In [4]:

```
data.time = pd.to_datetime(data.time)
dayTimeDict = {0:'night',1:'night',2:'night',3:'night',4:'night',5:'night',6:'morning',7:'mornin
g',8:'morning',9:'morning',10:'morning',11:'morning',12:'morning',13:'noon',14:'noon',15:'noon',
                        16:'noon',17:'noon',18:'noon',19:'night',20:'night',21:'night',22:
'night',23:'night'}
data.loc[:,'timeOfDay'] = data.time.map(lambda x: int(str(x)[11:13])).map(dayTimeDict)
data.loc[:,'hour'] = data.time.map(lambda x: int(str(x)[11:13]))
data.loc[:,'day'] = data.time.map(lambda x: str(x)[:10])
data = data.drop_duplicates()
data
```

Out[4]:

	unit	time	Events	timeOfDay	hour	day
0	D7NC3109	2017-11-22 13:16:07	INOP4 Car Door Open Command Failure	noon	13	2017-11-22
10	D7NC3109	2017-11-22 13:48:01	ALARM_CLEAR	noon	13	2017-11-22
11	D7NC3113	2017-11-22 14:48:06	INOP7 Hoistway Safety Chain Failure - Car Active	noon	14	2017-11-22
13	D7NC3113	2017-11-22 14:53:57	ALARM_CLEAR	noon	14	2017-11-22
14	R2NJ0425	2017-11-22 09:24:29	INOP8 Hoistway Safety Chain Failure - Car Idle	morning	9	2017-11-22
23	R2NJ0425	2017-11-22 09:32:18	ALARM_CLEAR	morning	9	2017-11-22
24	D7NC3111	2017-11-23 11:03:53	INOP4 Car Door Open Command Failure	morning	11	2017-11-23
34	D7NC3111	2017-11-23 11:08:56	ALARM_CLEAR	morning	11	2017-11-23

2017/11/22 - 2017/11/23

General Metrics

1.Alarm Distributions - group by events

In [5]:

```
# data_tmp exclude clear events
data_tmp = data[data['Events'] != 'ALARM_CLEAR']
```
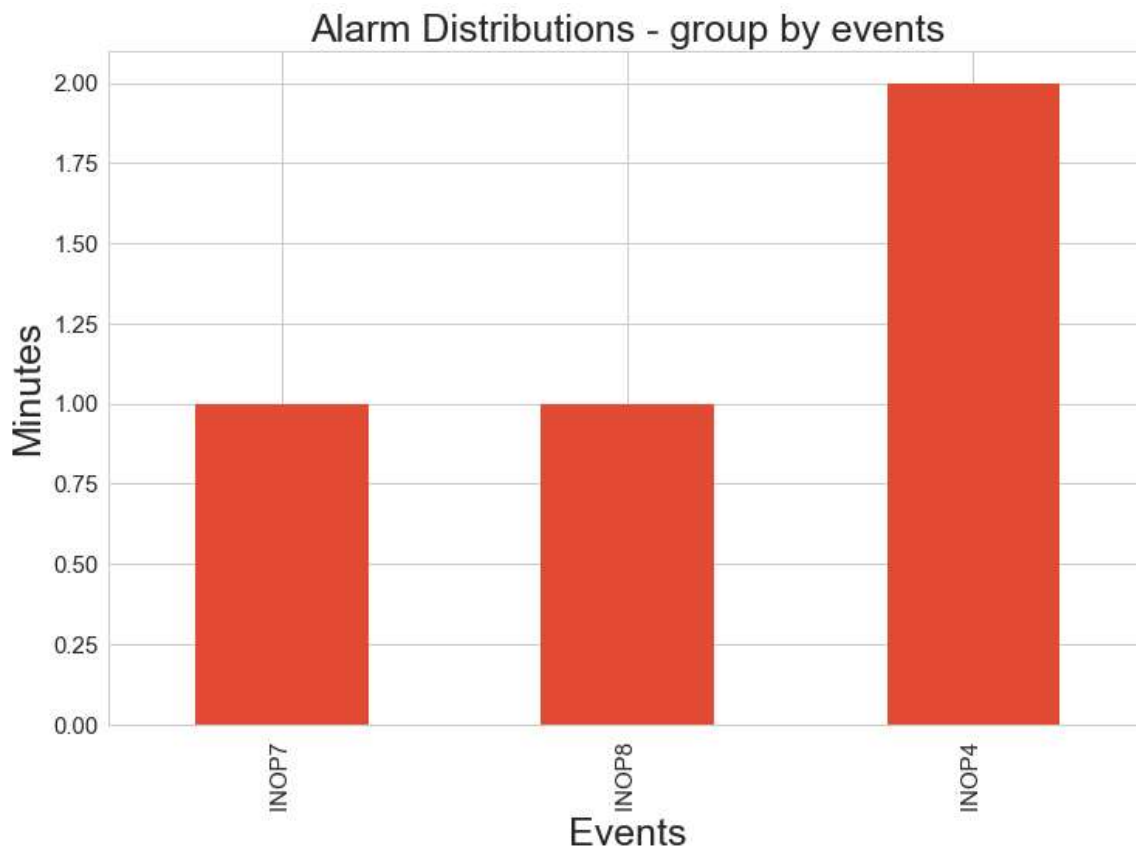
In [6]:

```
data_tmp['Events'] = data_tmp['Events'].map(lambda x: x[:6])
var = data_tmp.groupby('Events')['Events'].count().sort_values()
var.plot(kind='bar')
plt.xticks(fontsize=15)
plt.yticks(fontsize=15)
plt.ylabel('Minutes',fontsize=25)
plt.xlabel('Events',fontsize=25)
plt.title('Alarm Distributions - group by events',fontsize=25)
```

Out[6]:
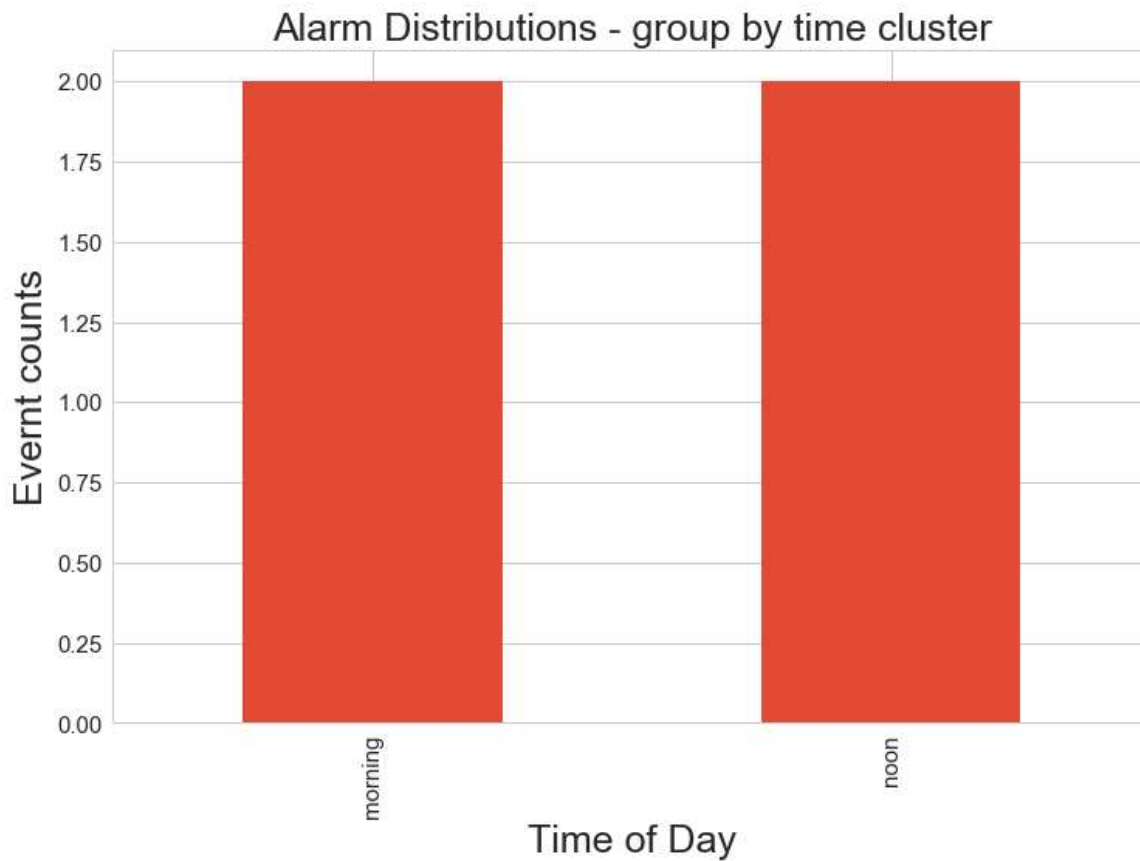
<matplotlib.text.Text at 0xde6aa58>

2.Alarm Distributions - group by timeCluster

In [7]:

```
var = data_tmp.groupby('timeOfDay')['Events'].count().sort_values()
var.plot(kind='bar')
plt.xticks(fontsize=15)
plt.yticks(fontsize=15)
plt.ylabel('Evernt counts',fontsize=25)
plt.xlabel('Time of Day',fontsize=25)
plt.title('Alarm Distributions - group by time cluster',fontsize=25)
```

Out[7]:

<matplotlib.text.Text at 0xe0d8be0>

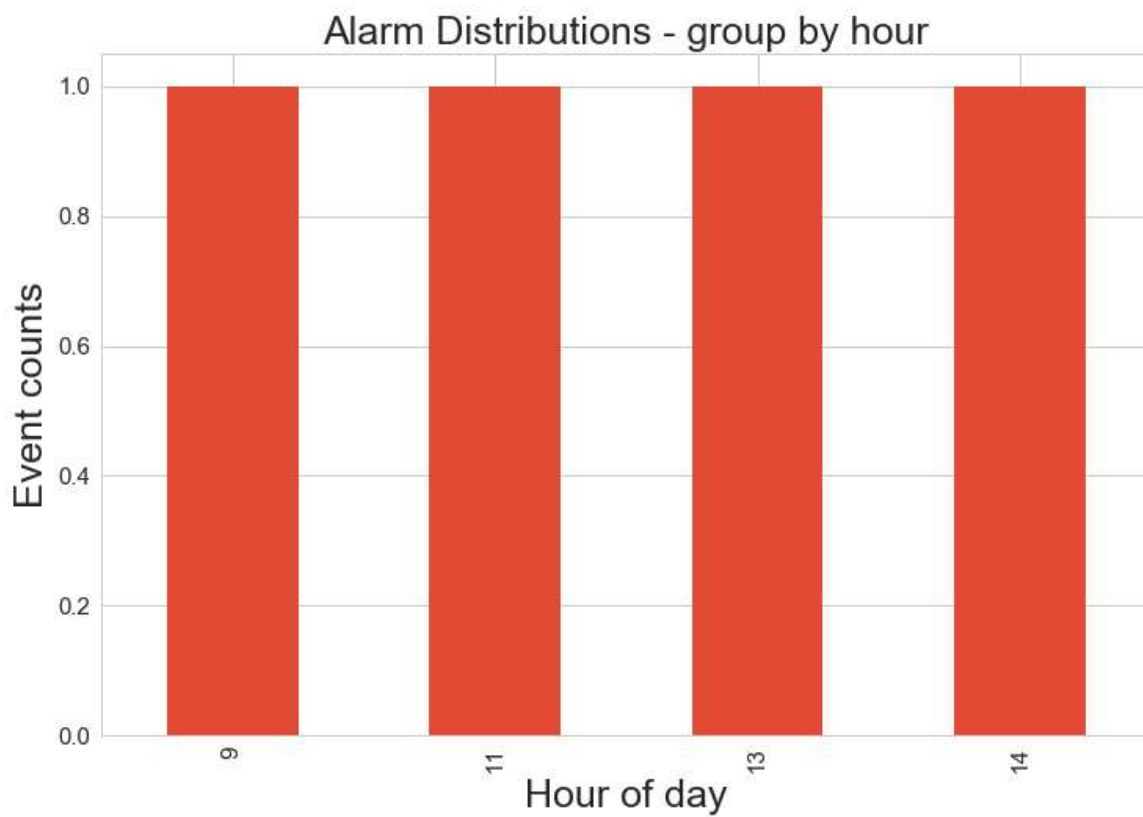## 3.Alarm Distributions - group by hour

In [8]:

```
var = data_tmp.groupby('hour')['Events'].count().sort_values()
var.plot(kind='bar')
plt.xticks(fontsize=15)
plt.yticks(fontsize=15)
plt.ylabel('Event counts',fontsize=25)
plt.xlabel('Hour of day',fontsize=25)
plt.title('Alarm Distributions - group by hour',fontsize=25)
```
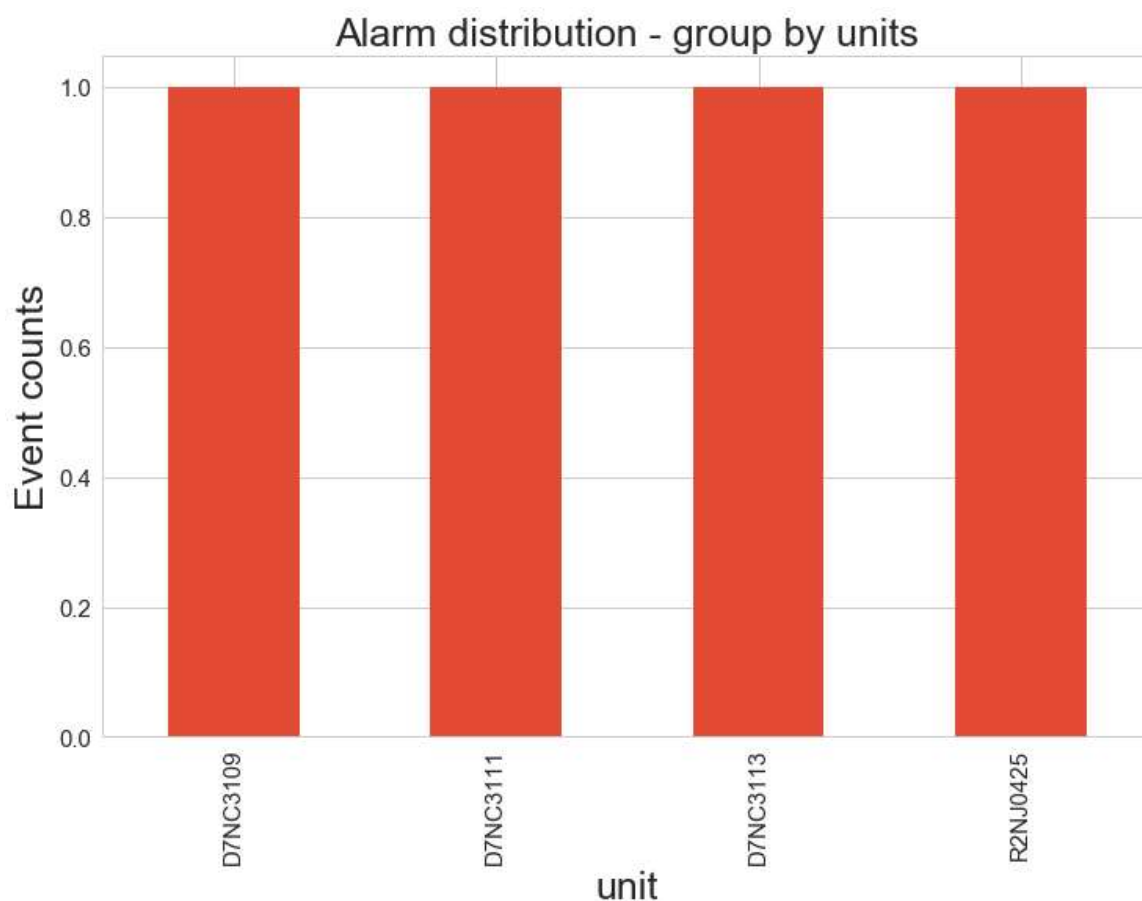
Out[8]:

<matplotlib.text.Text at 0xe235c18>

4. Alarm distribution - group by units

In [9]:

```
var = data_tmp.groupby('unit')['Events'].count()
plt.xticks(fontsize = 15)
plt.yticks(fontsize = 15)
plt.xlabel('Unit',fontsize=25)
plt.ylabel('Event counts',fontsize=25)
plt.title('Alarm distribution - group by units',fontsize=25)
var.plot(kind='bar')
```

Out[9]:

<matplotlib.axes._subplots.AxesSubplot at 0xe130908>

Highlight - D7NC3111

Alarm elapse time distribution - Unit