Pollution from Diesel Generators – Gurugram

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CSE Study - Overview

- Aim - Assess the impact of diesel generator set operation on the increase in pollution levels in its immediate vicinity

- CSE selected generator sets from five residential areas with following criteria
  - No other significant source of pollution present near the DG set's chimney like construction work, high traffic laden roads
  - Convenient location for air pollution monitoring equipment chosen– safety, uninterrupted power supply

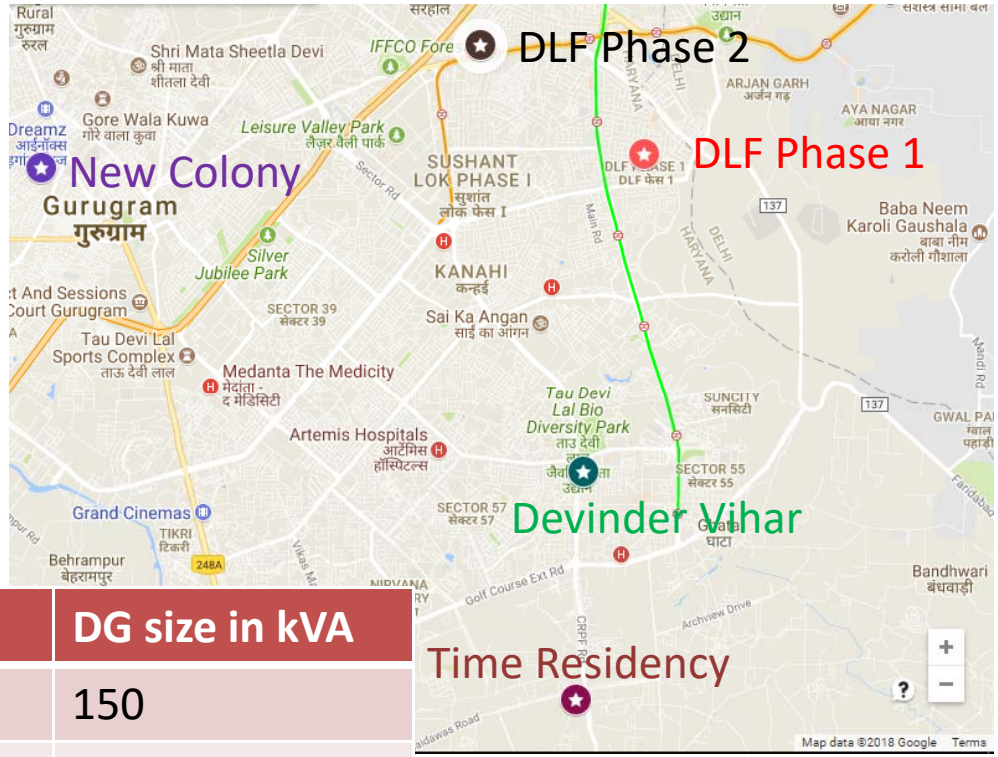
- CSE along with Envirotech installed automatic air pollution monitoring equipment to record dust pollution (PM levels) for five days.

- Operation hours of DG sets were noted separately. The impacts during non-operation and operation of the DG sets were studied.

Representative Sample locations

- Gurugram – Popular for both flat and villa type houses – sites for the study were selected such that it gives a representative idea of both the types

- Residents used DG of size 50kVA – 750 kVA – focussed to sample DG of various sizes



Location	Houses	DG size in kVA
DLF Phase 1	20 – 25 villas	150
DLF Phase 2	50 villas	325
Time Residency	875 units in 7 towers	750
New Colony	**1 commercial, 3 units**	**64**
Devinder Vihar	**450 units in 9 blocks**	**325 X 2**

- Most locations – generator owned and operated by a third party
- Third party operates similar to DISCOM

Data Collection

- Data has been collected by the air pollution monitoring devices for

  - 5 different locations for

  - 5 five consecutive days over

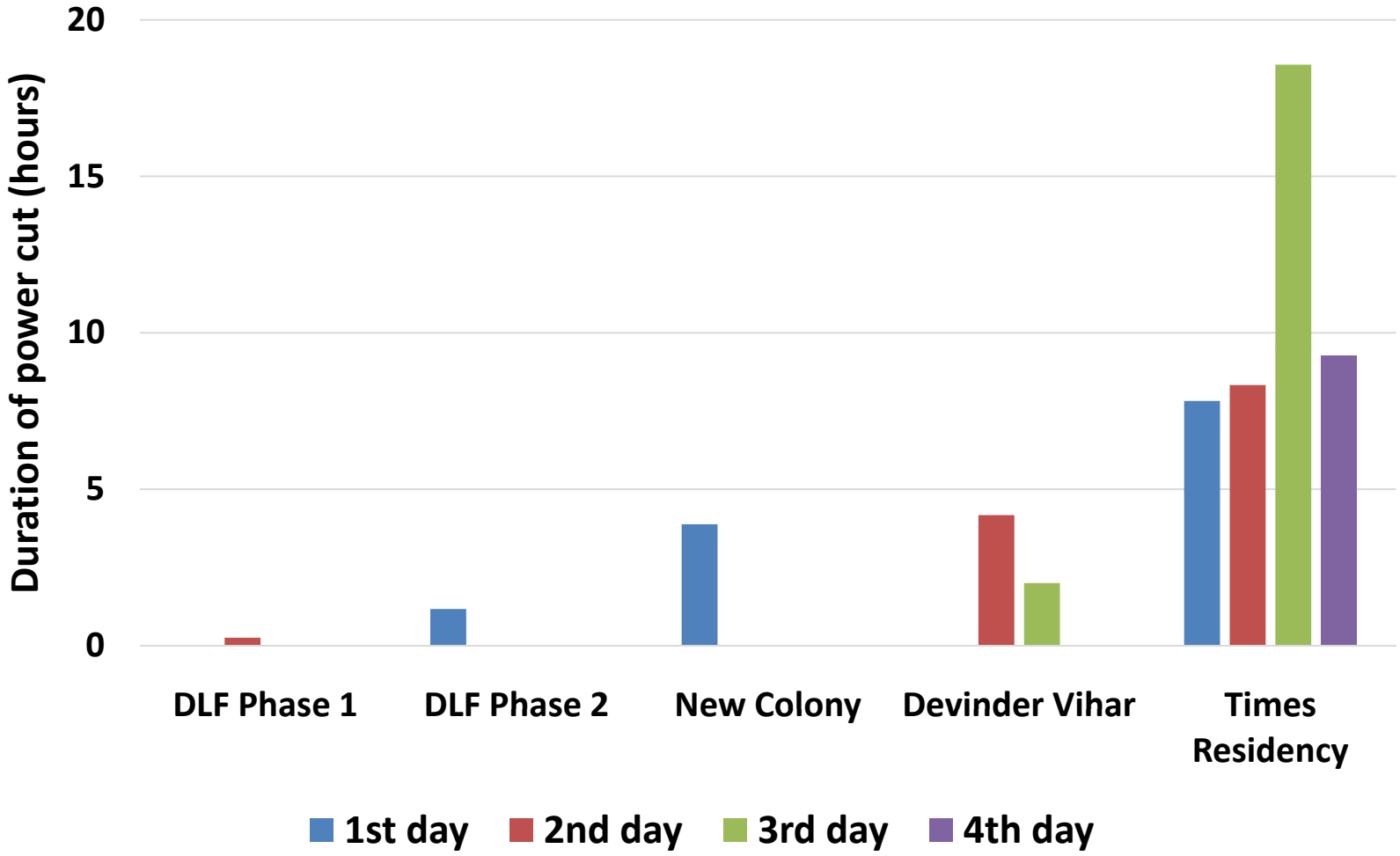
  - 24 hours a day in

  - 5 min interval

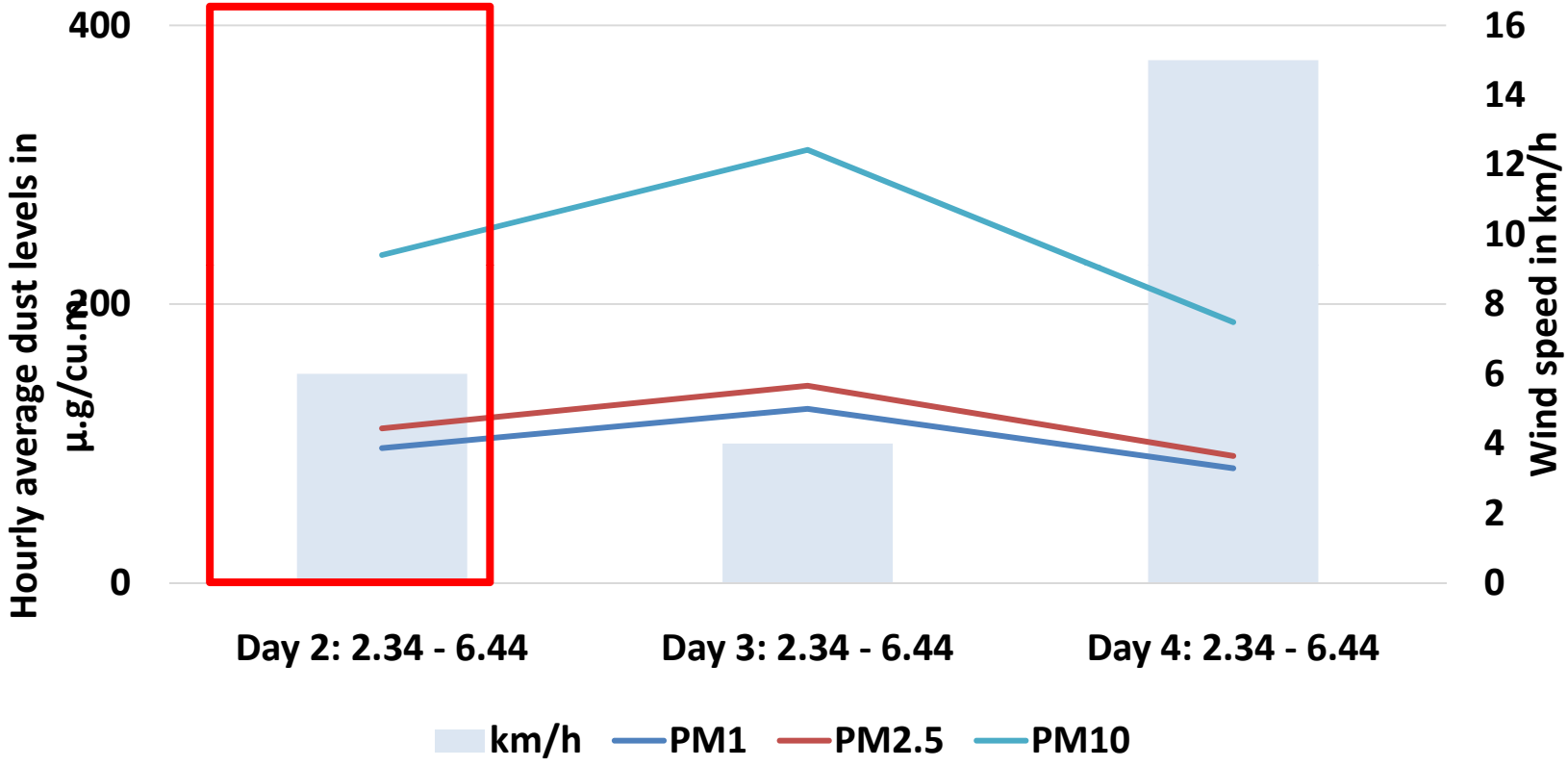
  - Particulate Matter (PM) 1, PM 2.5, PM 4, PM 10 and Total Suspended Particles (TSP)

- The DG set operation timings have been noted from DG usage logs.

DG Set Operation Duration



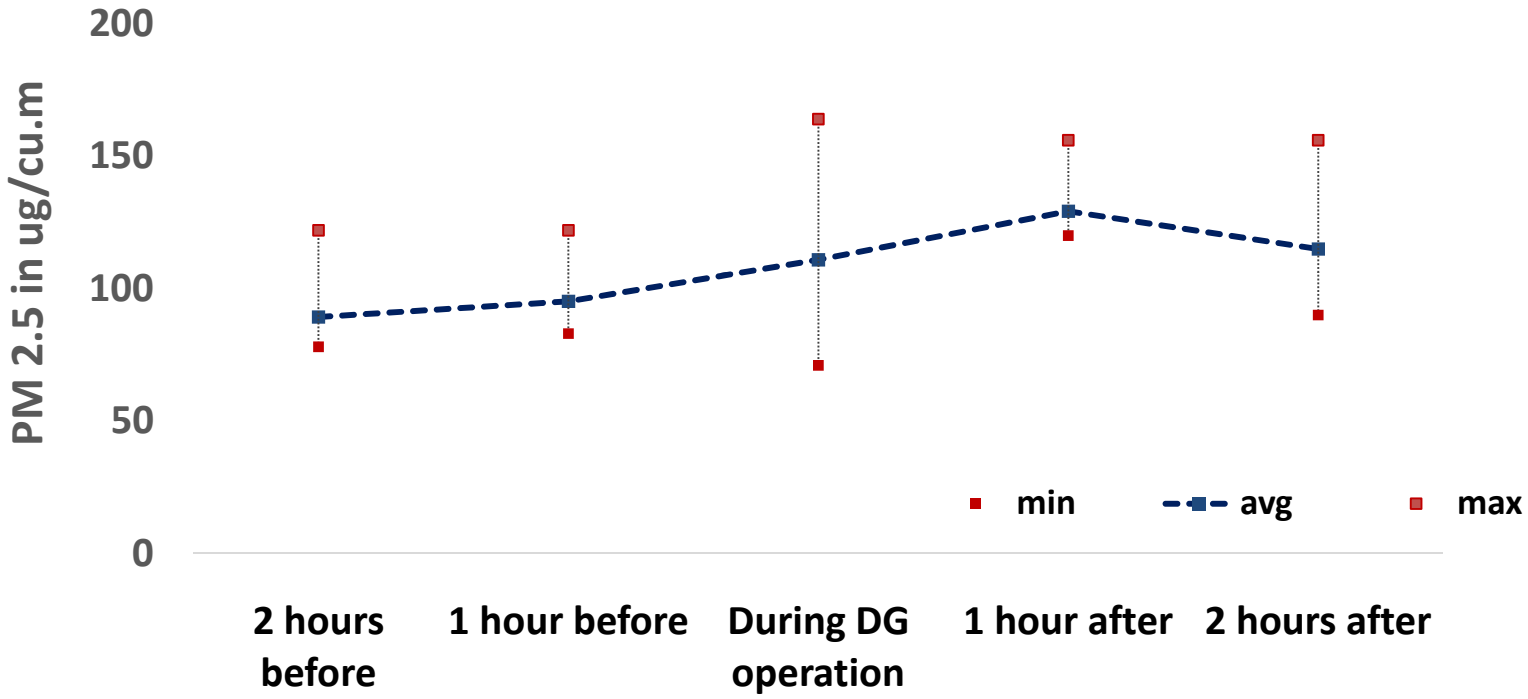
Devinder Vihar – Analysis 1



Devinder Vihar – Analysis

Monitoring Period – 17/05/2018 to 21/05/2018

DG set under operation – Day 2 (18/05/2018 between 02:34 and 06:44 hrs)

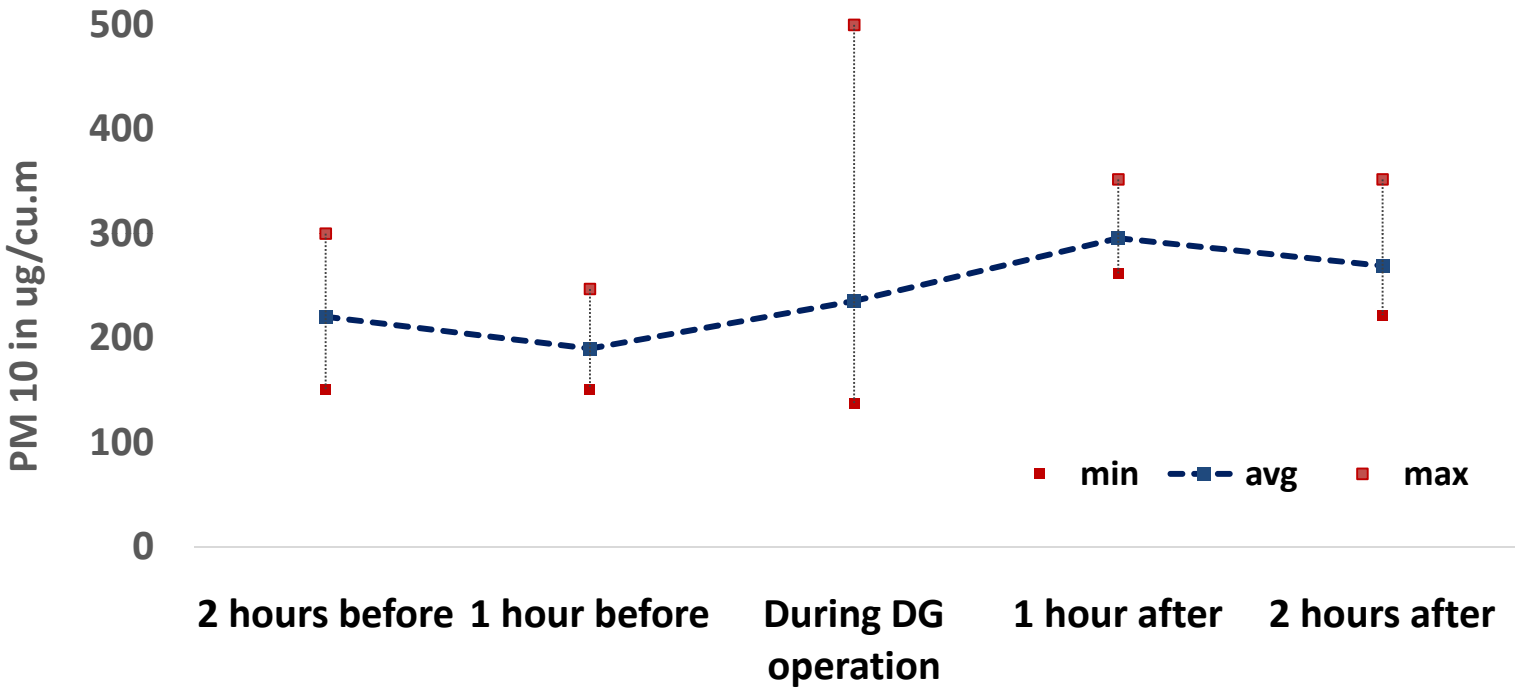


- PM2.5 max levels increased from 130 to 180 ug/N.cu.m and avg. levels from 90 to 110 ug/N.cu.m during DG operations. The avg remains above 100 for next 2 hrs.
- The PM 2.5 level during the DG operation time is 35% higher than the rest of the day.

Devinder Vihar – Analysis

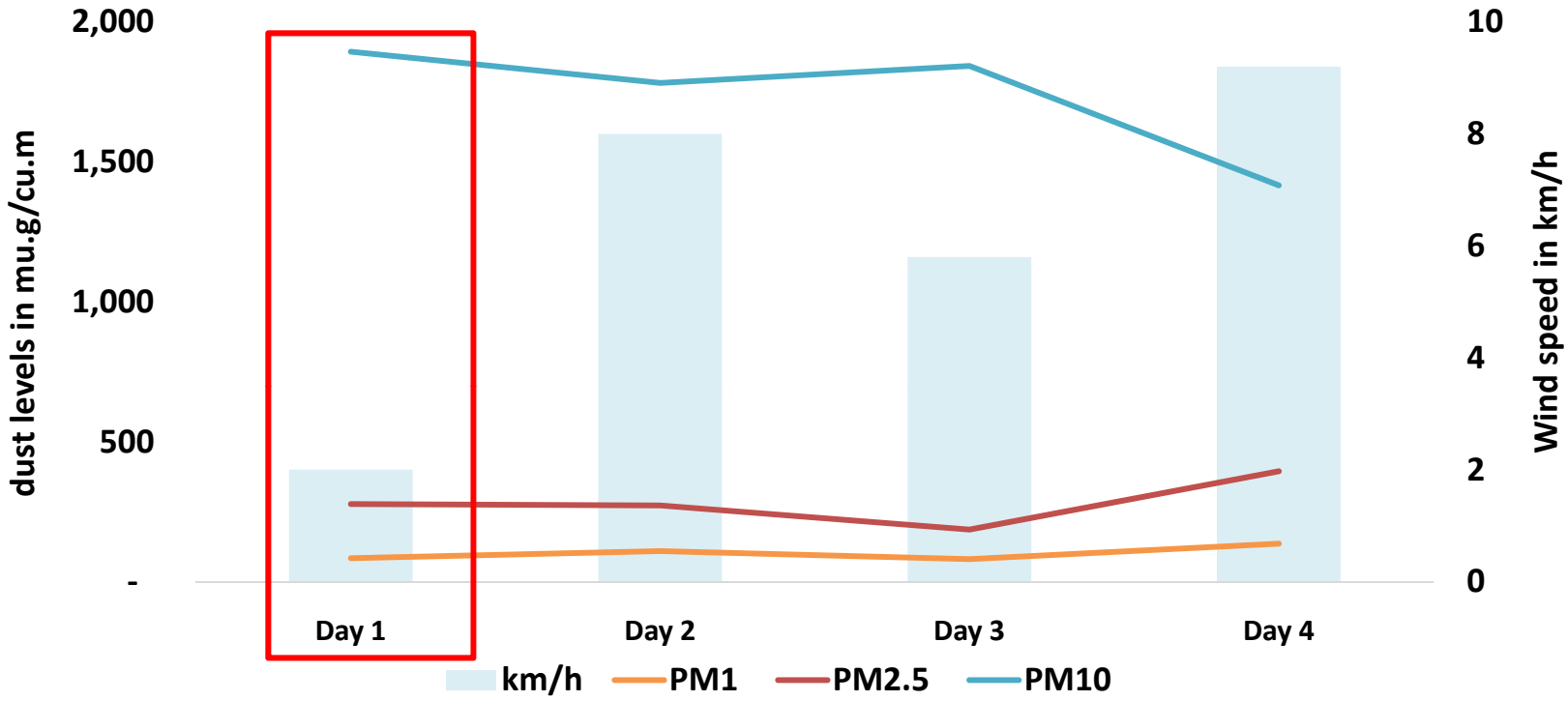
(Monitoring Period – 17/05/2018 to 21/05/2018)

(DG set under operation – Day 2 (18/05/2018 between 02:34 and 06:44 hrs))



- PM10 max levels increased from 250 to 500 ug/N.cu.m during DG operations, post DG operations the levels remained ~300 ug/N.cu.m over 2 hrs.
- After the DG set running for 2 hours, the average for rest of the time is more than 450 for rest of the 2 hours.

New Colony – Analysis 1

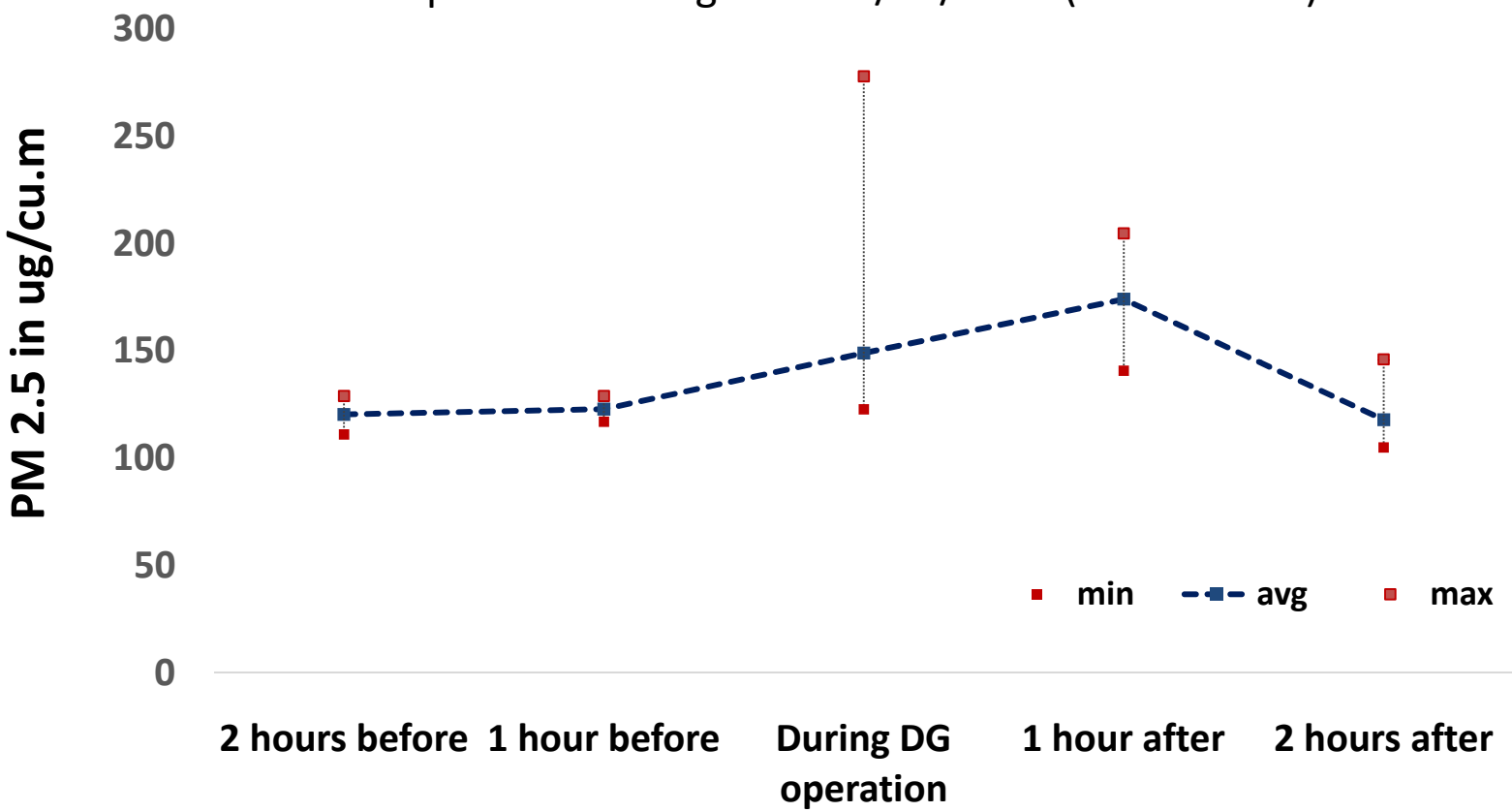


- Monitoring period - 23/05/2018 to 27/05/2018
- DG Set - 64 kVA GENSET (In an individual house powering a commercial venture and 3 houses)
- DG operation timing – On 23/05/2018 (04:07-07:30).

New Colony – Analysis

Monitoring period - 23/05/2018 to 27/05/2018

DG operation timing – On 23/05/2018 (04:07-07:30).

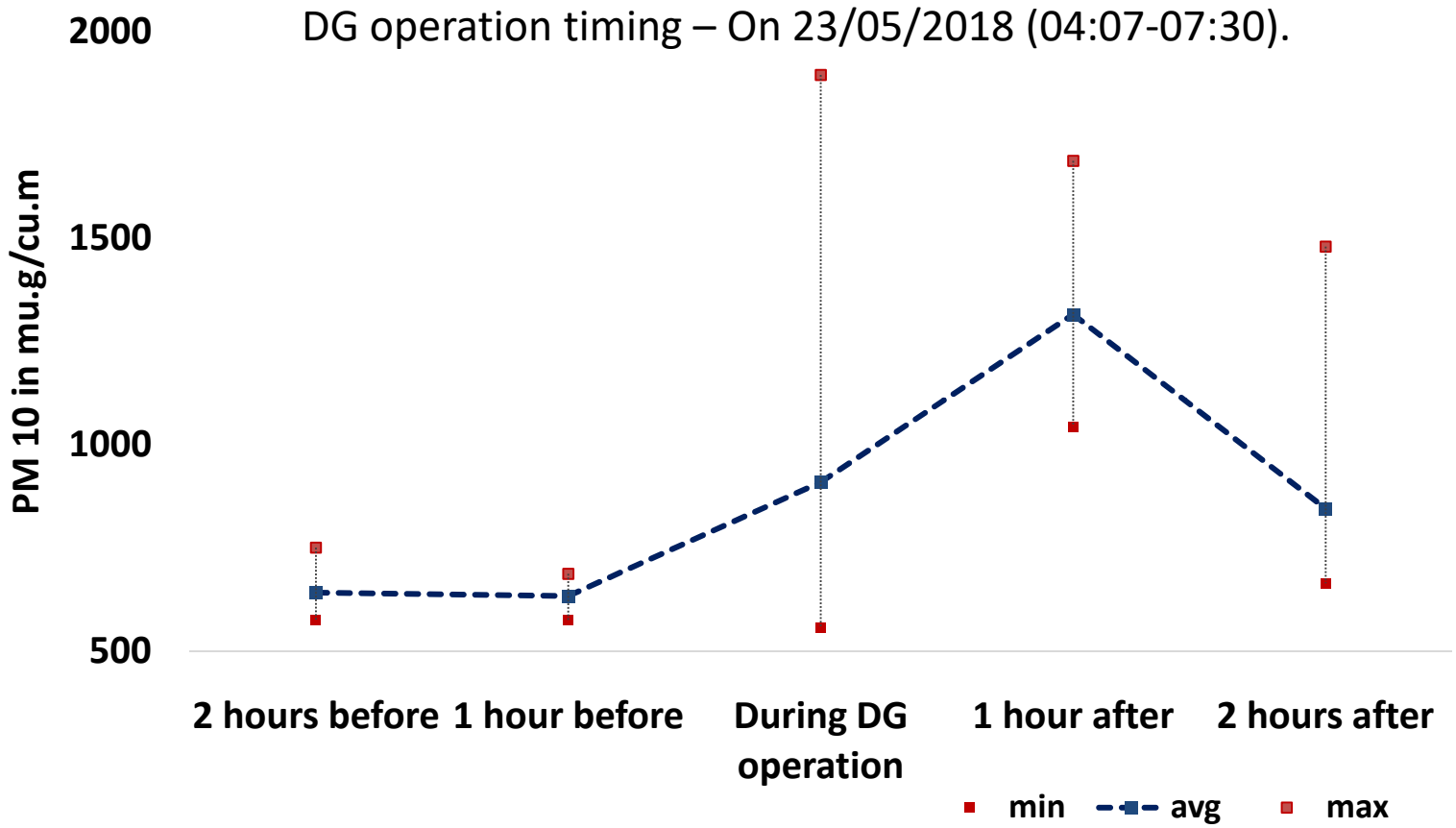


- The average PM 2.5 levels are close to 100 for 4/5 of all the monitored days.
- PM2.5 max levels increased from 130 to 280 ug/N.cu.m and avg. levels from 120 to 150 ug/N.cu.m during DG operations. The avg remains over 150 for next 1 hr.

New Colony – Analysis

Monitoring period - 23/05/2018 to 27/05/2018

DG operation timing – On 23/05/2018 (04:07-07:30).

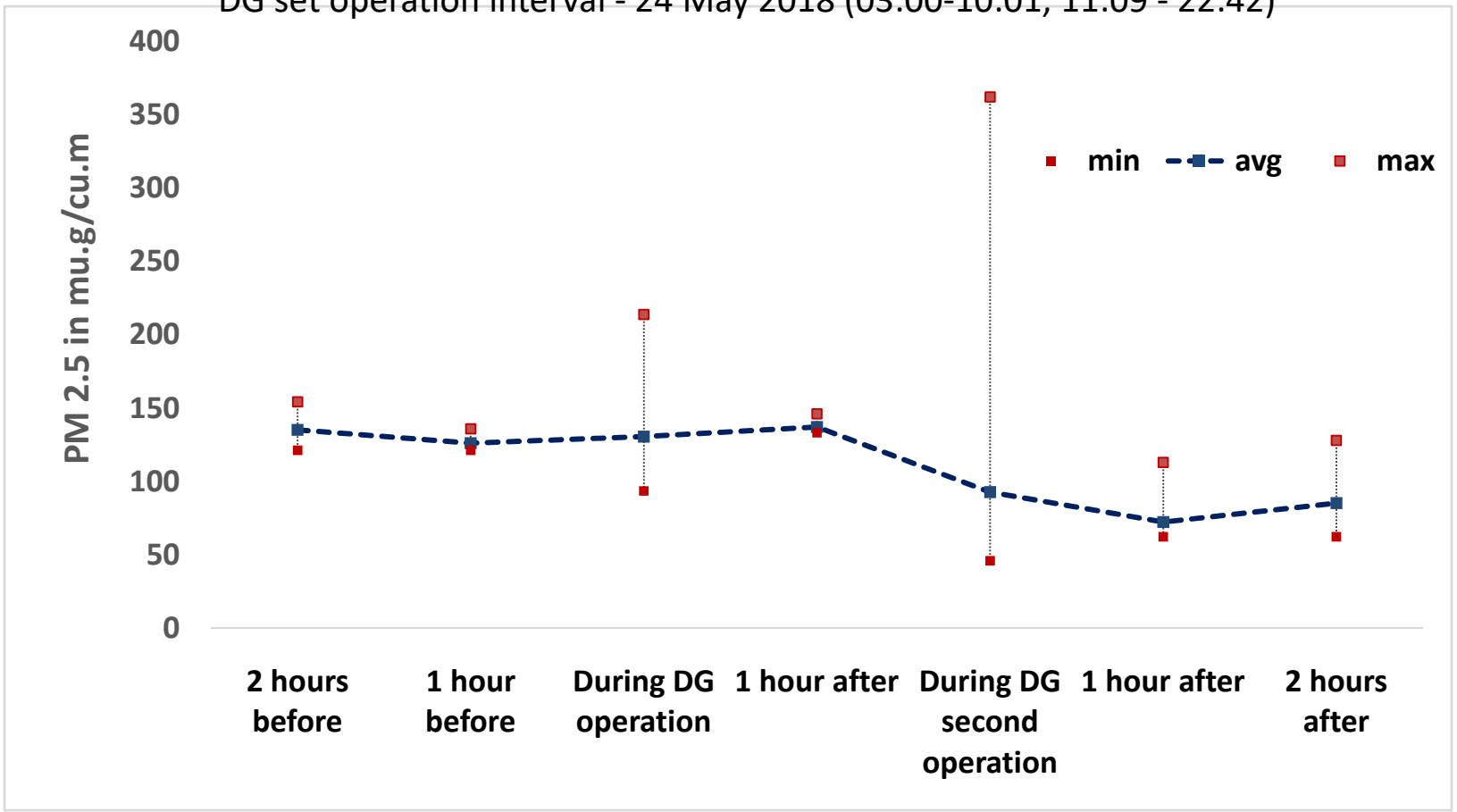


- For this location the average PM 10 levels were higher than 600 for all 5 days.
- PM10 max levels increased from 650 to 1900 ug/N.cu.m during DG operations, post DG operations the levels remained ~1500 ug/N.cu.m over 2 hrs.

Time Residency – Analysis

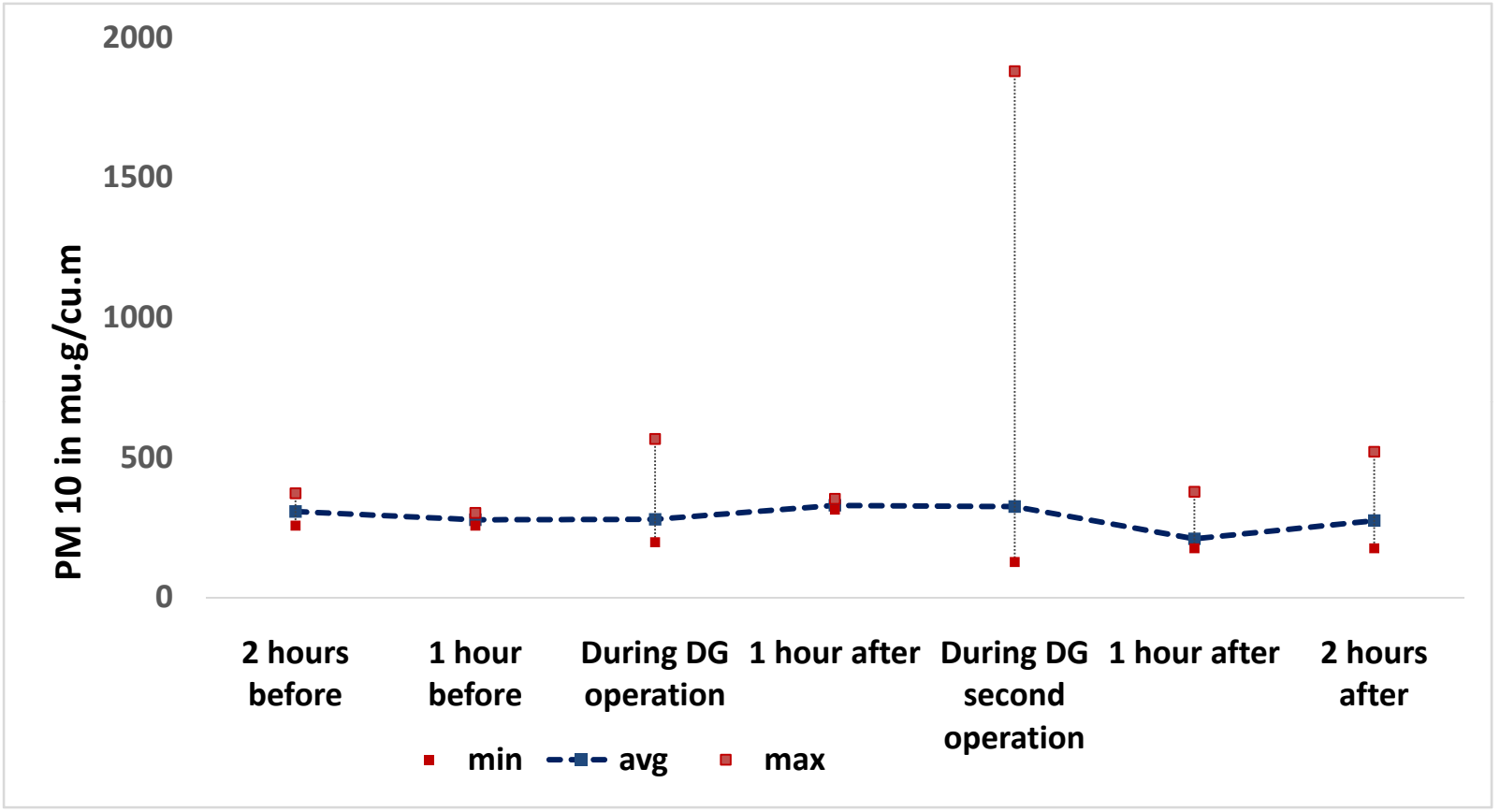
Monitoring period - 22/05/2018 and 26/05/2018

DG set operation interval - 24 May 2018 (03:00-10:01, 11:09 - 22:42)



- PM2.5 max levels increased from 150 to 220 ug/N.cu.m and avg. levels almost similar.

Time Residency – Analysis



PM10 max levels increased from 250 to 500 ug/N.cu.m during DG operations, post DG operations the levels remained ~300 mg/N.cu.m over 2 hrs.

When this highest PM 10 levels were reached, for over 25 mins the levels were above 1000. At the same time PM2.5 was over 250.

Observations - Average PM 2.5 levels

Average PM 2.5	2 hours before	1 hour before	during DG set operation	1 hour after	2 hours after Or Second time DG operation	1 hour after second power cut	2 hours after second power cut	DG size kVA
Devinder Vihar	89	95	111	129	115	-	-	325
New Colony	120	123	149	174	118	-	-	65
Times Residency	135	126	131	137	93	72	85	750

- The average PM2.5 pollution seems to accumulate over the DG operation time and the pollution levels are higher for next one hour.
- Even small size DG contributes to pollution significantly (15-20% increase in PM2.5 levels) if operated for more than two hours.
- Evidently even in the worst polluted locality of Gurgaon - New Colony - the pollution level increase due to DG set operation was clearly evident.
- The average levels of PM2.5 during the hour after DG operation is more than double the safe values.

Observations- Maximum PM 2.5 levels

Maximum PM 2.5	2 hours before	1 hour before	during DG set operation	1 hour after	2 hours after Or Second time DG operation	1 hour after second power cut	2 hours after second power cut	DG size kVA
Devinder Vihar	122	122	164	156	156	-	-	325
New Colony	129	129	278	205	146	-	-	65
Times Residency	154	136	214	146	362	113	128	750

- The maximum PM 2.5 levels shoot up during DG operation.
- The maximum values increase from 35% to 250% at different locations.
- These maximum values have significance as close range of such values persist for more than 15 mins at a time.

Observations - Average PM10

Average PM 10	2 hours before	1 hour before	during DG set operation	1 hour after	2 hours after Or Second time DG operation	1 hour after second power cut	2 hours after second power cut	DG size kVA
Devinder Vihar	220	190	235	296	269	-	-	325
New Colony	642	633	909	1314	845	-	-	65
Times Residency	306	277	278	328	324	209	274	750

- The average PM 10 levels are highest in 1 hour after the DG operation shuts down.
- The average PM 10 levels one hour before and after the DG operation time has been doubled in New Colony.
- DG operation significantly contributes to PM10 pollution.

Observations - Maximum PM 10

Maximum PM 10	2 hours before	1 hour before	during DG set operation	1 hour after	2 hours after Or Second time DG operation	1 hour after second power cut	2 hours after second power cut	DG size kVA
Devinder Vihar	300	247	500	352	352	-	-	325
New Colony	751	687	1894	1686	1479	-	-	65
Times Residency	372	302	566	352	1880	377	520	750

- The maximum PM10 levels are 5 to 19 times more than the safe limits.
- The case of Times Residency brings out the relation of pollution to the DG set operation time if dilution time is negligible.

Shifting to SRT

1. Economically more viable

A CSE study has already established that SRT are have economic benefits over DG set operations

2. Potential

The potential of the SRT in Gurugram is immense and there is a lack of progress in this direction

3. DG set pollution study

The pollution generated by DG sets is very significant and have adverse impact on environment and health.