

A NEXTGEN FUTURE FILLED WITH SFN'S

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EVP, Infrastructure

Sunday, April 24, 2022

NABSHOW[®]
Where Content Comes to Life

SIGNAL
INFRASTRUCTURE GROUP

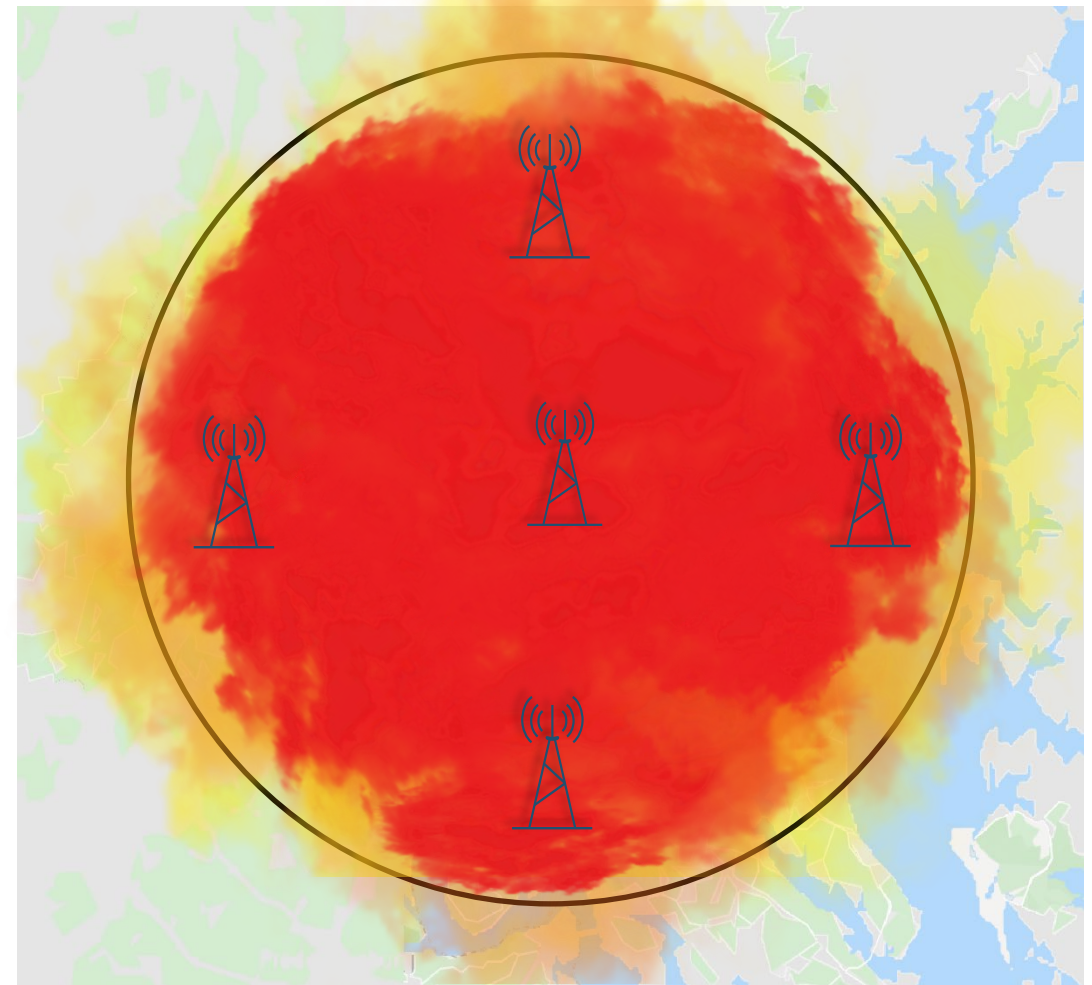
FIRST, WHAT IS AN SFN?

SINGLE FREQUENCY NETWORK = SFN

- **A NETWORK OF PRECISELY TIMED ON-CHANNEL DISTRIBUTED TRANSMISSION SITES WHICH FILL IN COVERAGE**
- **LOWER ERP AND HEIGHT THAN MAIN**

● Good OTA reception

● Poor OTA reception



SECOND, MEET JOE DOE



**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

SECOND, MEET JOE DOE



**HE HAS QUESTIONS
ABOUT HIS FUTURE**

**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

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**I KEEP HEARING ABOUT
NEXTGEN SINGLE FREQUENCY
NETWORKS (SFN'S).**

THEY LEAVE ME WONDERING?

**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

SECOND, MEET JOE DOE



**WHY DOES MY STATION
NEED TO SPEND \$ ON SFN'S?**

**MY EXISTING
TRANSMISSION SYSTEM
SERVES US JUST FINE??**

**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

SECOND, MEET JOE DOE



**WHAT NUMBER OF SFN
NODES WILL PROVIDE A
RETURN ON OUR
INVESTMENT??**

**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

SECOND, MEET JOE DOE



**HOW WILL WE DESIGN, BUILD,
AND OPERATE AN SFN WITH
THE LIMITED ENGINEERING
RESOURCES I HAVE??**

**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

SECOND, MEET JOE DOE



HOW WILL I PAY FOR IT?

**I DON'T HAVE TWO PENNIES
TO RUB TOGETHER FOR
CAPITAL EQUIPMENT!**

**JOE IS THE D.O.E. FOR A
TV STATION GROUP**

THIRD, ANSWER JOE'S QUESTIONS

SOME IMPORTANT GIVENS:

- **ATSC 3.0 IMPLEMENTATION IS HAPPENING, CONVERSION IS INEVITABLE**
- **OFDM MODULATION HAS SIGNIFICANT MULTIPATH AND DOPPLER BENEFITS**
- **INTERNET PROTOCOL OPENS FLOODGATES FOR NEW USE CASES**
- **KEY BENEFIT IS INCREASED FLEXIBILITY**
 - **MULTIPLE "PIPES" OF VARIOUS SIZES**
 - **ABILITY TO TAILOR EACH PIPE TO USE CASE**
- **ADVANCED VIDEO COMPRESSION YIELDS CAPACITY**
- **LDM LAYER CAN YIELD EVEN MORE CAPACITY**

WHY AN SFN?

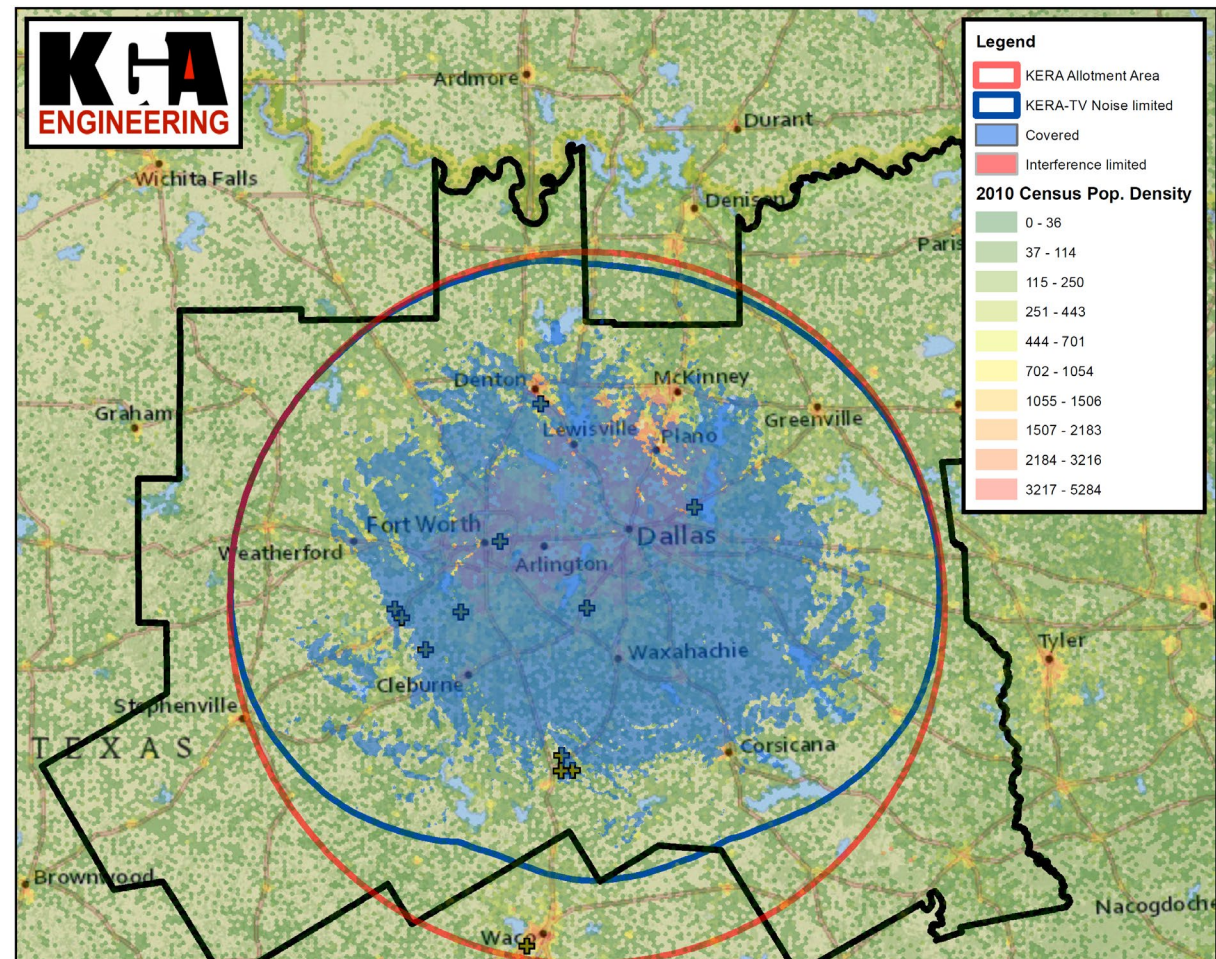
FCC CONTOUR PREDICTIONS OFTEN FALL SHORT OF REAL WORLD RECEPTION

- **50% TO 80% OF PREDICTED POPULATION IS MORE TYPICAL**
- **THIS IS DALLAS WHICH HAS LIMITED TERRAIN AND INTERFERENCE ISSUES**

81% COVERAGE

● High Population

● OTA reception



WHY AN SFN?

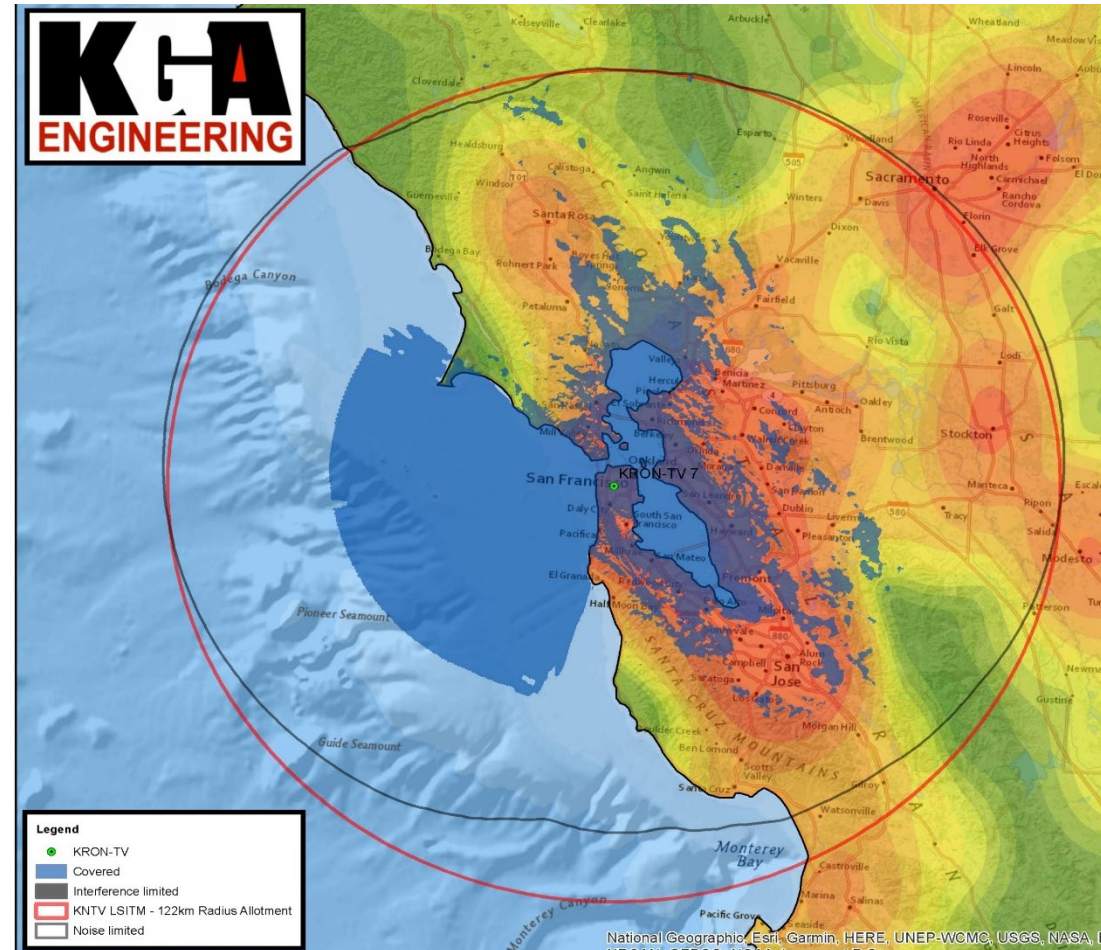
FCC CONTOUR PREDICTIONS OFTEN FALL SHORT OF REAL WORLD RECEPTION

- THIS IS SAN FRANCISCO WHICH HAS LOTS OF TERRAIN ISSUES

40% COVERAGE

● High Population

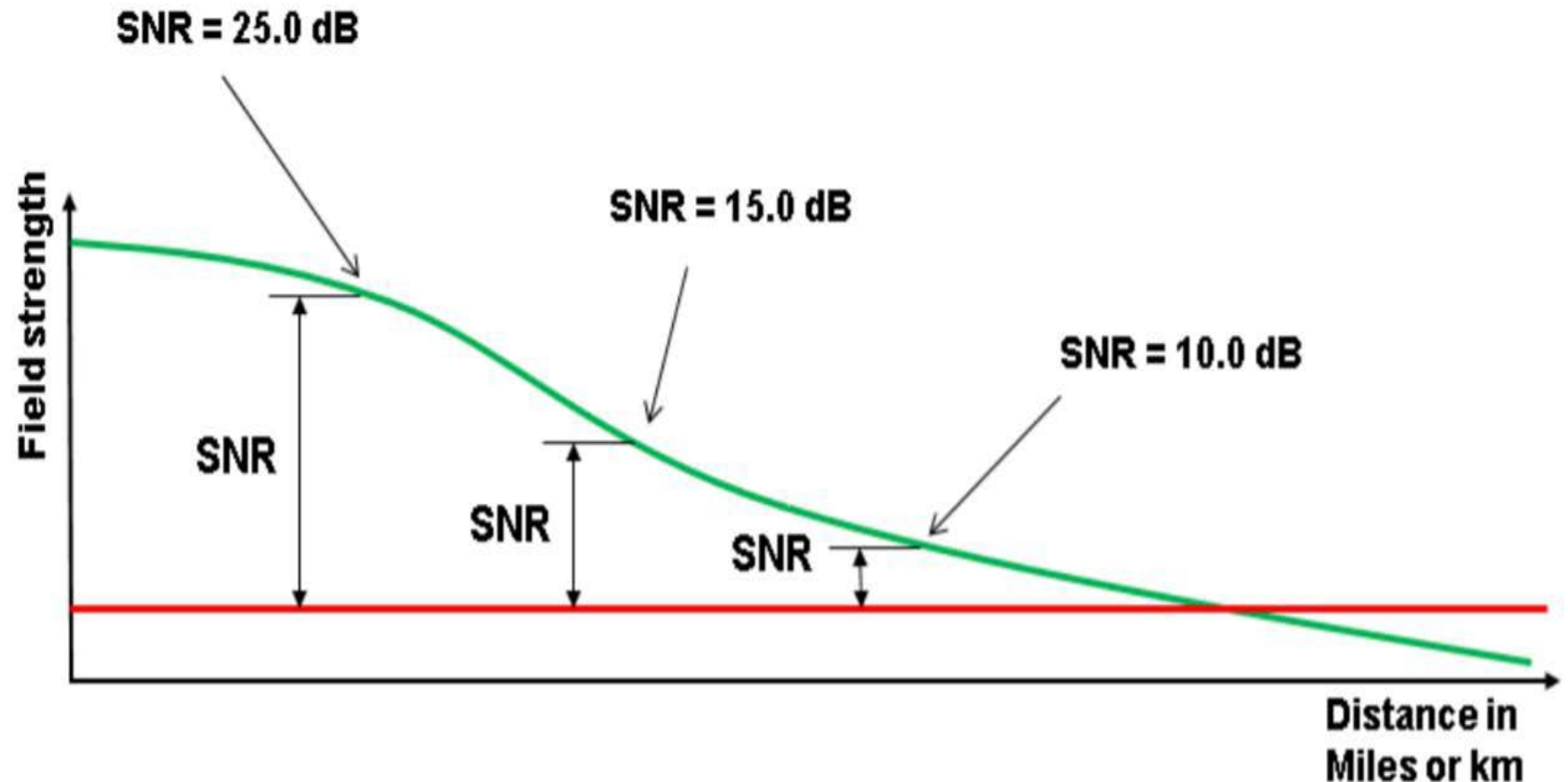
● OTA reception



WHY AN SFN?

IT'S DISTANCE FROM THE TRANSMITTER THAT MAKES A DIFFERENCE

- **SIGNAL LEVELS DECREASE BY DISTANCE SQUARED FROM TRANSMITTER**
- **FOR DIGITAL SIGNALS, RECEPTION OCCURS ONLY ABOVE A GIVEN S/N RATIO**



WHY AN SFN?

QUALITY IS INVERSELY PROPORTIONAL TO COVERAGE

**HIGHER
CONTENT
QUALITY/
QUANTITY**



REQUIRES



**HIGHER
BANDWIDTH**

**HIGHER
BANDWIDTH**



REQUIRES



**HIGHER
SNR**

**HIGHER
SNR**



REQUIRES



**MORE
SIGNAL**

**HIGHER
CONTENT
QUALITY/
QUANTITY**



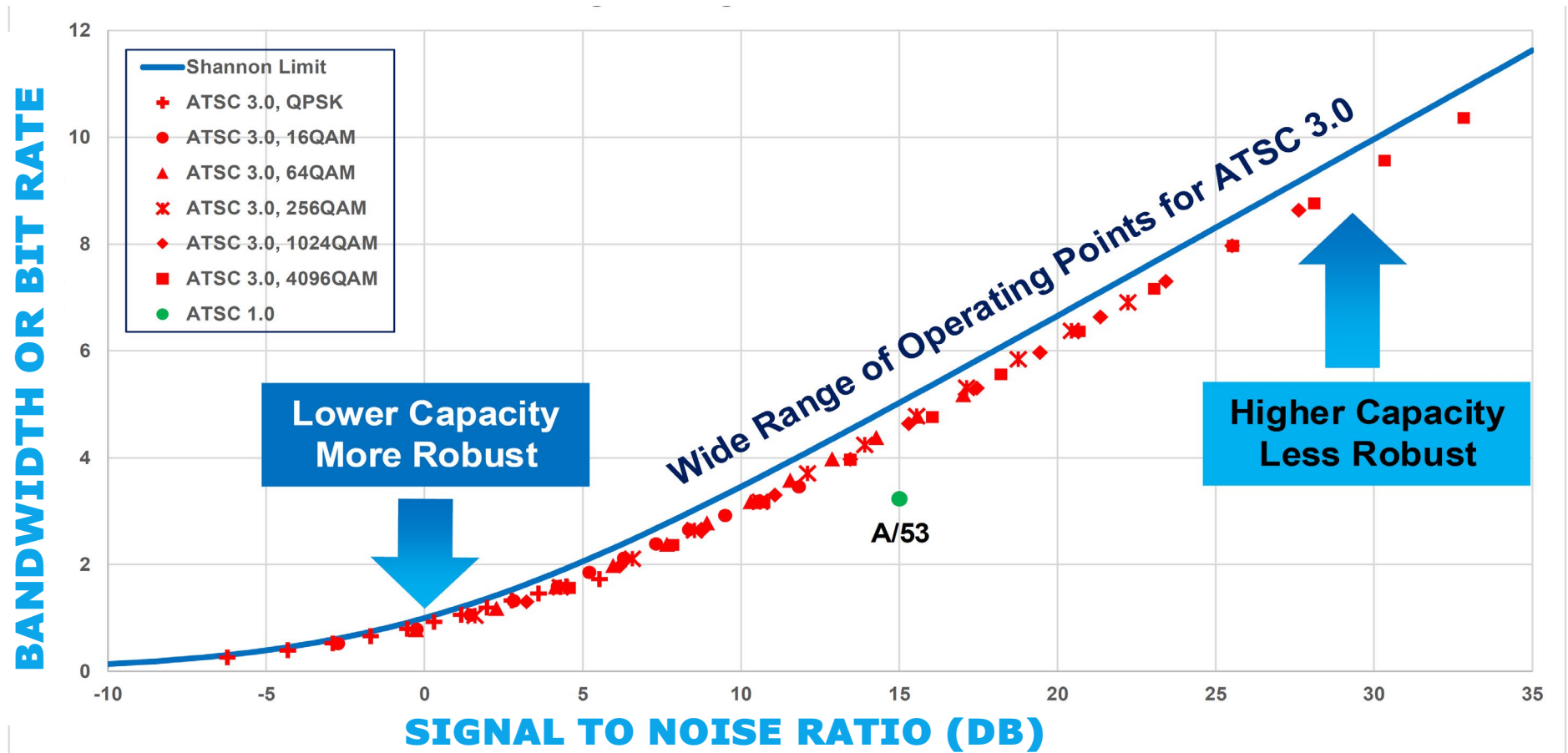
YIELDS



**REDUCED
COVERAGE**

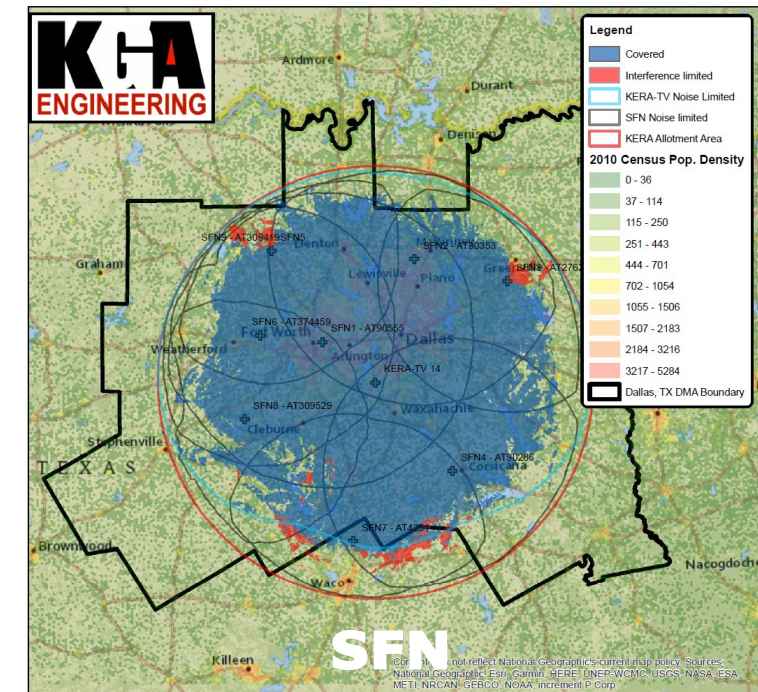
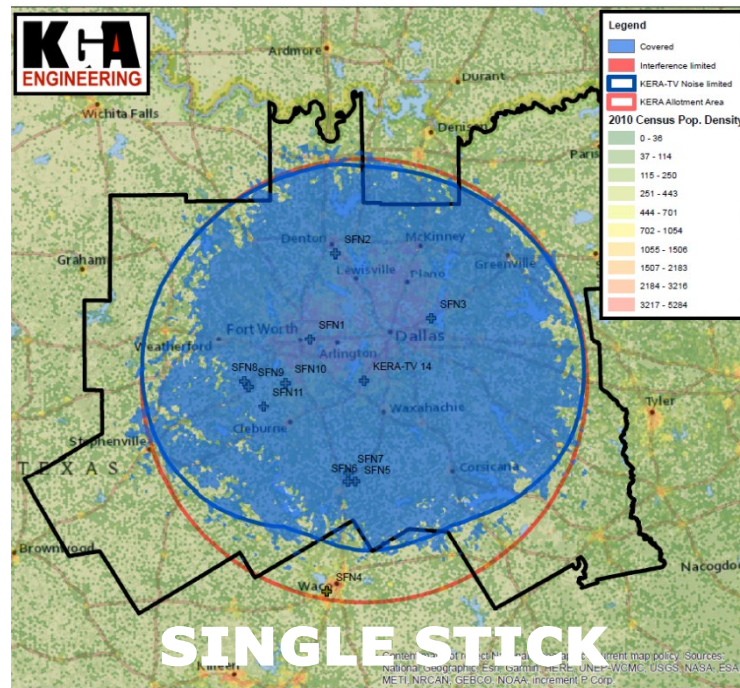
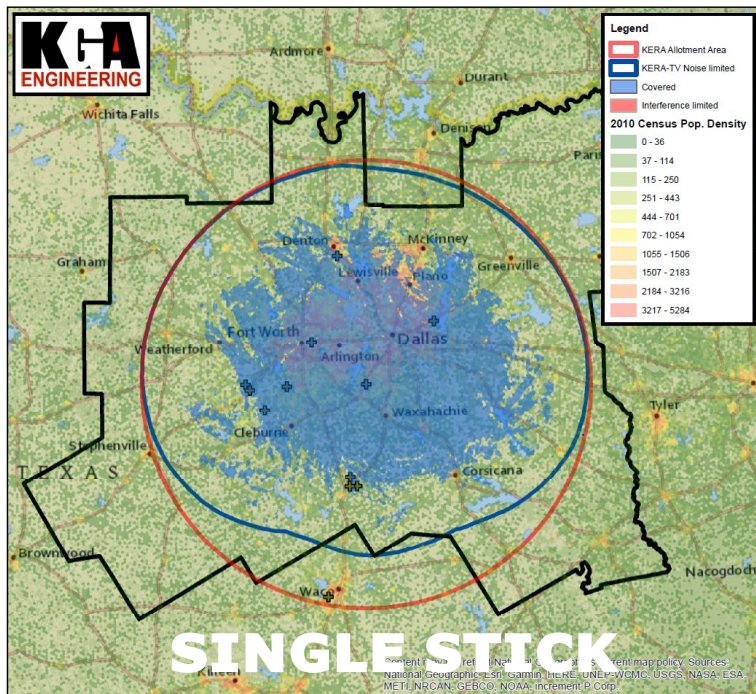
WHY AN SFN?

MORE STUFF IN THE PIPE MAKES IT HARDER TO RECEIVE



WHY AN SFN?

SFN'S ALLOW YOU TO HAVE YOUR CAKE AND EAT IT TOO!



WHAT WILL IT DO FOR ME?

FULL UTILIZATION OF ATSC 3.0 FEATURES AND USE CASES

- **SFN'S PROVIDE HIGH SIGNAL LEVELS TO LARGER AREA AND/OR POPULATION**
 - **OVERCOME TERRAIN BLOCKAGE**
 - **HANDLE URBAN SPRAWL**
 - **ALLOW TARGETED DEMOGRAPHICS**
 - **SPORTING EVENTS**
 - **PARTICULAR NEIGHBORHOODS**
 - **HIGHWAYS**

HOW MANY SITES ARE NEEDED?

IT DEPENDS!

- **DEFINE COVERAGE GOALS FIRST**
 - **INCREASE POP'S**
 - **CURE TERRAIN BLOCKAGE**
 - **TARGET PROBLEM AREAS**
- **INTERFERENCE PARAMETERS OFTEN KEY TO DESIGN**
 - **ADJACENT CHANNEL (MOSTLY FROM INSIDE COVERAGE)**
 - **CO-CHANNEL (MOSTLY FROM OUTSIDE COVERAGE)**

HOW MANY SITES ARE NEEDED?

IT DEPENDS!

DESIGN WITH A PHASED UPGRADE PATH:

- **INITIAL DESIGN MAXIMIZES GOALS WITH MINIMUM # OF SITES**
- **FUTURE PHASES**
 - **BOOST LEVELS FURTHER**
 - **ADD SPOT LOCATIONS/EVENTS**
 - **SERVE CHANGING POPULATION CENTERS**

HOW CAN I GET IT BUILT?

SHARED INFRASTRUCTURE IS KEY TO AFFORDABILITY

- **USE MULTI-TENANT, MULTI-CHANNEL DESIGNS FOR QUANTITY OF SCALE**
- **USE COMPUTER SIMULATION WITH TESTED MODELS FOR CONFIDENCE**
- **STANDARDIZE BUILDS WITH LIMITED SYSTEM VARIATIONS**
- **PARTNER WITH KEY VENDORS FOR QUANTITY AND QUALITY**
- **TIGHTLY MANAGE PROJECT FROM DESIGN TO BUILD TO OPERATION**
- **APPLY RF AND CONSTRUCTION KNOWLEDGE FROM SIMILAR BUILDS**

HOW WILL IT OPERATE?

TXAAS – TRANSMISSION AS A SERVICE

- **WE PROVIDE COMPLETE SYSTEM AND OPERATE IT AS A SERVICE**
- **NATIONWIDE/REGIONAL/LOCAL EXPERTISE AVAILABLE
DEPENDENT ON NEED**
- **NO STATION EXPERTISE OR ONGOING PERSONNEL REQUIRED**
- **24/7 MONITORING, CONTROL, AND DISPATCH**
- **MAINTENANCE MANAGED AND PRE-SCHEDULED INCLUDING
WARRANTY**

HOW CAN I GET IT PAID FOR?

TXAAS – PROVIDES FLEXIBILITY OF FUNDING

- **SHARED SYSTEMS HELP LOWER INITIAL AND ONGOING COSTS**
- **LIMITED OR NO CAPEX NEEDED**
- **STATIONS HELP RECRUIT OTHER PARTICIPANTS**
- **DEVELOP NEW USE CASES TO GENERATE REVENUE**

WHY SHOULD I BEGIN NOW?

DELIVER ON THE PROMISE OF NEXTGEN TV

- **POOR OTA RECEPTION DELAYS MARKET ACCEPTANCE**
- **NEW USE CASES BEING DEFINED EVERY DAY**
- **DESIGN/BUILD CYCLE TAKES TIME**
- **WE HAVE COMPLETED PRELIMINARY DESIGNS IN SEVERAL MARKETS**
- **START WITH A DESIGN ONLY PROJECT TO UNDERSTAND OPPORTUNITY**

CONCLUSION

THE FUTURE IS FILLED WITH SFN'S

SFN'S CAN:

- **FILL MARKETS WITH COVERAGE**
- **FILL BROADCASTING WITH NEW USE CASES**
- **FILL STATIONS WITH REVENUE AND MISSION OPPORTUNITIES**

AND TRANSMISSION AS A SERVICE (TXaaS) CAN DO IT EFFICIENTLY!

THANK YOU!



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