ATSC 3.0 and Public Broadcasting, a Case for Flash Cut

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Abstract – ATSC 3.0, often referred to as "NEXTGEN TV", is gaining traction and is now being broadcast in over 60 markets in the United States. There are many challenges for broadcasters to adopt this technology and this is especially a concern for Public Broadcasters who may not have a necessary simulcast partner in their markets to continue ATSC 1.0 transmissions while beginning ATSC 3.0 operations. This paper presents a potential roadmap for stations, with an emphasis on statewide networks, to deploy ATSC 3.0. Examples in this paper will focus on two PBS North Carolina broadcast facilities and one Iowa PBS broadcast facility, but the criteria used could easily be adapted for other stations.

Background

The Federal Communications Commission (FCC) approved the first Digital Television (DTV) standard in 1996. Now commonly known as ATSC 1.0, it was designed around then state-of-the-art video and audio encoding technology and the "8VSB" modulation standard. The FCC developed a transition plan for all broadcasters allowing them to add a second broadcast channel for ATSC 1.0 to complement their analog channel. Through a program administered through the U.S. Department of Commerce and the National Telecommunications and Information Administration (NTIA) a coupon program was initiated to incentivize viewers to purchase Set-Top-Boxes to convert ATSC 1.0 broadcast signals to analog for them to use on their existing television receivers. In late 2009 full power analog broadcast facilities ceased operation in the United States.

ATSC 1.0 was a significant development. It allowed for much higher resolution, High Definition (HD) video, surround sound audio, and the ability to include multiple video/audio streams into one broadcast television channel. However, the standard has been plagued by reception issues caused by multi-path signal reflections that causes video disturbances. ATSC 1.0 is also a technology locked in time; although some innovations with the technology were developed, some of those improvements were not adopted. To remain competitive in media distribution and better serve their audiences, broadcasters needed a better system.

In 2013 the Advanced Television Systems Committee (ATSC) issued a call for papers for a new television standard. The President of ATSC at that time, Mark Richer, noted that "Technology continues to advance and we are always looking to the horizon. Internet technology now permeates the

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consumer experience, and mobility has become a requirement. As we look forward to next-generation television standards, we want to take advantage of advances in compression and transmission technologies that will keep millions of people informed and entertained through broadcasting's inherently efficient one-to-many architecture".[1] The ATSC began developing the ATSC 3.0 standard, which is in reality a suite of standards, to address all aspects of the new technology.

The FCC, through its November 20, 2017 report and order, FCC 17-158, authorized the voluntary adoption of ATSC 3.0.[2] In that report and order ATSC 1.0 simulcast and coverage requirements are set forth, amongst a myriad of other mandatory needs. In June 2020, through the release of FCC 20-72,[3] the FCC provided additional guidance regarding the transition from ATSC 1.0 to ATSC 3.0. In June 2022 the FCC requested comments on the current status of ATSC 3.0 in the marketplace and whether the simulcast requirement should be allowed to sunset in 2023.[4]

Currently there are a number of guidelines that must be met for stations to begin ATSC 3.0 operations. Below is a summary of most of those requirements.[3 & 4] Stations are **strongly urged** to contact their legal counsel to discuss their situation prior to making any decisions.

- Simulcast Partner
  - All stations in the partnership must be licensed in the same market.
  - The ATSC 1.0 host station must have 95% of its population within its coverage area of the ATSC 3.0 partner station carrying its primary program service.
  - Only requires broadcasting the ATSC 3.0 Primary Program Service on an ATSC 1.0 station. However, it is preferable if all ATSC 3.0 program services were available on an ATSC 1.0 station.
  - TV translators and Low Power stations are excluded from the simulcast requirements.
- Waivers are considered on a case-by-case basis.
- Flash Cut Possibilities – Switching from ATSC 1.0 to ATSC 3.0 without a simulcast partner.
  - If fewer than 3 full power stations in a market meeting the community of license requirement. The community of license requirement for full power stations is the ATSC 1.0 host signal completely covering the partner station's community of license.
  - Providing program delivery to at least 95% of the population served by the ATSC 1.0 signal is still required. Low cost ATSC 3.0 receive devices are mentioned in one of the FCC proceedings as being acceptable to meet this requirement in lieu of a receivable ATSC 1.0 signal.
- Vacant channels cannot be used to meet audience coverage requirements.
- MVPD carriage
  - Must carry is based on the original ATSC 1.0 signal. No expansion due to changes in the coverage area of the ATSC 1.0 host partner
  - A good quality signal is still required.
  - ATSC 3.0 signal currently has no must carry rights.
  - Must negotiate carriage if the station flash cuts from ATSC 1.0 to ATSC 3.0, currently no carriage rights exist for these stations.

Benefits

With the deployment of ATSC 3.0, new and improved services will become available to not just viewers but the entire community. It goes beyond an improved viewing experience with the delivery of 4K Ultra HD video with immersive sound. There's also the addition of interactive video, extended education initiatives,[5] automotive mobile data,[6] improved emergency and first responder communications,[7] in addition to the potential of more services in the future.

Simulcast Partnership Overview

The accepted means of adopting ATSC 3.0 in a market is through an effort called a “Simulcasting Partnership”. Through complex legal, business and technical work as well as cooperation among multiple broadcasters in a market may enable an ATSC 3.0 facility to be launched.

For our example we will look at two broadcasters in a market. One broadcasts on Channel 25 and the other on Channel 30 and each station carries one HD and two SD program services. See Figure 1.

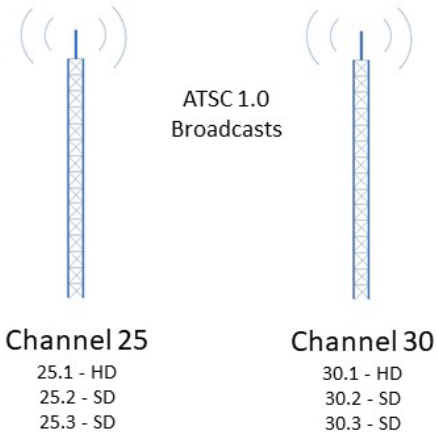

Figure 1

To enable ATSC 3.0 in this market the owners of Channels 25 and 30 will need to engage in a business/legal relationship. From there they will engage the FCC on licensing and build the necessary technology infrastructure to begin the simulcast effort. In our example below, Channel 30 will cease broadcasting in ATSC 1.0 and convert its facility to ATSC 3.0. Channel 25 will continue to broadcast in ATSC 1.0 and will accept Channel 30’s three program services. Bringing the total number of streams on that facility to six. The Channel 30 facility will become the new ATSC 3.0 facility, carrying at least the two stations’ primary services but presumably all six program services. See the example in figure 2.

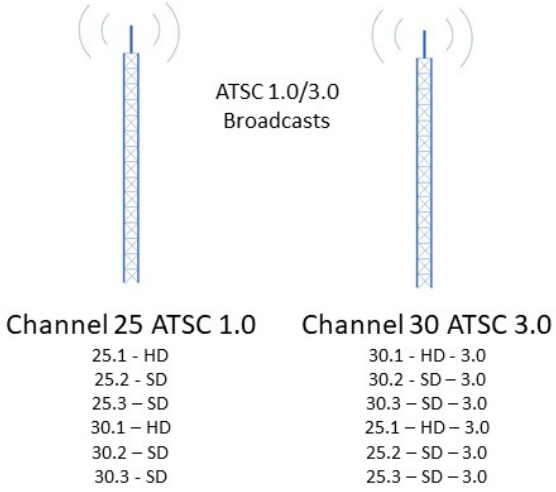

Figure 2

Population Overlap Determination

One of the simulcast coverage requirements is maintaining ATSC 1.0 coverage to 95% of the population of a station's initial ATSC 1.0 transmission facility. For this paper, the percentage of population overlap is determined by analyzing data created by general purpose studies from the FCC's TVStudy interference analysis software application.[7] This is the RF analytic software used by RF consultants to perform coverage and interference analyses for most television stations.

The application uses a geographic cell grid to determine coverage and interference. The application generates output data files that include information that indicates whether reception is possible for each cell that is inside the station's service contour. With TVStudy configured to use a global grid, a common cell grid is used for calculating all stations' coverage. This allows the output data files to be used to determine where stations have a receivable signal. Those data files also supply area, population and household data for each cell receiving coverage. From this, population overlap percentages can be calculated. If overlap from one or more stations is used to achieve the 95% threshold, the coverage results from each station pair (the planned ATSC 3.0 station and its ATSC 1.0 lighthouse) must be merged and the data consolidated to eliminate counting the same coverage cell area more than once.

PBS Station Challenges

Although affiliated with the Public Broadcasting Service, PBS stations are independently licensed and operated. They are a mix of community licensed stations, university licensed stations, and stations with governmental licensees. Community licensed stations typically are standalone broadcasters. University and state licensed stations often have multiple transmission sites to serve a state or region. These stations usually broadcast the same program services on each of their stations. This could provide an opportunity for university and state licensed stations to transition to ATSC 3.0.

There are a number of business, legal, and technical hurdles to overcome to create a simulcasting agreement between broadcasters. This is especially true for university and governmental licensees with the statutory restrictions they are required to abide by for any agreement.

Because of the unique mission of public broadcasters to serve the under-served, this results in some stations serving areas not normally served by commercial broadcasters. As a result, simulcast partners that fulfill the requirements don't exist in many cases. In some markets, public broadcasters have joined commercial broadcasters in sharing agreements. However, in several markets, public broadcasters have not had the opportunity to be included in multi-station simulcast partner arrangements, leaving them with little, if any, transition options. There have also been a few markets where public broadcasters have been able to transition to ATSC 3.0 when they partnered with another public broadcaster or had sufficient signal overlap from a co-licensed station to fulfill the simulcast requirement.

PBS Station Examples

We have examples of three (3) public television stations with ATSC 3.0 transition challenges that we will explore. Each station has its own unique set of challenges. All three stations are part of a state network group. The stations are WUNE-TV, Linville, North Carolina operated by PBS North Carolina; KTIN, Fort Dodge, Iowa operated by Iowa PBS; and WUNU, Lumberton, North Carolina operated by PBS North Carolina.

WUNE-TV Linville, North Carolina

WUNE-TV Linville, North Carolina is one of 12 full power stations operated by PBS North Carolina. The transmission site is in the mountainous area of northwestern North Carolina and is in the northern corner of the Charlotte television market.

WUNE-TV Linville, NC
1000 kW Directional

Service Area	
Population	3,146,865
Households	1,255,782
Area	14,279.1 sq miles

Coverage Area	
Population	2,484,186
Households	979,361
Area	11,248.1 sq miles

Table 1: WUNE-TV Area Served[1]

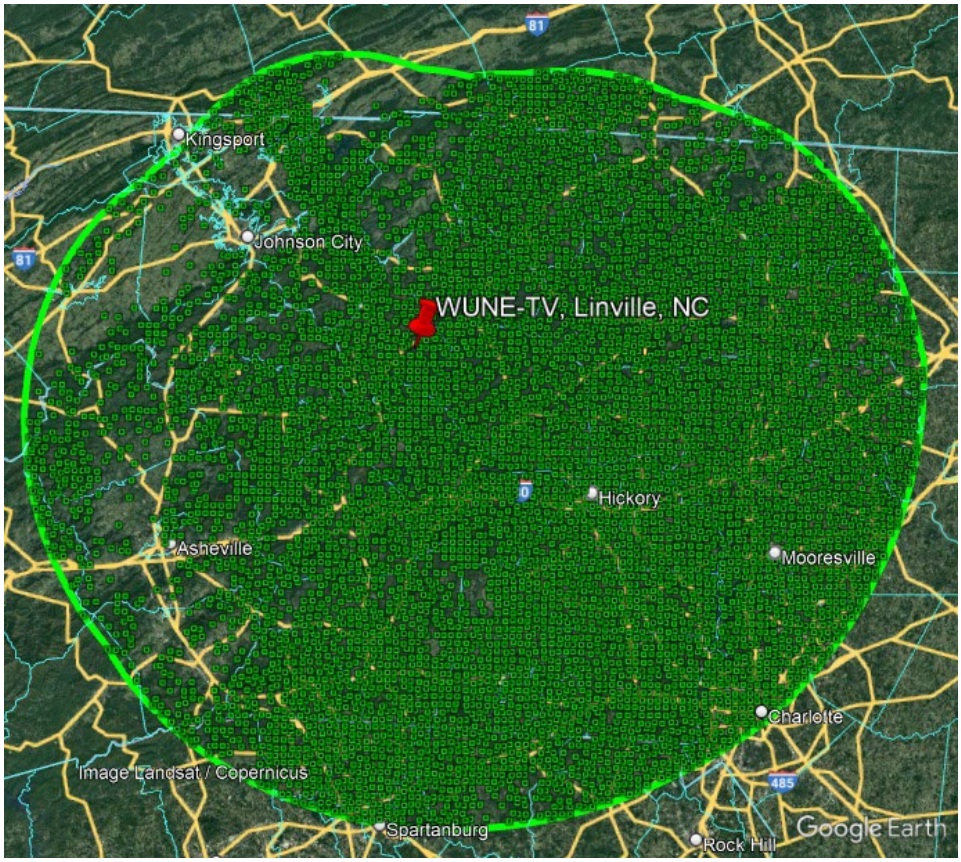

Figure 3: WUNE-TV Service and Coverage Area Map[2].

[1] WUNE-TV statistics were determined using TVStudy version 2.2.5 with default settings of 2km cell size (4 sq km) and a propagation profile resolution of 1 point per kilometer.
[2] Reception is based on a general purpose study created using TVStudy version 2.2.5 using the default settings of 2km cell size (4 sq km) with a propagation profile resolution of 1 point per kilometer.

The noise limited service contour, the green circle on the map in figure 3, does not mean a station has 100% coverage inside that circle. It simply represents the area where the station receives interference protection. The green blocks inside that circle represent areas where WUNE-TV can be received. In areas like the mountains of western North Carolina, coverage can be significantly reduced due to a number of factors, most notably terrain obstructions.

WUNE-TV was “repacked” as part of the FCC’s spectrum incentive auction. A byproduct of that work was the ability to maximize the station’s coverage. Also, equipment such as transmitters and antennas had to be replaced as part of the repack process. That resulted in making the potential technical transition to ATSC 3.0 for WUNE-TV a relatively simple task. The much larger task is how to fulfill the FCC’s guidelines to allow the station to make that transition.

There are three other PBS member stations in the Charlotte television market. They are WUNE-TV's sister station WUNG-TV, Concord; South Carolina ETV’s WNSC-TV, Rock Hill; and Central Piedmont Community College’s WTVI, Charlotte. As shown in figure 4, none of these stations meet the community of license requirement for being a simulcast partner for WUNE-TV.

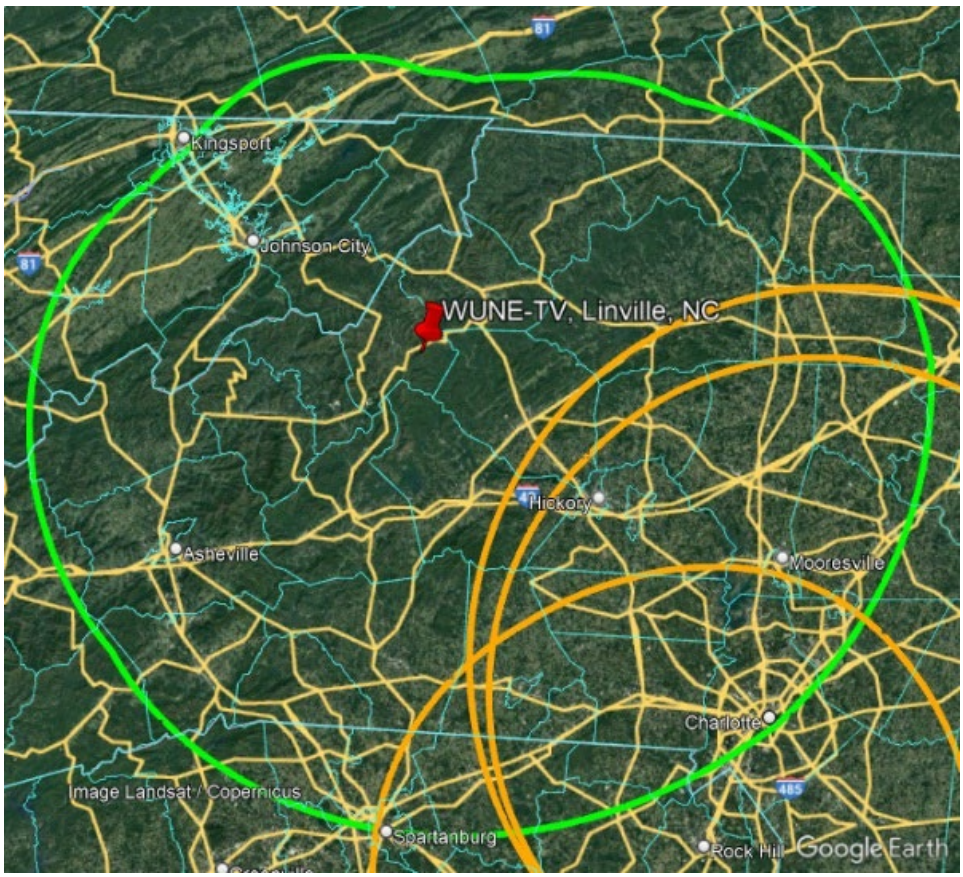

Figure 4: Charlotte Market PBS Member Stations

There are four commercial stations in the Charlotte television market that appear to meet the community of license requirement for WUNE-TV. They are WBTV, Charlotte (CBS); WCNC-TV, Charlotte (NBC); WHKY-TV, Hickory (IND); and WJZY, Belmont (FOX).

Three of these stations, WBTV, WCNC-TV, and WJZY, are already involved in an ATSC 3.0 simulcast partnership in the Charlotte market. The fourth station, WHKY-TV, Hickory was not considered a viable simulcast partner. While WHKY-TV met the community of license requirement, it only duplicated

66.3% of the population served by WUNE-TV. Also, with just WUNE-TV and WHKY-TV, there would be insufficient ATSC 1.0 bandwidth to accommodate a total of two high definition program services along with nine standard definition program services on one station.

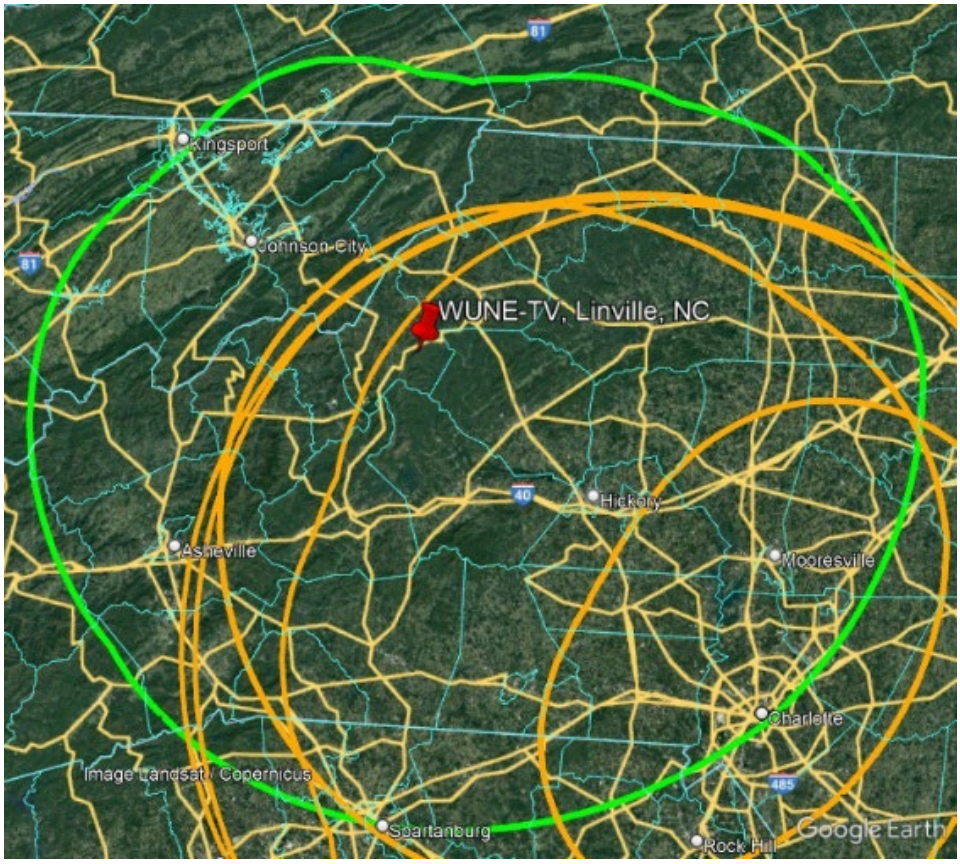

Figure 5: WUNE-TV Potential Commercial Simulcast Partners

Another potential option for reaching the 95% population duplication threshold is the other PBS North Carolina signals that overlap with the WUNE-TV service area. The PBS North Carolina stations carry the same four program services on all stations. The overlap of other PBS North Carolina stations includes four full power television stations and 11 TV translators.

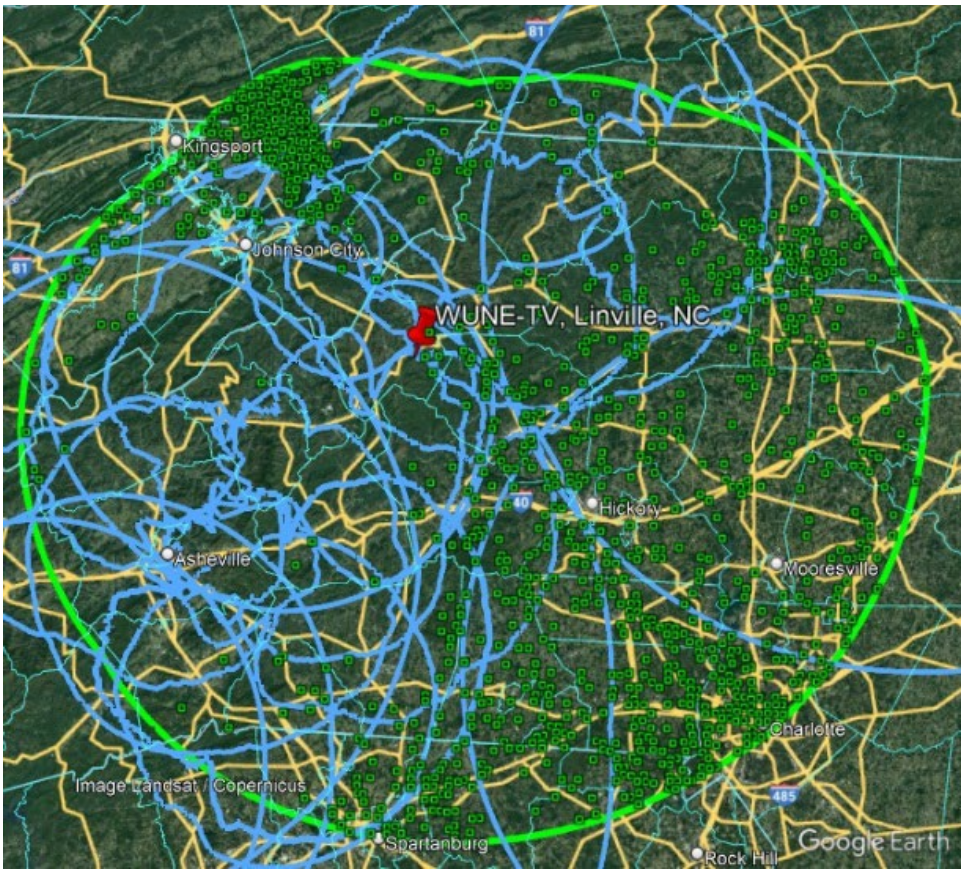

Figure 6: PBS NC Stations Service Contour Overlap with WUNE-TV and WUNE-TV Unique Coverage

The 95% population duplication threshold is not a duplication of service area, but a duplication of population that theoretically can receive the same programming from another signal. In areas like the mountains of western North Carolina, coverage can be significantly reduced due to terrain obstructions.

For WUNE-TV, the population common with the other PBS NC stations is about 1,841,379 (74.1%) or about 724,382 (74.0%) households. For the remaining 642,807 people (25.9%) WUNE-TV is the only PBS North Carolina station serving that area. That would leave those viewers without a PBS North Carolina ATSC 1.0 signal. If PBS North Carolina were to flash cut WUNE-TV, they would need to address the loss of reception at about 254,979 households (26.0%).[3]

KTIN Fort Dodge, Iowa

KTIN Fort Dodge, Iowa is one of nine full power stations operated by Iowa PBS. The transmission site is in north-central Iowa and is in the northern portion of the Des Moines television market.

[3] WUNE-TV statistics were determined using TVStudy version 2.2.5. with default settings of 2km cell size (4 sq km) with a propagation profile resolution of 1 point per kilometer were used.

KTIN Fort Dodge, Iowa
600 kW Directional

Service Area	
Population	281,280
Households	118,800
Area	10,754.5 sq miles

Coverage Area	
Population	278,253
Households	117,462
Area	10,657.0 sq miles

Table 2: KTIN Area Served[4]

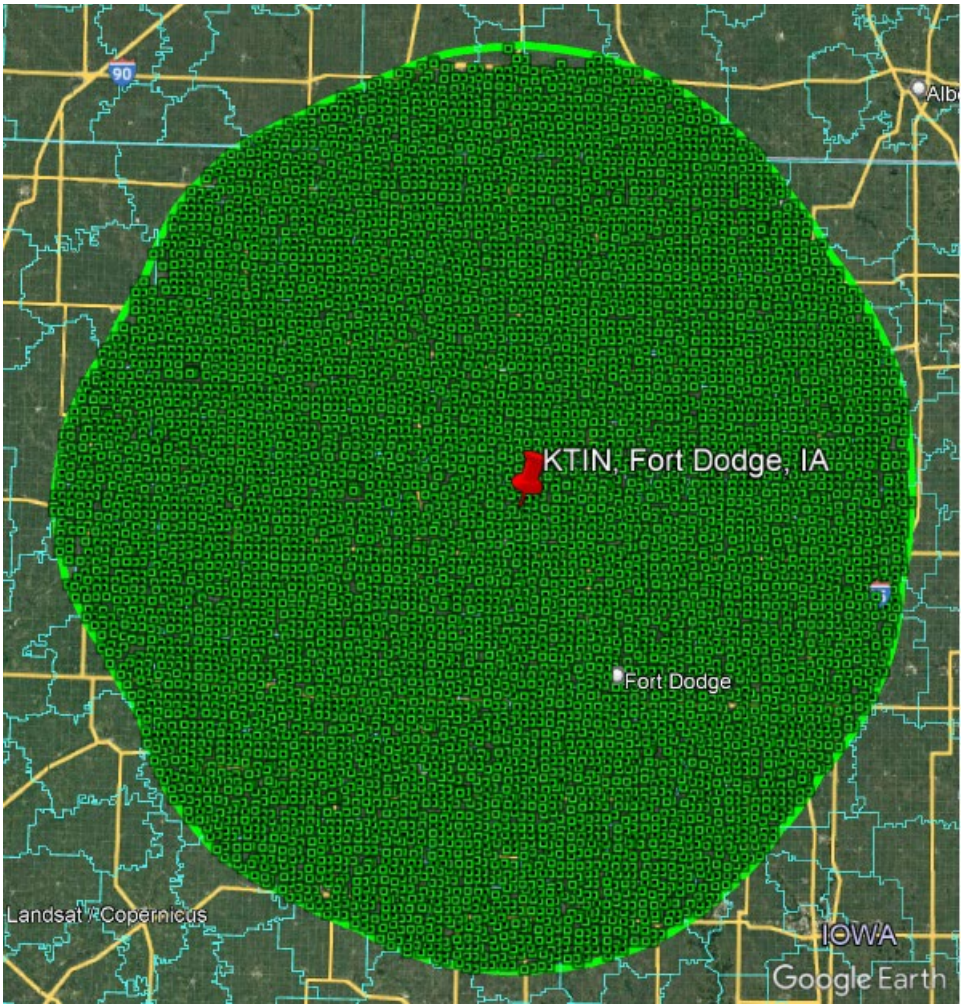

Figure 7: KTIN Service and Coverage Area Map[5]

[4] KTIN statistics were determined using TVStudy version 2.2.5 with default settings of 2km cell size (4 sq km) and a propagation profile resolution of 1 point per kilometer.
[5] Reception is based on a general purpose study created using TVStudy version 2.2.5 using the default settings of 2km cell size (4 sq km) with a propagation profile resolution of 1 point per kilometer.

KTIN was not “repacked” as part of the FCC’s spectrum incentive auction. As a result, for KTIN to begin broadcasting in ATSC 3.0 will require not just the task of how to fulfill the FCC’s transition guidelines, the station will need to address the various transmitter and antenna system needs that are required to convert the facility to ATSC 3.0 operations.

The Des Moines television market is reportedly scheduled to transition to ATSC 3.0 operations in the spring of 2023. KTIN is not being included in the planned ATSC 3.0 operations.

As shown in figure 8, there are eight (8) full power stations in the Des Moines television market that meet the community of license requirement for being a simulcast partner with KTIN. They include KTIN’s sister station KDIN-TV, Des Moines. The other seven (7) stations are KCCI, Des Moines(CBS); KCWI-TV, Ames(CW); KDMI, Des Moines(TCT); KDSM-TV, Des Moines(FOX); KFPX-TV, Newton(ION); WHO-DT, Des Moines(NBC); and WOI-DT, Ames(ABC). KTIN’s most likely simulcast partner is its sister station KDIN-TV.

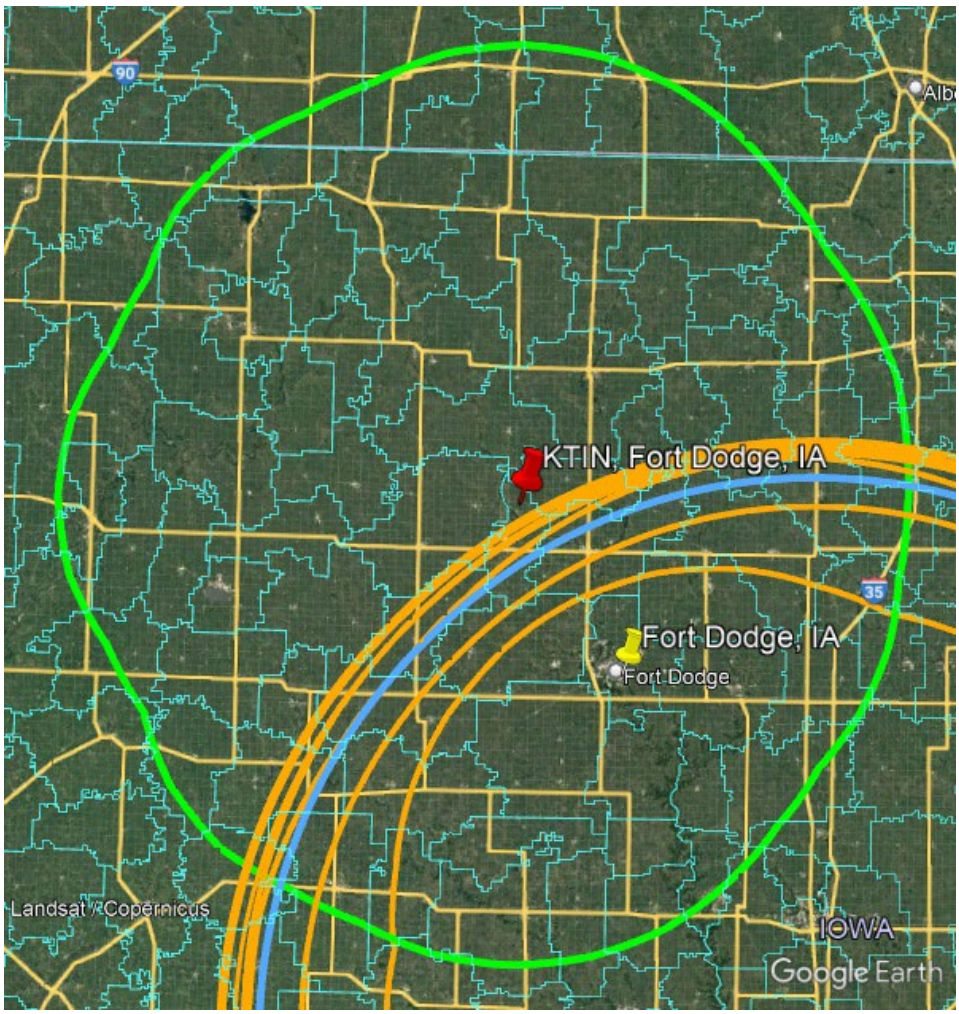

Figure 8: KTIN Potential Simulcast Partners

Iowa PBS also has three (3) other full power stations and one translator that have overlapping coverage with KTIN. See figure 9.

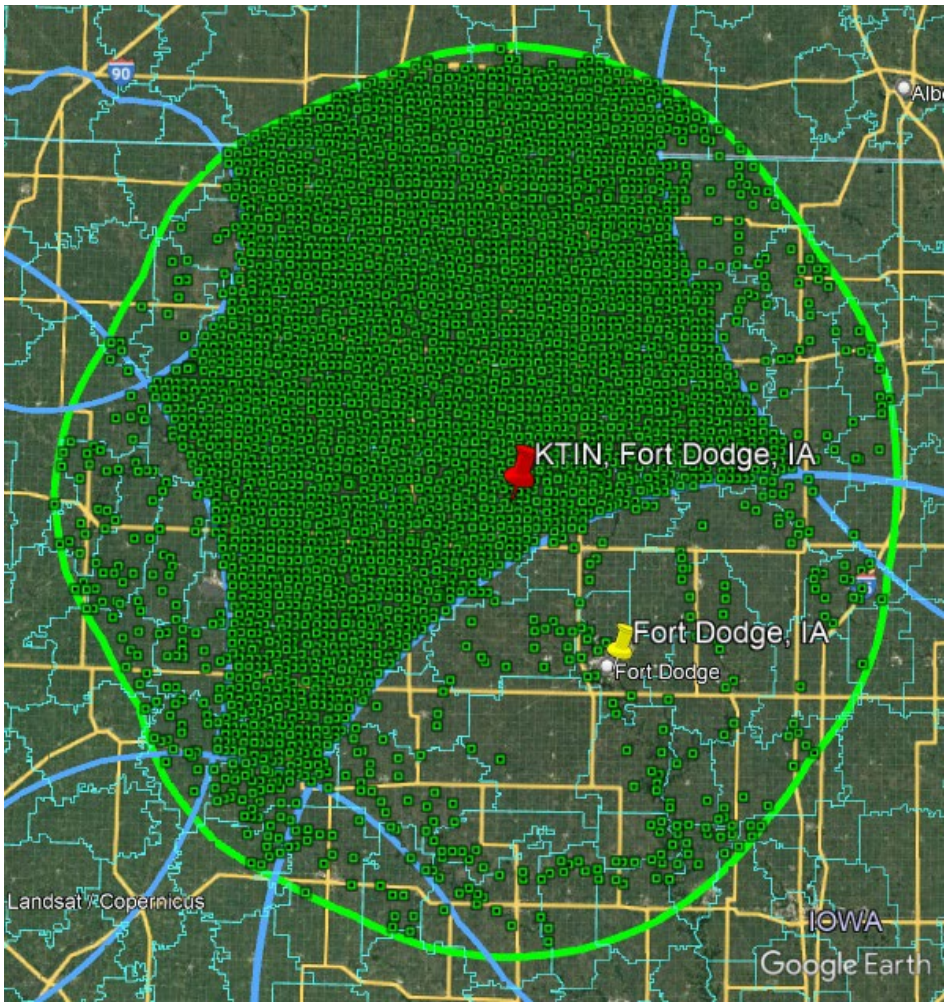

Figure 9: Iowa PBS Stations Service Contour Overlap with KTIN and KTIN Unique Coverage

In the case of KTIN the population common with the other Iowa PBS stations, including KDIN-TV, is about 145,359 (52.2%) or about 59,930 (51.0%) households. For the remaining 132,894 people (47.8%), KTIN is the only full power station serving that area. If Iowa PBS were to flash cut KTIN, they would need to address the loss of reception at about 57,532 households (49.0%).[6]

WUNU Lumberton North Carolina

WUNU Lumberton, North Carolina is one of 12 full power stations operated by PBS North Carolina. The transmission site is in southeastern North Carolina and is in the northern most portion of the Myrtle Beach-Florence television market.

[6] KTIN statistics were determined by using TVStudy version 2.2.5 with default settings of 2km cell size (4 sq km) and a propagation profile resolution of 1 point per kilometer.

WUNU Lumberton, NC
329 kW Non-Directional

Service Area	
Population	1,202,495
Households	456,995
Area	9,875.0 sq miles

Coverage Area	
Population	1,163,925
Households	441,877
Area	9,198.6 sq miles

Table 3: WUNU Area Served[7]

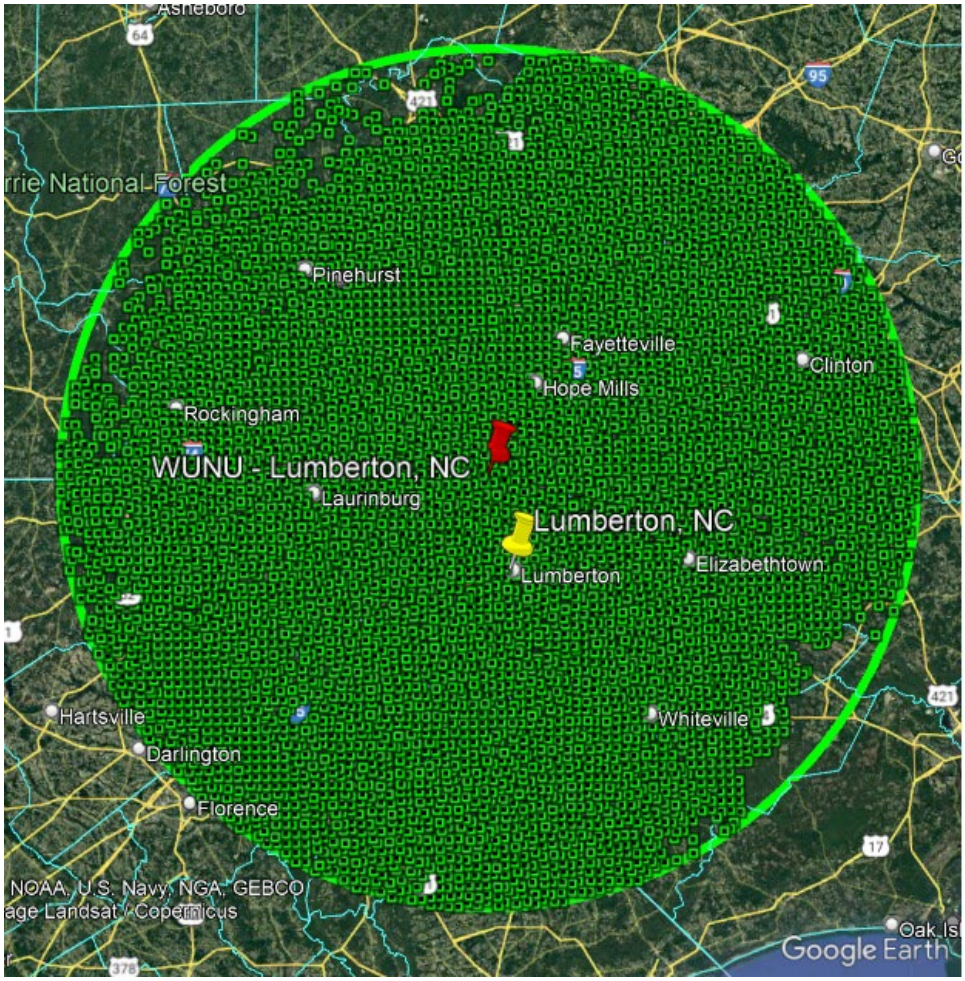

Figure 10: WUNU Service and Coverage Area Map[8]

WUNU was “repacked” as part of the FCC’s spectrum incentive auction. A byproduct of that work was the ability to maximize the station’s coverage. Also, equipment such as transmitters and antennas had to be replaced as part of the repack process. That resulted in making the potential technical transition

[7] WUNU statistics were determined using TVStudy version 2.2.5 with default settings of 2km cell size (4 sq km) and a propagation profile resolution of 1 point per kilometer.
[8] Reception is based on a general purpose study created using TVStudy version 2.2.5 using the default settings of 2km cell size (4 sq km) with a propagation profile resolution of 1 point per kilometer.

to ATSC 3.0 for WUNU a relatively simple task. The much larger task is how to fulfill the FCC's guidelines to allow the station to make that transition.

As shown in figure 11, there are two other PBS member stations in the Myrtle Beach-Florence television market. They are South Carolina ETV's WHMC, Conway and WJPM-TV, Florence, both in South Carolina. Neither of these stations meet the community of license requirement for being a simulcast partner for WUNU. WHMC's noise limited service contour covers part of WUNU's community of license, Lumberton, NC, but it fails to cover the entire community which is required to meet that requirement.

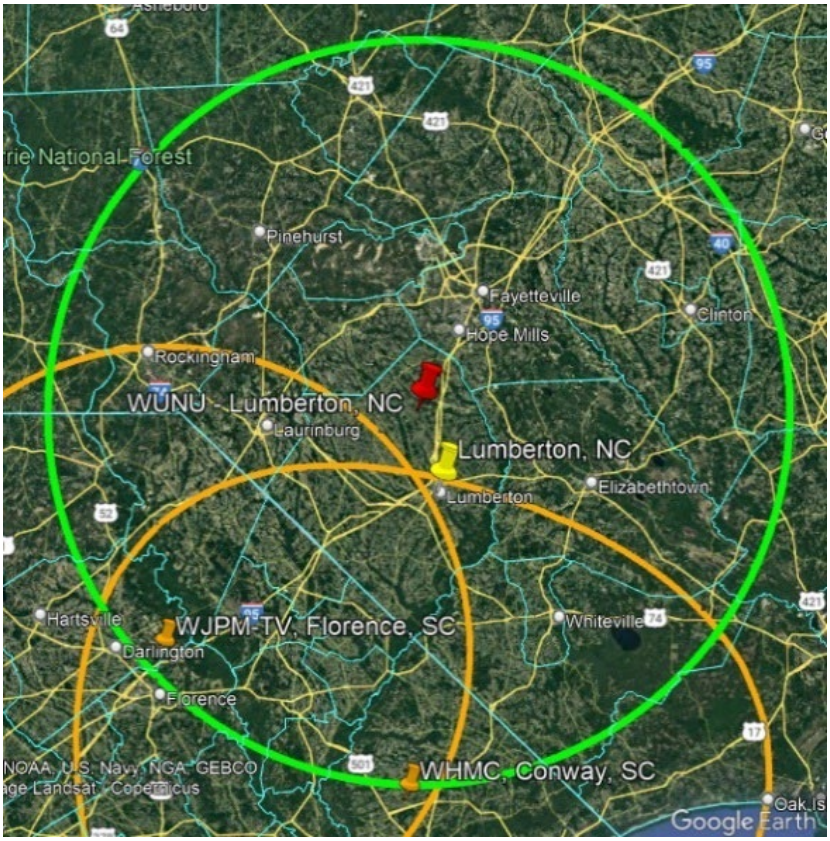

Figure 11: Myrtle Beach-Florence Market PBS Member Stations

Figure 12 shows that PBS North Carolina has four (4) other full power stations with service areas that overlap with the WUNU coverage area. That common coverage area includes a population of 854,993 (73.5%) living in 324,797 households (73.5%). Even with the significant signal overlap of PBS North Carolina signals, if PBS North Carolina were to flash cut WUNU, it would leave a population of 308,932 (26.5%) living in 117,080 (26.5%) households without the ability to receive a PBS North Carolina ATSC 1.0 over-the-air signal.[9]

[9] WUNU statistics were determined using TVStudy version 2.2.5 with default settings of 2km cell size (4 sq km) and a propagation profile resolution of 1 point per kilometer.

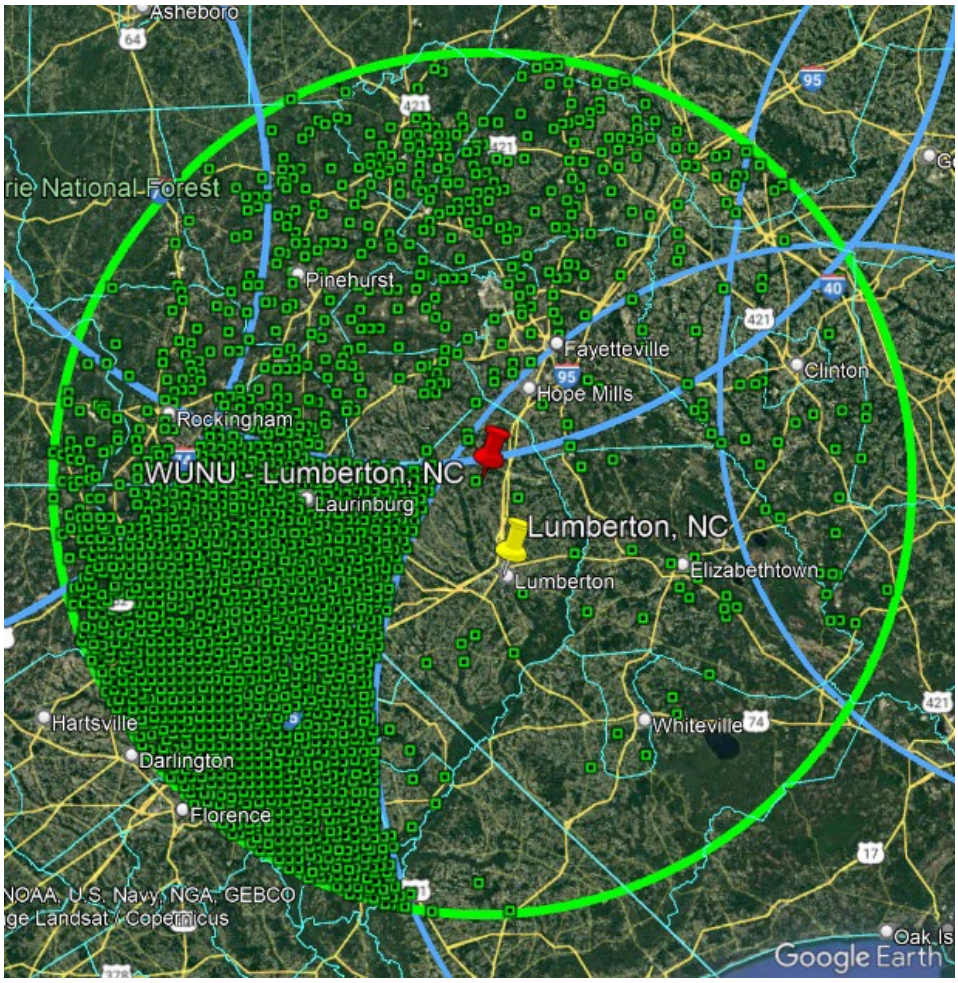

Figure 12: PBS NC Stations Service Contour Overlap with WUNU and WUNU Unique Coverage

Another option to achieve the 95% population duplication threshold would be the use of a simulcast partner. As shown in figure 13, there are four full power commercial stations in the Myrtle Beach-Florence television market that meet the community of license requirement for WUNU. They are WBTW, Florence(CBS); WFXB, Myrtle Beach(FOX); WPDE-TV, Florence(ABC); and WWMB, Florence(DABL). There is also a Class A television station, WTNG-CD, Rockfish, North Carolina. This station is not considered a viable simulcast partner due to the bandwidth requirements necessary to accommodate its 15 program services.

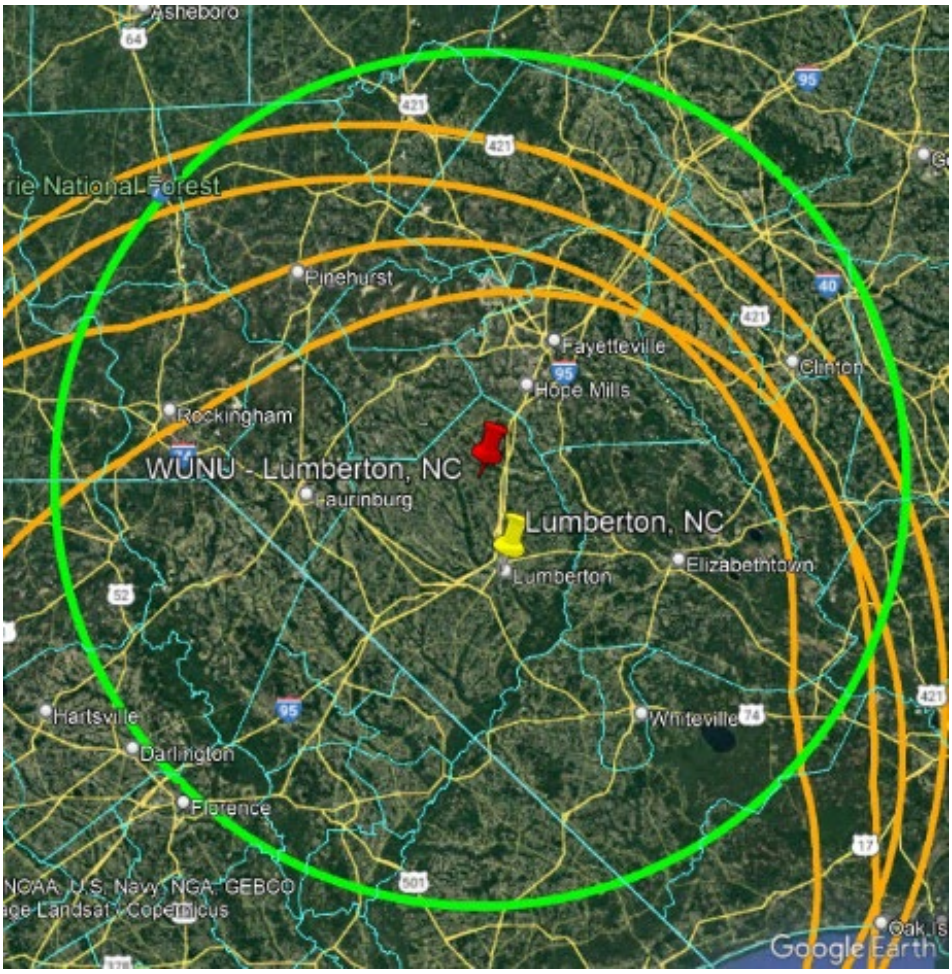

Figure 13: WUNU Potential Commercial Simulcast Partners

The analysis of the overlap of the four (4) stations indicates that none of the stations meets the 95% population duplication threshold[10]. The WUNU population duplication for each station is:

Station	Population Duplicated	% of WUNU Coverage
WBTW	818,681	70.3%
WFXB	661,851	56.9%
WPDE-TV	825,983	71.0%
WWMB	715,214	61.4%

Table 4: WUNU Potential Commercial Simulcast Partners Coverage Duplication

The analysis was expanded to combine the 73.5% overlap from the four PBS North Carolina stations with each of the potential simulcast partner stations. That combination still failed to meet the 95% population duplication threshold.

[10] The stations' population duplication was determined by using TVStudy version 2.2.5 with default settings of 2km cell size (4 sq km) and a propagation profile resolution of 1 point per kilometer.

Station	Population Duplicated	% of WUNU Coverage
WBTW + PBS NC Net	1,052.613	90.4%
WFXB + PBS NC Net	1,027,754	88.3%
WPDE-TV + PBS NC Net	1,050,844	90.3%
WWMB + PBS NC Net	1,038,014	89.2%

Table 5: WUNU Coverage Duplication from Potential Commercial Simulcast Partners and PBS NC Stations

Other Options

With none of the stations in the three scenarios meeting the 95% population duplication requirement, what other options do these stations have?

Alternate TVStudy Parameters

One potential option is to investigate alternate study parameters within the FCC's TVStudy application. The FCC's TVStudy application performs Longley-Rice signal analysis by overlaying a grid on a station's service area and then analyzing the station's signal within each cell of that grid. The path profile for calculating path loss can be altered by adjusting the propagation profile resolution. This is defining the number of terrain sample points per kilometer. The TVStudy analysis to determine whether a station is receivable within a cell takes into account interference from other stations as well as path loss. TVStudy's default configuration of a cell 2 kilometers per side or 4 square kilometers, and a propagation profile resolution of 1 sample point per kilometer was used for the initial data presented earlier in this paper.

The FCC has previously accepted application exhibits using TVStudy analyses that used geographic cell sizes and propagation sample profiles other than the default. Typically, exhibits containing analyses using cell sizes ranging from 0.25 square kilometers up to 4 square kilometers have been accepted. The application will also support propagation profile resolutions from 1 to 50 points per kilometer.

We examined what impact utilizing alternate geographic cell sizes and propagation sample profiles can have on the theoretical population duplication. In doing so, would it be possible for a station to meet the 95% population duplication requirement? We looked at cell sizes of 0.25, 1, and 4 square kilometers. We also looked at propagation profile resolutions of 1, 10, 30, and 50 points per kilometer for each cell size.

WUNE-TV Scenario

For WUNE-TV using the default analysis parameters of 4 square kilometers and a propagation profile resolution of 1 point per kilometer, a 74.1% population duplication from the other PBS North Carolina stations was calculated. When the cell size is changed to 0.25 square kilometers with a propagation profile resolution of 50 points per kilometer, the population duplication increases to 84.5%. See table 6 for the results of the various cases studied for WUNE-TV.

Cell Size (sq km)	Propagation Resolution (points per km)	Population %	Households %	Area %
0.25	1	77.7%	77.5%	87.9%
	10	84.2%	84.0%	91.3%
	30	84.1%	84.0%	91.5%
	50	84.5%	84.4%	91.5%
1.0	1	83.1%	83.0%	88.2%
	10	84.3%	84.1%	91.7%
	30	84.2%	83.9%	91.8%
	50	84.2%	83.9%	91.9%
4.0	1	74.1%	74.0%	85.8%
	10	83.2%	82.9%	91.3%
	30	83.4%	83.1%	91.6%
	50	83.9%	83.8%	91.7%

Table 6: WUNE-TV-PBS NC Stations Duplication Using Various TVStudy Scenarios

KTIN Scenario

For KTIN using the default analysis parameters of 4 square kilometers and a propagation profile resolution of 1 point per kilometer, a 52.2% population duplication from the other Iowa PBS stations was calculated. When the cell size is changed to 0.25 square kilometers with a propagation profile resolution of 10 points per kilometer, the population duplication increases to 56.1%. See table 7 for the results of the various cases studied for KTIN.

Cell Size (sq km)	Propagation Resolution (points per km)	Population %	Households %	Area %
0.25	1	51.7%	50.6%	46.0%
	10	56.1%	54.9%	47.5%
	30	56.0%	54.9%	48.0%
	50	55.8%	54.9%	48.0%
1.0	1	52.0%	50.8%	45.9%
	10	55.1%	54.0%	48.0%
	30	55.5%	54.3%	48.0%
	50	55.2%	54.0%	47.8%
4.0	1	52.2%	51.0%	46.4%
	10	51.8%	50.9%	47.8%
	30	54.7%	53.3%	47.4%
	50	54.1%	52.7%	47.8%

Table 7: KTIN-Iowa PBS Stations Duplication Using Various TVStudy Scenarios

WUNU Scenario

For WUNU using the default analysis parameters of 4 square kilometers and a propagation profile resolution of 1 point per kilometer, a 73.5% population duplication from the other PBS North Carolina

stations was calculated. With the same cell size of 4 square kilometers but the propagation profile resolution changed to 30 points per kilometer, the population duplication increases to 82.1%. See table 8 for the results of the various cases studied for WUNU.

Cell Size (sq km)	Propagation Resolution (points per km)	Population %	Households %	Area %
0.25	1	71.3%	71.5%	70.6%
	10	78.9%	79.5%	74.9%
	30	79.5%	79.9%	75.3%
	50	79.5%	79.8%	75.4%
1.0	1	71.1%	71.2%	70.6%
	10	79.0%	79.7%	75.0%
	30	79.5%	80.0%	75.3%
	50	79.6%	80.0%	75.4%
4.0	1	73.5%	73.5%	70.7%
	10	80.0%	80.4%	75.2%
	30	82.1%	82.5%	75.9%
	50	82.0%	82.3%	75.8%

Table 8: WUNU-PBS NC Stations Duplication Using Various TVStudy Scenarios

The duplication of WUNU's potential simulcast partners were re-evaluated using the 4 square kilometer cell size and a propagation profile resolution of 30 points per kilometer. Again all 4 stations failed to achieve the 95% population duplication threshold.

Station	Population Duplicated	% of WUNU Coverage
WBTW	896,322	76.8%
WFXB	711,860	61.0%
WPDE-TV	903,699	77.5%
WWMB	806,494	69.1%

Table 9: WUNU Potential Commercial Simulcast Partners Coverage Duplication

The simulcast partner analysis was again expanded to include the four PBS North Carolina stations in the population duplication calculations. The combination of any one potential simulcast partner station with the four PBS North Carolina stations meets the 95% population duplication threshold.

Station	Population Duplicated	% of WUNU Coverage
WBTW + PBS NC Net	1,122,753	96.3%
WFXB + PBS NC Net	1,127,241	96.6%
WPDE-TV + PBS NC Net	1,141,045	97.8%
WWMB + PBS NC Net	1,133,355	97.2%

Table 5: WUNU Coverage Duplication from Potential Commercial Simulcast Partners and PBS NC Stations

However, further investigation of the potential simulcast partners revealed a potential problem. Each of the four stations being an ATSC 1.0 simulcast partner would create significant coverage expansion for

WUNU. The increases in population and coverage areas for PBS North Carolina are shown in figures 14A through 14D for each station:

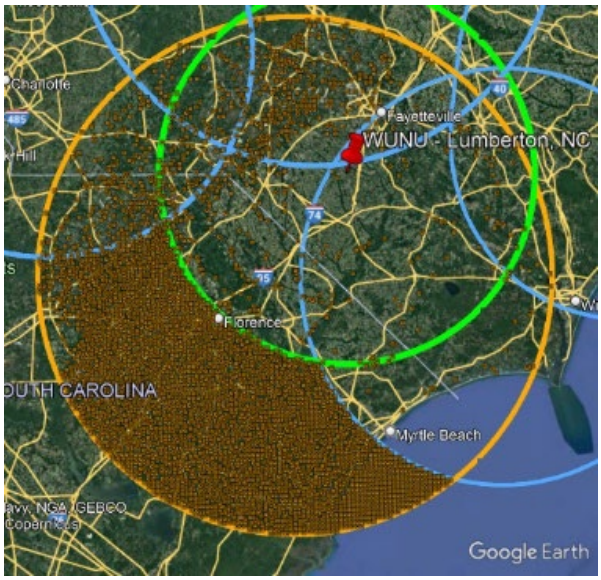

Figure 14A: WBTW Coverage Expansion – 683,412

Figure 14B: WFXB Coverage Expansion – 428,216

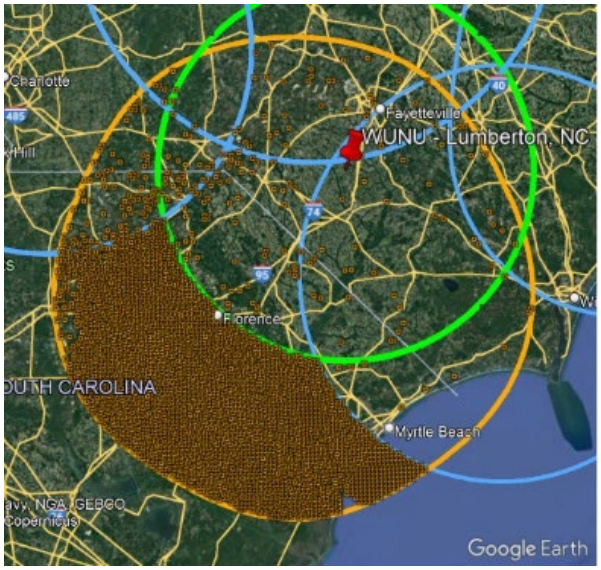

Figure 14C: WPDE-TV Coverage Expansion– 552,007

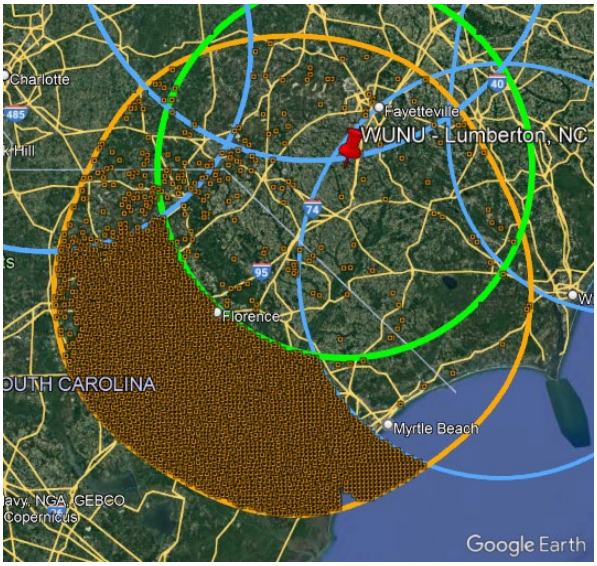

Figure 14D: WWMB Coverage Expansion – 457,426

This coverage expansion could pose a broadcast rights problem due to the significant increase in coverage area. Further investigation would be required to determine the significance of this problem.

Other PBS Member Station Partners

We examined what impact including the coverage of neighboring PBS member stations would have on the ability to still receive an ATSC 1.0 signal. During the digital television transition in 2003 WNVT-DT was granted permission by the FCC to become the first digital only full power television station.[8] In their application request they cited the possibility of providing receive devices for the new digital signal.

They also believed that the impact of their transition would be minimized since it would not create a white space where PBS programming would not be available to analog viewers.

WUNE-TV

There are two other PBS member stations in the Charlotte television market. They are South Carolina ETV's WNSC-TV Rock Hill, South Carolina and Central Piedmont Community College's WTVI Charlotte. Adding these two stations to the coverage of the other PBS North Carolina stations, increases the WUNE-TV population percentage to 93.3%[11]. This combination is still short of the FCC mandated 95% threshold.

There are also three (3) out of market PBS member stations that also have coverage overlap with WUNE-TV. They are Blue Ridge PBS's WBRA-TV Roanoke, Virginia and East Tennessee PBS's two stations, WETP-TV Sneedville and WKOP-TV Knoxville, both in Tennessee. Adding these other three stations increases the WUNE-TV population percentage to 97.4%[12], possibly meeting the 95% requirement.

KTIN

While there are several other PBS member stations near the coverage area of KTIN such as Twin Cities PBS, South Dakota Public Broadcasting, and KSMQ-TV, none of the stations have coverage that overlaps with KTIN. As a result, KTIN's population coverage duplication remained unchanged at 56.1%.[13]

WUNU

There are two other PBS member stations in the Myrtle Beach-Florence television market. They are South Carolina ETV's WHMC, Conway and WJPM-TV, Florence, both in South Carolina. Adding the two South Carolina ETV stations to the coverage of the other PBS North Carolina stations increases the WUNU population percentage to 96.2%[14], possibly meeting the 95% requirement.

This strategy is not mentioned in the FCC ATSC 3.0 transition guidelines. Stations are **strongly urged** to contact their legal counsel to discuss whether this is a potential strategy for you.

Conclusions

In the three station scenarios studied, none of the stations met the simulcast partner requirements for transitioning to ATSC 3.0. A Flash Cut is the only option for these stations. With the voluntary adoption of ATSC 3.0 and the current FCC guidelines that must be met to transition to ATSC 3.0, many Public Broadcasters will have significant challenges to overcome to make that conversion. Examples of those challenges were presented here. A number of receiver manufacturers have products in development that will eventually be available to the general public. Once these products are readily available, more viable ATSC 3.0 transition options will become available for broadcasters. The key is for the FCC to provide flexibility in its ATSC 3.0 transition guidelines that will allow more stations to transition.

In preparing this paper we discovered that utilizing TVStudy data along with simple database analytics made determining population, household, and areas of reception duplication an achievable task. We also determined that the TVStudy default settings did not provide the most optimistic results for

[11] The WUNE-TV duplication percentage was determined using TVStudy version 2.2.5 with settings of 0.5km cell size (0.25 sq km) and a propagation profile resolution of 50 points per kilometer.
[12] The WUNE-TV duplication percentage was determined using TVStudy version 2.2.5 with settings of 0.5km cell size (0.25 sq km) with a propagation profile resolution of 50 points per kilometer.
[13] The KTIN duplication percentage was determined using TVStudy version 2.2.5. with settings of 0.5km cell size (0.25 sq km) with a propagation profile resolution of 10 point per kilometer.
[14] The WUNU duplication percentage was determined using TVStudy version 2.2.5. TVStudy settings of 2km cell size (4 sq km) with a propagation profile resolution of 30 points per kilometer.

showing common coverage areas between stations. We also found that there is no “one fits all” set of alternate study parameters for TVStudy that provides the most optimistic results.

For WUNE-TV we found that a full power station with maximized coverage in a mountainous area is difficult to duplicate coverage when the stations aren’t co-located. We determined reaching the 95% population duplication level with simulcast programming wasn’t possible. However, we were able to demonstrate that a flash cut of WUNE-TV to ATSC 3.0, 97.4% of the station’s viewers would still be able to receive an ATSC 1.0 signal containing PBS programming.

The KTIN scenario is an example of public television stations serving the under-served. Over 40% of the population that receives a signal from KTIN can’t receive another television station, that’s both public and commercial stations. Flash cutting KTIN will require a significant number of ATSC 3.0 receive devices in viewers homes to prevent viewers from losing all over-the-air television service.

The WUNU scenario shows a problem resulting from the use of a simulcast partner that has a significantly different coverage area from its partner station. For WUNU, while none of the simulcast partners on their own met the FCC’s 95% population duplication requirement, factoring in the duplication of the surrounding PBS North Carolina stations pushed that total over the 95% threshold. However, it was also discovered that PBS North Carolina would increase its population served by over 420,000 people with the inclusion of the simulcast partner’s coverage area. PBS North Carolina currently does not have broadcast program rights for its content in this expanded coverage area. In order to move forward with one of these simulcast partners will require determining whether the broadcast rights to the program content can be obtained for that area and at what cost.

We discovered a different approach that could be taken that avoids the program rights problem. We were able to demonstrate that a flash cut of WUNU to ATSC 3.0, 96.2% of the station’s viewers would still be able to receive an ATSC 1.0 signal containing PBS programming.

A reminder that the percentages of duplicated coverages presented here are all theoretical. Even with 100% theoretical overlap, a station in practical terms will have some viewers that will lose reception. The primary cause will be reduced signal level. An example would be a location where an indoor antenna was being used because it was sufficient to receive a good quality signal. However, the simulcast partner’s signal is weaker at that location, requiring a higher gain antenna in order to maintain good quality reception. The viewer might need an outdoor antenna to again receive that good quality signal. If that viewer lives in a location like an apartment building where an outdoor antenna isn’t a possibility, what do they / you do so the viewer can once again receive the programming? A station needs to be prepared to address this and similar reception challenges.

While the FCC is currently justified in their concern of viewers being deprived of over-the-air television with stations flash cutting to ATSC 3.0, they also need to provide station flexibility to promote the transition to ATSC 3.0. Not doing so would not only delay the transition process, it would also deprive individuals access to the various services that a station transmitting an ATSC 3.0 signal can provide. Services that were only contemplated a few months ago are now becoming reality. Not allowing stations to transition to ATSC 3.0 deprives individuals access to these helpful, informative, and potentially lifesaving services. There are many benefits that public broadcasters will be able to offer viewers utilizing ATSC 3.0. The question is will they be given the opportunity to provide them by transitioning to ATSC 3.0.

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