



Setting the Standards for
Home Energy Efficiency

Virtual QA, Timely Feedback in a Long Distance Partnership

Glenn Pease

EnergyLogic

Aaron Gary

US-EcoLogic

Paul Gay

US-EcoLogic

Daran Wastchak

D.R. Wastchak, LLC

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Presentation Outline

- ✓ "Virtual" QA as part of the new RESNET QA
- ✓ Overview of Working Group work to date
- ✓ Overview of Virtual QA draft Protocol
- ✓ "Let's Give It A Try"...Lesson Learned
- ✓ What's next

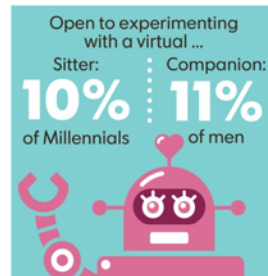
Virtual QA, Timely Feedback in a Long Distance Partnership



"Virtual" QA as part of the new RESNET QA

USA SNAPSHOTS®

Rise of 'Ex Machina'



Source Intel's "Architecting the Future of the Smart Home 2025" survey of 2,500 U.S. adults
TERRY BYRNE AND KARL GELLES, USA TODAY
February 26, 2016

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"Virtual" QA as part of the new RESNET QA

✓ RESNET Standard Amendments for Quality Assurance

- 904.3.3.2.5 Virtual QA Field reviews. QA Field reviews not completed on-site, in-person by a Quality Agent, may be completed remotely using video technology and processes, protocols, and procedures approved by RESNET.
- 904.3.3.1.5 "Virtual" QA Field reviews. All HERS Raters and RFI's must annually receive a minimum of one (1) on-site, in-person QA Field review on a completed home and also one (1) on-site, in-person QA Field review on the same or a different home before drywall is installed. All subsequent QA Field reviews, for completed and pre-drywall homes, may be performed using a "virtual" QA Field review methodology specified by RESNET.

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Overview of Working Group Work To Date

✓ Getting Started

- Several conference calls to build an outline of what the process involved. Proof is in the pudding, realized we needed a field test or tests to really see how things would go.



- Four field BETA tests, each providing useful feedback – and ways to improve the process.

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Overview of Working Group Work To Date

✓ BETA 1

- EnergyLogic (Broomfield, CO)
- Follow up on rating done the previous day
- Google Hangout
- Daran was off site doing "virtual QA"
- Glenn was onsite by himself acting as the QA assistant
- Glenn walked us through his process
- Files /plans etc. provided to all
- Video/audio through phone mounted on a chestcam rig
- Just getting a feel for process and system connectivity / feedback

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Overview of Working Group Work To Date

✓ BETA 1 Outcomes

- It works !!!



...but

- We need to develop an effective data recording protocol – photos or save video?
- Make sure notifications are turned OFF
- NEED 4G connection
- NEED Hands-free video.
- Need to be sure to follow a QA Checklist

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Overview of Working Group Work To Date

✓ BETA 2

- TEXENERGY
- “Side by side” review
- WebEx (free and records)
 - Other options played with: Join Me and GoToMeeting – had issues with our internal server allowing us to use these two options
- Daran QA, Randy Rater, Aaron and Josh helpers, Paul setting up webinar
- Did a dry run day before. Had to solve camera Jump issue, find out how to lock on person with video.
- Used a head cam



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Overview of Working Group Work To Date

✓ BETA 2 Outcomes

- Video feed froze. Used devices and 2 cell services to make work, one for sound (iPad on ATT) and one for video (iPhone on Sprint). This worked OK because we had enough people, but would be problematic if only Rater onsite.
- No delay or pause, but fuzzy video (reinforce the need for photo documentation)
- Drained battery
- Dry run is very important. Need to have a plan B and C if Mr. Murphy isn't cooperating.
- 2.75 hours of video saved in Dropbox = 216.9 MB

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Overview of Working Group Work To Date

✓ BETA 3

- EnergyLogic
- "Follow up" review i.e. rating done the day before
- Used Google Hangout for video and GoToMeeting to show docs to those of us watching remotely
- Glenn was in office acting as QA while Scott Doyle was QA Assistant by himself in the field
- Goal to get the process down to an hour

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Overview of Working Group Work To Date

✓ BETA 3 Outcomes

- Split data. In office, QA used desktop for file review and tracking and used tablet to view video
- Glenn figured a way to record video
- Builder said home was ready but..... no power and some equipment not installed
- Decided to postpone review
- All we had to do was reschedule. Minor inconvenience compared to if QA had needed to fly in, book hotel, car rental, etc.
- This is one of the major benefits of virtual QA



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Overview of Working Group Work To Date

✓ BETA 4

- EnergyLogic
- Repeat of Beta 3 – different home
- Glenn was in office acting as QA while Tom Flanagan was QA Assistant by himself in the field
- Goal to get the review done in one hour



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Overview of Working Group Work To Date

✓ BETA 4 Outcomes

- Lost connection for a bit, video interrupted when a call came in
- Tom provided great feedback and communication.
- Felt process was intense and having the camera strapped to your chest is more rigorous than in person QA

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Overview of Virtual QA Draft Protocol

✓ Virtual QA Protocol broken into 4 parts

- Roles and Responsibilities
- Preparation by Rater and QAD
- On-site Process
- Minimum requirements and Appendices



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Overview of Virtual QA Draft Protocol

✓ Roles & Responsibilities

- QAD
- Rater
- Virtual QA Assistant (could be the Rater)
- Helper (optional)



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Overview of Virtual QA Draft Protocol

✓ Roles

- QAD
 - Same as current RESNET Standards
- Rater
 - Same as current RESNET Standards



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Overview of Virtual QA Draft Protocol

✓ Roles

- Virtual QA Assistant
 - There are multiple ways to conduct Virtual QA Review, all of which require a Virtual QA Assistant (VQA). This Assistant must, at a minimum, be a certified HERS Rater or Rating Field Inspector.
 - Options for Virtual QA Assistants:
 - A QAD oversees the Rater acting as the VQA at the Rater's initial site visit to complete a rating on a dwelling;
 - A QAD oversees the Rater acting as the VQA as the Rater completes a "re-test" of a dwelling previously rated by the Rater, replicating the Rater's own results;
 - A QAD oversees another Rater or RFI acting as the VQA testing and inspecting a dwelling previously rated by another Rater, guiding them through the dwelling.



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Overview of Virtual QA Draft Protocol

✓ Roles

- Helper
 - A helper may be used during this quality assurance process. Please note on documentation, and state verbally, that a helper is present. If a Rater/RFI or QAD is uncomfortable with the helper at any time, the helper may be asked to leave.
 - Helpers are permitted to act as a general helper (e.g., run the camera, clean props, prep for test, etc.).
 - Helpers are NOT permitted to be involved with any aspect of the evaluation of the minimum rated features and may NOT discuss testing with the Rater/RFI during the Virtual QA evaluation.

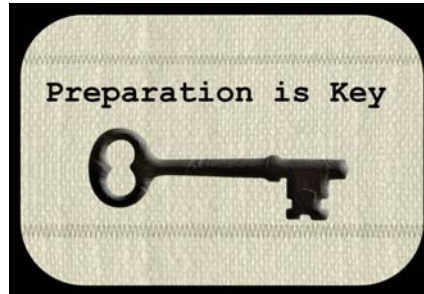


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Overview of Virtual QA Draft Protocol

- ✓ **Preparation by QA (including VQA) and Rater**
 - Remote preparation for QAD and Virtual QA Assistant
 - On-site preparations by Virtual QA Assistant



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Overview of Virtual QA Draft Protocol

- ✓ **General Preparations for QAD and Virtual QA Assistant**
 - The Rater being evaluated, or their Provider, shall send to the QAD the Rating Data Files that are available for the home to be used for QA, including the energy simulation file; any data previously collected in the field by the Rater/RFI for the home; if available, data from architectural drawings and specifications.
 - Rater sends the QA a copy their inspection checklist. QA will compare to official QAD checklist for completeness. If aligns Rater can request to use either the raters checklist or the official QA checklist.
 - To confirm that all connections and equipment are working properly, whenever possible the QAD and VQA should complete a test of equipment, software and/or aps to make sure that all is working properly before the scheduled session in the Field.



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Overview of Virtual QA Draft Protocol

✓ Preparation by Virtual QA Assistant

- Make certain all hardware is fully charged with minimum of 3 hours of run time. Have extra batteries, external power supply, and/or charging cords.
- Have the required tools (see above minimum requirements) and make certain that they are operable (including available power or a generator).
- If possible, test the connectivity and signal strength at the project site that will be required to support live streaming video.
- Make sure power tools and equipment are not running in the background so that the call audio is clear.
- Follow specific instructions for recommended video conferencing applications from Appendices

SOMETHING MISSING

I remember I put on my socks.
I remember I put on my shoes.
I remember I put on my tie
That was painted
In beautiful purples and blues.
I remember I put on my coat.
To look perfectly grand at the dance.
Yet I feel there is something
I may have forgot—
What is it? What is it? . . .



By Shel Silverstein

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Overview of Virtual QA Draft Protocol

✓ Pre-Event QA Review site work

- The following needs to be completed on site before the start of the event. These items will be spot checked during the virtual QA event.
- If duct testing is completed at final, setup of duct leakage equipment, including sealing off of all duct openings. If duct testing is/was completed pre-drywall, then QA of duct testing will be completed at pre-drywall QA.
- Setup of blower door equipment.
- Measuring room pressures (ENERGY STAR QA).
- Measuring exhaust fan flows (ENERGY STAR QA).
- Measurement of house dimensions (e.g. wall, floors, ceilings, windows, etc.).
- Any other processes that will save time (e.g. setting up ladders to access attic).



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Overview of Virtual QA Draft Protocol

✓ Virtual QA Process

- Begin QA Review at street view looking at the structure. The address must show in the initial view. Digital still photos must be taken of all four orientations of the home.
- The QAD shall follow the RESNET Field QA Checklist, or their own version of the form which collects essentially the same general data points, to ensure that all data for minimum rated features and, if applicable, ENERGY STAR Homes QA are collected.
- The QAD should provide clear guidance to the VQA on the process to be followed.
- The VQA must verbally communicate and make note of any correction items that are visible at the time of QA Review.

RESNET QA File-Field Review Checklist ver 1.1

Street Address	City	
State	ZIP	
Date Rated	Date Reviewed	
Date Reported	Updated Date	
Rating ID	ENERGY STAR? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Rating Company	Builder	
Rater	Field Inspector	
Quality Assurance Provider	QA/QC/RSO	

Item	No	Yes	Not	None
Does this address have a duplicate in the Registry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the ZIP Code correct for the address?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the Rater match the RTN?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the Provider match the Provider ID?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Did the Rater provide a signed Standard Disclosure Form?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the envelope ceiling area a envelope floor area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If the envelope ceiling area is a envelope floor area, did the Rater indicate any vaulted or sloped ceilings?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Divide the conditioned volume of the home by the conditioned floor area. Is the result (average ceiling height) reasonable and match the site data collected?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Multiply the foundation perimeter by the number of stories. Divide the above grade wall area by that result to get the approximate wall height. Is this value reasonable and close to the average ceiling height calculated previously?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If vaulted or sloped ceilings are in the simulation file, subtract the flat ceiling area from the envelope floor area. Divide the sloped/vaulted ceiling area by that result to determine the slope ratio. Is that ratio reasonable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do the number of bedrooms match the site data collected?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the foundation type and area/length match the site data collected?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Overview of Virtual QA Draft Protocol

✓ Virtual QA Process

- If the VQA is the Rater being QA'd
- The Rater/RFI shall do the following:
- Perform the QA Review following the Rater/RFI's typical protocols.
 - Be prepared to walk the QAD through as much detail as possible of their process for equipment and systems set up for conducting a rating.
 - "Think out loud" and communicate what it is they are seeing and doing to demonstrate to the QAD their understanding of the rating process.



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Overview of Virtual QA Draft Protocol

✓ Virtual QA Process (cont.)

What if things aren't working...

- If a Rater/RFI or QAD is uncomfortable with the helper at any time, the helper may be asked to leave.
- If the VQA feels unsafe or uncomfortable at any time, they may request that the session be stopped.
- If at any point the QAD believes that the Virtual QA process is not allowing them to properly assess the Rater/RFI's work, they may request that another quality assurance visit be scheduled, including making that visit in-person rather than Virtual.



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Overview of Virtual QA Draft Protocol

✓ Minimum Requirements

- All minimum rated features that are visible at the time of QA Review must be captured in a way sufficient for the QAD to evaluate the feature (e.g. need to see manometer readings, model numbers, insulation, etc.).
- The following equipment will be required, at a minimum, to complete a Virtual QA Field Review:
 - All testing tools and equipment required to complete a HERS Rating on an existing home;
 - Lighting to illuminate even the darkest corners;
 - Computer hardware device (e.g. cell phone, tablet, laptop, etc.) must be capable of live video streaming;
 - Any necessary apps must be loaded on the hardware device (see Appendix A for recommended applications). App should allow for recording of Virtual QA evaluation;
 - Minimum of 3G connection (recommend 4G or wireless internet connection);
 - Hands free video equipment that allows the Virtual QA Assistant to perform rating tasks and for the QAD to easily see what the Virtual QA Assistant is doing. If a Helper is available to hold the video equipment, then hands free equipment will not be necessary;
 - Digital still camera for recording photos as requested by QAD.



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Overview of Virtual QA Draft Protocol

✓ Appendices

- Helpful tips, not requirements
- Examples
- How to use Google Hangout
- Hands free video equipment research
- Etc.



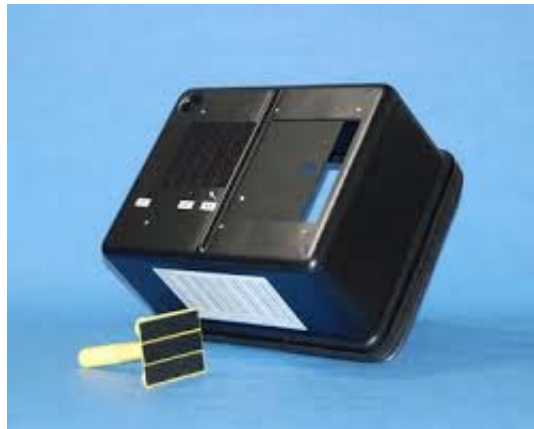
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Let's Give It a Try



[Google Hangout](#)

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The Technology



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The Ugly



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Better



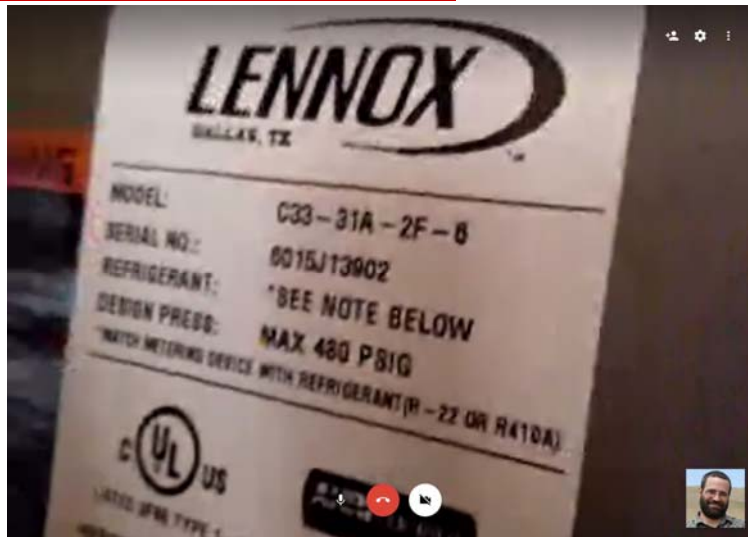
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Same House



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Best



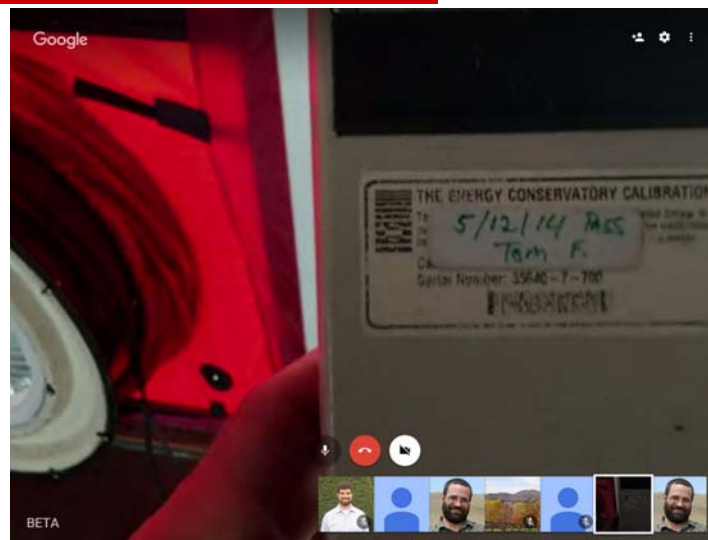
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More Shots/Ideas with Virtual QA



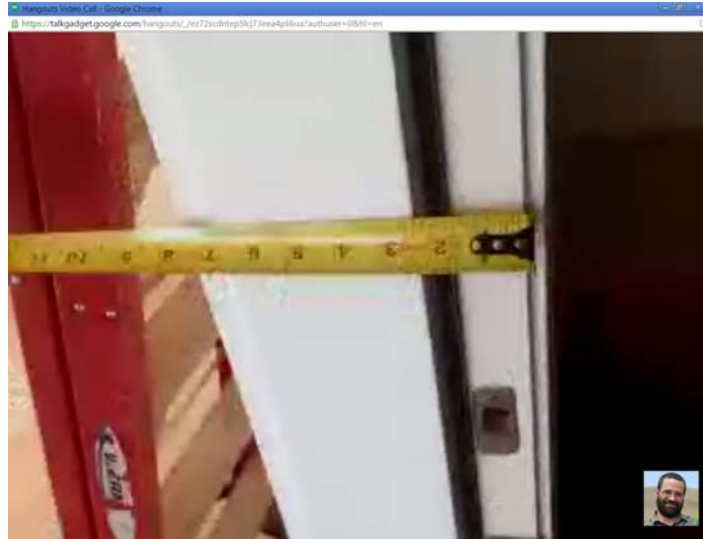
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Checking the Easy Stuff



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Can you hear me?



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Lessons Learned



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Lessons Learned



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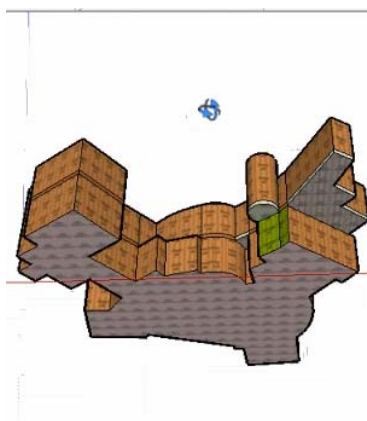
Don't Get Lost in Space



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Don't Get Lost in Space



Above grade Walls - Gross area				2nd Fl AGWR Calculator			
Notes	Length	Height	Total	Notes	Length	Height	Total
157 Garage	11.2	9	100.8	2nd Fl	11.2	9	100.8
158 2nd	23.5	9	211.5	2nd Fl	23.5	9	211.5
159 2nd	0	0	0	2nd Fl	0	0	0
160 2nd	0	0	0	2nd Fl	0	0	0
161				2nd Fl			
162 2nd	0	0	0	2nd Fl	0	0	0
163 2nd	0	0	0	2nd Fl	0	0	0
164 2nd	0	0	0	2nd Fl	0	0	0
165				2nd Fl			
166 Front	35	9	315	Front	35	9	315
167 2nd	0	0	0	2nd Fl	0	0	0
168 2nd	0	0	0	2nd Fl	0	0	0
169 2nd	0	0	0	2nd Fl	0	0	0
170 2nd	0	0	0	2nd Fl	0	0	0
171				2nd Fl			
172 2nd	0	0	0	2nd Fl	0	0	0
173 2nd	0	0	0	2nd Fl	0	0	0
174 2nd	0	0	0	2nd Fl	0	0	0
175 2nd	0	0	0	2nd Fl	0	0	0
176				2nd Fl			
177 Right	44.12	9	397.08	Right	44.12	9	397.08
178 2nd	0	0	0	2nd Fl	0	0	0
179 2nd	0	0	0	2nd Fl	0	0	0
180 2nd	0	0	0	2nd Fl	0	0	0
181 2nd	0	0	0	2nd Fl	0	0	0
182 2nd	0	0	0	2nd Fl	0	0	0

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Don't Get Lost in Space...Ask ?'s



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Don't Get Lost in Space...Ask ?'s

- ✓ Let's look at a video that is exemplary of this issue



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What's Next

- ✓ Beta 5 (and likely more)
- ✓ Collaborate with others
- ✓ Finish "Virtual QA Protocols"
- ✓ Make part of QA Pilot Training (Fall 2016) and QA Pilot Program (2017)
- ✓ Update Protocols based on lessons learned
- ✓ Adopt as part of new RESNET Quality Assurance (2018)...sooner?

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Presentation Review

- ✓ "Virtual" QA as part of the new RESNET QA
- ✓ Overview of Working Group work to date
- ✓ Overview of Virtual QA draft Protocol
- ✓ "Let's Give It A Try"...Lesson Learned
- ✓ What's next

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