1.015)^{\text{year}-2000}$  in years 2004 and later in the Mandate Scenario (p. 74) and in years 2006 and later in the Phased Mandate Scenario (p. 77).

<sup>11</sup> ADL Study, p. 72 and p. 74.

higher under the Mandate Scenario.<sup>12</sup> This violates a basic principle of economics, namely, the Law of Demand. That Law states that if the price of a product increases, the unit sales of that product will decrease. The ADL mandate projections imply that the number of televisions sold is invariant to the price of televisions.<sup>13</sup>

The Law of Demand recognizes that the higher television prices faced by consumers under an IDR Mandate will result in fewer television sales. Estimating the impact an IDR Mandate would have on television sales requires a more sophisticated analytic approach than that employed in the ADL Study.

A second shortcoming of the ADL Study follows from the first. Because ADL did not account for the decline in television sales that would likely accompany an IDR Mandate, their projections overstate the degree to which the cost of installing IDRs into television sets fall as a result of experience/sales driven efficiency gains. Recall that ADL projected the manufacturing cost of installing an IDR into a television set would fall 25 percent each time sales levels doubled. By overstating future television sales under the IDR Mandate scenarios (which follows from the first shortcoming), ADL has overstated the rate at which televisions sales are projected to double. Accordingly, ADL overstated the degree to which television manufacturing costs and, consequently, television prices would fall.

The first and second shortcoming, when taken together, suggest that an IDR Mandate would have a more enduring effect on television prices and sales than suggested by the ADL Projections. Because television sets would be more costly to produce under an IDR Mandate, television set sales in the first year impacted by the mandate would be lower than projected by

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<sup>12</sup> ADL Study, p. 74.

<sup>13</sup> IDRs are likely to contribute only negligibly to the value consumers place on the television sets. The ADL analysis assumes that standard definition IDRs will be required by a Mandate and project manufacturing costs and television prices accordingly (ADL Study, p. 52 and p. 72). According to CEA, the incremental benefits of a digital television picture displayed on an analog set are marginal at best.

ADL (first shortcoming). It follows that, since sales are less than projected by ADL in the first year, first year experience driven cost-savings along with first year television price declines would be less than projected by ADL (second shortcoming). Consequently, second year television prices would reflect a higher than projected manufacturing cost and, consequently, an IDR Mandate would dampen television sales in its second year. Because this cycle would cascade through the following years, the impact an IDR Mandate would have on television sales, price and manufacturing costs would be more enduring than suggested by the ADL projections.

A third shortcoming of the ADL Study is that ADL's projections of the annual per unit cost of integrating a digital receiver into a television set reflect an assumption that the experience-based efficiency gains realized by television manufacturers are driven by sales volumes and are independent of the amount of time required to learn by experience. That is, doubling the sales of television with IDRs is projected to reduce the manufacturing cost of installing an IDR by 25 percent, regardless of whether it takes a long time for sales to double (e.g., a decade) or a short time (e.g., a month).<sup>14</sup> ADL motivates this assumption based on its observation that "production efficiency improves with experience and results in reduced labor and costs of production."<sup>15</sup> When a given year's production accounts for as much as 26.5 million of the 28.2 million integrated digital receivers produced to date, a scenario examined in the ADL analysis, such an assumption appears rather aggressive.<sup>16</sup>

To see just how aggressive the ADL Study's use of the cost reductions are, one only needs to examine the learning by doing hypothesis underlying the projected cost reductions. One important driver of the increased efficiencies and, hence, reduced costs from increased

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Further, according to CEA Market Research, only 13 percent of households rely on over-the-air broadcast for their primary video signal.

<sup>14</sup> See the cost reduction expression on p. 59 of the ADL Study and note that projected cost reductions are a function of sales volumes in a given year and not the length of time it took a given amount of sales to occur.

<sup>15</sup> ADL Study, p. 59.

production comes from the improvements embodied in successive generations of manufacturing equipment. The paper they rely on by Harald Gruber notes that incremental costs are driven by current output, cumulative output and “time that has elapsed since production started”.<sup>17</sup> The estimates used from that paper are based on production data generated in the normal course of manufacturing and, even if appropriate for the base case, would be inappropriate for the accelerated production of either Mandate Scenario. To scale annual production up 25-fold would require significant duplication of current manufacturing technologies without the advantages of successive generations of manufacturing equipment that would be enjoyed if the same level of output was produced over 5 years, as in the baseline scenario.<sup>18</sup> If, as it appears to have done, ADL inappropriately ignored the time it takes to process experience efficiencies, their projections understate future television prices and manufacturing costs under the IDR Mandate scenarios considered.

A fourth apparent shortcoming of the ADL Study is that it may understate the current costs to television manufacturers of integrating digital receivers. According to “Comments of Thomson Multimedia, Inc.” the current manufacturing cost of installing an IDR capable of standard digital reception is between \$200 and \$295 per unit.<sup>19</sup> ADL projected that the manufacturing cost of installing a standard definition IDR in 2002 would be \$60 per unit.<sup>20</sup> Because of the sequential nature in which ADL projects future television manufacturing costs, any understatement of current costs will initiate the learning by doing process from too low of a base and, consequently, understate future television manufacturing cost and retail prices.

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<sup>16</sup> ADL Study, p. 74.

<sup>17</sup> Harald Gruber, “The Yield Factor and the Learning Curve in Semiconductor Production”, *Applied Economics*, 1994, 26, p. 837.

<sup>18</sup> ADL Study, p. 72 and 74. Under the Mandate Scenario, cumulative DTV sales are projected to reach 28.2 million in 2004, the first year the mandate goes into effect, while under the Baseline Scenario, cumulative DTV sales are not projected to reach that amount until 2009.

<sup>19</sup> Comments of Thomson Multimedia, Inc. in MM Docket No. 00-39, p. 6.

<sup>20</sup> ADL Study, p. 72.

Like with the first two shortcomings, the latter shortcomings also exacerbate the degree to which ADL's projected television sales are overstated and retail prices and manufacturing costs are understated with an IDR Mandate. As described above, this exacerbation follows from the cascading impact that higher manufacturing costs in earlier years would have on the later year projections.