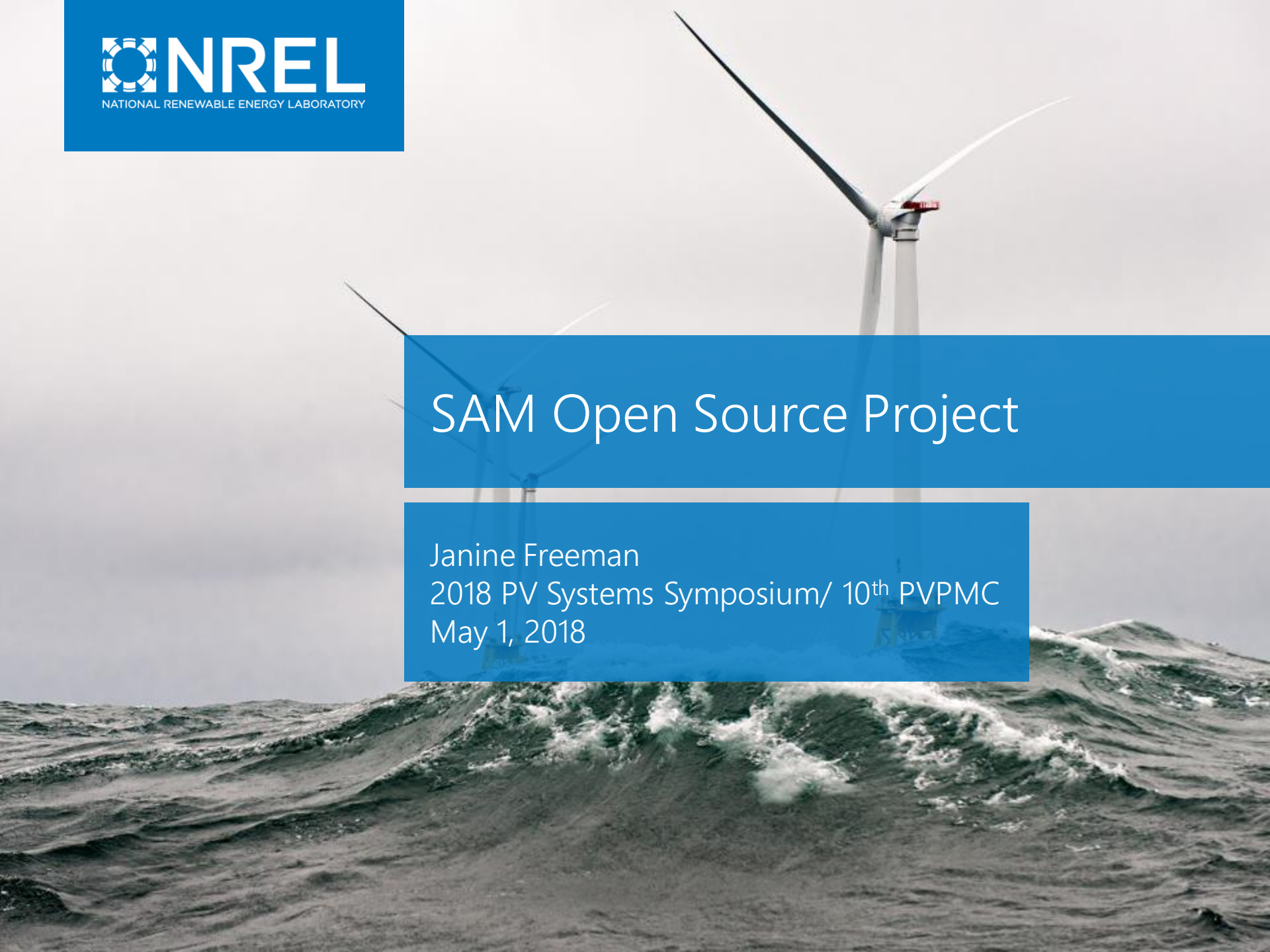

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

SAM Open Source Project

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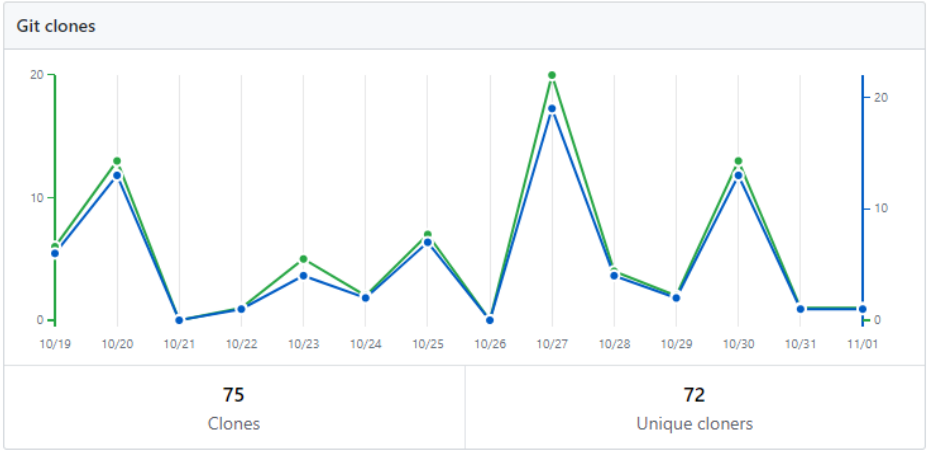
Why Open Source?

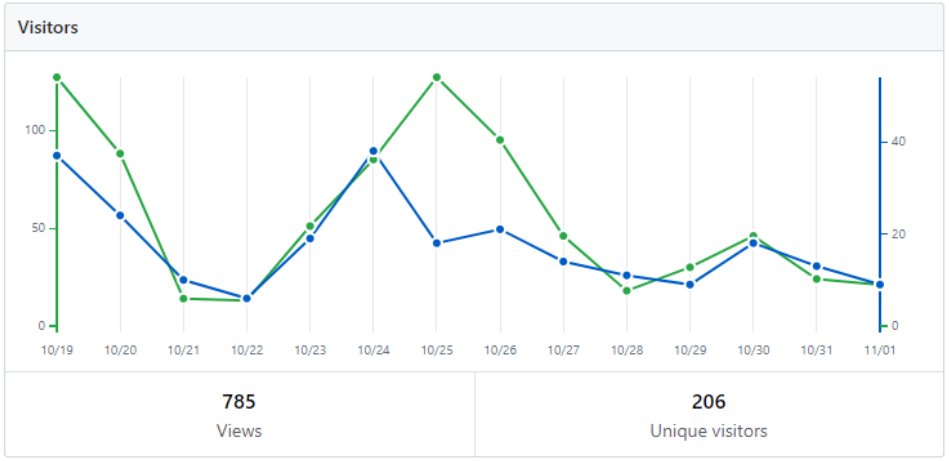
- ✓ Transparency
  - ✓ Look at the underlying model implementation
- ✓ Flexibility
  - ✓ See the effect of a new module temperature model on a whole simulation
  - ✓ Tweak a model to represent a new or unusual configuration
- ✓ Collaboration
  - ✓ Add new technology models, sub-models, dispatch algorithms
- ✓ New ways to interact with the community
  - ✓ NREL will continue to release public desktop & SDK versions, but now we can include user-contributed models and it's easier to share work in progress

Are people interested in open source software?

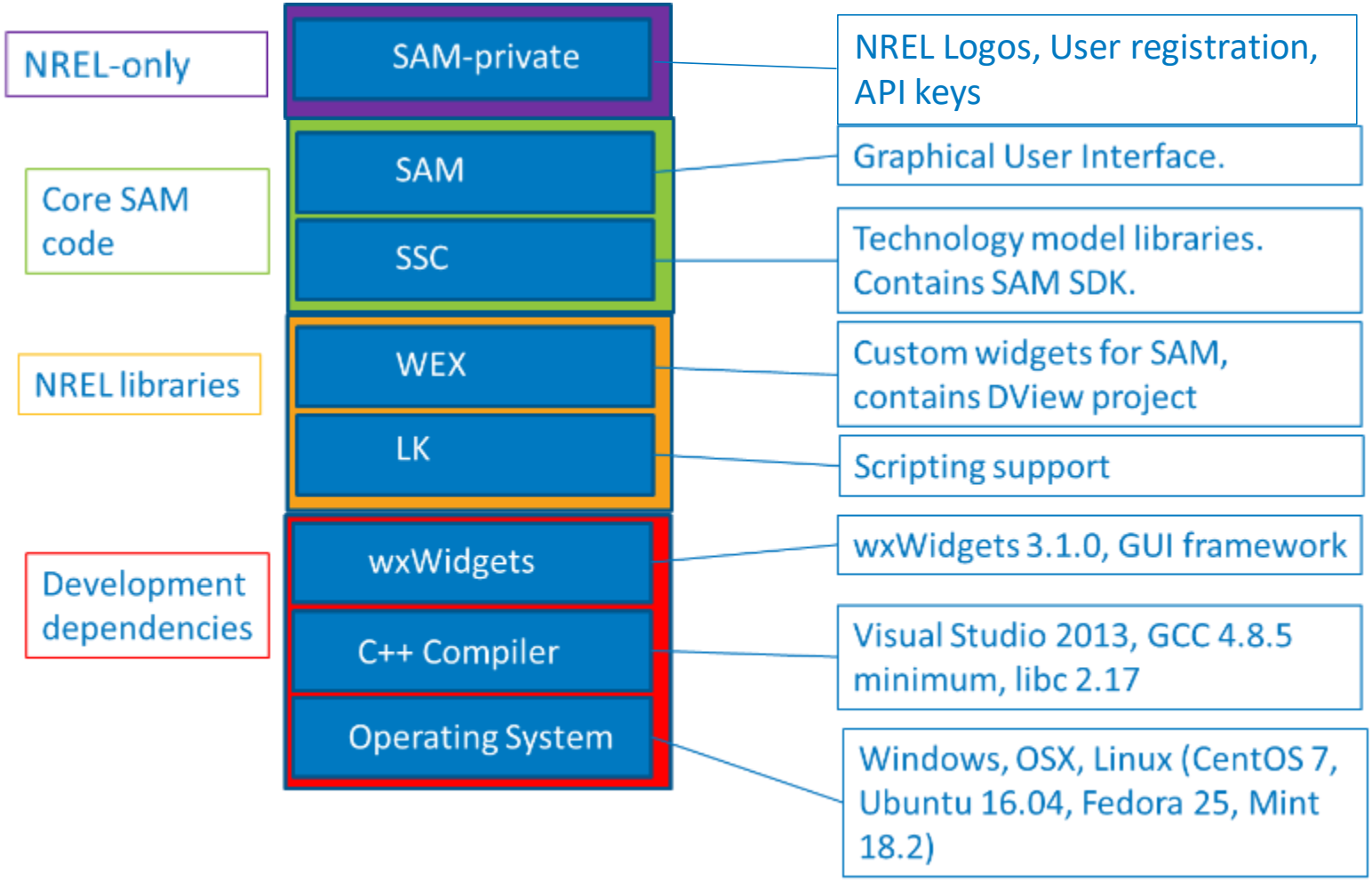
Table 2: Open Source Usage Statistics 1/1/18 – 3/31/18

Repository	Unique Visitors	Views	Unique Cloners	Clones
LK	162	535	270	418
WEX	967	2376	244	326
SSC	552	3426	231	268
SAM	823	3533	123	132





SAM Code Structure



License Structure

LK and WEX repositories: MIT-type license

SSC and SAM: Mixed MIT-type license and GPLv3 license

- **Commercial entities: MIT-type license**
  - Encourages companies to use SSC and SAM as a foundation for growing their business and leveraging high-quality PV modeling algorithms
- **Research and non-profit entities: GPLv3 license**
  - Encourages research institutions to share back new innovations or make them publicly available so the whole community benefits

Contribution Process

- ✓ Read the contribution policy (still a work in progress!)
  - ✓ https://github.com/NREL/SAM/blob/develop/CONTRIBUTING.md
- ✓ Agree to the contribution policy via email
- ✓ Scope your contribution
  - ✓ Coordinate with our team if it's a large feature!
- ✓ Add your model
- ✓ Build and test it
- ✓ Submit a pull request

NREL's Open Source Work

- ✓ Incorporating Doxygen for generating documentation from annotated code

```
/**
 * \enum Opcode
 * Operation codes used by interpreter
 */
enum Opcode {
    ADD, SUB, MUL, DIV, LT, GT, LE, GE, NE, EQ, INC, DEC, OR, AND, NOT, NEG, EXP,
    PSH, ///< push
    POP, ///< pop
    DUP, NUL, ARG, SWI,
    J, ///< if-elseif-else
    JF, JT, IDX, KEY, MAT, WAT, SET, GET, WR,
    RREF, ///< right-hand reference
    LREF, ///< left-hand reference
    LCREF, ///< left-hand constant reference
    LGREF, ///< left-hand global reference
    FREF, CALL, TCALL, RET, END, SZ, KEYS, TYP, VEC, HASH,
    __MaxOp };
struct OpCodeEntry { Opcode op; const char *name; };
extern OpCodeEntry op_table[];
```

- ✓ Adding GoogleTest framework and building up unit tests

```
C:\Code\ssc\build_vs2017\x64\Release\test.exe
Running main() from gtest_main.cc
[==========] Running 52 tests from 21 test cases.
[----------] Global test environment set-up.
[----------] 1 test from LithiumIonBattery
[ RUN      ] LithiumIonBattery.LithiumIonCapacityUnitTest_lib_battery
[       OK ] LithiumIonBattery.LithiumIonCapacityUnitTest_lib_battery (0 ms)
[----------] 1 test from LithiumIonBattery (0 ms total)

[----------] 1 test from LeadAcidBattery
[ RUN      ] LeadAcidBattery.LeadAcidCapacityUnitTest_lib_battery
[       OK ] LeadAcidBattery.LeadAcidCapacityUnitTest_lib_battery (0 ms)
[----------] 1 test from LeadAcidBattery (1 ms total)

[----------] 3 tests from NightCaseIrradProc
[ RUN      ] NightCaseIrradProc.solarposTest_lib_irradproc
[       OK ] NightCaseIrradProc.solarposTest_lib_irradproc (0 ms)
[ RUN      ] NightCaseIrradProc.incidenceTest_lib_irradproc
[       OK ] NightCaseIrradProc.incidenceTest_lib_irradproc (0 ms)
[ RUN      ] NightCaseIrradProc.CalcTestRadMode0_lib_irradproc
[       OK ] NightCaseIrradProc.CalcTestRadMode0_lib_irradproc (0 ms)
[----------] 3 tests from NightCaseIrradProc (0 ms total)
```

Learn More:
https://sam.nrel.gov/opensource

Thank you! Questions?

Janine Freeman - project lead, photovoltaic and wind models
Nick DiOrio - code architecture, battery storage models
Nate Blair - emeritus lead, financials, costs, systems
Steve Janzou - programming, utility rate structures (subcontractor)
Paul Gilman - user support and documentation (subcontractor)
Ty Neises - concentrating solar power models
Mike Wagner - concentrating solar power models

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