INTRODUCTION
Foreca currently forecasts road weather conditions for approximately 200,000 km of roads with around 1500 road weather stations, mostly in Northern Europe. Some of our customers have raised the issue of “too much data”. Especially inexperienced supervisors are at times overwhelmed by the amount of information available in the decision support systems.

The maintenance recommendations described in this presentation are Foreca’s response to the too much data issue. We have created a recommendations engine that can summarize the maintenance situation in a couple of clear sentences. The recommendations have been formulated with personnel training in mind and provide an overview of the expected maintenance tasks with some specific advice. Instead of just being “do that” commands, the texts include the rationale behind the action, i.e. “because of this, do that”. This also makes it easier for users to evaluate the relevance of the recommendations to the operational situation.

During the winter 2015-2016, selected pilot customers have evaluated Foreca’s maintenance recommendations in two very different settings:
1. a meteorologist-supervised area
2. an area with completely automated forecast production with no meteorologist intervention

METHODS
The METRo road weather model is used to predict the sequence of road weather events for the next 24 hours. Events for the past 12 hours are obtained from earlier predictions. This 36-hour sequence of road weather events is used as input for the recommendations engine, which identifies an optimal sequence of maintenance actions. As of now, the system includes 46 different actions, such as checking meltwater, plowing, personnel break, etc.

There are two separate recommendations engines: one for roads where chemicals can be used and another for roads where salt use is not allowed, e.g. due to ground water protection.

To test the impact of nowcasting on the recommendations, two parallel experiments were made, both using atmospheric forecasts from the SMHI HIRLAM (6-hourly, 3 h latency), and the other additionally using automatic nowcasting based on radar and Meteosat-PRIME cloud analyses.

RESULTS
Customer feedback of recommendations was positive for the area with meteorologist supervision. For the area with completely automated forecasts we received some negative feedback, which was at least partly traced to failed snow forecasts, see case 4 for an example.

Numerical verifications show that the road surface temperatures were improved significantly by the recommendations, see case 4 for an example.

CONCLUSIONS
The recommendations engine is a great help in meteorologist-supervised markets, but further refinements are needed for radar processing before completely automated use is feasible. Cloudiness nowcasts can be endorsed without hesitation.

FUTURE WORK
With the increasing availability of real-time maintenance action data from the fleet, it will become feasible to base the recommendations on the real sequence of maintenance actions that have already been performed.

REFERENCES
Crevier, L.-P., and Y. Delage. METRo: A New Model for Road-Condition Forecasting in Canada.

Computer Generated Maintenance Recommendations with and without Automatic Nowcasting
Samu Karanko, Kati Saarikangas, Petri Takala – Foreca Ltd
Henry Tennberg – RoadMeteo Oy