NATIONAL EXCHANGE CARRIER ASSOCIATION, INC.

ACCESS SERVICE
TARIFF F.C.C. No. 5

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VOLUME 1: DESCRIPTION AND JUSTIFICATION

Defines the purpose of the filing, describes the rate structure of the access services and summarizes results.

VOLUME 1-2: TARIFF REVIEW PLAN

VOLUME 2: DEVELOPMENT OF ACCESS ELEMENT REVENUE REQUIREMENTS

Provides a projection of the companies' interstate investments, expenses, revenues and taxes for the past year cost of service study and test year.

VOLUME 3: DEVELOPMENT OF BASELINE DEMAND AND REVENUES

Provides the development of the demand quantities and revenues for the test year at current rates.

VOLUME 4: COMMON LINE RATE DEVELOPMENT

Describes and documents the procedures used to develop Common Line Rates, Federal Universal Service Charges, and Consumer Broadband-only Loop rates.

VOLUME 5: TRAFFIC SENSITIVE RATE DEVELOPMENT

Describes and documents the procedures to develop recurring and non-recurring rate levels for Switched Access and Special Access services. It also describes the procedures used to develop miscellaneous charges for additional engineering, maintenance and testing of these services, as well as describing the development of Eligible Recovery, ARC rates, and CAF ICC support estimates.

Volume 3

DEVELOPMENT OF BASELINE DEMAND AND REVENUES

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DEVELOPMENT OF BASELINE DEMAND AND REVENUES

Section 1

INTRODUCTION

A. OVERVIEW

This Volume describes the development of the demand forecasts for the access lines and Consumer Broadband-only Loop (CBOL), Traffic Sensitive Switched Access and Traffic Sensitive Special Access categories. Section 2 describes the development of access line forecasts by service category based on historical and forecasted access line counts together with service category shares received from Common Line pool participants. It also describes the source of data for CBOL forecasts. Section 3 describes the development of interstate local switching minutes of use (LS MOU) forecasts which are used to pre-populate the interstate MOU in the Connect America Fund Intercarrier Compensation (CAF ICC) data collection[1] NECA conducted in April. It also describes the CAF ICC Data Collection for fiscal year 2017[2] historical data and 2018/2019 test period projections of intrastate and interstate switched access demand and 2018/2019 test period projections of reciprocal compensation from NECA's Traffic Sensitive

[1] To implement the *USF/ICC Transformation Order* issued in November 2011, NECA designed a web system to collect information needed to develop the rate elements and support amounts in the order. Appendix B 2018 CAF ICC Data Collection details the design and the variables of NECA's web system. See FCC *Connect America Fund*, WC Docket No. 10-90 *et al.*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 (2011). NECA members have the ability to override NECA's forecasts.

[2] Fiscal year 2017 is a time period from October 1, 2016 to September 30, 2017, as defined in FCC *Connect America Fund*, WC Docket No. 10-90 *et al.*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663 (2011).

pool members. Using the collected data, NECA developed each carrier's Access Recovery Charge (ARC) at the exchange/rate zone level and CAF ICC at the study area level. Section 4 describes the methods NECA used to develop aggregated and disaggregated forecasts for Special Access revenues. Special access demand at the rate element level was derived from the aggregate special access forecast using data from NECA's Advanced Services Demand Data Request[3], in which NECA collected demand for major rate elements for Ethernet special access services from its TS pool member companies, and CABS billing data. Using the same datasets, NECA developed the revenue projections for banded and unbanded Special Access services.

B. ACCESS LINES DEMAND FORECAST METHODOLOGY

NECA used Unobserved Component Models (UCM) [4] to develop access line forecasts for all study areas in the CL pool. NECA's line forecasts were then used to interpolate the forecasts between the months of September 2017, September 2018, and September 2019 which member companies submitted in the annual Forecast Line Count Data Collection in February 2018. Section 2.A describes the details of this methodology.

In its annual Forecast Line Count Data Collection[5], NECA collected both historical and forecasted access line counts by service category from individual exchange carriers.

1. NECA asked its member companies to provide historical data as of September 30, 2017 and forecasts as of September 30, 2018 and September 30, 2019.

[3] Refer to Appendix C 2018 Advanced Services Demand Data Request for details.

[4] See Harvey, A. C. 1989. "Forecasting, Structural Time Series Models and the Kalman Filter", Cambridge: Cambridge University Press.

[5] Refer to Appendix A 2018 Forecast Line Count Data Collection for details.

2. To assist member companies in developing their line count forecasts, NECA provided them with study area specific service category level "guidance forecasts" as a reference before opening its Forecast Line Count Data Collection website in January.
3. NECA used the data collected from member companies to calibrate NECA's study area line count forecasts and develop test period End User revenues for the Form 508 filing filed on March 30, 2018 with USAC. Companies had the option to override these projections with their own projections for the purposes of the Form 508 filing and this filing.
4. NECA used the calibrated forecasts to pre-populate access line forecasts for the CAF ICC Data Collection. Companies had the flexibility to either use NECA's forecasts or override them with their own forecasts for purposes of this filing.

C. CBOL DEMAND FORECAST METHODOLOGY

Companies reported projected broadband-only loop demand to NECA in support of the estimation of projected CAF BLS amounts. Volume 1, Appendix C contains carrier certifications attesting to the accuracy of the carriers' CAF BLS data. These certifications were obtained via the Form 508 certification filed on March 30, 2018 with USAC; or for companies with updated consumer broadband-only loops after that filing with USAC, with new certifications attesting to the accuracy of a carrier's underlying data submitted with this filing. The broadband-only loop counts were used to develop CBOL rates as described in Volume 4 of this filing.

D. SWITCHED ACCESS AND SPECIAL ACCESS DEMAND FORECASTING METHODOLOGY

NECA applied a standardized four-step approach to forecast both Interstate Switched Access and Special Access demand.

1. All data were adjusted to reflect July 3, 2018 tariff participation changes[6] and were trued-up, if necessary, to anticipated final levels using factors calculated from historical pool updates[7].
2. Study areas not affected by acquisitions of exchanges and, in the case of special access DSL, that did not detariff DSL were identified to construct homogeneous data groups used to model and forecast aggregate demand growth.
3. A time-series model of Autoregressive Integrated Moving Average (ARIMA) was selected based on statistical criteria to forecast demand at the aggregate pool level[8].
4. A time-series model of UCM was estimated for each study area to develop each study area's share in the group. It was then used to develop test period company-level forecasts and billing data were used to develop access service rate element forecasts for the pool.

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[6] See Vol. 1, section 1.A and Vol.1, Exhibit 1 for a display of tariff participation changes.

[7] NECA's pooling procedures, which have been in effect since the inception of access charges, permit a period of up to twenty-four months after the data month for the companies to report "trued-up" interstate revenues and demand to the CL and TS Pools.

[8] See Hamilton, J. D. 1994. "Time Series Analysis", Princeton University Press, Princeton, NJ.

All interstate forecasts were adjusted to include demand levels relating to study areas affected by acquisitions of exchanges. The study area's interstate MOU forecasts were used to pre-populate the interstate MOU section of the CAF ICC Data Collection system and companies had the ability to modify the projections rather than use NECA's projection in their final data submission.

NECA relied on individual study areas to develop their own intrastate switched MOU and reciprocal compensation forecasts. NECA collected its members' fiscal year 2017 historical data and 2018/2019 test period forecasts of interstate switched minutes, intrastate terminating switched minutes and reciprocal compensation minutes in April as part of NECA's CAF ICC Data Collection. The details are described in Section 3.B.

Study areas' interstate special access forecasts were used to develop proposed rates displayed in Volume 5.

E. FORECAST RESULTS

Using the methodology described above and data collected as part of the CAF ICC Data Collection, NECA's test period demand growth forecasts are as follows:

Access Lines Forecast

(Common Line Pool)

Residential CPT Growth (Excluding Lifeline)	Single-Line Business CPT	Multi-Line Business CPT	Total Access Lines Growth
-4.2%	-2.9%	-3.2%	-4.0%

MOU Forecast

(Traffic Sensitive Pool)

Interstate MOU Growth	Intrastate MOU Growth[9]
-9.0%	-5.0%

DSL Line and Special Access Revenue ($, constant rate) Forecast

(Traffic Sensitive Pool)

DSL Lines Growth	DSL Revenue Growth	Non-DSL Revenue Growth	Special Access Revenue Growth (DSL & Non-DSL)
2.0%	-0.4%	-8.4%	-5.3%

[9] For the companies that did not provide their FY 2017 intrastate MOU, the data from the March 2018 settlement view was used in the calculation.

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Section 2

ACCESS LINES DEMAND FORECASTS BY SERVICE CATEGORY

A. NECA'S STUDY AREA LINE FORECASTS

NECA used a UCM model to develop the forecasts for each study area participating in NECA's Common Line pool that reported common line data since at least January 2015 for the 2018/2019 test period.

Forecasts were developed separately for a consistent set of companies that have participated in NECA's Common Line pool and for companies that have recently joined the Common Line pool. The consistent set of companies includes companies meeting the following four criteria:

1. They were in the NECA Common Line pool throughout the period from January 2003 to December 2017 and reported their lines to NECA.
2. They elected to remain in the Common Line pool for the 2018/2019 test period.
3. They neither bought nor sold exchanges during the period from January 2003 through December 2017.
4. They did not experience any major decline in demand due to the loss of major customers.

For this set of companies (about 98% of the access lines reported to the pool), study area level forecasts were developed using a unique UCM model for every study area[10].

For the companies not in the consistent sample, their forecasts were developed using a UCM model for each study area, accounting for different start periods of NECA pool membership and shifts in access line counts. For each study area monthly forecasted line counts for the period from July 2018 through June 2019 were averaged to arrive at NECA's test period access line forecasts. The test period line count for all Common Line pool members is the sum of study area test period forecasts.

UCM models were estimated for (natural logarithm of) line count series. The basic model was specified, in its most general form, to account for historical patterns, such as seasonality, individual growth rate, and recent trends of line count series of each study area and includes:

- stochastic intercept component
- stochastic slope component
- stochastic seasonality component[11].

The model is specified as follows:

$$y_t = \mu_t + \gamma_t + \epsilon_t,$$

where μ_t is a locally linear trend component, γ_t is a seasonal component, and ϵ_t is an irregular (or error) component which is assumed to be Gaussian white noise.

Locally linear time trend μ_t is specified as:

[10] Model specification and goodness of fit statistics for each study area are available upon request.

[11] See SAS Institute Inc. 2011. "SAS/ETS® 9.22 User's Guide", Cary, NC: SAS Institute Inc.

$$\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t, \quad \eta_t \sim i.i.d.N\left(0, \sigma_\eta^2\right),$$

and

$$\beta_t = \beta_{t-1} + \xi_t, \qquad \xi_t \sim i.i.d.N\left(0, \sigma_\xi^2\right).$$

The term "stochastic" above refers to the case where σ_η^2 and σ_ξ^2 are positive. Observe that when $\sigma_\xi^2 = 0$, μ_t reduces to random walk with deterministic drift, and when $\sigma_\xi^2 = \sigma_\eta^2 = 0$, μ_t is just a linear time trend.

Seasonal component of length $s = 12$ months is characterized by the system of equations:

$$\sum_{i=0}^{s-1} \gamma_{t-i} = \omega_t \ , \quad \omega_t \sim i.i.d.N(0, \sigma_\omega^2).$$

Similar to the definitions above, when $\sigma_\omega^2 = 0$ the seasonal component is deterministic and can be thought of as a collection of $s - 1$ dummy variables corresponding to months of the year except one. When $\sigma_\omega^2 > 0$ the seasonal component is stochastic and evolves over time.

To estimate the line count model for each study area, the general model was refined to either restrict a specific component to be deterministic, or to drop it from specification for that particular study area on the basis of a significance test with ex-post verification by Akaike Information Criterion.

After the models were estimated at the study area level, the forecasts generated by the models were checked for reasonableness. In particular, the forecasted growth rate of line counts for the study area was compared with the historical growth rate for that study area and with the pool average forecasted growth rate. In cases of substantial difference between the forecasted growth rate and the historical and/or pool average growth rate, the forecast was individually re-examined and, if necessary, re-estimated.

For the Common Line pool member study areas that had not been in the pool long enough to estimate their demand based on a robust model, the forecast for the test period was made on the basis of fitting a log-linear trend between company-provided forecasts for September 30, 2017, September 30, 2018 and September 30, 2019. For the rest of the study areas a model forecast was used to populate monthly values between January 2018 and September 2019 after rescaling it to exactly match September forecasts provided by the member companies.

After combining forecasts for the consistent set of companies with the companies not in the consistent sample, the projected NECA Common Line pool total access lines annualized growth rate from year 2017 to the 2018/2019 test period is -4.0%.

B. ACCESS LINES DEMAND FORECASTS BY SERVICE CATEGORY

NECA worked cooperatively with member companies to develop service category access line forecasts. These forecasts served as the basis for developing NECA's End User revenue projections. NECA Common Line participant study areas provided NECA with line count history and forecasts by the following service categories: Residence Customer Premises Terminations (CPTs), Lifeline Assistance CPTs, Single-Line Business CPTs, Multi-Line Business CPTs, Residential Centrex CPTs, Business Centrex CPTs, Basic Rate Interface ISDN arrangements, Primary Rate Interface ISDN arrangements, DS1 Channel Service arrangements, total payphone stations, payphone stations subject to FUSC, Special Access Surcharge channels and Unbundled Network Element (UNE) lines.

To generate the service level forecasts and End User revenue forecasts by service category, NECA followed the steps below:

1. Calculated September 30, 2017, September 30, 2018 and September 30, 2019 service category shares of total study area access line counts based on data collected from NECA Common Line pool participants in February 2018.
2. Linearly interpolated access line shares by service category for intermediate months.
3. Applied monthly service shares to monthly study area total access line forecasts to obtain monthly service category line count forecast by study area.
4. Calculated service category End User revenue by applying end user rates to each study area's average monthly access line counts by service category for the 2018/2019 test period.

The pool level access line counts by service category are shown in Volume 3, Exhibit 1, Workpaper 1.

C. CBOL DEMAND FORECAST

NECA collected CBOL demand forecast from all Common Line pool members. Cost companies reported CBOL demand projections for calendar years 2018 and 2019 with their 2018 cost forecasts. Test period 2018/2019 projections were calculated as an average of the companies' 2018 and 2019 annual projections. For average schedule companies, test period 2018/2019 CBOL demand projections were collected as part of the 2018 Annual Forecast Line Count Data Collection.

Members had an opportunity to update the forecasts before final Form 508 certification filed on March 30, 2018 with USAC and in exceptional circumstances following the filing of Form 508. All such updates were certified by the member companies[12].

[12] See Vol. 1, Appendix C for details.

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Section 3

INTERSTATE, INTRASTATE LOCAL SWITCHING

AND RECIPROCAL COMPENSATION DEMAND FORECASTS

A. INTERSTATE LOCAL SWITCHING MINUTES OF USE DEMAND FORECAST

1. Interstate Local Switching Minutes Aggregate Level Forecast

NECA developed its interstate MOU guidance forecasts for TS pool participants using a time series technique known as an Autoregressive Integrated Moving Average (ARIMA) [13]. This forecasting technique predicts a value in a response time series as a linear combination of its own past values and past errors (also called shocks or innovations), using the natural log of interstate LS MOU as inputs.

NECA developed the aggregated MOU of a consistent sample of companies meeting four criteria:

(1) They were in the NECA pool throughout the period from January 2003 through December 2016 and reported their interstate LS MOU to NECA.

(2) They elected to remain in the TS pool during the 2018/2019 Test Period.

[13] For a description of ARIMA, see Hamilton, J. D. 1994. “Time Series Analysis, Chapter 15: Models of Nonstationary Time Series”, Princeton University Press, Princeton, NJ.

(3) They neither bought nor sold exchanges during the period from January 2003 through December 2017.

(4) They did not experience any major decline in demand due to the loss of major customers.

The specific ARIMA model fitting this set of companies' historical MOU data best was selected as NECA's aggregate MOU forecasting model. The forecast model was specified as follows:

The log of interstate LS MOU was differenced by taking twelve month differences to remove seasonal effects and produce a stationary series.

Independent variables included:

- Lags of the dependent variable (AR variables)
- Lags of the error term (MA variables)

The results of NECA's Interstate LS MOU aggregate model are shown below.

Interstate LS MOU ARIMA model estimation:

Variable	Coeff.	Std. Error	T-Stat.
MA1,1	-0.18978	0.07719	-2.46
AR1,1	0.99242	0.01235	80.36

R^2	0.9989	Durbin-Watson	2.13
Observations	168	Degrees of Freedom	165
Estimation Interval	200301 – 201712		

These diagnostics indicate the model captures the underlying demand behavior well. The t-statistic is highly significant. The Durbin-Watson test indicated the absence of serial correlation in the residual series. The projected growth in demand from fiscal year 2017 to the 2018/2019 test period results in an annual decline in total minutes of 11.5 percent for the consistent sample used for MOU analysis.

2. Study Area Level Interstate MOU Forecast

To develop study area level MOU forecasts, a five-step procedure was used.

(1) Aggregated MOU monthly historical and forecasted levels for the consistent sample served as the baseline for developing study area specific forecasts.

(2) For each study area in the consistent sample, a preliminary forecast was generated by applying a UCM method[14] and the associated monthly shares were derived based on the ratio of the monthly projection relative to the total projection. By applying the monthly shares to the aggregate MOU monthly forecasts obtained from step (1), the study area level monthly forecasts were produced.

(3) For each study area not in the consistent sample, because there are not enough observations to develop statistical models, the UCM method was not used. Forecasts for these study areas were computed using the average proportion of their minutes to the aggregate minutes of the consistent sample for the period October through December 2017 for

[14] See Volume 3 Section 2.A for a detailed description of UCM method.

Non-Alaskan companies and from January through December 2017 for Alaskan companies[15].

(4) Projected minutes for the consistent sample companies and companies not part of the consistent sample were combined to produce the study area interstate MOU forecasts for the total NECA pool.

(5) The study area interstate MOU forecasts were used to pre-populate the interstate MOU field of the CAF ICC Data Collection system. Companies had the flexibility to override it with their own forecasted minutes.

About 49.6 percent of member companies used NECA's projection of interstate minutes and the rest of the companies replaced NECA's projections with their own. The test period annualized growth rate for the total pool is -9.0 percent based on the combined NECA and company projections.

B. INTRASTATE SWITCHED ACCESS AND RECIPROCAL COMPENSATION DEMAND FORECAST

In order to develop Access Recovery Charge (ARC) and Connect America Fund Intercarrier Compensation (CAF ICC) support, NECA developed a web application to collect its TS pool members' test period forecasts of intrastate MOU, access lines by three major service

[15] In order to capture a 12-month seasonality cycle exhibited by Alaskan companies's data series, January through December 2017 is used as a base period to generate the forecasts for this group of companies.

categories (residential, single-line business, & multi-line business), and reciprocal compensation minutes.

NECA also collected fiscal year 2017 intrastate and interstate minutes to calculate test period annualized growth rates. In addition to demand quantities, the web system also collected local charges by exchange / rate zone, state support amounts, intrastate switched access terminating revenue and net reciprocal compensation revenue which were used to calculate the test period revenue requirement and revenue[16]. The pool level projections of interstate switched MOU, intrastate switched MOU, and reciprocal compensation MOU for NECA's Traffic Sensitive pool members are summarized in Volume 3, Exhibit 2, Workpaper 1.

Appendix B details the CAF ICC Data Collection system, process, and data field definitions.

[16] See Volume 5 Section 4.B for a detailed description of development of ARC and CAF ICC.

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DEVELOPMENT OF BASELINE DEMAND AND REVENUE

Section 4

INTERSTATE SPECIAL ACCESS DEMAND FORECASTS

A. INTERSTATE SPECIAL ACCESS AGGREGATE LEVEL FORECASTS

NECA's special access aggregate demand forecasts include two categories: special access revenue forecasts and DSL line forecasts. The demand forecasts are the sum of forecasts for the following sets of study areas:

(1) Study areas that have been in the pool since July 2013 and subscribe to NECA's special access tariff or DSL tariff in the entire period (named consistent sample)

(2) Study areas subscribing to NECA's tariff but excluded from the consistent sample because of at least one of the following reasons:

  a. they were not in the TS pool or the DSL pool for the entire period,

  b. they have bought (or sold) exchanges since July 2013,

  c. they have incomplete data series.

(3) Study areas entering NECA's TS pool or DSL tariff on July 3, 2018.

The special access revenue forecasts are separated according to service type, i.e. DSL and Non-DSL revenue. DSL revenue and DSL line forecasts include forecasts for all study areas subscribing to NECA's DSL tariff. Non-DSL revenue forecasts include forecasts for all study areas subscribing to NECA's special access tariff.

1. Special Access Revenue Aggregate Forecast

NECA used the ARIMA time series technique[17] to develop test period special access constant rate (unbanded) revenue forecasts for Non-DSL and voice/data DSL service categories. The constant rate revenue excluded historical banding and rate change impacts on billed revenue so that the data series are indexed on a uniform basis. The practice is to separate the individual study area's billed revenue from the pricing (or banding) factors which represent the premium/discount ratios associated with companies' specific bands and the uniform rate index which represents the rate change history. Given the different historical growth patterns in the DSL revenue and Non-DSL revenue data series, they were projected separately. The aggregate forecast model was specified as follows:

> The log of interstate voice/data DSL or Non-DSL constant rate revenue was differenced using adjacent months to produce a stationary series. Dummies were tested for the rate-change months and the adjacent months. The dummy variables were designed to eliminate the residual rate-change effect on the historical special access constant rate revenue series which was not captured by the constant rate conversion process. Besides dummy variables, the independent variables may include:

- Intercept (MU)
- Lags of the dependent variable (AR variables)
- Lags of the error term (MA variables)

[17] See the discussion relating to forecasting interstate LS MOU in Section 3.A

The results of NECA's special access constant rate revenue aggregate models for voice/data DSL service are shown below.

Voice/data DSL constant rate revenue ARIMA model estimation:

Variable	Coeff.	Std. Error	T-Stat.
MA1,1	-0.29774	0.14235	-2.09

R^2	0.9793	Durbin-Watson	1.95
Observations	53	Degrees of Freedom	51
Estimation Interval	201307 – 201712		

The model produced a total consistent sample test period annualized special access voice/data DSL constant rate revenue[18] growth rate of -0.4 percent.

The table below shows the results of NECA's special access Non-DSL constant rate revenue aggregate model.

Non-DSL constant rate revenue ARIMA model estimation:

Variable	Coeff.	Std. Error	T-Stat.
MU	-0.0085	0.001585	-5.37
MA1,1	-1.09047	0.13961	-7.81

[18] All revenues are at current unbanded rates or adjusted for banding and rate change impacts.

MA1,2	-0.95966	0.12934	-7.42
AR1,1	-1.50209	0.19471	-7.71
AR1,2	-1.68923	0.27431	-6.16
AR1,3	-0.77486	0.25082	-3.09
AR1,4	-0.2954	0.16333	-1.81

R^2	0.9835	Durbin-Watson	2.03
Observations	53	Degrees of Freedom	45
Estimation Interval	201307 – 201712		

The statistics for both models indicate the models fit historical data well. The Durbin-Watson test indicated the absence of serial correlation in the residual series.

The model produced a total consistent sample test period annualized special access Non-DSL constant rate revenue growth rate of -8.5 percent.

For study areas not in the consistent sample groups, NECA produced forecasts based on each company's specific historical proportions to aggregate revenue of the consistent sample for the voice/data DSL and Non-DSL categories respectively.

NECA developed second mile transport broadband-only DSL revenue projections for study areas having 2nd-mile transport by pricing out projected broadband-only DSL lines[19].

The sum of these projections produced an aggregate annual growth rate of -5.3 percent for NECA's total pool special access constant rate (unbanded) revenue.

2. Special Access DSL Lines Aggregate Forecast

[19] Refer to Secton 4B for details.

Voice/data DSL lines aggregate forecasts follow the same procedure applied for projecting voice/data DSL revenue. NECA used monthly aggregate voice/data DSL lines data series starting from July 2013 to estimate an ARIMA model and develop voice/data DSL lines forecasts for the 2018/2019 test period. The results and the model significance analysis are shown below.

Voice/data DSL lines ARIMA model estimation:

Variable	Coeff.	Std. Error	T-Stat.
MU	0.002553	0.000345	7.4
MA1,1	0.43324	0.17	2.55
AR1,1	0.37005	0.13778	2.69
Out_201701	-0.00402	0.000993	-4.05

R^2	0.9933	Durbin-Watson	2.18
Observations	53	Degrees of Freedom	48
Estimation Interval	201307 – 201712		

The statistics indicate the models fit historical data well. The Durbin-Watson test indicated the absence of serial correlation in the residual series. The model produced a -2.0 percent test period annualized growth rate for voice/data DSL lines for this group of study areas.

The higher voice/data DSL revenue growth rate of -0.4 percent, compared to the voice/data DSL line growth rate of -2.0 percent, is attributable to customers' migration to higher speed DSL services resulting in higher average revenue per voice/data DSL line.

B. INTERSTATE SPECIAL ACCESS STUDY AREA LEVEL FORECASTS

NECA applied the same procedure used for study area interstate local switching minutes demand forecasts to develop individual study area special access voice/data DSL and Non-DSL constant rate (unbanded) revenue forecasts and voice/data DSL lines forecasts. For each study area in the consistent sample, a test period monthly share was developed based on its monthly share of total special access revenue obtained from the UCM method relative to the corresponding pool aggregate revenue. By applying the series of monthly shares to the aggregate forecasts from section A, the study area special access voice/data DSL and Non-DSL constant rate revenue forecasts and voice/data DSL line forecasts were derived. The UCM estimation results for individual study areas are available upon request.

For all other study areas not in the consistent samples, because there were not enough observations to develop statistical models, forecasts were computed using the average proportion of their revenue to the corresponding aggregate revenue for the consistent sample for the period October 2017 through December 2017 for Non-Alaskan companies and from January 2017 through December 2017 for Alaskan companies.

To generate the study area level forecasts of broadband-only second mile transport DSL revenues, NECA followed the steps below:

1. For cost companies providing broadband-only DSL lines with their 2018 cost forecasts, NECA averaged the broadband-only DSL lines reported for calendar year 2018 and 2019.

2. For cost companies not providing broadband-only DSL lines with their 2018 cost forecasts and for average schedule companies, NECA used certified broadband-only projections from Form 508 data.

3. For study areas not providing broadband-only DSL lines in either the cost forecast or Form 508 filing, NECA projected broadband-only DSL line counts by applying the historical growth rate of all study areas to the historical broadband-only DSL lines.

4. For companies with projected second mile transport, NECA calculated the average second mile transport broadband-only DSL constant rate revenue per line for all study areas and projected study area level second mile transport broadband-only DSL revenue by pricing out the line count forecasts from 1, 2 and 3.

5. For companies with projected second mile transport and broadband-only lines, but with no second mile transport broadband-only revenue history, NECA estimated revenue using the projected average constant rate revenue per line for companies with non-zero broadband-only DSL lines and second mile transport revenues.

C. SPECIAL ACCESS REVENUES AND DEMAND AT RATE ELEMENT LEVEL

In the past, NECA maintained rate element level demand detail in its Tariff Element Tracking (TET) System, a database containing CABS information. TET consisted of 109 study areas in NECA's TS pool that billed Special Access revenues in 2015. Because of changes in TS pool participation, NECA stopped maintaining the TET system. To estimate rate element level demand for the traditional special access services (Voice Grade, High Capacity DS1 and DS3, etc.), NECA used the frozen view of the revenue shares and the demand growth rates from the 2015 TET data.

To supplement the TET data, NECA gathered additional data from the Advanced Services Demand Data Request to develop rate element level demand forecasts for advanced services (DSL, DSL Connection Points, ATM, Frame Relay, SONET, ETS, and IP Gateway Access Service), because these services were not well represented in the TET data. NECA priced out demand collected in the Advanced Services Demand Data Request to estimate advanced services revenue, then subtracted this revenue from the aggregate Special Access revenue estimate to derive revenue associated with the traditional special access services represented in TET. To develop the forecasts for traditional Special Access services at the rate element level, NECA used the following process:

1. Use the frozen share of TET revenue and the frozen growth rate for each TET element based on the 2015 TET data [20]
2. Expand each element's revenue to the traffic sensitive pool level by applying the resulting revenue shares to estimated 2017 Special Access revenue net of advanced services at the current uniform rates.
3. Derive rate element demand at the pool level by dividing each element's estimated 2017 revenue by its corresponding June 30, 2018 uniform rates.
4. Estimate demand for the 2018/2019 test period, by applying a frozen growth rate to each element's 2017 demand.
5. Multiply the estimated 2018/2019 test period rate element demand levels by the current uniform rate to arrive at test period revenues at current rates, which are

[20] For the frozen view, NECA priced demand in TET at June, 30, 2016 uniform (unbanded) rates to estimate 2015 revenue at constant rates. Then NECA computed the frozen share of TET revenue for each TET element. The frozen growth rates were derived based on comparisons of the demand for eight broad categories of traditional Special Access services recorded in TET in the second half of 2015 relative to the first half of 2015.

then scaled to correspond to the Special Access test period revenue forecast for traditional services.

6. Divide these revenues by the current uniform rate to arrive at rate element demand at the pool level for the test period. The demand trends for the major components of Special Access services are displayed in Volume 3, Exhibit 3, Workpapers 1 and 2.