Standards and Quality Assurance

Central Hudson Electric & Gas-Solar Summit

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

March 2nd, 2023

Standards and Quality Assurance Team

Our Approach to Quality Assurance and Insights

Standards and Quality Assurance – QA vs. QC

Quality Control, QC: “control of the process, before and during the process”

Planned and systematic activity implemented to ensure quality requirements are met and deficiencies documented in a QA inspection are corrected.

Contractors/builders/installers should have their own QC resources to confirm their work.

Quality Assurance, QA: “assuring the work is done properly, at the end of a process”

Field and photo evaluations to verify compliance of key milestones within projects to assess compliance with industry standards and Program requirements; identify corrective action necessary to comply with said standards and requirements.

NYSERDA’s QA team provides 3rd party Quality Assurance and monitoring. NYSERDA’s QA team does not fix broken projects but looks at the quality of the projects being performed.

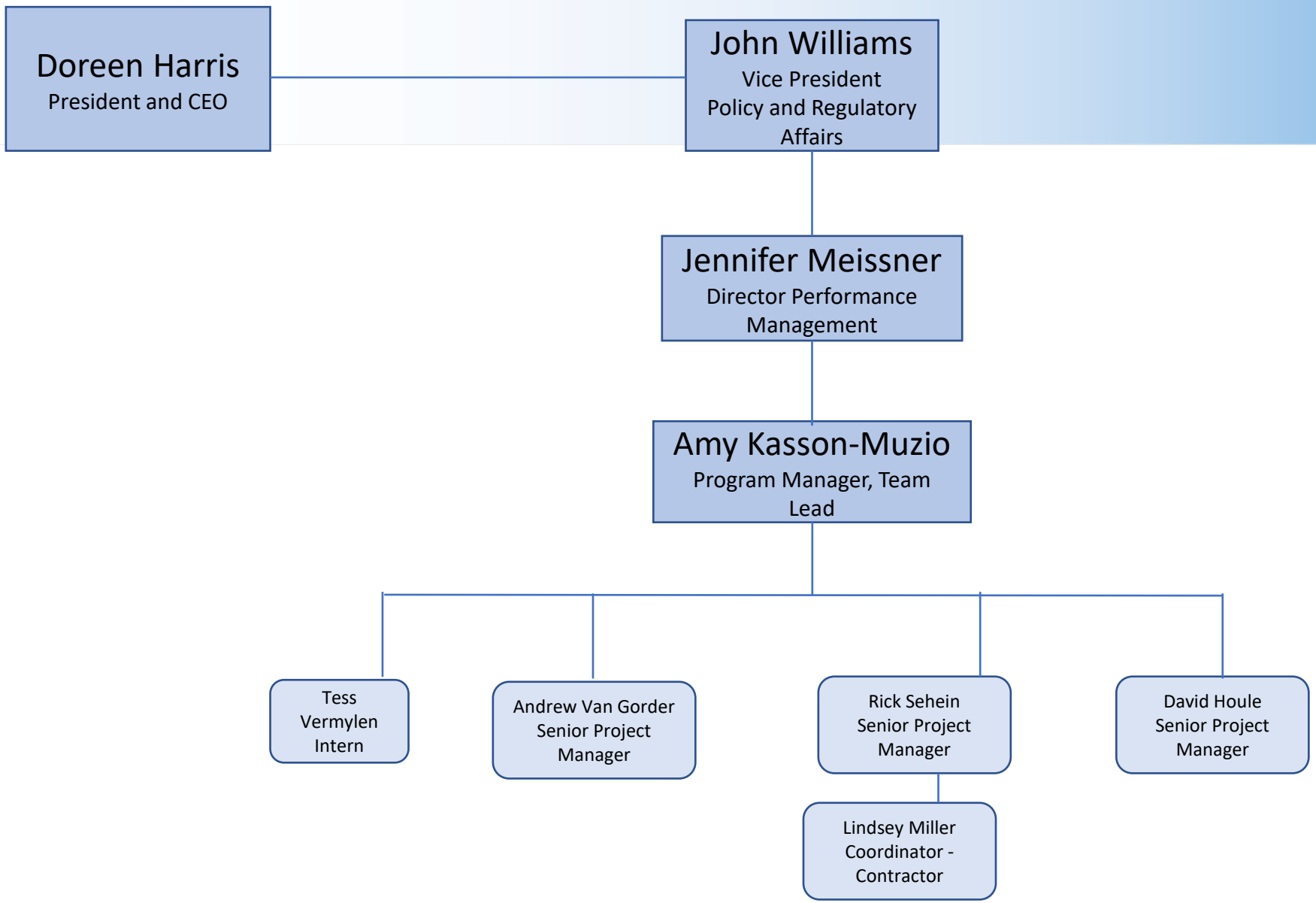
Standards and Quality Assurance Team's Origin and Changing Role

The Quality, Standards and Compliance team was created in 2010 to support the Residential Energy Services team. The team provided in-field QA and technical support to EmPower, HPwES, NYESH, small PV and Solar Thermal.

With the expansion of solar and restructuring under NY-Sun, the team began to support multiple departments and began servicing large PV.

Under restructuring to support the CEF in 2016, the Standards and Quality Assurance team was created and chartered with a NYSERDA-wide role. The team has added or is in the process of adding services to support authority wide programs.

Staffing for Standards and Quality Assurance



What is the SQA team responsible for?

- Provide effective and efficient in-field and desk Quality Assurance and technical services to support NYSERDA investments into clean energy technologies.
- Assess contractor performance and identify corrective actions needed to ensure projected performance and longevity of clean energy technology and services.
- Foster market-based strategies to increase consumer and investor confidence in clean energy technology and solutions.
- Work with third party professionals, technical and trade associations to become drivers of Market Based quality through standards, certifications and training.

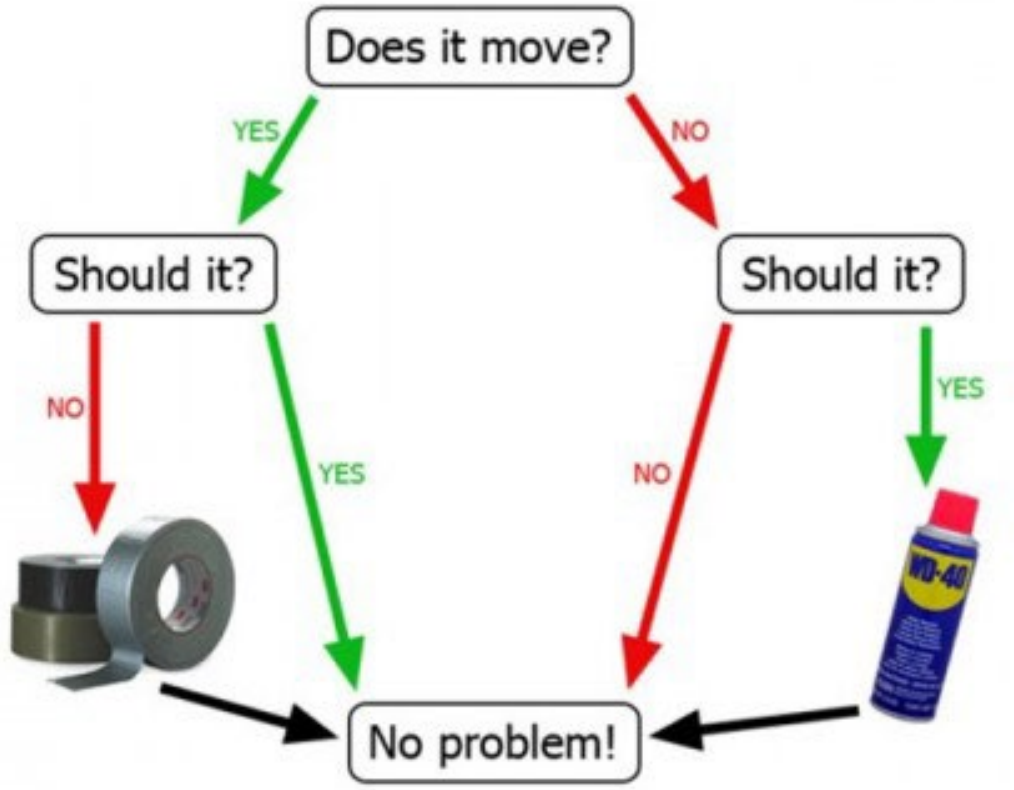
Team Approach

- Work with existing programs to refine the approach to QA based on statistical sampling of projects and statistical analysis to address technical issues, contractor issues, market needs in the most cost-efficient way.
- Work with maturing markets to drive adoption of QA and best practices by Market Actors.
- Develop and Plan cost-effective QA in new programs as part of risk management of new technologies and new market partners.

Why do you need a quality program?

Ever wonder why they don’t make these with Philips head screws, so you won't die if your screwdriver slips?

Why do you need a quality program?



Current SQA Portfolio

- 3,758 project inspections in 2021 across 15 programs
- 3,489 projects inspected in 2022 across 11 programs
- 519 projects inspected from 01.01.2023 – 02.20.2023 across 11 programs

- Average QA score for all programs is stable or improving over last quarter/last year
  - NY-Sun Res/Nonres + Storage program has new contractors entering the program, slightly lowering the average QA Score.
  - Comfort Homes contractors have seen an increase in new crew members due to expanding regions, where there has been a slight increase in uninstalled measures causing the average QA score to decrease.

- ~88% of builders (contractors) across programs are meeting program requirements with average scores of 3.0 or above for their jobs

What to Expect When Inspected

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FACT SHEET

STANDARDS AND QUALITY ASSURANCE

EmPower New York

The Independent Standards and Quality Assurance Team manages a network of third-party inspectors to verify a sampling of

What customers should expect when selected for a quality assurance inspection

Why does NYSERDA inspect?

FACT SHEET

STANDARDS AND QUALITY ASSURANCE

The Independent Standards and Quality Assurance Team manages a network of third-party inspectors to verify a sampling of projects for compliance with program rules and technical requirements.

If you have questions, please contact the

What contractors and builders of NYSERDA programs should expect when selected for a quality assurance inspection

NYSERDA adopted a rational sampling plan and generally inspects up to 20% of all projects to verify compliance with program rules and technical requirements. Inspection rates may vary based on a contractor or builder's status in the program or past performance.

Types of Inspections

NYSERDA programs, which include a quality assurance component, will receive field inspections. Some programs may also include photo inspections or "desk reviews" of

FACT SHEET

STANDARDS AND QUALITY ASSURANCE

Air Source Heat Pumps

The Independent Standards and Quality Assurance Team manages a network of third-party inspectors

What customers should expect when selected for a quality assurance inspection

FACT SHEET

STANDARDS AND QUALITY ASSURANCE

Home Performance with Energy Star

The Independent Standards and Quality Assurance Team manages a network of third-party inspectors to verify a sampling of

What customers should expect when selected for a quality assurance inspection

Why does NYSERDA inspect?

SQA Process Overview

10K View of SQA's Process – Field Inspections

- Every program has an inspection checklist.
- Each checklist item corresponds to program requirements and design and workmanship.
- Each checklist item is designed a non-conformance category and is weighted.
- A QA score is calculated from the non-conformances identified on the inspection checklist.
- Non-conformances are collected.

What does SQA do with QA data?

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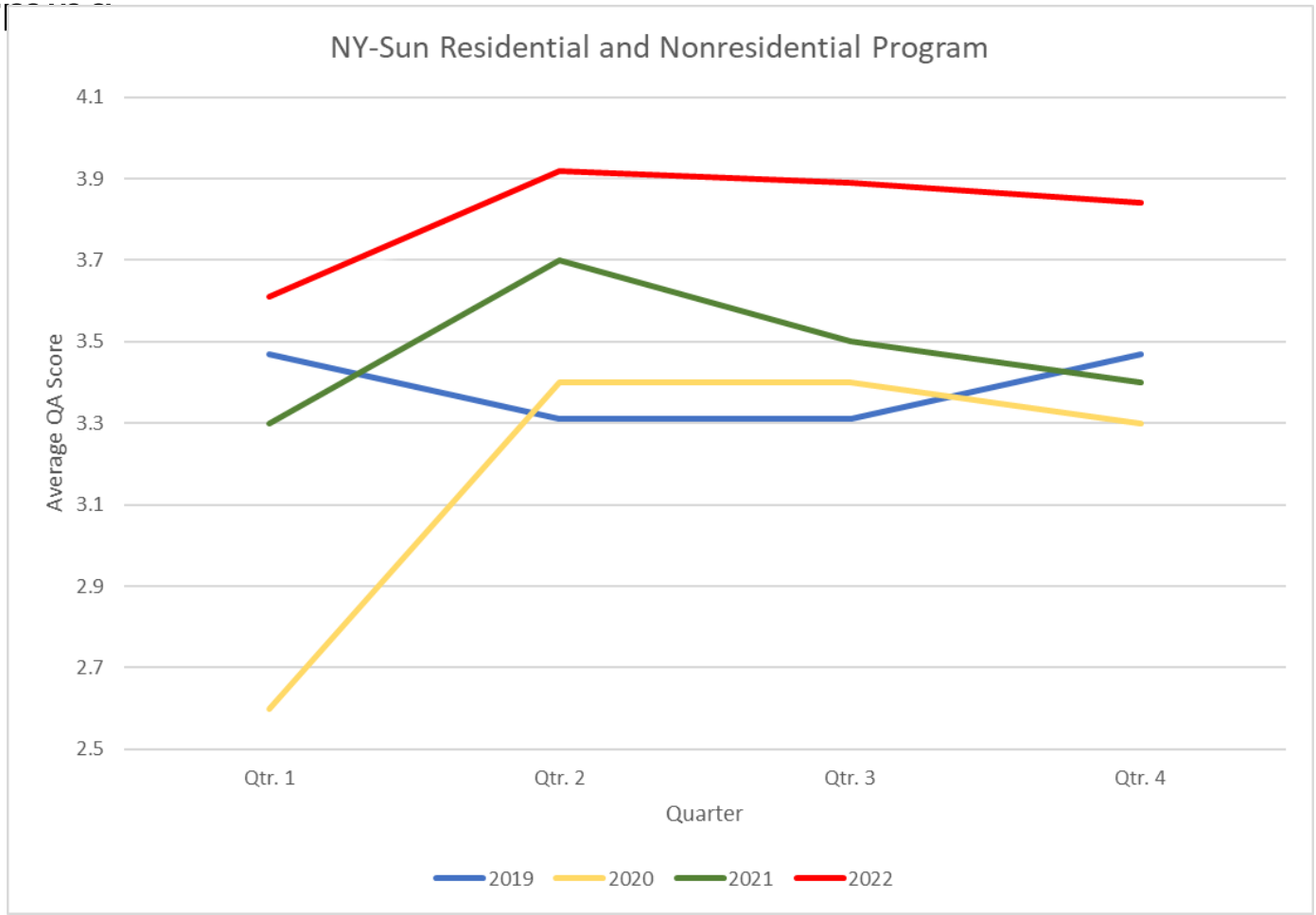
Standards and Quality Assurance Data Interpretation

Data provides an overarching snapshot of how well a program is perfor



Regional Scores

NY-Sun Residential and Nonresidential

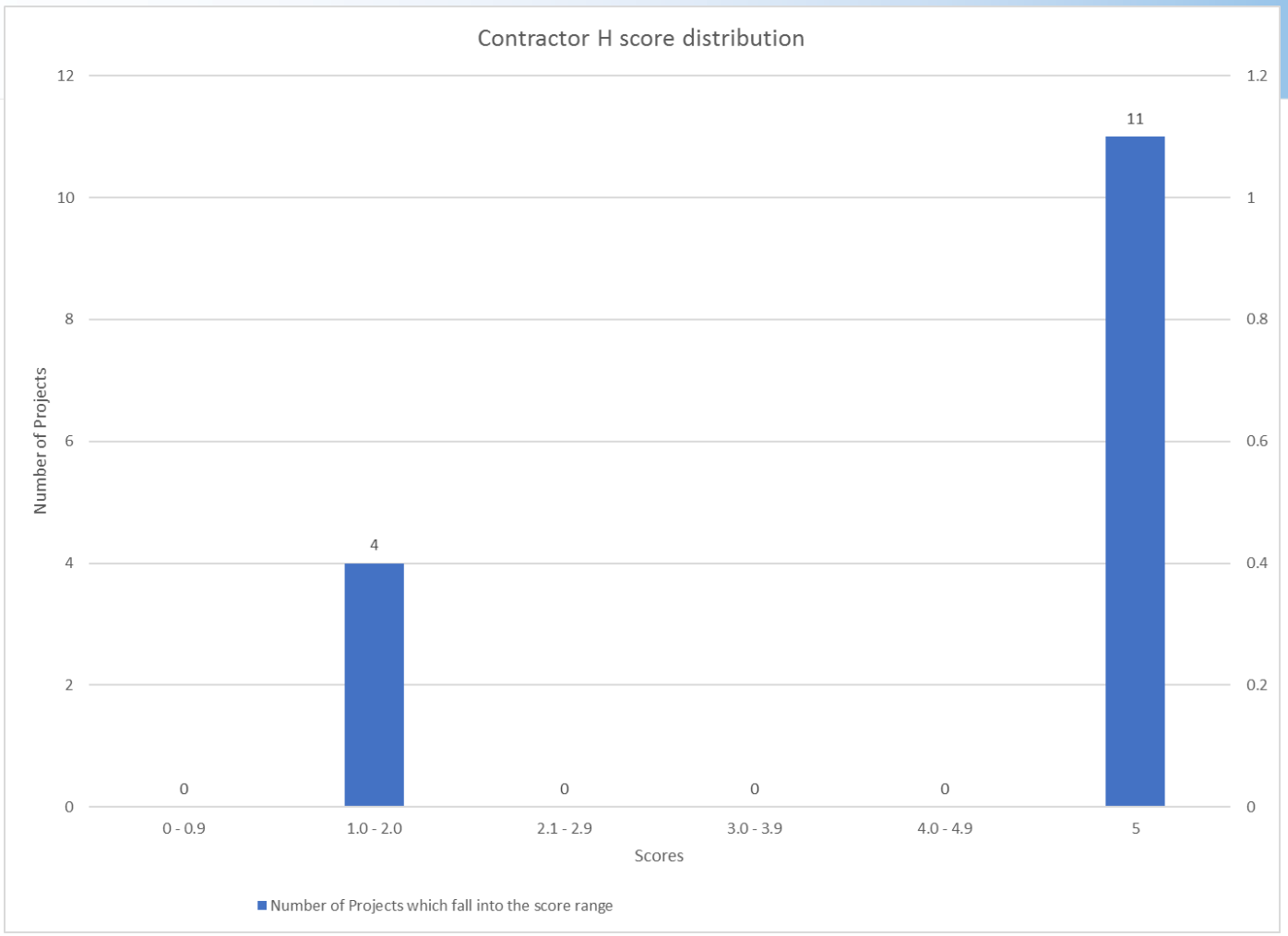
Region	Average In-Field QA Score
Statewide	3.82
CHE&G	3.26

Region	Average In-Field QA Score
Statewide	3.82
Albany	3.06
Columbia	3.14
Dutchess	4.13
Greene	3.29
Orange	3.95
Putnam	1
Schoharie	5
Sullivan	2
Ulster	3.8

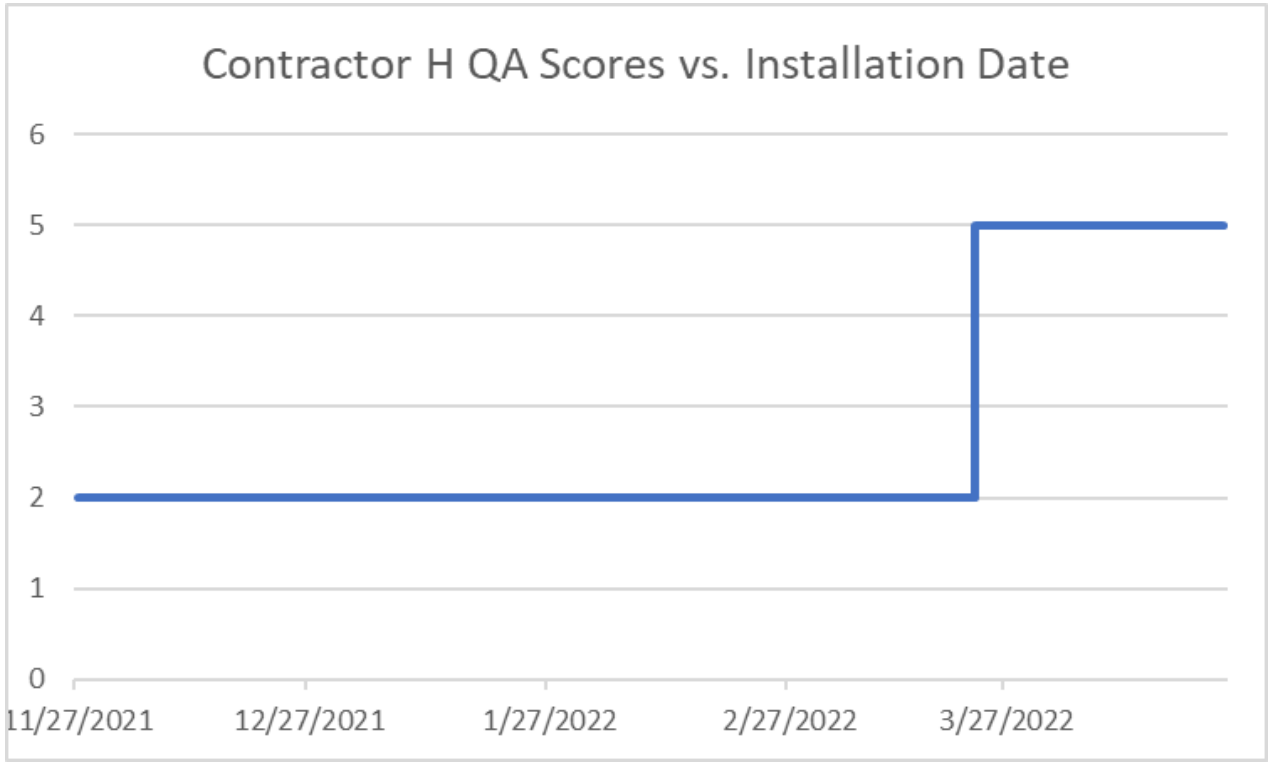
Program Health

NY Sun Residential and Non-Residential Field Inspections YTD 2022							
Quality Score Description	Score	Average Quality Score	Number of Contractors Inspected in Score Range	Number of Projects by Contractors in Score Range	Average Number of Projects per Contractor	Percent of Contractor Inspected	Percent of Inspections
Exceeds or Meets all Requirements	5	5	22	359	16.3	16.7%	5.4%
		4.0 - 4.9	34	6,914	203.4	25.8%	46.7%
Meets Requirements at Minimum Level	3	3.0 - 3.9	37	4,030	108.9	28.0%	32.9%
					Total Passing	70.45%	84.93%
Does Not Meet Requirements		2.0 - 2.9	22	598	27.2	16.7%	11.4%
	1	1.0 - 1.9	17	75	4.4	12.9%	3.7%
					Total Failing	29.55%	15.07%
Program Totals		3.82	132	11,976		100.0%	100.0%

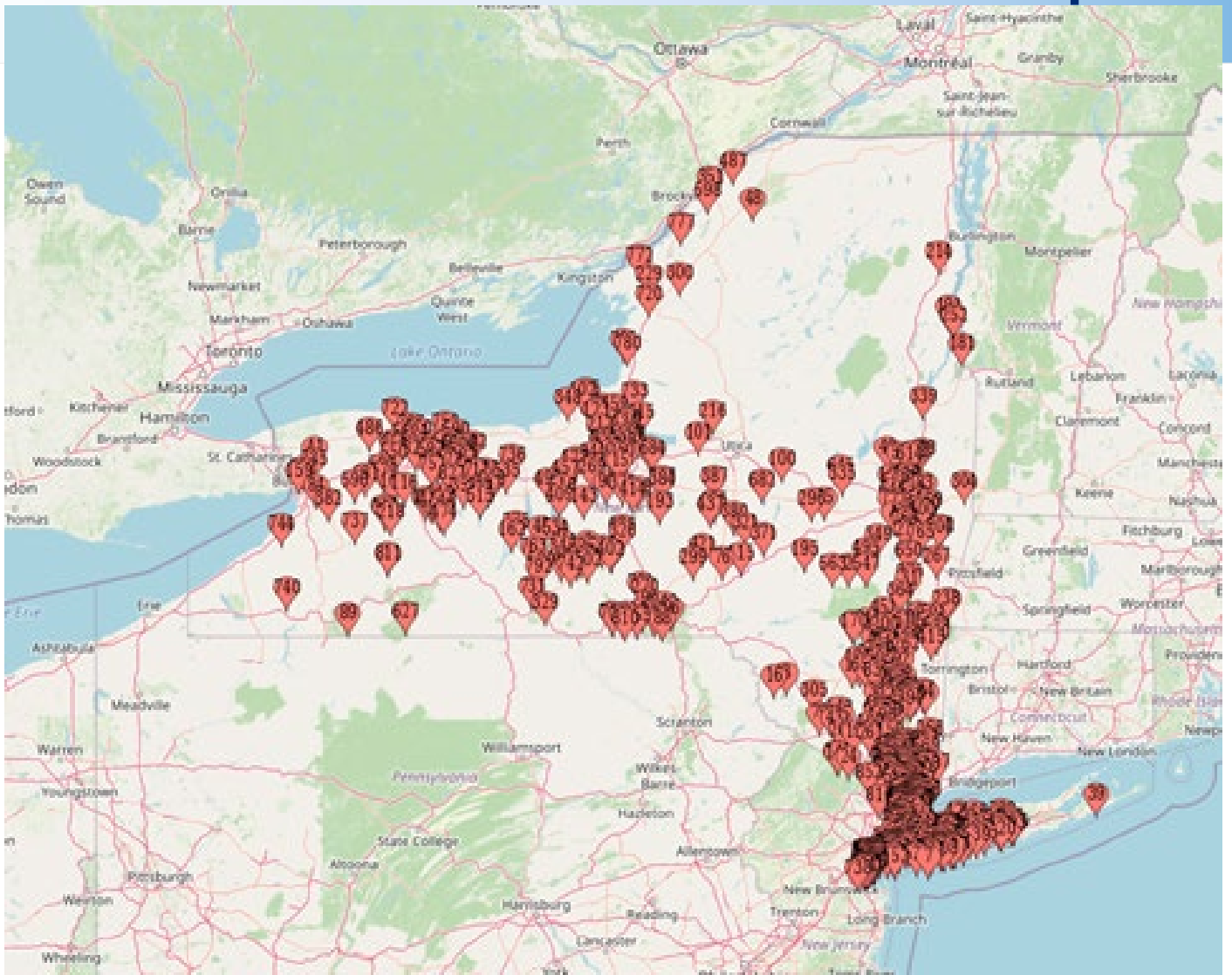
How contractors can use QA data



Installation Date	Inspection Date	Final Score
11/27/2021	2/23/2022	2
3/19/2022	4/12/2022	2
3/23/2022	5/28/2022	2
3/23/2022	5/16/2022	5
4/24/2022	7/26/2022	5



Map of all 2022 NY-Sun Residential/Nonresidential inspections



What else do we do with the data?

NY Sun Residential and Non-Residential Field Inspections YTD 2022	
Non-conformance Category	**Percent of Non-conformances**
Critical	1.00%
Major	17.00%
Minor	22.00%
Incidental	61.00%

Nonconformance Category	NY-Sun Residential and Nonresidential Field Inspection Non-Conformance Q4 2022	Number of Occurrences	Percentage of Occurrence of all Inspected Projects
Design and Workmanship			
Critical	The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent.	1	0.14%
Critical	Feeder conductors are properly sized for expected current load.	1	0.14%
Critical	Equipment must be sufficiently rated for expected voltage and/or current.	1	0.14%
Major	Grounding electrode conductor is properly bonded to the main premises grounding electrode system.	13	1.80%
Major	The conduit is grounded (when required).	10	1.38%
Major	Equipment shall be firmly secured to the surface on which it is mounted and used in accordance with any instruction included in the listing or labeling.	10	1.38%
Major	Grounded conductors are isolated from enclosure and ground terminal.	8	1.10%
Major	Roof penetrations are properly sealed and flashed.	7	0.97%
Major	Module is properly secured to the racking system per manufacturer instructions.	5	0.69%
Major	Grounded conductor(s) terminal lug is properly installed.	5	0.69%
Major	The AC OCPD is properly sized for the expected output current of the PV system.	4	0.55%
Program Compliance			
Major	All Material and equipment must be new and undamaged, per NY Sun program requirements.	5	0.69%
Major	Current Transformers are installed and meet Program requirements.	1	0.14%
Minor	As per Program requirements, any roof damage must be repaired prior to installation.	3	0.41%
Minor	Program compliant means is present for customer to verify system electricity generation.	2	0.28%
Incidental	Array Module Number matches application.	17	2.35%
Incidental	Array Azimuth (degree) matches application.	17	2.35%
Incidental	Inspected TSRF shall match Program records.	16	2.21%
Incidental	Array Tilt (degree) matches application.	10	1.38%
Incidental	Installed Inverter model number shall match Program records.	8	1.10%
Incidental	Installed Inverter manufacturer shall match Program records.	8	1.10%
Incidental	As built system capacity must match the submitted and approved plan.	8	1.10%
Incidental	Array Module Manufacturer must match application.	8	1.10%
Incidental	Array Module Quantity matches application.	3	0.41%
Incidental	Installed Inverter quantity shall match Program records.	1	0.14%

Collect Non-conformances.
Top statewide non-conformances for the Residential Single-Family Program.

NY-Sun Residential and Nonresidential Program Wide		
Nonconformance Category	**Field Inspection Non-Conformance**	**Percentage of Occurrence of all Inspected Projects**
Design and Workmanship		
Critical	The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent.	0.14%
Critical	Feeder conductors are properly sized for expected current load.	0.14%
Critical	Equipment must be sufficiently rated for expected voltage and/or current.	0.14%
Major	Grounding electrode conductor is properly bonded to the main premises grounding electrode system.	1.80%
Major	The conduit is grounded (when required).	1.38%

NY-Sun Residential and Nonresidential Central Hudson Electric & Gas Regions		
Nonconformance Category	**Field Inspection Non-Conformance**	**Percentage of Occurrence of all Inspected Projects**
Design and Workmanship		
Critical	AC Combiner Overcurrent protection is sufficient.	0.20%
Critical	AC Disconnect is properly rated for expected current load.	0.20%
Critical	All array conductors are properly connected.	0.20%
Critical	Equipment must be sufficiently rated for expected voltage and/or current.	0.20%
Major	Grounded conductor(s) are insulated from metal enclosure surfaces and the ground terminal inside combiner box.	3.28%

Regional Top Non-Conformances

NY-Sun Residential and Nonresidential Central Hudson Electric & Gas Regions		
Nonconformance Category	**Field Inspection Non-Conformance**	**Percentage of Occurrence of all Inspected Projects**
Design and Workmanship		

What else can the data be used for?

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Inspect the Inspector

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Inspect the Inspectors

2018 implemented “Inspect the Inspector”

Across all program areas QA services.

Physically shadow inspectors in all programs to identify opportunities for improvement.

Evaluate inspectors on scores, cancellations, etc.

Taking a holistic approach to reviewing all components of each program.

Extracting granular data to evaluate each inspector by a series of critical points.

Quality Solar Installer

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Background on Quality Solar Installer Designation

- Long-standing NY-Sun QA activities (field and photo inspections), provide a tremendous amount of experience and data to objectively understand how well solar installers are performing

- 306companies are currently approved to participate in the NY-Sun Residential and Nonresidential Program

- In early 2018, NY-Sun and SQA team members met to discuss:
  - How can we motivate builders to consistently install quality systems?
  - How can we reward builders who are consistently installing quality systems?

Answer: Quality Solar Installer Designation!

What is the Quality Solar Installer Designation?

Launched in 2019 it is a designation given to high quality solar installers (builders) who consistently exceed the annual quality assurance criteria in the NY-Sun Residential and Nonresidential Program.

In a calendar year, builders need to meet for exceed the following guidelines:

- Active Builders
- Full Status
- Installed at least 12 projects
- Have an average QA field inspection score of 4.0 or greater on a 1-5 scale

What is the Motivation to obtain Quality Solar Installer Designation?

Builders can use this designation as a **third-party differentiator** and **validation of the quality** of their work with customers and prospective customers.

Designated builders are recognized in a **special listing on the NY-Sun website,** https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Home/How-to-Go-Solar/Find-a-contractor/Residential-Installers, and receive a **NYSERDA Quality Solar Installer logo to use in marketing** materials.

NEW in 2021: additional **Gold Status** for builders that have achieved Quality Solar Installer designation three consecutive years.

The designated QSI builders install 43% of all projects in 2022.
26% of all projects were installed by a QSI-Gold builder.

10% of all active NYSun, Residential-Nonresidential builders have the designation of Quality Solar Installer.

Of the 10% :

31% of the builders were once on Probation Status.
6.9% of the builders were once Suspended.
25% of QSI- Gold were once on a disciplinary status.

Combined, 43% of the builders were once on a disciplinary status.

The combined efforts of SQA and Program Staff of presenting a prescriptive plan and working directly with the builders has a positive effect on the market.

Root Cause Analysis

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What is Root Cause Analysis?

Above the surface you see the

Symptoms

of the problem

Dig deeper to find the

Root Cause

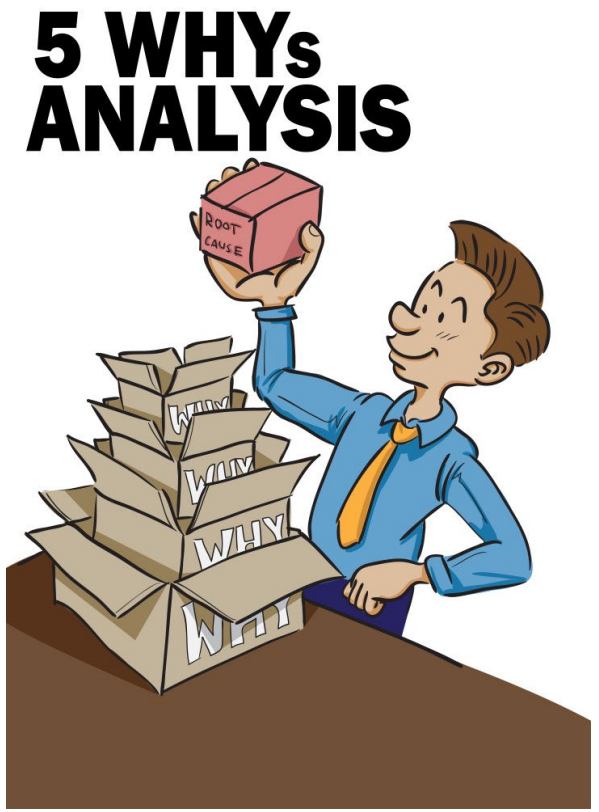
of the problem

NYSERDA has implemented the 5 Whys.

Five Whys is a technique for drilling down into a problem to uncover its root cause.

Most useful when a problem involves human factors or interactions.

Not just 5 questions beginning in “WHY” but each question must lead to the next.



Five Whys Benefits

It helps to quickly identify the root cause of the problem.

It helps determine the relationship between different root causes of a problem.

It can be learned quickly and doesn’t require statistical analysis to be used.

NYSERDA is rolling out RCA 2.0

Piloted in the NY-Sun residential and nonresidential program in 2022.

Grounding electrode conductor is properly bonded to the main premise grounding electrode system.

2021 – 85*
2022 – 63*

26% Reduction

The conduit is grounded (when required).

2021 – 43*
2022 – 13*

70% Reduction

Module is properly secured to the racking system per manufacturer instructions.

2021 – 35*
2022 – 24*

31% Reduction

* - total number of nonconformances builders had who received the letter

NYSERDA is rolling out RCA 2.0

Piloted in the NY-Sun residential and nonresidential program in 2022.

Builders who did not receive the letter.

Grounding electrode conductor is properly bonded to the main premise grounding electrode system.

10% Increase

The conduit is grounded (when required).

105% Increase

Module is properly secured to the racking system per manufacturer instructions.

100% Increase

Internal Quality Management Systems

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Checklists

When to utilize a checklist:

When things go wrong.

When things go right.

Two Types of Checklists

Do-Confirm Checklists

- Used to confirm that everything that was supposed to be done was done.
- Used to document existing conditions prior to starting work:
  - Pre-Existing Conditions Checklist
  - Installation Crew Procedure Checklist
  - Installation Quality Control Checklist

Read-Do Checklists

- Like a recipe.
- List of instructions of how to do a task.
- Crew Chief Checklist

Creating Checklists

Bad Checklists

- Vague, imprecise
- Too long and too detailed – assumes that people using them know nothing
- Hard to use
- Impractical

Good Checklists

- Precise
- Don’t spell everything out- act as reminders of most critical steps
- Easy to use
- Practical

Designing Checklists

Keep them short

Keep wording simple and exact

They should fit on one page

They’re not comprehensive field guides

Test them in the field before deployment

Implementing Checklists

It is a QA/QC tool that

- Instructs on how to do a task.
- Double-checks that a task has been done and creates accountability.

There will be resistance

- It’s another piece of paper that has to be filled out
- “We don’t need a check list. We know what to do.”

It won’t work unless it’s enforced and monitored.

Recent SQA Activities/Improvements

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Recent Quality Assurance Activities/Improvements

- Standardized measuring devices (for spray foam)
- Increased and solidified communication platform
- Standardized language across all SQA programs in the authority
- Met with PSEG to discuss their QC/QA process
- Benchmarked QA process with national and neighboring states.
- Formed the Residential QA/QC working group
- Rolled out a Customer Satisfaction Survey – RSF and NY-Sun res/nonres
- Finalized the Energy Affordability and Equity QA inspection checklist, planned to be implemented with revised program and Salesforce module completion

Quality Assurance Additional Enhancements

Rolling out Root Cause Analysis with contractor expert panel involvement

Building Contractor Score Cards – Once SQA module is in SalesForce

- QA scores: Contractor and Program average
- QC information
- Customer Satisfaction Survey Results
- Non-conformances: Contractor and Program
- Realization Rates

Thank you!

The contractors are our greatest asset, and every member of the Authority is helping to build a vibrant and sustainable clean energy future in our State – we thank you for all that you do.

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THANK YOU!
Have a Quality Day!

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